

During the past twenty years, the personal computer has cooleed from an oddity reserved for hobbyists to one of the central technologies of our time. The one company most responsible for this transformation is Apple Computer. As the first firm to introduce a PC in a molded plastic case, the first to offer a mass-market computer with a graphical user interface, the first to offer desktop publishing, multi-media and handheld computing, and the first to incorporate a consistent industrial design language in all of its products, Apple has spearheaded or popularized nearly every design element found on the modern PC. In the process, Apple has built the most creative and successful industrial design group in the world—responsible for more design awards in recent years than any other Fortune 100 firm.

To celebrate Apple's twentieth anniversary, *AppleDesign* provides a rare inside look at the Industrial Design Group, examining the role this small team of creative individuals has played in the rise of Apple from a Silicon Valley garage to a billiondollar corporation. It details the formation of the Group, outlines their method for turning great ideas into even greater products, reveals many design concepts and products that never reached the marketplace, and offers a glimpse at the triumph and turmoil that results when creative desire meets (and occasionally collides with) corporate reality.

With more than 400 color illustrations and detailed discussion of more than 100 products, design concepts and works-inprogress, *AppleDesign* provides the most thorough examination of a corporate design group ever published.

From the Macintosh to the PowerBook, the Newton MessagePad, the eMate and the just-released Twentieth Anniversary Macintosh, Apple's designers have given us some of the most compelling and enduring products of our time. Their work not only enriches the lives of more than 50 million Apple users worldwide, it influences the computer



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THE ANNALS OF CORPORATE DESIGN, FEW COMPANIES HAVE EQUALLED **ple Computer** in the scope of their achievement. Rising **m its first** headquarters in a Silicon Valley garage in 1976 to **ranks** of the Fortune 100 in 1979, Apple has become one **the most** influential companies in the world by setting a **que standard** in the design of its products. By paying close **ention** to the shape of detailing of its first mass-market per**tal computer**, the Apple II, set in motion a series of events **t later gave** rise to the most creative corporate design group **world** has ever seen.

he success of the personal computer was due first and forest to technology—the microprocessors, memory chips, and er components that Steve Wozniak used to design the inside that first Apple product. Yet almost as important was the sim-, but crucial, observation made by his partner Steve Jobs: that order for Apple's computer to succeed, it had to have qualithat ordinary people could understand and enjoy.

ntuitively, Jobs understood that how people respond to a induct is determined as much by its look and personality as by features and performance. That decision led Jobs to pick the lustrial designer Jerry Manock to give the Apple II the right appe and detailing, which in turn played an important role in product's success. Fueled by sales of the Apple II, Jobs, nock and a small team of developers later created a much ger success called Macintosh, which still directs Apple's prodtiphilosophy to this day. Once the Macintosh had been fined, a world-class design consultancy was then brought in give Apple's products a more unified look, after which a ong in-house industrial design group was established, giving firm a quality of design that is now unsurpassed.

rom the factory floor to the CEO's office, there is an inherunderstanding that good design ultimately serves the cusner by making the things Apple sells look and perform bet-. That makes good design a strategic rather than aesthetic cision—one that business leaders everywhere would do well emulate.

The evidence of this decision is everywhere: from the architece on Apple's sprawling campus, to their advertisements and nuals, the graphics on their shipping boxes, and the products emselves. "We're expected to contribute to Apple's business ccess on a daily basis," says Jonathan Ive, director of the lustrial Design Group. "At the highest level, design is consided a core function, as important as hardware and software velopment."

The ability of Apple's designers to shape products is legdary. For this reason, business schools around the world use g projects in their case studies to teach future managers the ht way to harness a company's most precious asset: its creve potential. But the real essence of the Industrial Design oup's work cannot be learned from a case study. Only by entering the non-descript stucco building in Cupertino, walking past the security door, and surveying the full range of their work will you begin to understand what they do. The talent and spirit at work within IDg's walls is so strong that even Apple's chairman Gilbert Amelio views the Group with a certain awe. This gives IDg not only a special place within the company but an almost mythic stature within the design profession. One that is well deserved.

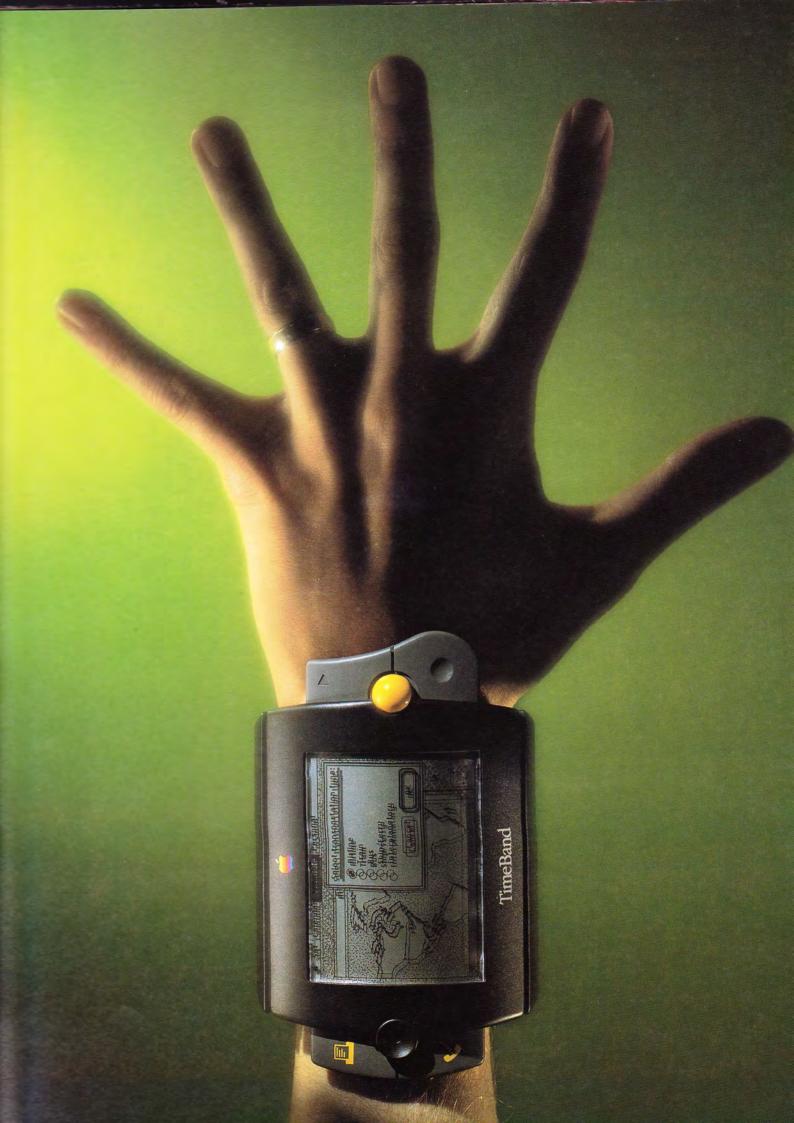
Despite their fame, the actual work of the Design Group has, until now, been shrouded in secrecy. This is understandable in a business as fiercely competitive as the computer industry. Thus, we should be thankful that on the eve of their twentieth anniversary Apple would allow its designers, engineers and other specialists to discuss their work. Much has already been written about Apple's crown jewels-the Apple II, the first Macintosh, the first PowerBook, the follow-up version known as Blackbird, and the recently unveiled Twentieth Anniversary Macintosh. But less is known about the concepts that precede a finished design, which show us how a good idea can be honed into greatness. Even less is known about concepts that Apple's designers urged the company to develop, but were not. These nearly-forgotten works with names like BigMac, Jonathan, Columbo, Boombox, Figaro and Nautilus often equal and occassionally surpass the products that Apple actually released. For this reason, the company has kept most of these discarded ideas a secret-until now. Seen as a group, they form a "shadow" history of Apple's product development, a subtext to the designs we already know. We see many of them for the first time.

The text and illustrations that follow provides a rare inside look at how a great corporation designs and develops its products. The philosophy and process behind each product is detailed as well as the clashes of personality and vision that sometimes resulted. Along the way, the book resurrects two nearly-forgotten figures, Jerry Manock and Terry Oyama, who designed the original Macintosh. It details the process that led to the SnowWhite design language, examines the fertile (and sometime tumultuous) relationship between Apple and frogdesign, charts the formation of Apple's in-house design group under Bob Brunner and the rise of a new sensibility under IDg's current director Jonathan Ive.

As Apple enters its third decade, we see it evolving into a new organization, as different from its previous incarnation as that company was from the one that preceded it.

With Steve Jobs now back at the firm he founded and Gilbert Amelio firmly at the helm, there is more hope for Apple than at any time in memory. As always, the Industrial Design Group will do their part to carve out a future for Apple and its 50 million users by crafting the most evocative and meaningful computer products in the world. One can only wonder what these talented individuals will come up with next.





When writing a work of non-fiction, there is an old saying: "The first time a story is told is truth. The second time is fiction." With an organization as large and mythical as Apple Computer, I sometimes wondered whether I was hearing fact or fantasy, only to discover that the more outlandish the story or more improbable the fact, the more likely it was to be true. In the course of my research, I interviewed dozens of individuals who played a part in the design of Apple's products. Unfortunately, I could not find everyone. Nor would everyone speak to me. Those who did revealed a world that remains hidden even to many professionals, describing in detail how great industrial designs are transformed into even greater products. Piecing this story together forced me to rely upon the recollection of a great many people, both inside and outside the firm, without whom this book could not have been written. To those I list below, I offer my thanks.

Firstly, to the current members of the Apple Industrial Design Group: especially its director Jonathan Ive; Daniele DeIuliis; Thomas Meyerhöffer; Chris Stringer; Jay Meschter: Bart Andre; Cal Seid; Marc van de Loo; Danny Coster; Richard Howarth and Doug Satzker; Ken Provost and Bob Bellicitti; Ron Moller: Jane Taylor, Barbara Thompson, Michelle Burns, and Ria Monroe for their encouragement and assistance.

Former members of the Apple Industrial Design Group: especially Bob Brunner, without whom this book could not have begun; Ray Riley; Gavin Ivester and Lawrence Lam; Susanne Pierce; Tim Parsey: Masamichi Udagawa; Larry Barbera; Jim Stewart, Mark Pruitt, Grant Ross, Jr.; Tom Jacobson; Mike Pizzuti and Rob Barnette. To the early designers: Jerry Manock; Terry Oyama; Bill Dresselhaus and Ken Campbell, Clive Twyman, David Hodge, Rob Gemmell and Bill MacKenzie. Current and former Apple product designers, toolmakers, engineers and savants: Richard Jordan, Tom Bentley, Laszlo Zeidek, Burrell Smith, Ben Pang, Steve Balog, Bill Bull, Robert Elliman, John E. Johnston, Wil Oxford, Dexter Francis, Mike Milo, Betsy Diaz, Don Porter, John Tang, Julie McDonald, Pat Jackson, Wayman Lee, Mike Dhuey, Brian Berkeley, John Fitch, Jon Krakower, Harold Welch, Prabir Sarkhar and Steve Wozniak, who will always belong in a class by himself. Current and former Apple executives who shared their time, including: Satjiv Chalil, H.L. Cheung and Howard Lee; John Sculley, Jean-Louis Gassée, Michael Spindler and chairman and CEO, Dr. Gilbert Amelio; marketing managers Robert Kondrk, John Kelly, Dave Turnbull and Andrew Scoular; Kim Cooper and Kevin Saul at Apple Legal; Jim Oliver; Katie Cotton, Gabi Schindler and Tami Begasse in Corporate Public Relations; and photographers Pam Stanton, Beverley Harper and Daniel De Souza.

Thanks also go to Chee Pearlman at *ID* Magazine, who gave the project a gentle nudge early on; Hartmut Esslinger, for his generosity and trust; Stephen Peart; Tony Guido, Mike Nuttall, Bill Moggridge, Paul Bradley, Mark Biasotti, Chris Lowe, Jim Yurchenco. Naoto Fukasawa, Terry Christensen, Gerard Furbershaw, Jeff Smith, Dave Laituri, Gilbert Wong, Ken Wood, Brad Bissell, Doug Patton, Noland Vogt, Eric Chan, Rick Meadows, Jack Hokanson, Nick Butler, Giuliano Molineri, Mark Johnson, Peter Müller, Sue Booker, Jennette Schwarz, Herbert Pfeifer, Paul Montgomery, Tucker Viemeister, Tom Dair, the staff at the San Francisco Museum of Modern Art, the Museum of Modern Art, New York, the Cooper-Hewitt Museum of American Design, New York, Kristina Goodrich at the Industrial Designers Society of America, David Gresham, Ralph Caplan; Lex Lally, Rocky, plus sources who asked not to be mentioned by name. Final thanks g to Rick English and his staff at Rick English Pictures, whose vision no only brought the designs to life but inspired the project at every stage

At Graphis, I would like to thank Martin Pedersen for his unflinch ing support, my editors Claire Hayden and Kirsten Keppell, Joh Jeheber, Jenny Francis, Jack Crager, and Peggy Chapman. The boo could never have been finished without you.

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Library of Congress Cataloging in Publication Data

Main Entry under title: AppleDesign: The Work of the Apple Industrial Design Group 1. Design—United States—History—20th Century. 2. Apple Computer—Design. 1. Kunkel, Paul. II. Apple Computer, Inc. 97-71233 ISBN 1-888001-25-9 Copyright © 1997 10 9 8 7 6 5 4 3 2 1 150 million years B.C. Dinosaurs roam the Earth

100,000 B.C. Homo sapiens begin using intelligence to further their goals.

5,000 B.C. The abacus, which resembles the arithmetic unit of a modern computer, is developed in China.

2,500 B.C. The water clock is invented in China.

1310 A.D. The mechanical clock is invented in Europe.

1637. René Descartes develops the principles of rational skepticism (His conclusion: "Je pense, donce je suis.")

1692. Blaise Pascal perfects the Pascaline, the world's first automatic calculating machine.

1694. Gottfried Leibnitz perfects the Leibnitz Computer, a calculating machine that multiplies by performing repetitive additions, a technique still used in many modern computers.

1726. Jonathan Swift describes a machine that automatically writes books in *Gulliver's Travels*.

1781. Richard Arkwright builds the first hydraulic spinning factory, which leads to the decline of agrarian-based economy and the rise of the Industrial Revolution.

1805. J.-M. Jacquard devises a method for weaving using a punched cards, an technique that will be employed years later in the development of early computers.

1832. Charles Babbage develops the Analytical Engine, the first device that can be programmed to solve a variety of logical and computational problems.

1890. Herman Hollerith, incorporating ideas from Jacquard's loom and Babbage's Analytical Engine, patents "an electro-mechanical information machine" that uses punched cards. Six years later, Hollerith forms the Tabulating Machine Company, which will later become IBM.

1904. John Ambrose Fleming patents the vacuum tube.

1925. Vannevar Bush and co-workers develop the first analog computer, known as the Differential Analyzer.

1940. The British computer war effort, known as Ultra, creates the first operational computer, codenamed Robinson, which is used to decode messages from the German Enigma code machine.

1944. Howard Aiken completes the first American programmable

computer, the Mark I, which reads and stores programs on punched paper tape.

February 12, 1944. Jerrold Manock, Apple's first industrial design manager (1977-1983) and co-designer of the Macintosh, is born in Los Angeles.

June 5, 1944. Hartmut Esslinger, Apple's second industrial design manager (1983-86), is born in Beurren-Simmersfeld, Germany.

July, 1945. Vannevar Bush publishes the article, "As We May Think," proposing the development of a small computer-like device that can store and manipulate words and pictures.

1946. John Eckart and John Mauchley develop ENIAC, the world's first fully electronic generalpurpose digital computer.

1947. William Schockley, Walter Brittain and John Arden invent the transistor, a tiny solid-state device that functions like a vacuum tube, but at a much faster rate; the transistor launches a revolution in microelectronics that in turn leads to smaller, cheaper, more powerful computers.

1950. Eckan and Mauchley develop UNIVAC, the first commerciallymarket programmable computer.

1952. IBM's first production line computer, the model 701, is marketed for scientific use. When asked how many computers the world would need, IBM chairman T. J. Watson predicted: "No more than three."

1957. The USSR launch Sputnik; in response, the U.S. Defense Department forms the Advanced Research Projects Agency (ARPA) to establish the U.S. lead in science and technology, which fuels computer research.

April 26, 1958. Robert Brunner, Director of the Apple Industrial Design Group (1990-1995) is born in San Jose, California.

1958-59. Jack Kilby and Robert Noyce develop the microchip, which in turn leads to smaller, more powerful computers.

1959. Grace Murray Hopper, an early Mark I programmer, develops COBOL, a computer language that uses standard English words.

1960. Theorist J.C.R. Licklider introduces the concept of interactive computing in his essay "Man Computer Symbiosis." "The hope is that human brains and computing machines will be coupled together ... and that the resulting partnership will think as no human has ever thought..." **1960.** About 600 computers are in use in the United States.

1962. Ivan Sutherland develops SketchPad, a program that enabled the computer and user to interact using graphical representations on a display.

1963. Stanford researcher Douglas Englebart predicts that computers would one day allow "symbols to be arranged, moved, stored [and] operated upon ... in very rapid response ... coupled to a threedimensional color display within which sophisticated images will be constructed, the computer [will] execute a wide variety of processes in response to human direction."

March, 1964. IBM introduces System 360, which solidifies its leadership in mainframes and minicomputers.

June, 1964. Douglas Englebart invents a handheld directional device, called a mouse, for controlling a computer's on-screen interface.

August, 1964. Gordon Moore, one of the founders of Eairchild Semiconductor. predicts that integrated circuits will double in complexity each year; at the same time, the price per unit of performance will fall of half every year. His statement is later known as Moore's Law.

1965. ARPA sponsors a study on a cooperative network of time-sharing computers called ARPANET.

1967. IBM announces that it will no longer sell software and hardware in a single unit; the computer software business is born.

February 27, 1967. Jonathan Ive, Director of the Apple Industrial Design Group (1996-) is born in London.

1967-8. ARPA researchers Alan Kay and Ed Cheadle develop FLEX, the first computer to feature graphics and windowing capability.

1969. ARPANET goes on-line with 4 host computers.

1969. Intel Corporation begins development of the first microprocessor, the 4004.

1970. Xerox funds the Palo Alto Research Center with the goal of developing "the paperless office of the future"; over the next ten years. PARC researchers invent the basic technologies that would launch the personal computer industry.

1970. Bill Fernandez introduces Steve Wozniak to Steve Jobs.

1971. Fred Moore and Gordon French form the HomeBrew Computer Club in Palo Alto, CA. **1972.** Alan Kay develops SmallTalk, a breakthrough programming language for use in personal computers.

1973. Xerox PARC researchers implement the idea of overlapping windows on a personal computer display.

January, 1975. Intel introduces the 8008 micro-processor: MITS unveils the Altair, a personal computer for the hobby ist market: Steve Jobs begins attending Homebrew meetings with Wozniak, who begins designing his own personal computer, which will later become the Apple L.

1976. The "desktop" metaphor is first used in Xerox PARCs Officetalk software.

April 1, 1976. Stephen Wozniak, Steven P. Jobs and Ron Wayne found Apple Computer in Cupertino, CA.

May, 1976. Jobs and Wozniak sell their first Apple I computers to the Byte Shop.

January 3, 1977. Wozniak, Jobs and A.C. "Mike" Markkula incorporate Apple. Wozniak becomes employee number one; Jobs becomes employee number zero.

March, 1977. PARC researcher Alan Kay predicts in his essay "Microelectronics and the Personal Computer" that "just as the Industrial Revolution made possible the personal book ... the microelectronic revolution of the 1970s will bring about the personal computer of the 1980s with sufficient storage and speed to support high-level computer languages and interactive graphic displays."

April, 1977. At the first annual West Coast Computer Faire in San Francisco, Apple unveils the Apple-II, which becomes the fastest-selling personal computer to date. The PC revolution is now firmly under way.

June, 1977. The first Apple II computer leaves the factory; Regis-McKenna art direcotr Rob Janov designs the six-color Apple logo.

Fall-Winter, 1977-78. Dan Bricklin and Bob Frankston create Visicalc, the first PC-based electronic spreadsheet, for the Apple II.

1979. ARPANET establishes its first international link, evolving from a single network into a "network of networks."

Summer-Fall, 1979. Apple researcher Jef Raskin begins work a small self-contained computer code-named Macintosh.

December, 1979. Steve Jobs tours the Xerox Palo Alto Research Center, sees a demonstration of the

SmallTalk programming language, the graphical user interface, the Alto and Star computers and a networking system known as Ethernet.

February 12, 1980. Apple goes public in the largest initial public stock offering since Ford Motor Company.

1981. The number of hosts on the Internet now exceeds 1,000.

January 19, 1981. Jeny Manock joins the Macintosh team and begins his initial design under project leader Jef Raskin.

August, 1981. IBM introduces its first personal computer. Using an Intel microprocessor, an "open" hardware design and system sofiware supplied by a small Seattlebased firm called Microsofi: the IBM-PC is a significant success.

1981. Xerox introduces the Star computer, a commercial version of the prototype Steve Jobs saw at PARC in 1979; it fails.

January 1982. Microsoft assembles a team of software developers to produce applications for the Macintosh, code named SAND. The name was derived from Steve Jobs' vision, in which sand (from which silicon comes) is placed in one end of a factory, and a finished computer comes out the other end. SAND kickstarted Microsoft's first version of the Windows operating system, introduced in March. 1984.

April-May, 1982. Jerry Manock. Terry Oyama and Steve Jobs establish the basic design for the Macintosh.

January, 1983. Apple unveils the Lisa Office Computer. Finished units begin shipping in May: but its high price and lackluster performance result in a tepid reception.

March 17, 1983. Hartmut Esslinger and BIB present their SnowWhite concepts to Apple's board and top management. Esslinger's work prevails.

April, 1983. John Sculley joins Apple as President and CEO.

May-June, 1983. Jobs asks Esslinger to submit a SnowWhite design for the Macintosh that could fit over the existing chassis, but the design is not used.

July, 1983. Esslinger's firm frogdesign presents a second set of concepts, called "Snow White pure" to Jobs and Sculley. Jobs gives frogdesign responsibility for creating Apple's future industrial design: Esslinger is named corporate design manager.

August, 1983. frogdesign sets up its studio in Campbell, CA.

November 10, 1983. In an attempt divert attention for the Macintosh, Microsoft "preannounces" its first version of Windows, an operating system for the IBM-PC that features a crude facsimile of the Mac's graphical user interface; shipped versions of Windows 1.0 appear in 1985.

December 15, 1983. Apple's "1984" Super Bowl commercial runs for the first time on station KMVT in Twin Falls. Idaho, at 1 am (thus qualifying the spot for a 1984 Cleo awards the advertising equivalent of the Oscar.)

January 24, 1984. Steve Jobs unveils the Macintosh at Apple's annual shareholder's meeting.

May, 1984. Apple unveils its first portable computer, the Apple IIc. The first product to reflect the new SnowWhite design language, it is also the first Apple product to win awards for its design. The IIc will sell more than 400.000 units in its first year. Macintosh packaging and logo treatments also win awards for their design.

Summer-Fall, 1984. frogdesign creates BigMac and Baby Mac (later cancelled), the Apple IIGS and a range of portable Mac products

October, 1984. Jerry Manock resigns from Apple.

January, 1985. Apple introduces the Macintosh Office, which consists of the Macintosh XL, the LaserWriter and AppleTalk networking system.

April, 1985. Steve Jobs presents concepts for a portable Macintosh to Apple's board, the idea is turned down;Jobs initiates a shift in strategy causing frogdesign to develop the second SnowWhite design language.

April 29, 1985. The Macintosh XL, formerly known as the Lisa, is quietly discontinued despite heavy demand for the product.

May 23, 1985. Jobs and Sculley engage in a boardroom showdown; Jobs leaves the Macintosh Division; Jean-Louis Gassee becomes head of Macintosh R & D.

June, 1985. IBM-PC sales soar after the release of the spreadsheet program Lotus 1-2-3; frogdesign presents a concept for a crossplatform computer, code-named Jonathan; the concept is rejected; Bill Gates asks John Sculley to grant Microsoff a license for the Mac OS but is turned down.

June-July, 1985. Development of the Macintosh II under J.-L. Gassée is in full swing. September-October, 1985. Steve Jobs resigns from Apple: starts a new firm called Next Computer.

January, 1986. The Macintosh Plus is unveiled; used with PageMaker. Post-Script and the LaserWriter: the Mac Plus leads the revolution in desktop publishing.

December, 1986. Hartmut Esslinger agrees to end frogdesign's relationship with Apple,

January, 1987. The Macintosh II, Mac SE and related peripherals are unveiled; Jim Stewart becomes director of the Apple Industrial Design Group (IDg)

March, 1987. The one-millionth Macintosh rolls off the assembly line; by now, computers dominate all phases of corporate and government operations; PCs and PC client/server networks begin to replace old-style mainframes and minicomputer systems.

August, 1987, Apple unveils HyperCard and MultiFinder, an enhanced version of the Mac OS that runs two or more applications simultaneously.

August-September, 1987. John Sculley envisions the Knowledge Navigator: work soon begins on a handheld "personal digital assistant" code-named Figaro, which would evolve into the Newton.

January, 1988. Richard Jordan takes over management of the Apple Industrial Design Group.

January–June, 1988. Apple unveils the LaserWriter II, ImageWriter LQ, Operating System 6.0 and AppleScanner.

December, 1988. In the U.S., there are 11.500 mainframe computers. 120,000 minicomputers and 4.7 million PCs.

January-March, 1989, Apple introduces the Macintosh SE (30 and Macintosh IIcs: multimedia becomes industry buzzword: Microsoft Windows sales match Mac sales for the first time; Apple pursues a lawsuit with Microsoft over the "look and feel" of the Mac user interface.

May-July, 1989. Richard Jordan contracts Giorgetto Giugiaro to create Apple's new industrial design language.

September, 1989. Apple unveils the Macintosh Portable; the first Figaro design competition favors Giugiaro's slate concept.

1990. A multi-hundred-billion dollar computer industry emerges, together with a "network of networks" called the Internet. January 3, 1990. Robert Brunner becomes director of Apple IDg.

February, 1990. Brunner completes the foam model for a portable computer that will eventually become the PowerBook

March, 1990. Jean-Louis Gassee resigns from Apple: starts Be, Inc.

June 1990. Jaguar design concepts are unveiled to Apple management.

October 15, 1990. Apple introduces it "low cost computer family," the Macintosh LC, Mac IIsi and Mac Classic; sales skyrocket.

November, 1990. Michael Spindler becomes Apple president: Bob Brunner completes the final Jaguar concepts, which serve as the basis for the Espresso design language.

October-December, 1990. The second Figaro competition takes place; Giugiaro's concept again prevails.

1991. The first commercial Internet provider, The World, goes on-line.

February, 1991. Figuro program runs into trouble; Michael Tchao persuades John Sculley to abandon Figaro and develop a pocket-sized Newton product, code-named lunior.

March, 1991. Apple unveils System 7.0. QuickTime, the StyleWriter and Personal LaserWriter.

April 19, 1991. Apple outsells IBM in PCs shipments rise 85%

May, 1991. Microsoft unveils Windows 3.0: the perceived difference between the Mac and PC narrows.

July 3, 1991. Apple-IBM-Motorola join forces to develop PowerPC: Apple announces plans for a new \$200 million R&D campus.

August-September, 1991. Daniel De Iuliis and Larry Barbera complete the Macintosh Color Classic, the Espresso design language is established.

October, 1991. Apple unveils the PowerBook; sales quickly outstrip supply; its design revolutionizes the shape and feature set of all laptop computers.

1992. The number of Internet hosts exceeds 1 million: Tim Berners-Lee develops the World Wide Web at CERN.

May, 1992. John Sculley unveils the first Newton MessagePad at the Consumer Electronics Show.

October-December, 1992. Jonathan Ive joins IDg, designs the second Newton Messagepad (Lindy). October 15, 1992. Bob Brunner begins the Pomona Design Investigation, which eventually leads to the Twentieth Anniversary Macintosh, code-named Spartacus.

January, 1993. Apple introduces the PowerBook Duo DuoDock and Macintosh Color Classic.

May, 1993. Mosaic, an early World Wide Web browser, is introduced; traffic on the Web grows at a 341.643 annual percentage rate.

May-August, 1993. Pomonal concepts are tested among focus groups: the curved panel "B & O Mac" concept is judged best: Jonathan Ive takes over the project and redesigns the concept.

September, 1993. Apple offers the first AV Macintoshes featuring multimedia and on-board CD-ROM; the Newton MessagePad 100 is unveiled to weak reviews: the first Jaguar-derived products. Norsi and Telecaster, are well received: Michael Spindler replaces John Sculley as Apple's president.

October, 1994. Jonathan Ive's Pomona prototype is approved for development under the code-name Spartacus.

February, 1994. The Internet celebrates its 25th anniversary. Apple unwells the PowerBook 500 series (Blackbird) and Newton MessagePad 110 (Lindy), which together represent the pinnacle of Espresso design.

April, 1994. Apple completes the transition to PowerPC throughout its desktop computer line.

January, 1995. The Internet grows exponentially with 4.8 million hosts and 39,410 networks.

Spring, 1995. Netscape goes public, becomes the third largest NAS-DAQ IPO in history; Sun Microsystems unveils its Java programming language.

September, 1995. The long-awaited M2 PowerBook, successor to Blackbird, is unveiled to mixed reviews; reports of batteries catching fire mars the release; eventually thousands of units are recalled.

January 3, 1996. Robert Brunner leaves Apple: the following month, Jonathan Ive replaces him as director of Apple IDg.

February 12, 1996. Dr. Gilbert Amelio is named Apple Chairman. President and CEO. Fending offer merger rumors. Amelio begins the slow process of rebuilding Apple.

July, 1995. Internet traffic now encompasses 6.6 million hosts and 61,538 separate networks.

August, 1996. The Spanacus design is complete, will be unveiled in January, 1997 as the Twentieth Anniversary Macintosh: Microsoft introduces Windows 95.

October, 1996. Apple unveils the e-Mate.

November, 1996. Apple suspends work on its next-generation Macintosh operating system (Copland): begins negotiating with Jean-Louis Gassée to acquire his Be operating system.

December, 1996. In a surprise move, Apple acquires Next Computer, Inc. for \$433 million and with it the source code to the NextStep and OpenStep operating systems. Steve Jobs agrees to help develop the new OS using Next technology.

January 7, 1997. Apple celebrates its twentieth anniversary: Chairman Gil Amelio unveils the Twentieth Anniversary Macintosh at the MacWorld expo; Steve Wozniak is given unit number 00001; Jobs is receives unit number 00000.

February 1, 1997. Steve Jobs returns to Apple on a full-time basis: the resurgence begins.

1997-98. Apple unveils its "Third Decade" product line: which includes consumer and businessoriented CPUs, a new cross-platform computer, PowerBooks, enhanced Newton and eMate products, and a simple Internet computer that will sell for less than 5500. The new NextMac operating system is unveiled in January 1998, six months ahead of schedule.

1999. Half of all U.S. households own and use a personal computer.

Early 21st century. Computers dominate all aspects of society: intelligent courseware allows distance learning; K-12 and highered students begin attending classes via computer.

2006. With the advent of digital television, home PC ownership reaches 75 percent; PCs become intelligent assistants, combing the Internet for information 24 hours a day, distance learning in the K-12 realm becomes commonplace.

2006. Apple celebrates its 30th anniversary.

2020. Home computer ownership reaches 97%, equal to that of the home telephone and television.

2025. Computers approach human-level intelligence.

150 millions years later. Dinosaurs roam the Earth.

The FOUNDING OF APPLE COMPUTER BY STEVE JOBS AND STEPHEN Wozniak and its subsequent growth is a now-legendary story of curiosity, tenacity and obsession that has forged a unique place in American business history, popular culture and the history of design. Though the story is complex, with many twists and turns, it is all the more potent because of the innocence of its beginnings.

Born in a valley of fruit orchards at the southern end of the San Francisco peninsula, Apple was the product of a unique culture, the convergence of several different technologies and the vision of two suburban middle-class kids who created a machine that would make them both multimillionaires, build the careers of thousands who worked at the company they founded and have a profound effect on the way millions of people live and work—serving as a productivity tool, a vehicle for creative expression and a window onto cyberspace.

As the Adam and Eve of personal computing, Jobs and Wozniak grew up in a landscape that has long since disappeared, a quiet and lonely place full of engineers, technicians and designers who spent their days in anonymous-looking buildings designing missiles, satellites and high-tech equipment for defense and industry. Nights and weekends were spent in their garages reading technical journals and building odd contraptions using the circuitboards and tiny black chips that gave the place its name: Silicon Valley.

Short and stocky with wire-rimmed eyeglasses and a wide toothy grin. Steve Wozniak belonged to this gizmo culture. The son of an engineer at Lockheed, Wozniak built his first ham radio at the age of 12, won a blue ribbon at a science fair for constructing a primitive computer at the age of 13, spent hours in the library reading electronics magazines and touring computer rooms looking for parts he needed to build his home creations.

Though technically precocious, Wozniak rarely thought about what he was doing beyond the immediate challenge of building the next "cool" machine. For him, it was enough to have an idea, find the right parts, put them together, then figure out how to make the machine work. But to get anywhere, Wozniak had learn how to show off his creations in a way that would impress his friends. "In the early days, you weren't judged by how cool your stuff was, but how well you could demo it," he says. Years later, this ability to show your work and persuade others to pay attention would evolve into an ethos known as "demo or die," which drives the personal computer industry to this day. Even though Wozniak could design computers, he was often too tongue-tied to demo them effectively. For this reason, he worked mostly on his own, unaware that he was blazing a trail that would one day transform society and endow him with a fortune so large he would need a computer to count it. That awareness problem began to change, however, when Wozniak met a skinny 15-year-old named Steven Paul Jobs.

Introduced in 1971 by a high school friend, they were the original odd couple. Five years younger than Wozniak, the adopted son of an engineer, Jobs learned to write programs using the computer language BASIC by the age of ten, and impressed his ninth-grade shop class teacher by showing off one of his side projects: a small I that he built at home using borrowed parts. With his long hair, dyed shirts and vegetarian diet, Jobs seemed to have little in c mon with Wozniak, who wore clothes from J. C. Penny and live burgers and fries. Yet they made an interesting team: Wozniak hard-core computer nerd driven by a love of technology; and the young charismatic, driven by a belief in himself and an inte in technology more for what it could do than for how it wor When they first met, neither was fully-formed. Yet each made up what the other lacked. And both had at least two things in comr intense curiosity and a penchant for risk.

Like today's computer hackers, Jobs and Wozniak had little rest for "secrets" and enjoyed using their technical prowess to tweaknose of authority. Thus they became "phone phreaks"—fascinate the tiny hand-held devices known as "blue boxes" that could emil precise tones needed to tap into AT&T's long-distance lines. Intrig by an article in *Esquire* magazine about blue boxes supplied by W mother, they looked up an obscure electronics journal, which g instructions for building one using nearly \$1,000 worth of connents, then found an even more obscure AT&T technical manu the Stanford University library, designed their own box using just worth of parts, then made calls all around the world. As a pr Wozniak telephoned the Vatican posing as Henry Kissinger and as to speak to the Pope. When told that the Pope was asleep (it was middle of the night in Rome), Wozniak left a number for His Holi to call back. (He didn't.)

For Wozniak, the blue box was just for fun. But Jobs, sensing opportunity suggested they build the boxes in volume, take the dormitories at UC Berkeley (where Wozniak was a student), sell t door-to-door for \$100 apiece and split the proceeds. Their busi card had the slogan "He's got the whole world in his hand." The wildly profitable, the illegal business also had its downside. During sales call, held in the parking lot of a local pizza joint, Jobs negoti with a potential buyer while staring down the barrel of a gun, at w point Jobs abandoned the venture Woz continued, but doing so pla havoc with his schoolwork, forcing him to drop out of college in and take a job at Hewlett-Packard. But the experience was a form one. According to Jobs, "the blue boxes taught us that we could b a small thing and use it to control a giant thing With this box could control billions of dollars worth of infrastructure. That wa incredible lesson. I don't think there would ever have been an A computer if there hadn't first been a blue box."

Unable to make the boxes on his own, Jobs also dropped ou school, barely completing his freshman year in 1973. He then t elled to India, lived in an Oregon commune for several months wandered back to Silicon Valley, where he took a job at a fledg video game maker called Atari. This brought the two Steves h together, placing them at the cutting edge of technology just as personal computer revolution was about to begin. ŧ.

Homebrew Club. In 1974, Jobs and Wozniak began attending meetings at the Homebrew Computer Club. An informal fraternity of omputer experts, engineers from local high-tech firms and interestd onlookers, Homebrew met on Wednesday evenings at the Stanard Linear Accelerator Center in Palo Alto to give demonstrations, any and sell computer parts and show off the small machines that embers made in their home workshops using a new breed of icroprocessor developed by the Intel Corporation.

Looking back, it's hard to grasp what a revolutionary idea the peronal computer was in 1975. Since the late 1940s, when machines inch as the Electronic Numeric Integrator and Computer (called NIAC) filled entire rooms and weighed in at nearly 30 tons, most cople thought of computers as huge menacing beasts. Rarely seen a ordinary mortals, those early computers were used by the miliry, large banks and insurance companies, tended by earnest men white coats, consumed megawatts of electricity and carried with em connotations of evil and control of the many by the few. In usuing decades, a series of technical developments, beginning with e advent of transistor, brought about a new breed of computers the as the IBM 1130, the Varian 620 and Data General's Nova—that ere far more powerful than ENIAC yet small enough to fit in a case e size of a filing cabinet.

The ever-shrinking size and growing power of computers evolved accordance with a concept known as Moore's Law—coined by ordon Moore, a co-founder of Intel—which holds that every two rars, the processors that form the heart of a computer will double speed as their price and size fall by half. Even though the metal id silicon used to make processors are inexpensive, Moore prected that ways would always be found to pack more circuits onto given surface area, allowing components to become faster, smalland cheaper than anyone could predict.

In 1969, Moore's Law began to take hold when Intel unveiled its st semiconductor mounted on an inch-long piece of silicon. Called e Intel 4004, it was one of a set of chips used to control devices ch as stoplights and small desktop calculators made by companies ch as Hewlett-Packard and Litronic. Heralding a new era of inteated electronics, the 4004 looked like nothing at all until you put under a microscope. Suddenly a maze of circuits resembling a eet map of Manhattan came into view, with each circuit performg a specific function.

HETHER IT'S A MAINFRAME WEIGHING HUNDREDS OF POUNDS, OR A LAPTOP, computers do basically the same thing. They process numerical ta: adding and subtracting, multiplying and dividing, they provide esult and wait for the next instruction. For that to happen, the data as the translated from *binary code* (the 1s and 0s that all computs understand) into *computer language*, the basic software that tells e machine what to do with the data and in what sequence. Using language such as Cobol, BASIC or C, programmers can type instructions into the computer using basic English words and symbols, thus creating a piece of software called an *operating system* the internal traffic cop that tells the computer how the keyboard and monitor are connected to the central processing unit (CPU), how files are stored, and how the computer interfaces with external devices such as printers and disk drives. With an operating system, the programmer can then write a special piece of software (like the one Jobs wrote at the age of ten) called an *application* or *program*, which tells a chip such as the Intel 4004 how to perform a specific task. When connected to a different kind of semiconductor called a memory chip, the 4004 could function as a tiny computer. But, as its name implied, it could only handle 4,000 (or 4k) bits of memory, which meant its power was limited. But that soon changed.

Following Moore's law, Intel unveiled its next microprocessor in 1972. Known as the 8008, it could handle 24k of memory and served as the key component for a small kit computer known as the Mark-8, which became a favorite among the soldering iron set in 1973-74. Housed in a sheet metal box with a row of blinking lights on the front, the Mark-8 was designed for the hard-core hobbyist, someone more interested in the idea of owning a computer than in what the machine could actually do. Aesthetically, the Mark-8 was closer to the test equipment found in the garages of Silicon Valley than a computer anyone would use in a home or office. But the fact that it had a case at all put it miles ahead of the homemade creations being shown at the Homebrew Club, which were usually housed in cigar boxes that members painted themselves.

By the spring of 1975, Intel unveiled its third chip, the 8080, which could handle 65k of memory and became the heart of a new kit computer, the Altair 8080, which *Popular Electronics* magazine hailed as the "World's First Minicomputer Kit to Rival Commercial Models." Made by a tiny firm called MITS in Albuquerque, New Mexico, the kit sold for \$375 and came in a stern metal case with the obligatory lights and switches. With no ports on the back for connecting a monitor, keyboard or printer, there was little one could do with an Altair except flip the switches and watch the lights blink. But when news of it reached Homebrew, it caused a sensation.

At first, Stephen Wozniak "thought it would be neat" to build an Altair. But as soon as he saw the circuitboard layout, he decided that the Intel 8080 was not the wonder chip that *Popular Electronics* had promised. Though speedy for its time, it needed six additional chips and a complex layout in order to function, thus defeating the basic challenge of computer design—to squeeze the maximum performance from the minimum number of chips. Instead, Wozniak designed his own computer with all the components on a single board using a new microprocessor made by Motorola called the 6800.

Beginning in October 1975, Wozniak spent six months designing his computer and more than 40 hours with Jobs in March 1976 building and testing that first prototype. By today's standards, it was laughingly simple: there was no keyboard, no sound, no video, only 8k of memory (the equivalent of six typewritten pages) and no case. But when they powered it up, it worked. Wozniak tried to sell the design to H-P, but was rejected because the company could not see a future in making personal computers. Intel's Robert Noyce later said that "any number of companies in the Valley could have created a PC but didn't have the vision that Wozniak and Jobs had."

To demonstrate their creation at Homebrew, Jobs and Wozniak fashioned a simple wooden box to protect the circuitboard. But first, Jobs showed it to Paul Terrell, the owner of a computer store in nearby Mountain Valley called The Byte Shop. The owner made a suggestion: if Jobs could deliver 50 preassembled boards within the next 30 days, the store owner would pay cash on delivery and supply a proper-looking case for anyone who asked.

Looking back, Wozniak sees Terrell's offer as the turning point. "Nothing in subsequent years was so great and so unexpected," he says. Quickly, Woz and Jobs raised \$1,500, secured \$20,000 worth of parts from a nearby supplier, and set to work building a hundred computers-fifty for Terrell and fifty that they would try to sell on their own. Their factory was Jobs' garage. As work proceeded, Jobs asked Ron Wayne, a salesman at Atari, to draw schematics for the manual and help them set up the new company in return for 10 percent ownership. But first they needed a name. As a joke, Jobs suggested Apple-a reference to one of the stranger periods in his life, when he adopted an all-fruit diet, believing that he could avoid taking showers by eating nothing but apples. The fruit diet didn't work. But the name appealed to the three partners. On April Fools Day 1976. Wozniak, Jobs and Wayne signed the papers that made Apple Computer official. Wayne and Jobs then designed the first company logo, a Victorian-inspired illustration of Sir Isaac Newton seated under an Apple tree with the phrase: "A mind forever voyaging through strange seas of thought ... alone."

With no money coming in, the partners kept their day jobs, devoted nights and weekends to the business and delivered the first 50 Apple I computers to The Byte Shop in June 1976, where they retailed for \$666.66. Initially, sales were slow, causing Ron Wayne to quit the firm and sell his 10 percent ownership back to Jobs and Wozniak for \$1,700. By August, however, sales rebounded as hundreds of hobbyists decided they wanted a computer but had no desire to build one from a kit. Instead, they took pleasure in building the case, devising every imaginable style of enclosure: from simple pine boxes and polished cherrywood containers with integrated keyboards to rugged brushed aluminum and black metal boxes with rivets on the sides, which evinced a high-tech look. One owner even installed his Apple I inside a leather briefcase, with the circuitboard in the top, a keyboard bolted to the bottom and a lamp cord trailing out the back, thus creating the first laptop computer.

To keep up with sales. Jobs and Wozniak spent every waking hour either working at their jobs, building computers in the garage or filling orders, with little time for eating or sleeping. They needed help. Soon Jobs met the venture capitalist Don Valentine, who introdu Jobs and Wozniak to a 33-year-old millionaire named Armas Clif "Mike" Markkula, a former marketing executive at Fairc Semiconductor and Intel. Markkula took an immediate interest the two Steves and their young firm. As marketing manager for Intel 8080, Markkula knew as well as Jobs did how microproces would allow millions of individuals and businesses to afford and personal computers. As one of the Valley's Wise Men, Markkula brought organizational skills, business experience and a steady influence over the mercurial Jobs, which he would have to exer countless times in the coming years. He could also tap into the work of venture capitalists and corporate movers and shakers w could help turn Apple into a giant. To get things moving, Markl suggested they negotiate a partnership agreement, which promp Jobs and Wozniak to write their first business plan in Noven 1976. In the document, they predicted a 10-year sales goal of § million per year-a wildly optimistic number considering that t came up with it while sitting in the garage assembling App boards. But as it turned out, they would meet their target not in years, but in just over five.

"From the start, Apple had two very strong advantages over ev one else," Markkula recalls. "The first was a darn good busin plan... We knew exactly where we were going, what we need what we were trying to accomplish. We understood that our tomers would need to be educated, that there was a potentially gig tic market out there, and that the only way to survive would b grow as fast as the market or faster. In fact, our first business plan ed that IBM would be our biggest competitor; we always though them as the guys to beat—even though they didn't enter the ma until 1981. Other computer companies simply didn't have that de of understanding. That's why a lot of those names no longer ex

By December 1976, with Apple I boards selling in computer sta from Silicon Valley to New York, Jobs and Wozniak agreed to sp monthly salary of \$250. Then, after weeks of negotiation, they inporated Apple Computer on Monday, January 3, 1977 with their r partner and chairman, Mike Markkula, who agreed to invest \$91,00 his own money, guaranteed a \$250,000 line of credit, secured a tional venture capital, planned Apple's marketing and distribution s egy and brought in a colleague from Fairchild named Mike Scot serve as president. Since Wozniak had designed the company's product, Markkula decided that Woz would become Employee Nurr One. Not to be outdone, Jobs appointed himself Employee Zero. (Si Markkula and Scott were designated Employees Three and Four, J decided that there would be no Employee Number Two.) Once papers were signed, the company moved from Jobs' garage to a r building on Stevens Creek Boulevard in Cupertino.

Relieved of the task of running a business. Wozniak quit his at Hewlett-Packard and set to work redesigning the Apple I, givin more processing speed and memory, the ability to display co aphics on an external display, expansion slots for plugging cusmized circuitboards onto the motherboard, an integrated keyboard, ad a cassette recorder for storing documents (floppy disks for pernal computers would not appear for another year). The result, lled the Apple II, would be unveiled at the West Coast Computer ire in nearby San Francisco in mid-April, just three months away.

This left Jobs to concentrate on how the computer would look. hlike existing machines, Jobs wanted the Apple II to look and feel like real product—something that ordinary people could use without ring confused or intimidated. In Jobs' mind, a slick-looking plastic se with soft edges, muted colors and a lightly textured surface would spire enough confidence for first-time buyers to take the plunge. As bls later said, "it was clear to me that for every hardware hobbyist who inted to assemble his own computer, there were a thousand people no couldn't do that but wanted to mess around with programming ... st like I did when I was 10. My dream for the Apple II was to sell the st real packaged computer."

Once the Apple II reached the growing mass of software fanatics no tended to work at universities, corporations and at the dining ole instead of in garages—it was only a matter of time before somete would use his Apple II to come up with a "killer application," a ftware program that would make the new computer indispensible a wide range of users.

When Steve asked me to design the case for the Apple II, it didn't occur to me to say no. But I did ask to be paid in advance." —Jerry Manock

PLE II

lustrial Design: Jerry Manock *tes of Design:* January-March, 1977 *roduced:* April, 1977

er his first visit to the Homebrew Club in 1974, Steve Jobs develed strong opinions about how a personal computer should look. never understood why someone would spend hours building d debugging a circuitboard only to mount it inside a crude woodor cardboard box. At the other end of the spectrum, he consided the industrial-looking black and sheet-metal enclosures used IBM and Digital Equipment as cold and impersonal as the tiny oden boxes were naive. Neither option was appropriate for the oduct Jobs had in mind. As he said at the time, "I got a bug up rear that I wanted the computer in a plastic case"-a choice that ery other computer maker had avoided. Since sheet metal was eaper and provided better electromagnetic shielding, conventionvisdom said that plastic was a needless expense, particularly for bbyists (the principal buyers of personal computers in 1976) who ed less about the outside of a computer than the inside. Yet ple's second computer would be aimed not at tinkerers, but at tware junkies - any one of whom might come up with the "killer

application" that would make owning an Apple II a more likely proposition. With a molded plastic case, Jobs could then position the Apple II as a consumer item the same way Hewlett-Packard had done with the calculator, giving the computer the same sleek lines, beveled edges and pebble-like texture.

Searching for a Designer. Casting about for ideas, Jobs spent hours at Macy's department stores looking at household appliances and realized that he needed an industrial designer to give the Apple II the right shape and detailing. Since he didn't know about design, he started at the top, made an appointment with Noland Vogt, founder and president of GVO, the largest design consultancy in the Valley.

"Jobs turned up wearing a T-shirt and jeans," Vogt recalls, "He told us what he needed, but said he didn't have much money. He offered to pay us in stock rather than cash. The problem was ... companies like Apple came and went very fast in those days, and we weren't accustomed to doing work on the come. So we decided to pass"—a decision that Vogt would later regret when he learned that the founder's stock Jobs offered that day, after innumerable stock splits, would rise in value to more than \$1 million.

Next, Jobs met with John Anderson, president of Inova, a medium-sized design firm, this time offering cash instead of stock. But when Jobs described what he wanted and the price he was willing to pay, Anderson laughed the young man out of his office. Undaunted, Jobs then asked Ron Wayne, the Atari salesman who had helped design Apple's first logo, for sketches. Wayne proposed a box with a tambour door on the front that functioned like the hood of a rolltop desk to protect the keyboard and internal components; as the door opened and closed, it tripped a switch that turned the computer on and off—not exactly what Jobs had in mind. Growing desperate, Jobs spoke to an old friend of Wozniak's at Hewlett-Packard. The friend suggested that Jobs talk to Jerry Manock, a former Hewlett Packard designer who had since become a freelance consultant. Jobs telephoned Manock and suggested they meet at the next Homebrew meeting.

Jerry Manock. Born in Los Angeles, Jerry Manock received a bachelor's degree in engineering from Stanford University in 1966, then graduated from the prestigious Stanford Product Design Program in 1968. The design equivalent of a Harvard MBA, Stanford's program emphasized engineering over aesthetics, teaching its graduates to build products from the inside out. Rather than making fancy sketches as students did at Art Center College of Design in Pasadena (the "other" top West Coast design school at the time), Stanford students were taught to design individual parts as well as whole products, which they would then build by hand and debug just like professional engineers. With this background, Manock first worked at Hewlett-Packard, where he designed esoteric equipment for their microwave division, then joined Telesensory Systems in 1972 to develop electronic aids for the handicapped, including a talking calculator

PLATE 7

for the blind that reported entries, functions and final results using a bionic voice. Like all of his products, Manock gave the calculator a boxy enclosure with wide 45-degree chamfers at the corners and a dusty beige colored plastic case. By late 1976, Manock felt confident enough to go out on his own as a freelance designer in Palo Alto. He had been in business only a month when he answered Steve Jobs' call and agreed to meet him at Homebrew.

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"Everyone told Jobs that it was impossible to do what he wanted at the price he was willing to pay," recalls Manock. "But the Computer Faire was only nine weeks away, so Steve's back was against the wall." Jobs was unlike anyone Manock had met before. During that first meeting, says Manock, "[he] was ... carrying on conversations with three separate people ... examining some gadget in front of him ... and telling me what he needed for the Apple II, all at the same time."

Though he had never attended before, Manock fit right in at Homebrew. Like Wozniak, he was short, built like a fire plug and sprinkled his conversation with technical terms that had to be listened to carefully to be understood. Like Wozniak, he was also shy. Yet once the subject turned to engineering or design, he would immediately shift into the precise language and sense of absolute certainty that comes from being a Stanford Product Design graduate. "When Steve asked me to design the case for the Apple II, it didn't occur to me to say no," Manock recalls, "But I did ask to be paid in advance." His fee was \$1,500.

Since the tooling budget was tiny and Jobs needed something that looked like a mass-produced case right away. Manock designed the Apple II for reaction-injection molding, a fast-and-dirty method of plastic production, which is suitable only for low-volume production. The process relies on a chemical reaction to force molten polyurethane foam into an epoxy mold, which hardens on contact but often leaves bubbles and other irregularities on the surface. The preferred method, known simply as injection molding, uses a material such as ABS (acrylonitrile-butadiene-styrene), which is melted into liquid form, squirted into a metallic mold, then held under pressure as the plastic cools and hardens into a part that requires no painting or hand finishing. The Hewlett Packard calculators that Jobs admired were all made of ABS. But the metal tools needed for an injectionmolded case for the Apple II could take six months to build and cost more than \$100,000. Tooling for reaction-injection molding, on the other hand, was cheap and could be built in a matter of days. Since Jobs didn't expect to sell more than 5,000 Apple IIs in the first year, reaction-injection would have to do.

The Apple II Design. According to Manock, "the design for the Apple II was dictated by the size of the circuitboard and the keyboard that fits into a wedge on the front. It had to be tall enough for expansion cards to be slotted vertically onto the motherboard and have enough interior space to dissipate heat thrown off by the power supply. It also needed a removable lid so that users could open it up and install the expansion cards themselves."

The decision to install slots sparked a serious debate betw Wozniak and Jobs. Wozniak considered slots essential, since t allowed users to customize their systems with graphics adapters better display, extra memory and other add-ons, which made computer far more useful. But Jobs considered slots "inelegant": t reminded him of the hacker mentality he had seen at Homebr where people would insert boards of unknown vintage into t computers, only to have the boards short out and destroy the er system. Jobs considered that too risky for a mass-market proc hence, no slots. But Wozniak wanted the Apple II to have six s Jobs countered by saying it could have no more than two. Fina Wozniak put his foot down and said the Apple II would not ship w less than four slots, forcing Jobs to give in.

Having lost that battle, Jobs was determined to put his stamp so where on the product. So he suggested to Manock that they chro plate the internal chassis. "Steve wanted the inside to look pr when users opened the case," says Manock. Instead, Manock s gested that he help Wozniak test the motherboard or make sure the power supply, a critical component that was being designed fi the ground up, would be ready on schedule. "That's the last I he about chrome plating."

Because computer-aided design was not widely available in 19 Manock designed the Apple II using simple 2-D drawings, treating exterior as a slab with chamfered corners, much like his Telesens calculator, with a wedge shape on the front to hold the keyboard a functional recesses to protect buttons and prevent labels on the c from peeling off. Almost blunt in its simplicity, the design effective combined "Silicon Valley drab" with a chiselled look that was co mon on products in the 1970s.

On the original design, Manock included recessed areas on the si of the case to serve as handles. But Jobs, fearing that handles wo add to the cost, told Manock to remove them, saying that no o would be moving the computer around once it was set up. By February, Manock finished the design and suggested that a foame model be built to ensure that the parts described on paper wo actually fit together. But when Jobs learned that the model would c \$300, he refused. So Manock crossed his fingers and gave his dra ings to RIM Plastics in Cupertino to begin tooling. As Manock fear when the finished parts came out, each had to be sanded by ha then filled with putty and painted to be made presentable. "We l to be careful not to get the lids mixed up." he says; otherwise th wouldn't fit. Working nonstop, Manock managed to deliver 20 ished plastic cases to the Apple booth just hours before the Fa opened. "There was only time to put circuitboards inside three of cases," he says. "But that didn't seem to matter."

Dressed in clean slacks, a white shirt and vest, the 21-year-old Jobs put three completed boxes on a small table at the front of the booth w a large plastic banner suspended overhead, lined up the empty pl tic boxes behind him and waited for the crowd to descend. When visitors inspected the Apple II, they were mesmerized. Inside, was a model of efficient engineering, with everything laid out on a ngle board and the expansion slots readily accessible at the top. And he plastic case was a marvel. "Compared to the primitive stuff on view lsewhere at the Faire, our finished plastics blew everyone away," ecalls Manock. "Even though Apple was only a few months old, the lastic cases made it look like we had already achieved high-volume roduction"—an impression that Jobs did nothing to discourage.

By the end of the first day, Jobs took orders that far exceeded IM's ability to produce the plastic parts. Meanwhile, with adversements for the Apple II running in the magazine Scientific merican, an avalanche of orders came in from around the couny, forcing Jobs and Manock to find another plastics supplier-fast. Even though RIM's plastic was really bad"-paint would flake off en before the cases left the factory-"we promised them all the rders they could handle just to keep them working," says Manock. leanwhile, Jobs and Manock made a secret trip to Tempress [a eattle plastics house that Manock had used while working at ewlett-Packard] to build a new set of tools for the Apple II and egin volume production, which would then allow Jobs to cancel e agreement with RIM. "The problem was, we couldn't let RIM now we were about to cut them off," says Manock, "or they would we stopped work, Apple's cash flow would have disappeared, and e company would have died that first summer."

In June, the Apple II officially went on sale at a price of \$1,298. Ithin eight weeks, monthly sales reached \$84,000, thus establishg a \$1 million annual sales rate. Then disaster struck: unable to ithstand round-the-clock production, RIM's tooling broke down. oon printed circuitboards and power supplies began to pile up. esperate for Tempress to finish the new set of tools, Jobs made em an offer that was almost unthinkable (for him): a bonus of .000 for every day the tools could be completed ahead of schede. "It was life and death," says Manock. Finally, in December, just tys before Apple would have to close its doors for good, the new ols were finished, production resumed, and Apple's factories orked nonstop until the back orders were filled. For Manock, it as his first taste of the thrill and terror of working at the fastest owing company in the world.

In time, the \$1,500 design that Manock provided would launch ore than a million Apple II users on a voyage that continues to this by. The simple wedge shape with the keyboard in the front and nts wrapping around the corner at the back would become a clasto of early computer design—a totem that others would emulate but ever equal. With a professional-looking design, the personal comter, or PC, could now be sold as a real product.

Just as Jobs had predicted, the success of the Apple II brought rth the first "killer application," known as Visicalc. Invented in the ring of 1977 by a Harvard Business School student named Dan ickland and his friend Bob Frankston, Visicalc was a simple spreadsheet program that performed standard (but tedious) business calculations and served as an aid in accounting and financial planning. Using the program, anyone could plug numbers into a normal profit-and-loss spreadsheet, change any of the numbers on the grid and recalculate the others automatically by hitting the Return key. With Visicalc, and the addition of a new peripheral known as a floppy disk drive (which appeared as an option for the Apple II in early 1978), sales exploded—from \$770,000 in 1977 to \$7.9 million in 1978—making the Apple II the fastest-selling personal computer up to that time. Unable to compete, Apple's early competitors (Morrow, North Star, Cromemco, Ohio Scientific and a dozen others) soon faded from the scene, leaving the two Steves and their tiny startup company to spearhead the personal computer revolution.

SINCE THE APPLE II WAS THE FIRST MASS-MARKET PERSONAL COMPUTER TO offer color graphics, Steve Jobs asked Apple's PR consultant Regis McKenna to redesign the company's logo to reflect that fact, as well as convey the notion that Apple now sold computers to consumers. not just hobbyists. Regis McKenna's art director, Rob Janov, performed the task by drawing a simple apple shape with a round bite mark on one side, a playful comment on the world of bits and bytes. The bite mark also "prevented the apple from looking like a cherry tomato," says Janov. He then drew six colored stripes-green, vellow, orange, red, purple and blue-across the apple, thus creating one of the most enduring corporate symbols of all time. Jobs then asked Jerry Manock to source out a badge so that the new logo could be displayed on all of Apple's products. "Steve wanted something that looked beautiful but didn't cost a lot," says Manock. Nonetheless, Jobs was meticulous. "He refused one set of logos because the colors bled into each other I suggested that we run thin metallic lines between each color. But Steve said the colors had to meet precisely with no line and no overlap." In the end, they settled for a flat silk screened aluminum badge with the logo set against a chocolate brown background-a choice that would last barely three years before Apple's continued good fortune convinced Jobs to make a change.

In the meantime, Manock solved the issue of making labels of varying sizes for each product by devising a single parametric drawing of the new logo from which product labels of any size could be printed (small labels for disk drives, medium-sized labels for printers and displays, and larger ones for the computer itself), giving all products the same graphic identification. "Having consistent labels made it seem like we had a unified design effort," says Manock, "even though we didn't."

As Apple II sales continued to soar—from \$7.9 million in 1978 to \$49 million in 1979—attention soon turned to the development of five new products that would allow Apple to participate in every segment of the personal computer market. Just like those of the more established companies, each product would be developed as a separate program with its own code-name. They were:

- Sara, an enhanced Apple II, released in 1980 as the Apple III;
- · Lisa, an office computer, which would ship in 1983;
- Twiggy, a 5.25-inch floppy disk drive which would be cancelled;
- Annie a portable version of the Apple II, which evolved into the Apple IIc, code-named Moby, released in 1984; and
- Macintosh, a small appliance-like version of Lisa, which would be released in 1984 and become one of the most influential personal computers of all time.

SARA APPLE III

PLATE 8

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Industrial Design: Apple Computer: Jerry Manock, Bill Dresselhaus; Hovey-Kelley Design (Palo Alto, CA): Dean Hovey *Dates of Design:* October 1978–July 1979

Introduced: September 1980

Intended as a follow up to the Apple II, the Apple III was the company's third major product and could have been its third major success. Having more memory than the II, a faster processor, a built-in floppy disk drive, four internal expansion slots, and a monitor capable of displaying 80 characters across, its features should have given Apple a toehold in the fast-growing business market for personal computers. But instead of being Apple's third runaway success, the Apple III was something less, the result of an often fatal combination: over-confidence and inexperience.

One of Apple's early engineers, Richard Jordan, recalls the scene: "At the time, the Apple II wasn't merely a success, it was a phenomenon. It was cheap to produce and selling so fast that designers and engineers in the Valley were falling over each other to work for Apple ... many of them taking pay cuts in order to receive stock options." One of them was Jordan, who quit Hewlett-Packard to join Apple during the summer of 1978, just before the Apple III development began. "As Apple's stock price took off, we all felt like geniuses, even though most of us had nothing to do with the Apple II." Every time Apple's stock split two- or three-for-one, "it made us feel like supermen," says Jordan. "Pretty soon, we figured that it was *impossible* for us to fail, no matter what we did. When the time came to do the Apple III, we were convinced that every decision we made would be right." This atmosphere made the Apple III very different from the Apple II.

Long before the circuitboard had been laid out and components such as the floppy drive and power supply selected, the Apple III's industrial designers Jerry Manock and Dean Hovey had already designed the internal chassis and case without being certain that the components would fit inside. The engineers had already given Manock the maximum board size they thought they would need, and Manock designed accordingly. But as the project evolved, the engineers needed more space than Manock could give them.

For months, the whole PC industry had been waiting for the Federal Communications Commission to issue guidelines for shielding electromagnetic and radio frequency interference (EMI and to prevent home-based personal computers from interfering local TV and radio reception. Yet rather than wait for the guidel which could take months to finalize, Manock decided to make III "bulletproof"—designing a cast aluminum chassis that wa massive, it would pass the most stringent standards. In additio shielding the computer, the aluminum would also act as a heat to keep the internal components cool. Since everyone expected Apple III to ship in huge volume, Manock then contracted Do Jarvis, a Toledo-based auto parts manufacturer, to supply the aluminum chassis.

On the outside, the Apple III's blocky design, 45-degree cham keyboard wedge on the front and brown color were intende establish a "house style" that would inspire the look of future A products. But inside the case there was trouble. As the pr evolved, a phenomenon known as "feature creep" took hold which every member of the team (marketing, engineering, indu design, manufacturing) suggested some new feature, forcing the p uct to grow beyond its original size.

Unlike the Apple II, which had an efficient interior layout, Apple III was designed by committee," says Randy Wigginton, joined Apple in 1977 to write software for the Apple II. "Everyth had certain ideas about what the III should do ... and all of them w included." Ordinarily, that would not be a problem. But since Mar had already designed his cast aluminum chassis, there was little it rior space in which to expand. Rather than cut back on the hardw the engineers designed a circuitboard with pathways that were of seven-tenths of a millimeter apart, packed the heat-producing c ponents together very tightly, yet did not install a fan for ventilar (Since fans made noise, Jobs considered them "inelegant" and we n't allow the Apple III to have one, even though it was needed.

For months, the Apple III team had heard rumors of another sonal computer of similar size and price being developed in E Raton, Florida by the three most formidable initials in the histor American business: IBM. Known throughout the world for its (more than 300,000 employees), strict dress code (white shirts, of suits and ties) and immense revenues (larger than the GNP of m countries). IBM was the model of success through ordered burcracy. Because of its size, IBM was often slow to react but alw delivered on schedule. Therefore, when the Apple III team lear that IBM's first PC would come out at the same time as Sara, "w decided to work flat out and make sure that the Apple III ship first," says Richard Jordan

For Steve Jobs, the prospect of IBM entering the PC market both frightening and invigorating. "Big Blue epitomized everyth Jobs hated ... faceless corporations selling computers that of experts could understand," says Manock. IBM promised stability using its size to create a de facto standard. Yet Jobs viewed that a way to stifle innovation and extend its control from mainframe e desktop. "Steve figured the only way to beat IBM at its own me was to build a computer for people who didn't understand omputers, a computer for the rest of us," says Manock.

But the one essential ingredient missing from the Apple III was Jobs mself. When the program began, says Richard Jordan, "he obs]would sit on your desk and talk to you ... sometimes all day." Yet nee the general outlines of the project were set, Jobs moved on, suming that the managers would handle the handle the details. By e time Jobs returned, with IBM now breathing down Apple's mangers' their necks, "all the major decisions had been made, and it was the could on the Apple III, adopting a technique that colleagues later lled MBWA ("Management By Walking Around"), in which he would ow up unannounced and walk from cubicle to cubicle, inspecting ch person's work, praising those who were doing a good job and nallenging those who weren't, even if he didn't fully understand what e person was trying to do.

"In his quest for perfection, Steve liked to put others on the defenre," says Manock. "He'd fix his eyes on you in an intimidating stare, en bear down in a way that would make you break out in a sweat then praise you later in the day to make you work harder still."

After a few weeks of MBWA, Jobs realized that the Apple III was trouble. Yet because it had been mentioned in Apple's initial puboffering, the company had no choice but to ship it on schedule. the date approached, the project entered 'crash and burn' mode, rcing Jerry Manock to bring in another designer—Bill Dresselhaus. ho had just been hired to begin work on Apple's next project, the sa-to help finish the case. Dresselhaus's assignment was simple: ve the Apple III an angled front bezel and appropriate detailing ound the floppy disk slot using the same 45-degree chamfers and own color that Manock had used on the Apple II. Yet Dresselhaus ggested a sleeker case with tighter corners and no chamfers. hen Dresselhaus showed his sketch to Jobs, "he [Jobs] seemed to e it ... then changed his mind, saying that it looked too much like livetti, which I considered a strange comment, since Olivetti's sign was at that time considered the best the world." Rather than periment with the design at the last minute, Jobs fell back on the ed-and-true style that had worked so well on the Apple II, which esselhaus implemented, then moved on to the Lisa.

As the engineers warned of trouble, they were told "any probms that hadn't been fixed by the ship date could be ironed out tring the first month of production," says Jordan. "But that oved a fatal mistake."

Another problem was software. Because of the rushed schedule, ople's programmers didn't even see the computer until nine weeks fore it was supposed to be shipped. As a result, programming and berational manuals had to be reviewed on the same day that echanicals shipped to the printer, allowing so many errors to slip rough that an addendum had to be published. To make matters worse, Jobs was so obsessed by secrecy that he revealed as little as possible about the Apple III to outside hardware and software developers. Thus, no add-on products or "killer applications" appeared when the product was introduced.

After a fitful ramp-up, production went forward in May 1980, even though half the units coming off the line wouldn't function. Those that did work were shipped to dealers, functioned for a short time, then displayed the words: "SYSTEM FAILURE." Whenever technicians removed the circuitboard from the case, the computer would come back to life. Yet once the circuitboard was put back, it went dead again. Initially, the engineers blamed the problem on manufacturing, then on Manock's aluminum chassis. Yet further analysis showed a range of problems: connectors that wouldn't connect; screws in the case that pierced cables inside the machine; and a circuitboard that was so densely packed, it tended to short out. The real problem, however, was not the machine. It was the culture of invincibility that had grown up inside Apple.

"When Jobs realized what had happened, he was dumbstruck," says Jordan. "After the Apple II, he never imagined we could fail." Eventually, the assembly line was stopped, the problem corrected, and the product relaunched—leaving a gap in the market that IBM filled with its first PC computer in August 1981, giving Big Blue a toehold in the desktop computer market at a critical moment.

DESPITE THE APPLE III DEBACLE, APPLE'S INITIAL PUBLIC STOCK OFFERING ON December 12, 1980—4.6 million shares priced at \$22 per share quickly rose to \$29 and sold out within minutes. By the end of that first day of trading, Apple had a combined market value of \$1.778 billion, which made it the largest IPO since the day Ford Motor went public in the 1950s. Going public not gave Apple the funds it needed to pursue future projects, it earned Jobs, Wozniak, Markkula, and a handful of Apple employees and insiders a huge windfall. Jobs' fifteen percent share would soon be worth more than \$250 million.

Meanwhile, in a bid to end the confusion that had attended the Apple III, president Mike Scott conducted Apple's first reorganization (known as a "reorg") in January, splitting product development into three groups—Personal Office Systems (Apple II/III), Accessory Products (disk drives, printers, modems) and Professional Office Systems (the Lisa division)—while increasing product R & D spending to \$21 million, three times the amount spent in 1980. By March, however, the reorg had created such a backlash among employees that Mike Markkula—the stabilizing force in every crisis during Apple's early years—replaced Scott as president, causing Jobs to replace Markkula as chairman, and Scott to become vice-chairman, a ceremonial role that he eventually quit.

Ironically, Scott's reorg came at the perfect time. After two years of uncontrolled growth, when tiny one-product companies sprung up like mushrooms across Silicon Valley profiting from the boom in personal computers, the first industry shakeout was under way. Like most downturns, it was brutal. But Apple's reorg, plus news that the company had shipped \$1 million worth of products on a single day in March 1981, persuaded Wall Street that the company would turn itself around, which it soon did. Paradoxically, the arrival of the IBM-PC in 1980 was good for Apple, since it brought the legitimacy of the world's largest computer firm to a market that needed some stability. To thank Big Blue, Apple ran a full page advertisement in *The Wall Street Journal*, with tongue firmly planted in cheek, proclaiming: "Welcome IBM, seriously." By May 1981, the shakeout was over, by which time Apple was already into its next major development.

LISA

PLATE 9

Industrial Design: Apple Computer: Bill Dresselhaus, Ken Campbell, Clive Twyman; Steve Balog, Laszlo Zeidek, product design; Hovey-Kelley Design (Palo Alto, CA) Douglas Dayton, James Yurchenco *Dates of Design:* July 1979–April 1980

Introduced: January 1983

One reason for Jobs' lack of attention for the Apple III was his interest in the Lisa, which had always been seen as a more ambitious project. As far back as February 1978, long before the underlying technology was known, Jobs had definite ideas about how Lisa should look. Instead of massing the keyboard and CPU together with a separate display on top, he wanted the display, CPU and disk drives housed in a single unit with a separate keyboard in front. The original Lisa Business Plan called for finished units to be shipped in January 1980 with a manufacturing cost of \$600 and a list price of \$2,000. Yet those numbers soon went out the window as Lisa's hardware and software groups set to work developing what would become Apple's most powerful machine ever.

By the middle of 1979, interest in Apple had grown to such an extent that even the copier giant Xerox wanted to purchase stock—100,000 shares at \$10.50 apiece. Yet Apple would only sell on the condition that Jobs and a handful of Apple employees be allowed to tour Xerox's Palo Alto Research Center (known as PARC), where many of Xerox's future products were being developed.

Xerox PARC. Founded in 1971, PARC was Xerox's way of protecting its dominant position in the copier industry by developing what it called "the paperless office of the future"—a scheme that included desktop computers with high-resolution monitors that could display documents with startling clarity and print them using desktop laser printers. With fewer than 50 researchers on staff, PARC developed or predicted many of the key technologies that would later fuel the personal computer industry. But every time the researchers tried to explain their work to the executives back East, there was little or no interest.

Even though research at PARC was supposedly secret, everyone who cared already knew what Xerox was up to. In a promotional film made in 1970s to promote the Center, Xerox showed an experimental computer called the Alto, which had a high-resolution portrait-shaped display, a mouse that pointed to information screen, allowing fast and intuitive editing using a simple ar itive hand gesture, and a printer that could output exactly we saw on the screen—a technique known as WYSIWYG ("WH See is What You Get"). It was way ahead of anything Apple (one else) was doing.

In December 1979, Jobs gathered an entourage and m PARC researcher Larry Tesler, who gave them a tour. A recalled, "I remember they showed me three things. But I blinded by the first one, I didn't really see the other two."

The second thing Jobs saw, but didn't really see, was an oriented programming language called SmallTalk. Invented by systems engineer named Alan Kay, SmallTalk pioneered the icons instead of typed commands for telling computers what Using SmallTalk, Kay wrote a program called SketchPad (an up version of an earlier program of the same name written b Sutherland in 1962), which converted the computer's binary coa a medium that could manipulate pictures, sound and type of v sizes. Believing that the only computers worth designing were simple enough for a child to use, Kay coined the phrase "per computer" to describe a new breed of machine that would serve tool for creative expression rather than a simple number crune.

Next, Larry Tesler demonstrated a set of Alto computers together into a network, sending E-Mail back and forth using a nology known as Ethernet. The ramifications were enormous like the second demonstration that day, it didn't sink in com to the first thing Jobs saw.

"I was blinded by the first thing they showed me ... the grap user interface"—a method of arranging information on the s that substituted complex commands with visual metaphors that nary people could understand and manipulate.

The most recent machine to demonstrate this concept was the ? 8010 (also known as the Star), a \$16,000 computer workstatio Xerox planned to release in 1981. It had five features that inter-Jobs very much: (1) the graphical user interface, which arranged uments in overlapping windows that could be moved to any tion on the screen; (2) icons symbolizing tools, documents and ers placed on an imaginary desktop; (3) a bar at the top of the s that allowed users to select commands from menus that dro down automatically; (4) a high-resolution bit-mapped display, s ing black pixels against a white screen, which encouraged use create documents that combined text and graphics; and (5) a re desktop mouse that controlled a cursor on the screen, activate icons, windows and drop-down menus, and highlighted text and tures. Compared to the old command-line style of computing Star's paper-white screen, graphical interface and desktop meta were a huge advance in computer design.

"I thought it was the best thing I'd ever seen in my life," said Joh was obvious to me that all computers would work like this some

Convinced that Lisa should adopt the same features as the Xerox Star. is arranged for his Lisa software writers to attend a follow-up emonstration of SmallTalk. "In a single afternoon, Apple's people derstood PARC technology better than Xerox's executives had her years of internal briefings," said Larry Tesler. Bill Atkinson, a the Lisa software writer, says the SmallTalk demo didn't transform ber view as it had Jobs'. "It only confirmed our belief that a graphal interface was the way to go." To support the interface, Stephen iozniak decided to base Lisa's architecture on a brand-new boorola chip known as the 68000, a 32-bit silicon wafer that ran at why 8 megahertz (MHz), but could support more than one software polication at a time, a technique known as 'multitasking.' With the ent software and enough internal memory, multitasking would Lisa to switch from one program to another at the click of a etton, just like the Xerox Star. Armed with this information, Jobs Apple's board that he could deliver a Star-like computer by many 1981 for \$6,000, a price that most businesses could afford. d lowering the cost from Xerox's \$16,000 price tag would require monumental effort. Therefore, with funds still pouring in from the pple II, the board agreed to go on a hiring binge, scooping up any of the best engineers and product designers the computer dustry had to offer, including veterans from Hewlett-Packard. tetal Equipment and Xerox (among them, PARC's Larry Tesler).

Culture Clash. Unlike the Apple II (which still had one foot in garage) and the Apple III (which needed direction), Jobs wantd the Lisa to be a first-class development using the best minds oney could buy. Yet flooding the company with so many new peoe, most of whom followed a very different (and non-Apple) way fworking, threatened to upset Apple's corporate culture. To preent that from happening, Jobs begged Mike Scott to put him in urge of Lisa. But already a culture clash was developing.

The new guys working on Lisa, most of whom were degreed engiers, were very different from the hacker types like Wozniak who did e Apple II," says Clive Twyman. "They respected Jobs' obsession with oing Things Right. But they didn't trust him to manage Lisa as a 'topown' program. To them, the idea of Jobs [a non-engineer without ren a college degree] dictating the design and troubleshooting the etails was scary." As Larry Tesler observed, "Steve wanted us to create mething that was *great*... and, if necessary, he was prepared to *make* be great. But his high standards also made him obnoxious. It's not at he suffered fools badly. He didn't tolerate people who were a lot matter than he was if they didn't share his particular vision."

Bill Dresselhaus. Since hardware development on Lisa began aring the summer of 1979, while the Apple III was still under way, rry Manock could not design the project himself. Instead, he recommended Bill Dresselhaus for the job. Like Manock, Dresselhaus as a Stanford Product Design graduate who practiced design from mechanical rather than an aesthetic point of view. Like Manock, worked at Hewlett-Packard after graduation, and even shared

office space with Manock as a freelance designer in Palo Alto. Not surprisingly, Manock assumed his friend would give Lisa the same kind of design that he would.

"My first day on Lisa, I saw a concept model that Jerry had made and expected me to follow," says Dresselhaus. Like the Apple III, it had a heavy die-cast aluminum chassis and a blocky plastic case with wide chamfers at the corners.

Since Manock had established something of a house style for Apple with the Apple II and III, he assumed that Lisa would receive the same treatment. Yet Dresselhaus and co-designer Ken Campbell had their own ideas. Following Jobs' original concept, they joined the CPU, disk drives and display into a single unit with a keyboard tethered by a coiled cord at the front. Next, they arranged the internal components into separate modules (for easier servicing in the field); placed the modules inside a lightweight metal cage (for effective EMI shielding); positioned a display on the left and floppy drives on the right; and wrapped it in a shell of interlocking plastic parts, which were held in place by only a handful of screws.

Unlike the Apple II and Apple III, which tilted away from the user in an almost reticent manner, Lisa's cantilevered screen projected forward in a friendly gesture, providing space for keyboard storage underneath. Initially, Jobs approved the concept, causing Dresselhaus to order a finished appearance model of the design for presentation to the heads of the Lisa Division in February 1980. Then, for reasons that were never explained, Jobs changed his mind.

"Since Jobs had a reputation for blowing presentations by showing up early and passing judgment before anyone else could say a word, I kept the model covered until the meeting began," Dresselhaus recalls. Even so, Jobs arrived early, removed the cloth and expressed his displeasure. Soon, however, none of that would matter. By March of 1980, the Lisa engineers asked Mike Scott to allow Lisa to proceed without Jobs' further assistance. As a result, Scott put software specialist John Couch in charge of the program. Couch in turn hired Wayne Rosing, a serious by-the-book engineer from Digital Equipment, to manage Lisa's engineering and design.

"After visiting Xerox PARC, Steve had seen the future, but lacked the ability to achieve it himself," says Lisa co-designer Ken Campbell. "He didn't understand the difficulties in developing a new product." That caused him to misjudge the time it took and underestimate the cost at every stage. "By the time Steve was ordered out, Lisa had taken on a life of its own.... It wouldn't change the world the way he wanted."

Yurchenco's Mouse. With Jobs gone, Bill Dresselhaus continued his work on Lisa's industrial design, developing alternative versions (one with a telephone handset on the case, another with a printer mounted on top) then turned his attention to the mouse. Using "the clandestine mouse," a mechanism developed by ex-PARC researcher Jack Hawley, Dresselhaus and Douglas Dayton gave the mouse a basic brick shape, then called in Hovey-Kelley's James Yurchenco, who reduced the cost of the mechanism from \$400, the price Xerox charged for the mouse on the Xerox Star. to less than \$40. "Yurchenco's mouse was a masterpiece of product design," says Dresselhaus. Yet for Hovey-Kelley, it was a missed opportunity. When Apple gave the consultants the choice of designing the mouse for a fee or a royalty on each unit sold, they took the fee—unaware that Yurchenco's design would serve as the core technology for millions of mice produced in the years to come,

At that point, Dresselhaus had to commit. Still following the original business plan, which called for finished units to be released in January of 1981, Dresselhaus finalized his design during the summer of 1980 and waited for the hardware and software teams to catch up. Yet they were far behind—none more so than the group charged with developing Lisa's floppy disk.

Twiggy. In 1977, when the Apple II was first launched, the only device available for storing data was a portable cassette recorder. which was both unreliable and slow. Later that year, a Silicon Valley company called Shugart introduced an inexpensive 5.25-inch drive that recorded data on a floppy disk-a thin sheet of Mylar coated with magnetic material that spins inside a square plastic sleeve. Using a recording head like that found on a tape recorder, the floppy drive could store and retrieve information from any part of the disk, which greatly improved the computer's overall performance. Initially, Apple planned to purchase drives from Shugart and put them in an Apple-designed case. But when that proved too expensive, they developed a clone of the Shugart design with Alps Electric Company of Japan and unveiled the Disk II, which gave the Apple II much broader appeal. Since Jobs considered the floppy drive as important as the Apple II itself, he urged Apple's Mass Storage Division to develop its own low-profile drive, code-named Twiggy, and have it ready in time for Lisa.

"The only problem was that no one at Apple had ever designed a disk drive from scratch," says Richard Jordan, who worked on the project. "Steve was convinced that down the line computer sales would be limited by the availability of drives, and didn't want Apple to be dependent on an outside vendor. Since we could build computers, he assumed we could make a drive... But none of us realized that designing a floppy drive is harder than designing a computer. And mass-producing one that's reliable is like black magic."

The basic problem became apparent with the first prototype, when a bug in the redrive circuit forced the engineers to conduct what they assumed would be a minor fix. Yet the repair exposed two new problems that needed fixing. Once they were fixed, four new bugs appeared. "Each time we fixed one set of problems, a whole new set of problems appeared," says Jordan. "And the numbers increased geometrically." Three years later, the drive was so unreliable that the reject rate at the factory was nearly 100 percent, at which point Jordan begged Jobs to pull the plug on Twiggy. "I said, 'Take out your '45 and shoot the friggin' horse in the head.' But he just wouldn't do it." By the time Lisa was ready to ship, the Twiggy effort was still a impasse, thus forcing Jobs to cancel the program and autho *instead the use of a new 3.5-inch floppy drive made by Sony.*

Despite his protests about the "big company" mentality at work the Lisa Division, the fact that Jobs believed a company the size Apple could develop a disk drive in-house, rather than license technology from another firm. The very fact that he believes shows that he was already thinking of Apple as a big company. T kind of decision-making that brought about Twiggy—known as "NIH Syndrome," or the tendency of big companies to ignore ge ideas only because they were "not invented here,"—is so comm among large companies that business school students study it way medical students study the common cold. Certainly Jobs learn his lesson. As soon as he cancelled Twiggy and gave the green li to the Sony drive, Jobs reached outside the company in another of ical area, and sought out a European designer who would prov concepts for a new language that would help shape Apple's fut products and transform its approach to industrial design.

Meanwhile, Lisa's software designers had done something miralous. They had not only translated the Xerox Star's graphical interfainto a product that more people could afford, they also included c significant improvement that even Xerox couldn't manage—the ality to "grab" a window or icon using the mouse, "drag" it to a diff ent position on the screen and "drop" it into place. This "drag a drop" feature, along with the drop-down menus, floating cursor a other attributes of the graphical user interface soon became a key e ment of the desktop computing metaphor that users everywhe would appreciate.

Borrowing good ideas from wherever they could find them, to Lisa design team introduced a host of ideas that have since be widely emulated: such as how columns are widened on a spreasheet, to how people are notified of mistakes and problems, froits pop-up menus and overlapping windows (borrowed fro-SmallTalk) and status lines (from VisiCalc) to the automatic remoof extra spaces after text deletion (from Douglas Englebau research done at Stanford Research Institute). To this, they add the now-familiar menu bar at the top of the screen and one-buttmouse (both prototyped by software writer Bill Atkinson), mu tasking, plus details such as the Clipboard, the Trash can and we dows that would magically zoom open by double-clicking with t mouse—features that would all be adopted by Apple's next maj product, the Macintosh.

In January 1983, Lisa was unveiled amid high expectations. At t formal introduction, Jobs called the concept "revolutionary," whi was an understatement. But it would take another year and a who new product to make good on the promise that the Lisa foreto Despite its advanced features, its list price of \$9,995 (due in part the high cost of memory chips) made Lisa difficult to sell at first. Y all who saw it, particularly those familiar with old-style computers

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he IBM PC knew that Lisa's software and screen design represented he future. The most unusual part of the product was its industrial esign. The factor and cantilevered screen, suggesting a forehead bove the display and a chin below, were unlike anything the comuter industry had seen before.

Years later, Steve Jobs would make a point of describing Lisa's headke appearance, observing that the top of the screen and the top of he machine were almost even, giving Lisa's face "a Cro-Magnon look." hough he meant it as a criticism, the statement is revealing, for it hows that Lisa's industrial design did influence Apple's next product. Ay cutting Lisa's case in two, closing the left half into a smaller unit ind tucking a floppy drive under the screen, the result would resemle the design that Jerry Manock and Terry Oyama (working under bs' guidance) gave to the Macintosh, thus creating one of the nost recognizable design icons of all time.

Rather than design a product to fill a market niche, the goal was a computer that would change the way people thought about computers." —Jerry Manock

ACINTOSH

Plate 16

industrial Design: Apple Computer: Jerry Manock, Terry Oyama, teve Jobs; Ben Pang, Dave Roots, Laszlo Zeidek, Steve Balog, Bill Jull. product design

autes of Design: February 1981- May 1983

atroduced: January 1984

Weards / Collections: Permanent Collection, Cooper-Hewitt Museum American Design, New York; Permanent Collection, Museum of Iodern Art, New York

Despite Apple's growing size and clout, pockets of the company still ossessed the freewheeling atmosphere that allowed good ideas to ubble up and evolve into breakthrough products. One such idea egan as the brainchild of Jef Raskin, a former college professor and iomebrew member who managed Apple's publications department efore taking charge of a project in mid-1979 to develop a "person-I communications appliance" that would be as easy to use as a baster and sell for around \$600. Misspelling the name of his favorite pple, Raskin gave it the code-name Macintosh.

In December 1979, while Jobs was visiting Xerox PARC, Raskin wilt his first cardboard mock-up of the Macintosh that was small nd self-contained like a television set, with an all-in-one design,

folding keyboard on the front and all necessary software tored on preprogrammed ROM (read-only memory) chips on he main circuitboard. Like a TV, the user would simply plug in the Macintosh, turn it on and use it with no elaborate setup. The machine would be so simple, said Raskin, "it would become an indispensible part of every home," a theme that would echo through the computer industry to this day. Comparing the Macintosh to Apple's all-time best seller. Raskin said, "the Apple II is a system; the Macintosh is an appliance."

When Jobs first noticed the project in late 1980, Raskin had only three people on his team: software writer Guy "Bud" Tribble, the cherub-like engineering wizard Burrell Smith and market researcher Joanna Hoffman. To help out, Jobs recommended hardware and software people to Raskin; many had worked on the Apple II and Lisa. Eventually, they would include Bill Atkinson, Andy Hertzfeld and Larry Kenyon, who wrote system and application software; George Crow, who designed the power supply; Bill Bull, the product design; Bob Belleville, who replaced Tribble as the Mac's software chief; Bruce Horn and Steve Capps, who fine-tuned the Mac's Finder software; and industrial designer Jerry Manock, who was eager to redeem himself in the wake of the Apple III.

Like a draft horse that only felt right when pulling the heaviest load, Manock joined Raskin's team in February 1981 and immediately began work. Within days, he made his first sketch following Raskin's concept, showing a squat all-in-one design with a keyboard on the front that folded up and over the main unit to protect the screen when not in use, and also pivot downward, pushing the screen backward for a more comfortable working angle. "It was an interesting concept," says Manock. "But once Steve got involved, it began to change."

Having left Lisa behind, Jobs became so interested in the Macintosh that he offered to volunteer to help Raskin manage the hardware, took over hardware development completely, volunteered to co-manage the software, and absorbed that part of the program as well. Now in charge, Jobs submitted a "Preliminary Macintosh Business Plan" on July 12, 1981, which predicted that the Mac would ship in early 1982 with a retail price of \$1,500. Though wildly optimistic—the product would actually ship two years later and sell for \$1,000 more—Jobs based his estimate on a few solid assumptions.

Demystifying the Computer. Even though the personal computer revolution was now in its fifth year, Jobs felt that the PC had only begun to scratch the surface in terms of market penetration. In 1981, fewer than seven percent of the U.S. population had ever used a computer in the office or the home, and only three percent of American households had a personal computer (a figure that included toy-like machines made by Commodore, Atari and Coleco). With numbers like that, the home market represented an enormous opportunity for Apple if a way could be found to demystify the computer and make it easy to use yet powerful enough to perform serious tasks.

"IBM has it all wrong," Jobs would say. "They sell personal computers as data-processing machines, not as tools for the individual." In its first year, however, IBM had already made inroads in the business market. Rather than position the Macintosh as a niche product in a market dominated by Big Blue, Jobs focused instead on the growing number of individuals, home-based businesses and "early adopters" who wanted a PC that was genuinely easy to use and small in size as well as price. The solution was to provide the same graphical interface, high-resolution display, Motorola 68000 chip and hand-held mouse as the \$9,995 Lisa computer in a product small enough to carry in one hand at a price that anyone could afford. Designed to be "friendly" at a time when most computers were not, the Macintosh would set the standard for ease of use.

If such a product could be built, it would do for the personal computer what the Model T (the first mass-produced car to start without a crank) did for the automobile. Early on, Jobs picked up on this fact by calling the Macintosh "the first crankless computer." Like the Model T—which Henry Ford made available in only one color (his favorite), black—the Macintosh would come in only one configuration, the one that Jobs preferred. "Steve assumed that a one-size-fits-all approach was essential to the mass acceptance of personal computers," says Jerry Manock. "Providing options would only complicate things and drive up the cost. Besides, Steve figured that most people didn't know what they needed. So he would decide for them."

Terry Oyama. As the development gathered speed during the spring of 1981, Jerry Manock recruited five assistants to help him with the industrial design. From the Apple II division came Terry Oyama, a native Hawaiian who graduated from the Art Center College of Design in Pasadena in 1965 and worked at Singer Business Machines and the Silicon Valley design firm GVO before joining Apple in March 1980. Manock also asked Dave Roots, Steve Balog and Laszlo Zeidek to handle product design and tooling. Finally he took on Oyama's brother-in-law Ben Pang to handle drafting chores and design the Mac's cardboard box and packaging that surrounded the finished product.

In their first sit-down conversation, Jobs asked the designers to put aside the Raskin concept and start over, says Oyama, "But none of us knew what shape to give the Mac. Then Steve said something that impressed me.... He said that most people never do anything great because nobody ever demands it of them... He then looked at us and said, 'If we all agree that the Macintosh is going to be great ... it would become the defining moment of our lives.' "

Rather than work in one of Apple's existing buildings, where the project might be infected by Apple's big-company ways, Jobs found space for the team in a small office building set behind a Texaco gas station at the corner of De Anza Boulevard and Stevens Creek Road, a mere stone's throw from Apple's campus. Because of its diminutive size and proximity to the gas station, the team called its new head-quarters Texaco Towers. Inside, the space was wide open with low-slung cubicles so that Jobs could stand in the center and see each member of the team as he scanned the room, and the team members could all see him.

From day one, Jobs encouraged the team to think of itself as a breed apart, telling each member that it was "better to be a pirate than to join the Navy." This remark inspired two members to create a pirate flag with a skull and crossbones and hoist it from the roof. "Steve wanted to recreate the Apple II experience," says Jerry Manock, "of a tightly-knit group, all working toward a single goal. B rather than design a product to fill a market niche, the goal was create a computer that would change the way people thought abc computers. If we did that, he said, we would change the world."

A New Direction. With Jobs now in control, says Manock, "t goal was no longer transportability. It was a closed box with min mum footprint on the desktop." Unlike the Apple II and Apple I which had a removable lid for accessing expansion slots, or the Lis whose case could be easily popped off for servicing in the fie Jobs wanted the Macintosh case to be closed so tightly it wou require special tools to open it. "Steve felt that software, not han ware, would become more important in the computer industr says Manock. "He figured it wasn't necessary to have access to t computer's inside, because no one ever thinks of opening up a te vision, radio or telephone. Steve wanted users to think of the M in the same way."

The case would also be of a particular shape and size. "Ste had been looking at mass-market consumer products, such as Bra coffeemakers, which occupied very little counter space, and decid that the Mac should have a small footprint as well." Jobs imagined sitting on an executive's desk, says Manock. "It had to be sm enough so that someone sitting on the other side of the desk cou see around it. Because the Mac would be viewed from both sides the desk, it had to be pleasing from the back as well as the front.

Using the same nine-inch monochrome display as the Raskin co cept and a small square circuitboard designed by Burrell Smith the defined the product's footprint, Manock and Oyama made a series sketches in the spring of 1981 showing an upright all-in-one fo with a plain front bezel, a single floppy disk slot, wide chamfer corners (like the Apple II, Apple III and Lisa), the suggestion o "forehead" above the screen and a "chin" below with space for a ke board to be tucked underneath.

Manock and Oyama completed their first design by March. The years later, the final design would be very close to this initial sket. Yet before they could proceed, Jobs encouraged the designers explore other options. "After seeing our initial design, Steve fixat on the Mac's appearance," says Manock. "He wanted the machine have what he called 'elegant simplicity." Yet achieving the kind simplicity Jobs wanted was anything but simple. "When you st looking at a problem and think it's really simple, you don't und stand how complex the problem really is," Jobs said at the tir "Once you get into the problem ... you see that it's complicated, a you come up with all these convoluted solutions. That's where m people stop, and the solutions tend to work for a while. But really great person will keep on going, find the underlying proble and come up with an elegant solution that works on every lev That's what we wanted to do with the Mac."

For Jobs, "elegant simplicity" was just as important inside as it woon the skin. When he saw Burrell Smith's first design for the circ

woard, for example, he rejected it on aesthetic grounds, saying that the ircuits and components on the board should be as balanced and harnonious as a fine painting. He explained his reasoning this way: When you're a carpenter making a beautiful chest of drawers, you're not going to use a piece of plywood on the back. Even though it faces he wall and no one will ever see it, you'll know it's there. So you use beautiful piece of wood on the back ... the aesthetic has to be caried all the way through."

The 70/20 Formula. In order to package as much of the Lisa's unctionality as possible at a low price, Jobs urged the team to adopt in idea he called "the 70/20 formula." "Steve said that if the Mac offered 70 percent of the Lisa's feature set, yet sold for 20 percent of the Lisa's price, people would buy it," says Manock. Unlike the isa, which had 512k of internal memory and two floppy drives, the 4ac would have only 128k of RAM (which forced the software writters to write the most efficient code possible) and a single floppy frive. The one similarity was the chip at the heart of the system. To upport a Lisa-like graphical interface, the Mac would need a 4otorola 68000 running at 8MHz. "It eats 8088s for breakfast," Jobs aid, referring to the Intel chip used in the IBM PC.

"Steve thought users would accept 30 percent less function if the nice were 80 percent lower," says Manock, "so we made a conscious lecision not to go all-out, not to make it too big, powerful or expenive. In one way or another, every aspect of the Mac, both inside and out, follows this formula."

The 70/20 idea also drove Jobs' decision to make the Mac a closed" system. Unlike the Apple II and Apple III, which had expansion slots that allowed users to augment their systems with ideo. networking and other add-on boards, the Mac had its own ideo circuitry, lower-level software installed on a 128k ROM chip hat would be soldered to the motherboard and upgradeable software. That, in Jobs' mind, made expansion cards unnecessary. There was also a practical reason.

"There had been a lot of problems with the Apple II because of he proliferation of semi-compatible expansion boards that crashed he computer," says Manock. "Steve wanted to avoid that problem by declaring the Mac's interior off-limits to the user, which in turn hrove our decision to seal the case and make the area where the bezel meets the back bucket as tight as possible."

Once the team accepted this idea, Jobs also decided that there yould be no cursor keys (the four directional keys found on IBMtyle keyboards) on the Mac's keyboard. Because of its graphical user interface, Jobs assumed that users would prefer the more intutive but less familiar hand gesture of moving the mouse across the lesktop to the key commands needed to operate IBM machines. If hey didn't do this naturally, the absence of cursor keys would force hem to use the mouse anyway.

Jobs then decided not to include an internal hard disk. Weeks arlier, Macintosh marketer Joanna Hoffman had written an impassioned memo on her Apple III (which she wouldn't think of using without a 20-mega-byte hard drive) begging Jobs to give the Mac a hard disk. But Jobs said no: in part because it would make the machine more expensive; and in part because it would require the Mac to have an internal fan, which Jobs would not abide. He even resisted team members' suggestions to put a high-speed SCSI port on the back to attach an external hard disk at a later date. "In 1982, Steve thought that anyone who wanted hard drives had a 'big machine' mentality," says Manock. "In his mind, Mac users would be doing fairly simple things. He didn't imagine anyone writing 1000 books or conducting database management on a nine-inch screen."

Managing the program in a "top-down" structure, Jobs directed the team on all major issues, be they technical, philosophical or aesthetic, allowing ideas to bubble up from the trenches, and shaping them until they met his own exacting standards. According to Manock, "Burrell Smith would often work on something all night, only to have Steve come in the next morning and say, "That sucks," not because he [Steve] believed it, but because he hoped that by saying something critical, Burrell would go back and make it better, which he usually did." As software writer Bill Atkinson later observed, "whenever Steve criticized your work, it was his way of inviting you to teach him what you were doing." In the discussion that followed, "Steve would say something unwittingly that allowed me to improve the product. He often did that without understanding what we were doing."

"Four-Day Specials." Since Manock and Oyama got off to a fast start, Jobs prevented them from finalizing their design too quickly by giving them small assignments called 'four-day specials' that forced the designers to explore alternate concepts. "Occasionally Steve would get obsessed by an idea and have us work on it," says Oyama. The most memorable of these four-day assignments occurred after another Jobs visit to Macy's department store, after which he asked Manock and Oyama to design a Macintosh that looked like a Cuisinart food processor. Oyama complied with a model that had clean lines, a bright white surface and no chamfers at the corners.

Rob Gemmell. Around this time, Manock interviewed an ambitious young designer named Rob Gemmell to replace Terry Oyama in the Apple II Division. Though only 23 years old, Gemmell had already graduated from Ohio State, worked for the design firm Richardson-Smith, and the National Cash Register as well LucasFilms and had built an impressive portfolio. "During the interview, Jerry asked me what I thought of the design Apple was doing," Gemmell recalls. "Since I wanted the job, I said it was pretty good... But as soon as I was hired, I started designing concepts with a more European style," eliminating the chamfers, block-like forms and brown color that characterized the Manock look.

Since Apple II was reorganizing in the spring of 1981, Gemmell spent his first weeks working with Manock and Oyama at Texaco Towers. "Terry had just completed his third version of Cuisinart Mac,

which was beautiful ... It had a smoked glass screen that was mounted flush with the surrounding plastic, which gave the design a totally seamless look." Inspired by Oyama's concept, Gemmell began making his own drawings giving the Mac a fresh look that caught Jobs' attention. Yet before this new influence could affect the Mac's design, Gemmell transferred to the Apple II division, where he discovered that the same Tempress tools that Jobs had contracted for back in 1977 were still being used to mold the Apple."By 1981, more than a million Apple IIs had been shipped. Yet no one had had the time to update the design," says Gemmell. After learning that a revised Apple IIe (Plate 11) was being developed, Gemmell designed a new ABS plastic housing in collaboration with Hovey-Kelley Design and Apple engineer Randy Bleske, which followed the same lines as Manock's original but was stronger and thinner and didn't require any hand finishing, thus saving Apple millions in production costs over the next few years.

Oyama Front / Manock Back. With Gemmell gone, Manock and Oyama returned to their original conservative Macintosh design with the chamfered corners, and divided the next phase of work along the part line that runs around the front of the product just behind the bezel. Terry Oyama designed the front of the case, and Manock designed the back plus the sheet metal chassis inside.

"At that point, the back was squared off, which made it look huge," says Manock. "That's why I applied the chamfers at the top corners on the back. It's surprising how much larger the product looked without them." He then angled the top of the case by seven degrees, which further reduced the volume and freed up space for a handle on top that allowed the Mac to be carried with one hand. Since the back and front of the Mac were basically the same shape, angling the top also oriented the product. "The angled top instantly told you which direction the product was facing."

For the mouse, Manock and Oyama tested nearly 150 different shapes divided into six "wine-tasting" sessions. One model, called Arnold Palmer, resembled a golf ball. Another had a slender mouselike "head" and a tail-like cord that connected to the computer. By comparison, Manock's final design had a wide button on the top and chamfered corners that resembled the Mac itself.

Another New Logo. By the summer of 1981, Manock and Oyama were so far ahead of the Mac's software and hardware teams that Jobs put them on another "four-day special" to search for a new product logo. "Steve still wasn't satisfied with the logo we had been using, because he thought it looked too flat and cost too much," says Manock. "He wanted something that looked flashier yet was cheaper to product." An obvious way to reduce cost was to reduce the number of colors. So Jobs suggested they try a plain silver Apple set against a solid-colored background. Rather than argue, Manock ordered samples showing the silver Apple with six different backgrounds (one for each of the six colors used on the Janov-designed logo) and spread them out for Jobs to examine. But after only a few

seconds. Jobs admitted, "They don't look very good, do t Eventually, Manock found a small Wisconsin firm called Nor Engraving and had them produce an embossed aluminum b printed multiple times to give it a glassy surface, then have i mond-cut around the edges to make it look crisp and three-di sional. On Lisa, the first product to sport the new badge, the pops out far enough to cast a shadow. When Jobs saw it, he w thrilled that he agreed to use it on the Macintosh as well.

Susan Kare. Of all the design elements on the Macintosh, were more memorable than the screen icons, which began w telephone call made by Andy Hertzfeld to an old classmate na Susan Kare. Born in the suburbs north of Philadelphia, received a doctorate in fine arts at New York University in then moved to San Francisco to work as a graphic designer. W Hertzfeld called, he explained what was needed, then asked Ka find the smallest graph paper possible and see what kind of i she could make by filling the individual squares one, making symbol 32 squares high and 32 wide. Taking a minimalist appro Kare developed more than a dozen icons representing folders documents, a tiny wristwatch (that appears when the Mac is forming a heavy-duty task), animal icons (such as the Cow which appears in the Mac's Page Setup box), icons for applica such as MacWrite and MacDraw, the Trash Can for deleting files ejecting the floppy disk, the Command button symbol on the board (which Kare found in a book of Swedish map symbols; i nified "an interesting place" or "prominent feature"), as well as smiley-face Mac that appears on the screen when the machine s up. Kare's icons and graphic standards, which governed the app ance of the drop-down menus, windows, dialog boxes, fonts the interface look and feel, helped as much as the design of the to solidify the cult-like devotion to the Macintosh as it popular a metaphor for the digital world that the rest of the PC indu would inevitably follow.

Obsession. With so much attention given to details, Manock Oyama spent weeks fine-tuning their design. The on/off switch example, was moved from the front to the back, in part to reduce cost of manufacturing, eliminating the wire that extended from power supply in the back to the switch on the front; and also to vent the user from accidentally turning off the machine by bumping keyboard against the front of the case. Yet placing the switch on back required the user to reach around and hunt for it. To make task easier, Manock decided to leave a smooth area on the othery textured case along the back corner next to the switch to guide user's hand as it reaches around. "That's the kind of detail that turn ordinary product into an artifact," says the designer. He also applied bing to the underside of the handle on top. "You don't know the are there until you pick up the machine. When you grab the han you feel the ribs and, in a small way, you're grateful."

Another detail was added at Jobs' insistence. "From the beginn

teve wanted the I/O ports on the back to accept only Appleesigned connectors rather than industry-standard cords," says fanock. Since the Mac had a universal power supply, which could dapt itself to AC voltage anywhere in the world, it was difficult to redict what peripherals a user in, say, India or Brazil, might try to onnect. To prevent users from connecting noncompatible hardware, fanock installed a plastic barrier along the top of the I/O ports and esigned specially notched Macintosh connectors to guarantee that the product would only accept Apple-approved peripherals. This ray, the Mac would remain 'pure.'

For the I/O ports, on/off switch, display controls and other areas, tanock's team and Kare developed a series of product icons terived from the DIN (Deutsche Industrie Norman, a standard in the adustrial design world), with each icon printed on a clear plastic abel and applied by hand to the Mac's surface.

PMS 453. Weeks were spent selecting the right plastic for the case. fter Jobs discovered that the plastic used on Lisa (called Noryl) irned a bright orange color after prolonged exposure to sunlight, he usisted that the Mac's plastic be UV-resistant. Yet neither GE Plastics or Borg-Warner, who both vied for the contract, would allow their dastic to be tested alongside their competitor's. Eventually Manock onducted his own test, preferred Borg-Warner's ABS Cycolac and ave it a tawny brown color known as PMS 453, which he thought would age more gracefully than any other.

Since Jobs forbid the engineers from installing an internal fan (too oisy), venting on the Mac became crucial. "Jobs wanted the Mac to ave maximum airflow," says Oyama. "But Jerry worried about safe-. As an appliance computer, we assumed the Mac would be in omes with children. What would happen if a child pushed a paper lip through a side vent and touched the power supply?" To address hat problem, Manock designed louvered vents that forced air to egotiate a tight S-curve before entering the machine. But doing that educed the airflow. Since Jobs held fast to his no-fan rule and Jerry rould not redesign the vents, the decision was made to put vents in the top as well as the sides.

Revise, Revise. As the design evolved, every detail was analyzed, iticized and redone, often more than once. Burrell Smith redesigned he circuitboard three times, making it tighter and more efficient with ach iteration. The most important revisions occurred with the softare. Because high memory prices in 1983-84 allowed the Mac to ave only 128k of RAM, Jobs urged his software writers to create the ghtest, most elegant code possible. One feature that users now take or granted—the scroll bars that run along the right side and bottom fevery Macintosh window, allowing users to scroll through a document by dragging a white box (called a "thumb") or clicking the mow at either end—took software writer Andy Hertzfeld months to erfect. The first version consumed 80 pages of code. By the time he was finished, Hertzfeld reduced it to just 20 pages—perhaps the best xample of "elegant simplicity" in the entire product.

To convince software writer Larry Kenyon to shave five seconds off the lengthy start-up time when the machine is first turned on, Jobs implored him with the following: "Imagine that millions of people will be using the Mac ... if you can make it boot up just five seconds faster ... that's five seconds times *millions* of startups every day ... or fifty life times in a single year. Shaving off just five seconds, it will be like saving 50 lives every year ... *forever*."

Terry Oyama redesigned the Mac's front bezel three times: first to accommodate a 5.25-inch Shugart floppy disk drive, which was discarded in 1981; then for the ill-fated Twiggy drive, and finally for the 3.25-inch Sony drive, which first appeared on the Mac and soon became the standard for all personal computers.

For Manock, the most critical areas were the back bucket and the main case joint, which attaches the bucket to the front bezel in a part line that extends all the way around the case. "Steve was obsessed by the idea that the case appear to be a single piece. He didn't want any visible part lines or screwheads showing." The main screws that hold the case together at hidden inside the handle on top.

Once Manock handed his work to the product designers, tooling the case was a challenge. According to Bill Bull, "the shape of the rear bucket meant that it could not have a uniform wall thickness. To set correctly, the plastic had to remain in the mold much longer than usual, which made the thicker walls dimensionally unstable." In the end, 15 separate forming tools were needed to make that one piece of plastic.

The Fremont Incident. Because the inside of the case had to be sprayed with metallic paint to ensure proper EMI shielding, the joint that secured the back bucket to the bezel was so tight that workers at Apple's \$20 million Macintosh factory in nearby Fremont couldn't fit the two pieces together. Unlike Apple's other manufacturing plants in Dallas, Singapore and Ireland, the Macintosh factory was completely automated. Each step in the process, from unloading parts at one end to pushing finished Macs out the other, was controlled by robots. Since the design of the factory was as important to the success of the Macintosh as the design of the product, Jobs obsessed over every detail of the Fremont plant, from the just-in-time parts delivery (a technique borrowed from Toyota) to the color used on the walls, pipes and racks inside so that workers would stay in the right frame of mind.

Just as the plant was ramping up, Jerry Manock got an urgent call from the Fremont manager, complaining that the line had been halted. The reason: Manock's plastic cases wouldn't snap together. The plant manager called them "useless."

When Manock, Oyama and tooling engineer Laszlo Zeidek arrived the next morning, the factory seemed unreal. At one end, where components had been arriving by the truckload, where they were stored in gigantic three-story elevator storage units, all was quiet. Inside, where robotic arms were supposed to feed parts and components to other robots building Macs on the assembly line, all was still. Farther along, at dozens of build stations, where the Mac's brain was inserted and tested, workers stood idle. Meanwhile, at the point where the chassis was inserted into its plastic case, Manock found the plant manager pacing back and forth. Behind him, an enormous burn-in rack, standing seven stories high, should have contained hundreds of Macs receiving their 24-hour-stress test before being packaged for shipment. But the racks were empty.

As Manock and the others entered the assembly area, they brought with them an arbor press that Laszlo Zeidek had fished out of his basement the night before. Then, to the plant manager's amazement, the designers took two "useless" plastic parts from the discard bin, positioned the front bezel and rear bucket in the arbor press, and snapped them together with a gentle *thonk*. Within an hour, the factory was up and running again. "We expected that closing the case would be tricky, because making the unit tamperproof meant the joint had to be tight," says Manock. "To be honest, I was worried until the moment that first bezel and bucket actually went together."

With problems of this kind consuming every minute of the day, most team members no longer obeyed a 24-hour clock. For his part, Jerry Manock discovered that he could save five minutes a day by not shaving. In June 1983, he vowed not to pick up a razor until the Mac shipped. For that reason, all photos of Manock taken after that time show him with an ever-lengthening beard.

Package Design. Toward the end of the program, Ben Pang worked with Marketing, Manufacturing and Creative Services to design the Mac's cardboard and styrofoam packaging and make it as unique as the product it contained. "Like everything else, Steve wanted the packaging to be elegant," says Pang. "As you open the box, the computer should be presented to you immediately. So it sits right on top." After removing the Mac, every part of the product—the keyboard, mouse, software disks, cords and manuals—was packaged in separate compartments, forcing the user to remove, unwrap and discover each component in sequence, a ritual that establishes a personal relationship between owner and machine. Wrapped in bleached white cardboard with a simple black-and-white photo of the Mac with the now-classic Garamond Condensed type, design of the Mac's shipping box would influence the packaging used on all later Apple products.

A Design Icon. Looking back, Manock and Oyama had no idea that their work would one day become one of the most recognized industrial designs of the century. "When you're designing something, you're living in the moment. You don't think about the bigger issues until later, if at all," says Oyama. "But Steve thought about the Mac as an icon from day one. Even though Steve didn't draw any of the lines, his ideas and inspiration make the design what it is. To be honest, we didn't know what it meant for a computer to be 'friendly' until Steve told us." For this reason, Jobs's name is included with Manock's and Oyama's on the original Macintosh design patent. To return the favor and express his gratitude, Jobs ordered that the signatures of the entire Mac team (47 in all) be molded inside the case.

Neither Manock nor Jobs views the success of the Macinto design in terms of its outward appearance. "The Macintosh mad difference, because it was the first mass-produced compu designed around the user interface," says Manock. "My focus was value: how to make an honest design statement at the lowest p sible cost. Steve wanted it to be personal. He felt the compu would never be truly accepted until the user could relate to According to Jobs, "the Mac's design wasn't so much what it look like. The design was about how it worked on every level. Everyth about it had to be compelling yet immediately familiar." Years la he said, ""Ultimately, it comes down to taste ... expos[ing] yours to the best things that humans have done, then trying to bring the things in to what you are doing ... Part of what made the Macinto great was that the people working on it were musicians and po and artists, zoologists and historians, who also happened to be best computer scientists in the world."

The idea of a computer as a head on the desktop, with a face a a chin, encourages the user to think of it as an alter ego, a desk friend that will always be there. In a sense, when one looks at Macintosh, one can almost see Steve Jobs staring back, reflecting al his strengths—an inspired concept and good quality control—as w as his idiosyncrasies. But the key to the design—the all-in-one for factor—remains timeless. Years later, Apple designers would single the Mac's iconic quality as a yardstick for simplicity, the goal being create a design that was so strong and simple, it could be reduced a few pixels (like Susan Kare's startup icon) yet still be recognizab

As THE MACINTOSH DESIGN PROGRESSED DURING THE WINTER OF 1981– Rob Gemmell watched and wondered. "The brilliance of the M was the idea that the screen remained consistent no matter w application you were using. That was a *great* concept. But, unfor nately, the industrial design didn't support it as well as it cou Despite the consistency being preached on the software side, Appl hardware had very little consistency in 1982-83. Each division Apple II, Lisa, Macintosh and peripheral products—had its own st and approach to design, which made the products appear to confrom four separate companies instead of one."

Once he had finished the Apple IIe, Gemmell spent the first wee of 1982 filling sketchbooks with ideas for a portable Apple II. first, Jobs didn't like my sketches, because the technology did n allow them to be turned into products right away. But, later, he reized that concepts that are impossible to achieve in the near teare still useful as a goal. Then he encouraged me to push the emlope and wondered why Manock and the other designers were doing the same."

The Birth of SnowWhite. Gemmell couldn't understand it eith On the Macintosh program, the only conceptual work that ever ha pened, such as Cuisinart Mac, was initiated by Jobs, not Manock Oyama. "Since 1980-81 had been a fertile period for design," partie ×.

by in Europe with the rise of Memphis in Italy and a boom in prodts that stretched around the world, "Steve wondered why Apple's esign was stuck in low gear," says Gemmell. With Apple's technoloon track and sales still brisk, Jobs considered that attention to esign was long overdue. Yet he didn't know what steps to take, says emmell. "So I suggested that we invite some top European designs to give us some new ideas."

By coincidence, Gemmell had just attended a party given by a local odelmaker named Jack Hokanson and met a German designer nose work was already well known. His name was Hartmut slinger. "I first saw Esslinger's work in *Form* magazine," Gemmell calls. "So when I met him at the party, his personality made a ong impression on me."

Jack Hokanson. A small yet critical element in the transformation Apple's industrial design, Jack Hokanson was a Silicon Valley native 10 studied industrial design at San Jose State University, graduated 1980 and went to Europe hoping to kick-start his career. "I noticed ot of cool stuff in a European design magazine coming from a firm lled Esslinger Design in Altensteig, Germany," Hokanson recalls, "So topped a train to Germany, knocked on Esslinger's door and told n I wouldn't leave until he agreed to let me work there." At the time, slinger had two partners, Andreas Haug and Georg Spreng, a modmaker named Walter Funk, a junior designer named Herbert Pfeifer d an in-house engineer named Thomas Gengele. "Hartmut wanted hire me right away," Hokanson recalls, "but Georg Spreng worried at I might be a spy who would take all of their secrets back to nerica. My presence caused a lot of friction within the partnership. it I later realized that friction was an ingredient in everything utmut Esslinger did ... as necessary as oxygen."

Since Hokanson spoke English and grew up in Silicon Valley, he ent hours listening to Esslinger discuss his design philosophy and e differences between European and American design, and sat for ours as Esslinger showed slides of his trips to the San Francisco y area. "In the early 80s, there was an almost unnatural fascinan with California among the Germans," says Hokanson. For years, slinger had dreamt of setting up a design office in Silicon Valley, here he could explore the music scene in San Francisco to the rth, enjoy the white sandy beaches near Santa Cruz to the south, d feast on the billion-dollar high-tech corporations that lined the ghways in between. "When Hartmut spoke of California," says okanson, "you could almost hear the ring of a cash register. He emed to know everything about the place except how to say it. te many Germans, he pronounced it Californ*ian*. But once I set m straight on that detail, his knowledge was complete."

After seeing Esslinger's model shop, Hokanson realized that rman modelmaking techniques were superior to those being acticed in Silicon Valley. "Hartmut said I could probably make a tter living as a modelmaker than as a designer," says Hokanson. e taught me the correct way for designers to present their work and allowed me to study their methods so that I could set up my own shop in California." Hokanson agreed to return the favor one day ... "perhaps by helping him set up his own studio in California in the next year or two."

Using secrets learned at Esslinger's shop, Hokanson returned to the Valley in August 1981, co-founded the modelmaking firm Eikan in Campbell, midway between San Jose and Cupertino, and soon received contracts from Sun Microsystems, Hewlett-Packard and Apple. Hokanson then suggested that Esslinger stop over and visit during his next trip to Japan, which occurred in January 1982. Hokanson threw a party at Eikan's studio to introduce Esslinger to local designers, including Apple's Rob Gemmell.

After the party, Gemmell borrowed tear sheets from Esslinger's portfolio showing designs he had done for clients such as Sony, AEG and the German electronics maker Wega. "I considered Hartmut's design more user-oriented than the work we had been doing at Apple and wanted to show Steve the difference. But to my surprise, Steve wasn't very impressed. He thought it looked too soft." Even so, Gemmell's earlier criticism of Apple's design had forced Jobs to think. "After our first conversation, Steve agreed that we needed to improve Apple's design in a big way, but didn't know how to go about it."

Everyone around Jobs during the winter of 1981-82 could see that his attitudes and tastes were changing. With the initial public offering a year in the past and the value of his Apple stock now approaching \$250 million, Jobs had undergone a personal renaissance, replacing his flannel shirts and jeans with hand-tailored suits, expensive sportswear and \$100 New Balance running shoes. As Apple continued to expand, every new building became an opportunity for Jobs to exercise his taste in architecture, ordering that each building the company moved into be gutted and redesigned, even if it was new. Likewise, every piece of advertising, every bit of packaging, manual and letterhead had to be clear, logical and aesthetically pleasing. In this context, it was only natural that Apple's products have the quality and flair that world-class industrial design could provide.

"As we looked at the tear sheets I had taken from Jack Hokanson's party, I told Steve that Apple's industrial design had to at least catch up with the software in terms of consistency, or the whole product line would fall apart," says Gemmell. "To do that, we needed more than an incremental improvement ... we needed a whole new design language that would unify the look and feel of every product Apple sold. But developing a new language isn't easy and shouldn't be done in isolation ... so I recommended that we look outside the company and seek out some top European designers as consultants to help us."

Ordinarily, the place to suggest such an idea was the in-house group known as the Apple Design Guild. An informal grassroots affair founded by Jerry Manock in 1981, the Design Guild was intended to foster communication among designers who worked in Apple's various divisions but rarely met face-to-face. With the company approaching its fifth anniversary, Manock sensed a need for change and hoped that regular meetings would enable Apple's designers to spearhead change from within.

Since Gemmell considered his design language idea too important for a low-level discussion, he encouraged Steve Jobs to attend the next Guild meeting, scheduled for the first Tuesday in March 1982, and to bring it up there himself.

THE SNOWWHITE PROJECT

"Mirror, mirror, on the Wall ..., Who's the fairest of them all?"

-The Wicked Queen

At the March 2, 1982 Design Guild meeting, Steve Jobs opened the discussion by observing that Apple's industrial design needed to be more consistent and in tune with its software, echoing Rob Gemmell's earlier suggestion. "Steve said that we were all too busy doing ordinary things to think about doing anything great," recalls Lisa's co-designer Ken Campbell. "But that was going to change... Steve not only wanted our design to be the best in the computer industry, he also wanted Apple to be in the 1980s what Olivetti had been in the 1970s—an undisputed leader in industrial design."

Jobs then paraphrased Gemmell's recommendation—that Apple hire a top European designer to create a new design language for the next Macintosh, Lisa and Apple II—and snapped the designers to attention by volunteering to undertake the search himself. Frightened by this prospect, Jerry Manock quickly jumped in. "I agreed we had problems," Manock recalls. "But few American companies had what one would call a world-class design language in 1982. Compared to European companies, however, we *were* behind ... and needed to catch up if Apple was going to become a real international company. For that reason, we agreed to look for a European designer." Hiring an American was never even considered.

True to his product design background, Manock insisted that the process for selecting a consultant be clearly defined. "Instead of picking just one designer, I suggested that we invite three or four to participate, give each designer a list of future products with detailed specifications and ask them to create concepts that we could refine ourselves in-house." Inspired by a children's book that he had been reading to his daughter the night before, Manock proposed they call the project SnowWhite and asked designers from the various divisions to write detailed descriptions of the next seven products that Apple would need, each named after one of the seven dwarves.

Jobs loved the idea. Like the storybook characters, he wanted Apple's products to exude a sense of charm and optimism, with a playful personality that would appeal to the child in everyone, and a sophisticated look that buyers would instantly recognize. If handled correctly, the SnowWhite project would not only give Apple's products a new sensibility, it would also introduce Jobs to a wider circle of design talent, which he now realized was necess

To identify potential candidates, Manock and Oyama sp pouring over back issues of *I.D.* Magazine, *Domus* and *Form.* on the other hand, pulled out a sheet of paper and began placing a single name at the top, leaving the rest of the page Manock and Oyama to fill in. When Manock saw the r Gemmell had written, he had to ask Oyama who this Hartmu was. "To be honest," says Manock, "Td never heard of him."

IN APRIL OF 1982, ROB GEMMELL, JERRY MANOCK AND TERRY OYA: for Europe to interview the various SnowWhite candidate design brief had not yet been written, they told each cand Apple wanted concepts for an in-house exhibition the inspire Apple's designers and influence their forthcomi Each consultant's fee was set at \$50,000.

In London, they visited Nick Butler and Steve Bartle Design. Their dark, cool hard-edged designs looked extrem ern. Butler and Bartlett were interested in the SnowWhite and asked to participate. In Paris, French train designer Rog declined their offer, saying that he had no experience with ers. Next, they went to Milan to interview Ettore Sottsas Memphis Group was lighting a fire under the staid trac European design. "Sottsass wanted to do the project," or recalls, "but he also worked for Olivetti, which was then the personal computer business. So there was a conflict." T visited Mario Bellini, whose long-standing relationship with also made working with Apple impossible.

After the meeting with Bellini, Manock recommended th to California and proceed with BIB. But Gemmell reminded leagues that they still had one more candidate to visit. To they would need to fly to Stuttgart, then travel by car to the t of Altensteig in the Black Forest, where Hartmut Esslinger his firm Esslinger Design.

Hartmut Esslinger. Born in 1944, the son of a clothi owner, Esslinger studied engineering at Stuttgart T University, then switched to industrial design, where he st the Hochschule für Gestaltung at Schwäbisch Gmünd, while tained a strict Bauhaus atmosphere that taught design less of style than as a vehicle for social improvement. In 1969 B set up his own design firm in a garage in Altensteig with fel dents Georg Spreng and Andreas Haug. "All three had a sin tude toward design," says a colleague, "and they were det to make their mark on the world."

While still in the garage, the trio attracted high-profile clie as the dental equipment maker KaVo and the German ele giant AEG, and developed close relationships with many top tives, such as Dieter Mötte, the chairman of the German ele maker Wega. Mötte gave Esslinger wide latitude in the de Wega's style-conscious televisions and stereo gear. When H posed a design for the Wega 3020 television in a bright green case, tte nicknamed it "frog," which Esslinger then adopted for his corrate logo. In 1975, Esslinger began to advertise the firm on the back 'er of *Form* magazine, where designers around the world. includ-Rob Gemmell, could chart their progress.

When Gemmell, Manock and Oyama arrived at Stuttgart airport, linger was there to greet them. He loaded their suitcases into his and drove them to his studio. "He had a tricked-out red BMW, ich he drove at about a hundred miles an hour," Oyama recalls. "I s holding onto my seat. Then, during the trip, Hartmut put on a e of Kitaro playing *Silk Roads*. It felt like we were in a movie." In ensteig, a cozy medieval village set in a storybook landscape, linger gave the designers a tour of his three-story design studio I model shop and introduced his partners, Andreas Haug, Georg reng and designer Herbert Pfeifer.

Inlike the dark hard-edged concepts that the Apple designers d seen at BIB, Esslinger's designs were colorful and friendly, with t corners and tactile surfaces that encouraged the user to touch d interact. "Andreas Haug was considered the best designer in the n," says Gemmell. "Hartmut was the promoter and director. He ew how to get business by developing a personal relationship h the company's top management. Once he discovered what the airman wanted, Hartmut would have his designers pursue several callel directions, then synthesize the various ideas into one really underful solution. It was a smart way of operating."

After seeing his work, the Apple designers spent more time interwing Esslinger than the other SnowWhite candidates combined. e liked the fact that he had his own model shop and talked a lot but design philosophy," says Gemmell. "He was fascinated by ifornia and wanted to open a design office there, midway between Germany and the work he was doing for Sony in Japan."

Gemmell and Manock then gave Esslinger the same pitch they had en the others, asking him to make concepts for an in-house exhition. But Esslinger made a counter-offer. "I proposed instead a stegic study from the top down and the bottom up," he says, "in ler to achieve a common understanding, then implement products in there"—which was far more ambitious than what Apple's signers had in mind.

Back in California, Gemmell showed samples of Esslinger's and B's work to Steve Jobs to get his opinion. "Steve was enthralled BIB's hard-edged executive-looking products," Gemmell nembers. "But, once again, he didn't care for what Hartmut was ing. He considered it too soft."

A few weeks later, while in London, Jobs visited BIB's Nick Butler see their work in person and was even more impressed, "We had eady done some preliminary SnowWhite models," says Butler, ad Jobs was excited about what we were doing. The concepts he ed most were also the most technically feasible. So he asked us to rsue them." But once Jobs returned from London, Gemmell cautioned him not to make any quick decisions: "I told Steve that it's easy to develop a visceral response to a design, but that making the right decision takes time. I said that Hartmut's work was on a higher level than BIB's and would be a better fit for Apple, because Esslinger can humanize technology and give a computer the right emotional spin. So Steve agreed to back off ."

Meanwhile, in Germany, Hartmut Esslinger reflected on his first meeting with Apple's designers and decided it was time to meet Steve Jobs face-to-face. He then asked one of his designers, Herbert Pfeifer, to make sketches for a personal computer that he could take to California with him.

"It was a lot to ask for," says Pfeifer, "because personal computers didn't exist in Germany at that time. We'd heard the words 'user interface,' but didn't really know what it meant. So I filled a sketchbook with 20 or 30 drawings showing boxes with monitors on top, partly as a styling exercise and partly as an ergonomic study."

With Pfeifer's sketchbook in hand, Esslinger visited Cupertino in May 1982, met with several Apple executives, then received an audience with Jobs. "People warned me to be careful what I said to Steve," he recalls. Yet Esslinger quickly discovered that he and Jobs shared a number of opinions about design, such as a preference for Braun appliances and Mercedes automobiles. Jobs was also impressed that Esslinger worked for Sony, a company that used design in a way that Apple could emulate.

"Steve asked me to do for Apple what I had done for Sony: create a leading global image for Apple ... to make Apple the best in the world." By the end of the meeting, Esslinger agreed to conduct a strategic design study, called "New Brand Image," in addition to the SnowWhite concepts, for which Apple would increase his fee accordingly.

THOUGH STEVE JOBS HAD NO WAY OF KNOWING IT AT THE TIME, HIS MEETING with Esslinger in May 1982 would kick off a long and fruitful relationship that would soon transform Apple's entire product line. Even though Esslinger did little hands-on design himself, he was already a powerful force in the design world. The result of many qualities—a firm understanding of aesthetics, a good eye for hiring talent and indomitable will—the key to Esslinger's success was the recognition that the quality of a designer's work mattered less than the ability to show it to the top executives who make the decisions and convince them to follow the designer's lead. It was the "demo or die" philosophy translated into the design world. "Many great designers never become famous, because they can't get to first base with management," says Rob Gemmell. "Hartmut, on the other hand, could hit the ball out of the park."

On the rare occasions when he did put pencil to paper, colleagues say, "Hartmut could bring out the visual, tactile or emotional content of a product better than anyone. He loved to play his Deep Purple and Rolling Stones records at full volume while he was working, so he could *feel* the music rather than hear it. He liked to *feel* design in the same way ... [and] was very good at conveying this idea to clients. I've never seen anyone play a CEO the way Hartmut can: finding out what makes him tick, adopting his likes and dislikes and molding his message along the way. He did that with Dieter Mötte at Wega and later with the executives at Sony. Ultimately, selling is just as important as design, perhaps more important, because unless you can get your foot in the door, nothing else matters." Though trained as a designer, Esslinger was at heart an entrepreneur, Like Jobs, he was driven by two conflicting impulses: the adolescent need to dominate and be recognized, and a firm belief that the world could be made better possible through the appropriate use of design and technology.

Given this similarity, it's not surprising that Jobs' ideas about design began to change. When Nick Butler and Stephen Bartlett visited Cupertino in late May, for example, Jobs looked at the same concept he had approved in in London four weeks before and decided he no longer liked it, then became cool when Bartlett asked why. Assuming they would not be asked to continue, the two Englishmen prepared to leave. Then a peculiar thing happened. "After meeting with Jobs, we were asked not to drop out, but to continue as though nothing had happened," says Butler. "We were told that Hartmut Esslinger would be designing concepts as well. So we agreed to go ahead." Yet from that point onward, Jobs' preference tilted away from BIB and toward Esslinger.

By JUNE OF 1982, ESSUNGER AND BIB HAD BOTH RECEIVED THE SNOW WHITE design brief, which outlined the project's goals with descriptions of eight products that would form the backbone of Apple's future product line. "Apple is now selling products all over the world," it said, "thus the product design must reflect the 'global' aesthetic of a multinational company ... enhance the impression that [Apple's] products function as a unit ... establish standards of design craftsmanship ... emphasize the person/machine interface ... [and] establish that Apple products exhibit the best design in the world."

The schedule called for work to begin in July 1982, be reviewed in September and November and conclude in January 1983 with a final presentation to the executive staff in Cupertino on March 17, 1983. Each consultant was assigned an Apple designer to serve as in-house contact. Since Jerry Manock and Terry Oyama were spending all of their time completing the Macintosh, Esslinger was assigned to work with Rob Gemmell, who was in daily contact with Jobs and could relay any change in thinking as the project proceeded. BIB was assigned to work with Jim Stewart, a designer in the disk drives and peripherals division.

Named after characters in the SnowWhite story, complete with illustrations of each character, the brief included descriptions of the eight products for which Esslinger and BIB would supply concepts:

 Doc – a next-generation Lisa computer with a 15-inch portrait display, internal 5.25-inch hard disk, 3.5-inch floppy drive, keyboard and mouse, to be shipped in 1985;

- Sneezy a next-generation Apple II with a separate CPU, dis floppy drive and keyboard, for introduction in 1985;
- **Happy** an entry-level Macintosh that would be one-third s er in size with a 9-inch display, for introduction in late 1984;
- Bashful a prototype notebook computer, having an 8.5- by inch touch-sensitive liquid-crystal display, for introduction in 1
- Sleepy a desktop mouse;
- Grumpy a desktop dot-matrix printer;
- Dopey an external 3.5-inch floppy disk drive; and
- Flower an external 5.25-inch hard drive, named after a cha ter from "Bambi." (The SnowWhite story had only seven dwa

According to the brief, "this project is an investigation of Prejudgment as to implementation is to be avoided"—meaning Manock, Oyama and Gemmell would have the right to the final cepts, alter them to suit their own taste and use elements of the designs in their own work—a prospect that Hartmut Esslinger did exactly relish. But as a consultant, Esslinger had dealt with in-he designers before; when the time came to protect his interests would know what to do. As the final sentence in the SnowWhite noted: "It will be a true learning experience for all involved."

WHILE MANOCK AND THE OTHER APPLE DESIGNERS ASSUMED THAT SnowWhite project would serve their interests, Hartmut Esslinger things differently. He saw the proposal as a cry for help, an ad sion Apple's in-house staff could not design world-class proc without external help. He also saw it as an opportunity to work one of the most dynamic companies in the world and share i with its most famous and forward-thinking player, Steve Jobs.

"By then, it was obvious that personal computers would been the industry of the 1980s and '90s," Esslinger recalls. "Jobs already put Apple on the map with the Apple II and gained a l following. But to attract a wider audience, they [Apple] neede improve everything about their products, especially the design."

In Esslinger's view, "Jobs needed two things: in the short term needed design concepts that he could use to convince Apple's b that the hardware side of its business needed world-class indudesign." Yet Apple needed more than a design language. It need new *approach* to design that the SnowWhite brief did not address that reason, says Esslinger, "we had to go beyond the brief and coup with product ideas that Apple's people would never have imag on their own." Having seen what Apple's in-house designers had c and knowing the kind of design of which BIB was capable, Esslihad no doubt that his work would prevail in the end.

CHARGED UP BY HIS FIRST MEETING WITH JOBS, ESSUNGER DIDN'T RETUR Germany right away. Instead he drove to Jack Hokanson's momaking shop in Campbell, rolled up his sleeves and went to w Without his usual design team or German model makers to help Esslinger produced his first set of SnowWhite concepts in Hokans udio, using a generic style reminiscent of German products from the te 1960s. Characterized by simple shapes, soft corners and a generlack of definition, these first designs fell into two distinct groups. Inst came "The Hamburger Look" (Plate 22), which, Herbert Pfeifer tys, "had a brown horizontal stripe in the middle of the CPU sandtiched between two soft white layers on the top and bottom, which hade it look like a hamburger." One version had a portly Germanic uality (similar to a 1972 Esslinger computer design called the CTM-0 Middle-Frame Computer), another had thick chamfered corners at the back, similar to those used by Jerry Manock.

Next came a series called "The American Look," which Esslinger is was "oriented by Hollywood, comparable to Art Deco as defined movie sets rather than real buildings." Yet they too were soft; any semblance to genuine Art Deco was purely accidental. Included in is group was a concept known as WorkBench, in which separate imponents (CPU, display, printer, loudspeaker, telephone receiver) ere mounted on a beam-shaped track at the back of the desk for fore efficient use of space (Plate 18).

When Apple's designers saw the first models in September, they ere more impressed by the modelmaking than the design. "The uality of Hartmut's foams was so good," says Terry Oyama, "they oked like real products. He had sanded and painted them so that er surfaces were perfectly smooth. Our models were crude by omparison." The secret to Esslinger's models was a dense lighteight polyurethane foam called RenShape, which was not yet wideavailable in the U.S. By gluing sheets of RenShape together into a lock and placing it in a computer-controlled milling machine, he ould fabricate solid models that were an exact replica of the design eveloped on a CAD computer. Once the block emerged from the achine, it was then sanded and painted. "We had never seen anyne generate high-definition models so quickly and use them to try at ideas before choosing a final direction," says Oyama. "That abilgave him a clear advantage over BIB."

THER COMPLETING HIS FIRST SERIES OF MODELS IN CALIFORNIA, ESSLINGER turned to Germany with an Apple II computer, which he placed on *s* desk and studied for hours. "We looked at the CPU's boxy shape, e wedge on the front and the vents that ran around the corners on e back," recalls Herbert Pfeifer. The team then designed a new ries of concepts in September and October known as "The Wega ook," which borrowed elements from Esslinger's earlier work for the erman electronics maker, notably displays that connected to the PU by means of a rubber bellows, which allowed the screen to tilt any direction (Plate 17, 19).

Then came the November review, which took place in Germany, nder the watchful eye of Jerry Manock. Because of his work on the acintosh in the fall of 1982, Manock could not spend much time on nowWhite. During the November visit, he not only reviewed slinger's desktop concepts, he also collaborated with Esslinger's team in the model shop, coming up with a keyboard concept that was so thin and lightweight, it had no frame around the keys. Known as Cassie, this "frameless" keyboard would later become one of Esslinger's signature concepts at the formal SnowWhite presentation.

Spurred by Manock's input, Esslinger created a fourth series of concepts in late November with a brand-new element: narrowly-spaced parallel grooves on the surface. Crisper and more sophisticated than the "Hamburger," "American" and "Wega" series, the new concepts which Esslinger called "Digital Design"—were simple yet sophisticated, with a sense of scale and precision that the earlier designs lacked. (Plates 20. 21). "We liked Digital Design, because the surface lines made the components look smaller," says Esslinger. "They also allowed us to ventilate the product by punching through the lines at any point without affecting the overall look of the design." Working quickly, the team turned out a Digital Design version of Doc by wrapping a grooved box around a computer screen which tilted up and down on the front, and mounted a floppy drive on top; a scaled-down version of the same idea for Happy; and their first portable computer, a simple clamshell design called PaperBack (Plates 16, 23, 24).

The following week, Esslinger hired a new designer named Stephen Peart (pronounced 'Peert'), who arrived from London, with a sensibility that improved Digital Design at just the right moment.

Steven Peart. Born near Durham in the north of England, Peart studied art from an early age, trained in industrial design at Sheffield City College, graduated from London's Royal College of Art in 1981, and met Esslinger in April 1982 while touring Germany with a friend. "Even though Hartmut didn't know me from Adam," says Peart, "the minute he heard that my friend worked for Porsche, he invited us over, showed us around his studio and took us for a drive in his BMW ... tooling through the forest like a madman." Back in London, Peart sent his portfolio to Esslinger, and called again and again until Esslinger agreed to hire him. "Hartmut liked my tenacity," he says. "He looked at me and saw a bit of himself."

According to Herbert Pfeifer, Peart's arrival influenced the team's design in a subtle but important way. "Before Peart joined the firm, our concepts were still soft, which was common among German designers in the late 1970s. But the new style in the early '80s was coming from London, where everything had tight lines, sharp corners and precise surfaces." Soon this new attitude was injected into the SnowWhite concepts, causing them to evolve in a critical way just before Steve Jobs arrived to review the designs in late December. To finish the new designs, Esslinger's team worked seven days a week.

MEANWHILE, IN CUPERTINO, AS PROGRESS ON THE MACINTOSH CONTINUED, A tragedy occurred when a now-forgotten individual in the Lisa division put in a work order to have a vacated storeroom inside the Lisa building on Bandley Drive cleaned out so that a new design team could move in. "Since there was sensitive material in that part of the building, the custodians were supposed to work under supervision," says

Lisa co-designer Clive Twyman. "But, as we soon discovered, that didn't happen." Days later, Ken Campbell asked Twyman what had happened to all of the industrial designer's models and drawings. "At first, I didn't know what Ken was talking about," Twyman recalls. "I didn't even know that one of our rooms was being cleared. But as Ken explained it to me and we went to investigate, it dawned on me that the room that was supposed to be cleaned out was right next to the room where our entire design archive—every drawing model and photograph dating back to the earliest days of the company—was being stored. Finally, we reached the room that was supposed to have been cleaned out, and noticed that it hadn't been touched. Then we looked next door and saw that the room where our archive had been kept was empty. All of a sudden, I felt sick."

The missing material included hundreds of Apple II, Apple III, Lisa and Macintosh drawings, photos, foam concepts and hard models, including an early version of the Lisa with a telephone handset, dozens of mouse concepts, three versions of the 'Cuisinart Mac,' and a oneof-a-kind Macintosh in a transparent plastic case (used for thermal testing). In man hours and materials alone, Twyman estimated the archive's value at more than \$5 million. But, for the designers, its value was beyond calculation, particularly the Macintosh material. "Had any of that stuff leaked out during the winter of 1982/83, Apple's plans for the Mac would have been ruined," says Twyman. "Once I got over the shock of it, I realized that the missing archive was a *serious* situation."

The next day, Apple security fanned out in all directions, examined dumpsters, questioned janitors and even sifted through the trash at the Sunnyvale landfill with picks and shovels. But nothing was ever found. "When Jerry Manock learned what had happened, he was crushed," says Twyman. "For years, he'd told us to hang on to our drawings and models, that one day they would all wind up in a museum. To Jerry, the archive represented not only *our* history and the *company*'s history. It would one day become part of American design history. Then ... *poof* ... it was gone. Jerry was never quite the same after that."

WITH THE FINAL SNOWWHITE PRESENTATION SCHEDULED FOR MARCH 13, 1983, Rob Gemmell, Ken Campbell, Jim Stewart and product designer Bill MacKenzie converged on Altensteig in mid-December to inspect Esslinger's work, collaborate a little, and wait for Jobs to arrive. "Since Hartmut had a model shop right there in his studio, we could brainstorm together," says MacKenzie, "work on concepts, have dinner together, come back to work until midnight, then let the model makers take over. By the next morning, his people would have finished models that would have taken us weeks to do back in California."

When Jobs arrived, he examined Esslinger's Digital Design concepts, consulted with Gemmell and the others, and declared himself satisfied. "At that point, Hartmut really turned on the charm," recalls Herbert Pfeifer, "telling them how we could all work together, and suggesting that Apple needed an international perspective in their design effort." Having just given Rob Gemmell the green lig design a portable version of the Apple II, called the Apple IIc suggested that Esslinger develop some Digital Design concepthe IIc as well.

While in Germany, Gemmell looked one of his former stu from Ohio State, Anthony Guido, a young American who was t ing at an art academy near Stuttgart. For the past year, Guide been sending postcards to Gemmell, asking his old instructor to him in mind should any design positions at Apple become avai Meeting Guido over dinner, Gemmell suggested that a job mig opening up at Esslinger Design. The following morning, Guido Gemmell his resume and soon received a telephone call Esslinger asking him to come for an interview on January 1, 1

By THE TIME JOBS LEFT ESSLINGER'S STEDIO, "STEVE HAD ALREADY DI in favor of Hartmut," says Bill MacKenzie. "In his mind, there no point in seeing BIB's work, even though the SnowWhite called for him to do so. So when we arrived at the airport, said, 'I'm spending Christmas in California... Anybody else com Gemmell, Campbell and MacKenzie said yes, leaving Jim Stew visit Nick Butler and Steven Bartlett by himself.

In London, Stewart was struck by the difference in BIB's app compared to the work he had just seen in Germany. Smooth polished with sharp corners and a dark (almost black) finish, designs were as highly styled as any personal computer in dared to be. Yet the shapes did not reflect the friendliness or mism that the words SnowWhite implied. For Apple, BIB's de would have been a radical departure from its existing produ only Jobs had seen the work, Stewart thought, he might changed his mind about BIB. But while Stewart ponderect notion, Jobs was already in California. All Stewart could do wish Butler and Bartlett a Merry Christmas and leave.

A week later, Tony Guido arrived in Altensteig on New Year's where the streets were frozen and appeared to be deserted when he stepped into Esslinger's studio, nearly a dozen we were busy making models, looking as if they hadn't slept in w During the interview, Esslinger was all smiles. "He said he was to sign a contract with Apple to supply concepts for the IIc, Guido, "and was expecting a larger contract later on, at which he would open a second studio in California. Sitting there on Year's morning, you could see he was thinking way ahead and Apple as a stepping stone to some larger goal." Impresse Guido's quiet intensity, Esslinger hired him on the spot, hoping Gemmell would hear of it and be pleased.

BACK IN CUPERTINO, AS NEWS OF ESSUNGER'S WORK AND JOBS' REP spread, Apple's in-house designers decided to mount their own White presentation. Since it was too late to develop an entire of concepts, Terry Oyama built one model showing the next-ge Ś.

In Macintosh Happy as a small all-in-one product that resembled a prable television with a floppy drive on top. Meanwhile, Jerry anock wrote a proposal that would show Apple's board how the impany should manage its future product development, outlining ep-by-step how designers and engineers would work together in a chtly-defined process known as concurrent engineering, in which ch subordinate layer would report to the next layer in a rigid hierchy, with Manock slotted at the top.

Jerry knew he couldn't compete with Esslinger on an aesthetic vel," says designer Bill MacKenzie, "so he thought he could anage him instead, running Apple's product development the ay companies like IBM did ... focusing on process and receiver/ ovider relationships. But the "true believers" who worked at ople from the start didn't want to become like IBM. They wanted company where great ideas could crupt at any moment. Steve had almost visceral fear of process. He believed that process led to reaucracy, which in turn led to death."

As soon as Esslinger heard about Manock's proposal, he warned bs that concurrent engineering would be bad for Apple's prodts, because it would limit the designers to doing only what the gineers were willing to implement. "In Esslinger's mind, mechanal engineers and product designers were essential to the process," ys MacKenzie, "but are trained to make conservative judgments d will always adopt the "safe" solution. Instead, Hartmut told eve that he would challenge Apple's engineers to develop prodts the way Sony would do it." Since Esslinger had engineering ining, he promised Jobs never to design anything that couldn't be tilt. "The only problem," says MacKenzie, "was that Hartmut uldn't be managed by anyone he didn't consider his equal." He uld never work under Jerry Manock or Rob Gemmell. He could dy be managed by Steve Jobs himself.

RING THE FIRST WEEK OF JANUARY 1983, ESSLINGER HUDDLED WITH HIS im in Germany to plot its final strategy. Buoyed by Jobs' reaction the December Digital Design concepts, he first ordered Digital esign versions of his earlier Wega and Hamburger concepts to see w they would look. Meanwhile, Stephen Peart and Herbert Pfeifer I considered the concepts too soft. "Peart and I wanted the final odels to be as clean and sharp as we could make them." says eifer. In the process, they tightened the corner radius (the amount curvature between two perpendicular surfaces, usually expressed millimeters) on each concept to make them appear more precise. us, 5-millimeter (R5) corners on the November-December models came 3-millimeter (R3) corners on the January-February models. Fightening the corners made a big difference," Guido recalls. "Later . people would look back at those SnowWhite concepts and see em as a reflection of German design. Yet it was Peart more than yone who drove the tight corners and other details, such as the ationship of large and small corner radii, that characterized the

January-February concepts. By pushing Digital Design really hard, the later models had a clean, grounded appearance that was way ahead of the look that Manock was using on the Macintosh."

Until 1984, no computer manufacturer had dared to offer square plastic enclosures with flat perpendicular sides, because doing so required elaborate and expensive zero-draft tooling to mold them in plastic. As Peart explains: "Molding a plastic box with conventional injection molding requires two molding tools: a bucket-shaped mold that forms the bottom and four side walls of the box, and another tool to create the top. For the tools to operate efficiently, the toolmaker cannot make the side walls perfectly square with the top and bottom, because as the hardened plastic is removed from the mold, it must pull away cleanly. To do that, the side walls must be designed at a slight angle, which toolmakers call "draft." Applying one or two degrees of draft to the sides allows the finished part to pull away from the mold without breaking. Molding the same part with zero-draft [square 90-degree corners and flat perpendicular side walls] using conventional tools would create a vacuum in the mold as the plastic is removed. But with zero-draft tooling"-a more precise and expensive procedure-"a perfectly square box can be molded using a five- or six-sided tool that pulls apart in several directions to release the part."

The benefits of zero-draft tooling were considerable. "By replacing their old bucket-shaped enclosures with zero-draft boxes, Apple would have a more sophisticated look," says Peart.

Zero-draft also gave Apple a competitive advantage. "For more than a year, factories in the Far East had been churning out counterfeit Apple IIs using substandard components and simple drafted cases that looked identical to those coming out of Apple's factories," says Peart. Using zero-draft tooling would make Apple products difficult to copy, since only a few toolmakers in Japan, Germany and the U.S. could make such tools. Finally, since a zero-draft box can fit more tightly around a square circuitboard than a drafted enclosure, the computer itself could be smaller, consume less plastic, need smaller boxes for packing and cost less to ship—saving money at every step from the factory to the user.

In January-February 1983, Esslinger's team revised the Digital Design concepts into 40 new hard models:

- two versions of Sneezy (Apple II) with a monitor and stand;
- · three versions of Doc (Lisa) with different bezel treatments;
- · two versions of Happy (entry-level Macintosh);
- the Workbench concept, which had eight elements (a track/CPU, display, floppy drive, telephone, loudspeaker, vertical dot matrix printer, display stand, keyboard);
- three versions of Bashful, the notebook computer (a one-piece concept; a modular concept; and a wedge-shaped concept that tilted the keyboard and screen toward the user), each having a 9-inch flat-panel LCD display;
- · three keyboard concepts (standard, extended, ultrathin) plus a

piano-style keyboard for musical applications:

- three versions of Sleepy, the desktop mouse (elegant, ergonomic, avant-garde);
- five versions of Grumpy, the desktop printer;
- concepts for Dopey and Flower (stand-alone floppy and hard disk drives) and a file server to link several Doc and Happy units together into a network;
- · 15- and 19-inch monitors with display stands; and
- · connector cables for linking keyboards and peripherals with CPUs

Compared to the models that Jobs had seen in December, the revised SnowWhite designs reached a new level of refinement, radiating a sense of quality and power that surprised even the designers. With their zero-draft forms, precise corner treatments, surface lines, and off-white, blue, aubergine, and pinky-beige colors, the January-February concepts were better than anything Apple had on the drawing board. Better still, everything spoke the same language, building visual bridges between peripherals and CPUs to form a complete and coherent corporate image—reinforcing the idea that Apple was one company with a single broad product line.

Generating this final set of models apparently forced Esslinger to dip into his own pocket. "We never knew the details, but we all assumed that Hartmut spent some of his own money on the final concepts," says Guido. "He knew it was risky. But he also knew that if he could get a contract from Apple, the investment would pay off many times over." In one respect, it already had.

At Jobs' insistence, Rob Gemmell had sent Esslinger a consulting agreement, drawings and a blueprint of the new Apple IIc portable computer on which Gemmell had been working on since December. Fearing it would blow the schedule, Esslinger wanted to put the IIc aside until they had finished the SnowWhite models. Then Peart spoke up. According to Tony Guido, "Peart saw the IIc as a way to plug the work we had been doing on the SnowWhite models directly into one of Apple's products." Even though the chance that Apple would use the IIc design was practically zero, Peart reasoned that they should at least demonstrate how a real SnowWhite might look and show how well it could be slotted into Apple's product line.

Using Gemmell's sketches, Esslinger gave the IIc a Digital Design treatment, turning Gemmell's drafted enclosure a crisp zero-draft look with SnowWhite lines on the top and sides. He then ordered up three RenShape models showing variations on the theme and sent them to Gemmell, noting in his letter: "My thinking was faster than my hands, but as Moby leaves for California, you can see what we did ..."

Because of time spent on the IIc, Esslinger stepped up the pace during the final week of February to complete the SnowWhite models by February 28th, after which the models would be photographed, packed into cases and flown to California on March 7th for the final presentation at Apple headquarters the following week.

The SnowWhite Presentation. By March 13, 1983, a full year had

passed since Steve Jobs had met with the Apple Design Guild an the SnowWhite program in motion. After months of prepara thousands of miles of travel, and more effort than anyone could ulate, this was the moment of truth, the final presentation from w Apple's future design would flow.

The presentation occurred in two adjoining rooms inside Ap Mariani complex. One room was set up with chairs facing a so for showing slides. The other had a long grey curtain hung fror ceiling. The curtain divided the room into two discrete areas, BIB's and Terry Oyama's designs set up on one side of the cu and Esslinger's concepts assembled on the other—making it imp ble to see both BIB's and Esslinger's work at the same time.

At Jobs' request, nearly all of Apple's top brass were press including Mike Markkula, several other board members, Peter Q (Rob Gemmell's boss in the Apple II division), Wayne Rosing (of the Lisa division), Jim Ferris (head of Apple Creative Services people from Apple's PR consultant Regis McKenna, venture ca ists and senior VPs. John Sculley, the 44-year-old president of F Cola, whom Jobs and Markkula had been recruiting to bee Apple's new president and CEO, was also present. Jobs had proa show that no one would soon forget.

The presentation began with Jerry Manock, who addresse executives, explained why Apple needed a new industrial d language, and ticked off the steps taken to identify the candi and produce the designs that were about to be shown. He then I ed out his proposal, titled "Product Development: A Desig Perspective," showed an eight-minute video that gave a r overview of the proposal, then introduced the designers, at v point the show began.

First came Nick Butler and Steve Bartlett of BIB, who more the dais and flipped though a dozen slides showing concept were very smooth, very dark and hard-edged, reminiscent of end stereo equipment. The most interesting components were display monitors, which were cubed-shaped with tiny square lation holes that were so tightly spaced they resembled the pr on a screen door.

Next came Terry Oyama, who presented his single Macin concept in less than a minute.

By prior agreement, whenever one designer made his present the others were asked to leave the room. So as Butler and B ended their talk and filed out, followed quickly by Oyama, Ha Esslinger readied himself in the hallway outside, strode into the ened room, and began his presentation with a rapid-fire del Alternating his slides with a description of the philosophy b each concept, Esslinger highlighted the practical and aestheti sons for the various forms, the SnowWhite lines, zero-draft mor keyboard and product graphics, and corporate identity sugges

Compared to BIB's sharp edges and gleaming surfaces, Esslir designs were crisp but not intimidating. Their inventive form if pebble-like textures made them seem precise yet friendly. hppy and Doc, both all-in-one designs, had displays that stuck out the front and tilted up, like an upturned head fixed to a case that sembled a chubby little body, and a floppy drive on top that loked like a hat (Plates 29–31).

The range of shapes and attitudes was stunning: Doc and Happy oked like desktop pets; WorkBench was powerful yet miraculousthin (Plates 32, 33); and Bashful the portable concept came in two more: a sober wedge-shaped version for adults, and a cuddly veron for kids, with a baby blue keyboard, bright yellow floppy drive d light pink cutout handle—a bit of eye candy that caused Jobs to the and some of the older exects to lean forward, hoping for a betlook (Plates 41, 42). Then came the keyboards [a standard keyard with dish-shaped keys, a thin borderless model (the one mock had helped to develop in Germany) in standard and tended versions, a telephone keypad and a piano-style musical board with pink and beige keys, printers both horizontal and veral hard and floppy drives, displays and connectors that plugged erything together (Plates 34–40).

It was too much to absorb in one sitting. "Hartmut had so *many* meepts, we had to c ut some of them." says Rob Gemmell, "so that **B** wouldn't look bad."

In a smooth German-accented monotone, Esslinger asked the recutives to forget about the design that Apple had done in the St. Ignore what the competition was doing. Concentrate instead on eatness. Like no other firm of its time, Apple had the chance to set w standards with its industrial design. For a design to be effective, said, it must convey a sense of quality and competence to the er, as well as express Apple's philosophy, its sense of the future, very soul. Great design that is well executed should convey a rise of ownership in Apple, the feeling that one belongs to a vast orldwide family, so that whenever a user turns on an Apple prodt, types a memo, or moves the cursor across the screen, he or she II feel a kinship with every other Apple user.

The executives had never seen anything like it. The men from gis McKenna made notes. Markkula nodded his approval. Jobs as ecstatic. Meanwhile, John Sculley just sat there, taking it all in. Once the slide show was over, everyone filed into the next room view the designs in person. Stephen Peart stood by in amazement Esslinger worked the room. "*Everyone* was there," Peart recalls, oard members, division managers, venture capitalists, Jobs and ulley, all milling around looking at the models. You could almost *aell* the money." Meanwhile, "Hartmut was busy working the room, nilling and shaking hands like a politician. In a sense, it was all a bute to Steve. He had wanted to bring design to a new level withthe company, and this event was proof of his success."

With the presentation over and the dust beginning to settle, Rob emmell realized that one era at Apple was ending and a new one is about to begin. With Jobs' preference for Esslinger's work rising, his regard for his own designers' work gradually waned. In time, this would spell the end of the old style of design at Apple and signal the start of a new golden age. Like the SnowWhite character in the book, the company would throw off its provincial garb, dress its technology in a new set of clothes and create a look that would set a standard for years to come.

ENTER FROGDESIGN

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"And the river shall bring forth frogs abundantly, which shall go up and come into the house, and to thy bed chamber and into the bouse of thy servants ..." - EXODIS 8: 3-5 After the SnowWhite presentation, as Manock and Oyama returned to the Macintosh and Rob Gemmell resumed work on the IIc, a sense of calm hovered over Cupertino. Everyone knew that change was coming. And when it arrived, the change would be swift. For months, Apple had been working to shed its image as a second-tier computer company by acquiring the critical mass necessary to attract more business customers among the Fortune 100. To do that, the company needed a leader who could talk Wall Street's language and win their trust. Since January, 1983, Steve Jobs and Mike Markkula had been wooing their candidate until, finally, on a Friday morning in April, Markkula announced that John Sculley, the CEO of PepsiCo, would become Apple's new president.

Since Sculley knew almost nothing about computers, Jobs would tutor him on the technical side. In return, Sculley would teach Jobs about corporate strategy, the techniques of advertising, 'event marketing' and the fine points of management. In effect, Jobs and Sculley would serve as co-CEOs. Their goal would be to grow the company as fast as possible until it reached "critical mass"—making it large enough to fund lavish marketing programs, pursue its own technologies and invest in research and development so that future products would come in an unending stream. For Apple's designers, "Sculley's arrival meant that our products would change very quickly," says Rob Gemmell. "As it turned out, Esslinger had positioned himself to take advantage of that change. We hadn't."

Even before he finished the SnowWhite models in Germany, Esslinger telephoned his old friend Jack Hokanson, informing him that he would be setting up a design studio in the Valley as soon as the SnowWhite presentation was over. "Even though the presentation was weeks away, Hartmut spoke as though winning was a forgone conclusion," Hokanson recalls. "He said he would get a contract from Apple, then set up his business here. "But first, Esslinger wanted Hokanson to find some space for a studio and get started on the paperwork. He also mentioned, almost as an afterthought, that it would be wise for Hokanson to sell his partnership in Eikan. Once Esslinger arrived in California, Hokanson would then be working for him.

Within weeks, Hokanson did all that was asked and more: setting up the corporation (which Esslinger renamed frogdesign, Inc., spelled with a lower-case f), renting studio space in Campbell, arranging utilities, banking insurance, accountant and legal services, finding a condominium for Esslinger in Los Gatos, and attending to a hundred other details. He even ordered a vanity license plate (which read "FROGINC") for Esslinger's new silver Mercedes-Benz 190E—which had been ordered direct from the factory near Stuttgart and shipped by air to California, making it only the second "Baby Benz" to reach the U.S. "Jack made our transition from Germany to California so easy," says Tony Guido, "it allowed Hartmut to focus his attention on Jobs, which was a full-time occupation."

Redesigning the Macintosh. For months, Apple executives had been expecting another shakeout in the personal computer industry. After strong sales during the 1982 Christmas season, a tidal wave of new products were hitting the market just as customer demand was beginning to drop, the main threat for Apple being the IBM-PC. "No one was worried about the PC from a design perspective," says Rob Gemmell. "But IBM's marketing clout and the emergence of the first PC clone [a luggable PC made by Compaq] forced Jobs to rethink his strategy for the Macintosh and push hard to get it to market. He also worried that the Mac's industrial design would soon look dated compared to the SnowWhite concepts that Esslinger had just shown."

Acting on impulse, Jobs asked Esslinger to come up with a quick SnowWhite redesign for the Mac. Back in Germany, Esslinger gave Herbert Pfeifer a drawing of the Manock/Oyama design showing its interior and exterior dimensions and asked him to design a simple zero-draft shell with SnowWhite lines that would fit over the existing chassis.

"Hartmut said the project was on a rush schedule," says Pfeifer, "so I finished my drawings in a couple of days, and Hartmut took them back to California. But nothing ever came of it." Officially the reason was "scheduling"—Manock's design had gone too far to be changed. But according to Esslinger, the Mac design was still not finished, "Vents still had to be added to the top, the floppy slot had to be redesigned, and the back had to be changed to make it fit better." It was Manock, who learned of the redesign from one of Apple's tooling engineers, who put a stop to it.

"Jobs could have overruled Jerry," says Stephen Peart, "but he didn't have the heart. After all, Jerry had designed the Apple II, which had sold millions of units. Jobs couldn't turn his back on him just as the Mac was nearing completion. So the original design went ahead—a decision that set back the implementation of SnowWhite by at least a year."

As it turned out, the Macintosh wasn't Jobs' only concern. During the spring of 1983, rumors that IBM was developing a new pintsized computer called the PC Junior increased pressure on Rob Gemmell to improve his design for the Apple IIc. As Peart recalls, "when Steve asked Hartmut for a SnowWhite version of the Mac, Rob got wind of it and designed a new version of the Apple IIc using what he had seen at the SnowWhite presentation. But it didn't have the finesse it needed. That's when Jobs began to think about frogdesign coming to California and implementing SnowWhite products ourselves."

For weeks, Esslinger had been prodding Jobs on that ve ject, all the while molding his views, his tastes, and even his appearance to be more Jobs-like. When he learned that Jo vegetarian, for example, Hartmut gave up meat as well (at Jobs' presence). For years, Esslinger had forbidden his desi run around the Altensteig studio in their bare feet (as Herber recalls, "Hartmut put up signs that said 'Bare feet ruin the But the moment Esslinger saw Jobs in his office without his s no longer cared if his designers did the same. Later, when he Jobs wearing New Balance running shoes, he bought th model. Another fixation was cars. Since driving allowed Jobs more clearly, Esslinger would take the young tycoon on lon through the mountains as far west as Santa Cruz, where the walk the beach in their bare feet and chat as waves crashec the rocks. As their relationship grew, not even the smallest from Esslinger's lips went unnoticed. When Esslinger mentio he played the piano and had once dreamed of becoming a sional musician, Jobs became so excited that Esslinger took checkbook and bought a \$15,000 Bösendorfer baby grand f office. "The only person who ever touched that piano was H says an observer. "Jobs couldn't play a note."

As older men with an international perspective, the best fields, Sculley and Esslinger developed a rapport with the y Jobs and served a similar purpose: to teach him their secrets hired Sculley not only to move Apple forward, but to learn fro says Rob Gemmell. As Sculley himself acknowledges, "part of was to help Steve grow so that someday the board would I' option of allowing him to run his own company." The dialog I: Jobs and Esslinger was no less intense. But the relationship wa ly different. "With Hartmut, Steve could play the role of Rena prince," says Gemmell. "Hartmut was the court artist."

Jobs had always been impressed by creative people, while was Andy Hertzfeld, who could write software code the way wrote music. Burrell Smith, who solved arcane hardware pri in his sleep, or Esslinger, who could discuss Bauhaus theory about the inner-workings at Sony, then sit down at the Böse and perform a Beatles medley. "For someone like Steve, F was irresistible," says Gemmell. But if Esslinger was to reco contract he needed to move frogdesign to California and w Apple full-time, he would have to close the deal himself.

As Stephen Peart remembers, "Hartmut sat down with Steve the late spring / early summer of '83 and told him that we ha Apple more than he had asked for ... and would continue to Apple gave us an exclusive contract. Hartmut wanted to c California and had been laying the groundwork for months, bu ed some assurance from Steve before making the move." After negotiation, Jobs gave Esslinger everything he wanted: co ×.

athority over Apple's industrial design and a retainer of \$100,000 per nonth plus billable hours and expenses—more than any design conutant had ever received up to that time. As part of the exclusive connect. frogdesign agreed not to work for any Apple competitor. In num, Apple agreed not to hire any other design firm or terminate regdesign's contract without paying a hefty penalty (a condition that eemed natural to Jobs at the time but would prove troublesome later rector, reporting directly to Jobs and not Apple's Product Design or firketing groups, giving him special status within the firm.

In retrospect, hiring frogdesign to revive Apple's product line was revitable. Apple was poised to take the next step from being a minent firm to becoming the world's leading personal computer next, and it needed the services of a design group with internaonal experience. With the company still growing by leaps and ounds, it also needed a stable, highly focused design organization, with all of the designers using the same aesthetic to give Apple a merent look for all of its products. Steve Jobs also needed to end the chaos that an ad hoc approach to product development had used. With frogdesign designing Apple's products, says Stephen eart, "everything would be designed to the same standard, which could inevitably effect the inside of the products as well."

Only one potential roadblock stood in Esslinger's way-one esigner whom Jobs would have listened to, says Peart. "Rob enmell could have persuaded Steve that an exclusive arrangement as not a good idea. But he didn't. He thought he could control artmut. But Rob underestimated Hartmut big-time. They all did."

THE APPLE/FROGDESIGN CONTRACT WAS SIGNED, FROG'S DESIGNERS ontinued to work in Germany refining the March SnowWhite modis into a second set of concepts that would be presented to Jobs and Sculley in July.

The designs needed to be tightened up before we could implenent them on real products," says Esslinger. "So we eliminated necessary details and refined the language in ways that influnced our work for the next two years"—evolving into the style that og insiders still refer to in hushed tones as "SnowWhite pure."

According to Peart, "Hartmut wanted Apple's plastic to set a comletely new standard. Even though a product might cost \$300 to nanufacture, he wanted the design to be strong and precise enough blook like it should cost \$3,000." Gone were the fanciful elements, the playful upturned displays, contrasting colors and pet-like attitude, in their place, the "pure SnowWhite" concepts had a clean monoform look with sharper corners, surface lines that resembled the tripes on a banker's suit, and a Teutonic rigor that Esslinger nlivened with a touch of Euro-pop—a last-minute tickle that elevates food design to the level of greatness.

SnowWhite Pure. The larger 'Doc' (now called 'Big-Mac') and naller 'Happy' concept ('Mac-2') were both distilled into a simple

monitor-like enclosure with a flush-mounted display that tilted back to the correct angle, an integrated handle on top and a wide horizontal groove below the screen that masked the floppy drive slots and gave the design a sense of visual stability (Plates 44–47). Behind the bezel on both Big Mac and Mac-2, the case narrowed into a pristine zero-draft rear bucket that was wrapped with SnowWhite lines, which functioned as vents.

The redesigned Apple II ('Sneezy'), came in two flavors: a simple pizza box with a separate keyboard and display; and a IIe look-a-like, called the Apple IIs, which had an integrated keyboard that stuck out at the front and sides of the box, resulting in a design that resembled the head of a hammerhead shark (Plates 43, 48). "Hartmut liked the idea of a keyboard that was physically attached to the CPU but visually separated," says Tony Guido. Other July concepts included executive telephones, a freestanding L-shaped desk phone, flip phones and, for dessert, a Dick Tracy-style wristwatch phone with a head-mounted ear- and mouthpiece (Plates 49, 50).

"All the language details used on later SnowWhite products were defined on the July 1983 concepts," says Esslinger, with particular emphasis given to corner treatments and surface lines.

"Lines made the boxes look smaller," says Peart. "It was a visual trick. If you take two white boxes of identical size and draw lines on one of them, it will look smaller and more precise than the plain box. Since lines could extend through the plastic at any point, they were also a good means of ventilation. To maintain consistency, all lines had to be the same width and depth on all products regardless of size. We wanted them to be wide enough and deep enough to cast a shadow, but not read as a groove or slot." Thin lines conveyed a sense of precision. Yet they couldn't be too thin, or dust would collect inside. Ultimately, the designers made the lines 2 millimeters wide and 2 millimeters deep, spaced 10 millimeters apart when measured on center. The combination seemed to work well on everything. "We wanted the designs to say Tm powerful, but OK'," says Peart, "not 'I'm so strong that you should lock me up in a vault." " Once the width, depth and spacing of the lines were decided, Esslinger decreed that lines would always "address the user"-running toward and away from the user, never from side to side. Rather than extend to the edge of the product, the lines would always end in a perpendicular line-called a "setback"-30 millimeters from the front edge of the product and 4 millimeters from the back. "Wherever we saw a surface, we drew lines on it," says Peart. "The lines became part of the product's genetic code."

Corner treatments were also formalized. CPUs had tighter corners (2-mm radii) on the front, which the user sees first, and softer corners (3 mm) at the sides and the back. Displays had 5-mm corners on the sides and back and 7- or 9-millimeter corners around the outside of the bezel. To maintain a sense of rigor, the perimeter of the CRT screen and the inner and outer lines of the bezel were always treated as concentric shapes. And, unlike the March SnowWhite con-

cepts, the "SnowWhite pure" models were all the same color: offwhite with a lightly textured surface. "Despite all the rules, there was no SnowWhite rule book," says Tony Guido. "It was totally word-ofmouth. We didn't bother to write it down. To us, it was like art ... you just had to look at it to know whether it was right or not."

AFTER STEVE JOBS REVIEWED THE "PURE" SNOWWHITE DESIGNS IN JULY, 1983 he called Apple's in-house designers together-Manock and Oyama from the Mac division, Apple II's Rob Gemmell, Clive Twyman and David Hodge from the Lisa division, Jim Stewart, Mark Pruitt and Bill MacKenzie from the Peripherals group-and laid it on the line. "We were all waiting," recalls one participant, "when Jobs suddenly appeared with Hartmut, told everyone to shut up and informed us that frogdesign would be taking over Apple's industrial design effort." In effect, the scenario that Manock had proposed at the SnowWhite presentation was being shelved; instead, frogdesign would handle everything. "Jobs said we should be grateful for the chance to work with a firm like frog ... that we could all learn a lot from them. But when someone asked how it was all supposed to work, Jobs said, You figure it out,' then got up and left. Jerry was offended. Rob Gemmell was real quiet and later told us not to worry. But the rest of us felt that with frog doing the design, sooner or later, our jobs would be gone. That scared us."

Painful as it was, replacing Apple's in-house design team with frogdesign had to happen. Since the day Apple was founded, Mike Markkula recalls, "we had always recruited the best—the best financial people, the best manufacturing people, the best marketing people, the best engineers, the best directors. Every one of the disciplines needed to run the company was covered in spades"—except one, industrial design. With frogdesign in place, Jobs decided, that one final gap would be closed, and Apple could finally become a real world-class company.

Once the decision was made, Hartmut Esslinger swung into action. With Jack Hokanson having laid the groundwork, frogdesign's Campbell studio was quickly outfitted with the same equipment the designers had used in Germany-an Intergraph CAD (computeraided design) system, Maho and Zimmerman CNC milling machines (used for making models), K+M office furniture and drawing boards-all of which were shipped by air container from Stuttgart to San Jose. Meanwhile, frogdesigners Tony Guido, Stephen Peart, HansPeter Leins, Sigmar Wilnauer, Peter Müller, and various support personnel flew over from Germany, inhaled the glorious California air, posed for a group photo (Plate 52), then went to work. "During the first few months, we worked day and night, six and sometimes seven days a week," says Hokanson, "and the billable hours grew at a fantastic rate." The first Apple check Hokanson took to the bank was so large, in fact, the bank wouldn't take it without first calling Apple to make sure it was legitimate."

With so much going on, Esslinger either forgot about the

Manock/Oyama Macintosh design or assumed that it was alre beyond the point of no return. In fact, it was still in the midst of too in August, when frog arrived in California, leaving just enough time Esslinger to step in and give it a SnowWhite spin. Yet it didn't happ According to Peart, "Hartmut realized that Apple's in-house design were all scared of losing their jobs. He also knew that the Macint design was a delicate topic inside Apple. Even though the design deficient in many ways, Manock had been the guy who designed Apple II. If we'd tried to change the Mac at the last minute, the res the Mac team ... guys like Atkinson and Hertzfeld ... would have rai hell. So Hartmut decided to go easy. He figured that the follow-up the Mac, which would come out the following year, would be a f design. But that didn't happen." Years later, Esslinger would regret putting his imprint on the greatest of all Apple products. "SnowW would have progressed much more quickly if frog had had a hand the design of the first Macintosh," says Peart. "Because of that, we / to leave our mark on the next big project, the Apple IIc."

For months, Rob Gemmell had been designing the IIc, first us his own design, then including Esslinger's input, then proceeding his own, unaware that frogdesign was designing its own IIc of parallel track. "By December, we had our version, which was 'pu SnowWhite," says Peart, "and Rob had his design, which wasn't." the end, the two efforts merged into one of the strongest Ap designs of all time.

MOBY APPLE IIC PLATES 56

Industrial Design: Apple Computer: Rob Gemmell, Bill MacKenz Mark Pruitt; frogdesign (Campbell, CA): Hartmut Esslinger, Steph Peart, Anthony Guido, HansPeter Leins, Sigmar Wilnauer Dates of Design: December 1982–January 1984

Introduced: April 1984

Awards/Collections: Industrial Design Excellence Award, 1984; "B of Category," I.D. Design Review, 1985; Industrie Forum Desi Award (Germany), 1984

While managing the Macintosh, Steve Jobs also spearheaded to development of Apple's first portable computer, at various time called the Apple IIb, Annie and "the book computer." The only of ference between it and a true notebook computer was the lack of battery; at least two years would pass before miniaturization and st able batteries could be combined to create a truly portable compuer. Rather than wait, Jobs called a meeting on December 14, 198 attended by Rob Gemmell and Apple II marketing and engineeriti managers. Jobs explained what he wanted by taking an Apple II eccuitboard, keyboard and disk drive, placing the keyboard in from the disk drive in back and circuit board in-between, forming a boor sized package. He then said, "This should be our next product!"

For more than a year, Gemmell had been prodding Jobs to develop a portable (Plates 53–55). "Since computers were still considerable and unfriendly, I wanted the IIc to be small and soft enough to u

in your lap," says Gemmell, whose concepts included one concept dad in soft vinyl laid over a sheet metal box. "For months, I showed drawings of a portable Apple II to Jobs," says Gemmell, "and he'd lways say, 'Yeah, we'll do something like that one day." But when obs saw Toshiba's first portable PC in late 1982, he held the December 4th meeting and asked Gemmell to get moving.

Like the Apple IIe, the product would contain the circuitboard ind keyboard in a single unit with a handle on the back that folded down, raising the back of the product, which in turn tilted the keyboard to the proper angle for typing. Like the Macintosh, the bortable Apple II would be more like an appliance than a computer. All the user had to do was take it out of the box, attach it to an external display or TV receiver, and use it with minimal setup. As he first product of its kind, Gemmell's initial design was crude, with boxy enclosure and a flat keyboard that sat parallel to the deskop. "On that first model, the challenge was packing all the hardvare into a tight enclosure and keeping the product cool without using an internal fan," he says. "When Steve saw it, he decided that he case should be as trim and stylish as possible," prompting a midprogram reset, a new product name—the Apple IIc (short for "compact") —and a new code name, Moby.

While visiting Hartmut Esslinger in Germany to review his Snow-White concepts in December 1982, Jobs asked Esslinger to supply a nowWhite design for the IIc. "Since the internal layout and dimenions had already been fixed, there wasn't much Hartmut could do except change some details on the skin," says Gemmell. Yet the hanges he made set in motion a dual development that would proeed along parallel tracks and merge at the end to produce the first true nowWhite product.

When Esslinger first saw the IIc, "Rob had just finished his secind version, which still had no display. He wanted to use a flip-up CD screen. But the technology was still crude and expensive at hat time. Instead, we proposed a small CRT display that mounting in a cantilevered stand that attached at the back." The shape of the lisplay mirrored recalled an early Digital Design concept Esslinger ad done in late 1982.

After the March 1983 SnowWhite presentation, Jobs first asked sslinger to reskin the Macintosh using the SnowWhite language. But when Manock prevented that effort from going forward, Jobs uggested that Esslinger work on the IIc—without telling Gemmell. Steve kept me in the dark about Hartmut's work on the IIc," admits Gemmell. "He met with both of us individually, told each of us that were in charge of the project, then sat back to see what would appen. Occasionally, I would hear from Esslinger. But I had no lea that frog was developing their own version of the product until ery late in the process. By that time, we had already completed the esign, the engineering was nearly finished and the ship date was ust six months away. It was too late to make any changes."

To the untutored eye, the differences between Gemmell's and

Esslinger's designs were small; yet, in the designers' eyes, they were enormous. Gemmell's version had rounded corners and a conventional drafted exterior; Esslinger's design had tighter corners and a more precise zero-draft enclosure. Gemmell's design had a 7-millimeter radius along the front edge and around the keyboard. Esslinger's version had a 5-millimeter radius. On Gemmell's version, the inneredge radius around the keyboard was 3 millimeters, which followed the curvature of the keys. But Esslinger insisted on a 2-millimeter radius, which he considered more precise—even though it would force Apple to remove the existing keyboard and design a new one.

Two Designs Merge. Though Gemmell agreed to implement some of Esslinger's suggestions, he declined to change the keyboard. At one point in the discussion, Esslinger wanted the keys on the keyboard and LED indicators on the case above to be tilted at the same angle as the 48-point Univers Italic graphics on the keycaps—a daring suggestion.

Another issue was color. "Hartmut disliked the beige color that Apple had used on the Apple II and the first Macintosh," says Herbert Pfeifer, who came over from Germany as a tourist in the fall and stayed to run interference for Esslinger on the IIc. "He wanted something fresher." At that time, design magazines were full of coverage of Ettore Sottsass and the Italian style known as Memphis which made strong use of color. "Seeing that, Hartmut said, 'Let's make a statement with the IIc by giving it a bright white case'," Pfeifer recalls. "We can always return to a more conservative look later on.' The idea of demanding more than you expect, then compromising later, was an aspect of Hartmut's personality that influenced a lot of our thinking on the IIc."

Not surprisingly, Apple's designers argued against the idea of a white computer. Jerry Manock predicted that users would leave finger marks on the machine the moment they touched it. Another problem was venting. Esslinger wanted SnowWhite lines to cover the entire top surface (Gemmell's concept had vents on the left side only). He also wanted a zero-draft display with vents on three sides, which Gemmell agreed to implement. But when Esslinger asked that the IIc's case be zero-draft as well, Gemmell said no, since the tooling had already begun. This forced Steve Jobs to make the call.

For Apple, the design of the IIc came at a critical time. During the winter of 1982-83 the second computer industry shakeout was well under way, causing the value of most Silicon Valley stocks to plummet and *Business Week* to declare IBM the winner in the personal computer wars. With Jobs worried that Apple was about to introduce the Macintosh with a non-SnowWhite design, he considered it essential that the IIc's design be as "pure" SnowWhite as possible.

As John Sculley recalls, "Common wisdom in consumer marketing tells you it's better to have market share and then figure out how to make money. But that strategy hasn't always worked in the personal computer business, particularly at the low end. Instead, we wanted to focus at the end of the business where there is a genuine difference, where personal computers are not merely toys but tools conferring power on users. So we decided to give the IIc a sense of power and panache, positioning it as a computer for the serious home user."

The final decision came down in mid-December, 1983—one year after Gemmell's initial meeting with Jobs that launched the project. The meeting took place at Apple II's headquarters, known as the Triangle Building. On one side were Hartmut Esslinger and his second-in-command, Herbert Pfeifer. On the other side were Rob Gemmell, his boss Peter Quinn and Randy Bleske, an Apple II tooling engineer. In the middle were Steve Jobs, who did most of the talking, and John Sculley, who said little.

As Jobs reviewed the two designs, he sided with Esslinger on detail after detail, even agreeing to finance the design of a new, visually tighter keyboard, a decision that would cost Apple more than \$200,000. Instead of a bright white case, however, Jobs decided to make the exterior a creamy off-white color (known in-house as Fog) with a darker khaki-colored keyboard. Finally, Jobs conceded that the IIc case would not have zero-draft; the tooling for the case (a major expense) had gone too far to turn back. Nonetheless, Esslinger was exultant. According to Pfeifer, "he had pleased Steve and beaten Apple's designers on a major product."

By including Esslinger's suggestions, the final design was a sensation. Sleek and attractive with its clean profile and zero-draft display cantilevered over the keyboard, the IIc radiated an energy that few products at the time could match. A fitting debut for the new SnowWhite language, it was the first Apple design to be singled out for its industrial design, earning top honors in the *I.D. Design Review*, as well as an Industrial Design Excellence Award from the Industrial Designers Society of America.

To launch the product, John Sculley emphasized its small size by filling an auditorium with Apple dealers and hiding IIc computers beneath every other seat. At the moment Sculley unveiled the product on stage, members of the Apple II division who were positioned throughout the auditorium brought the IIcs out en masse, held them up in the air, then handed each new \$1,295 computer to a dealer sitting to the left or right. Within an hour, the dealers placed more than 50,000 orders, the highest first-day order in Apple's history. By the end of the first year, Apple sold more than 400,000 IIc's, most of them with the cantilevered display.

Twelve years later, the formal purity of the IIc is still impressive.

FOR FROGDESIGN, THE APPLE IIC MARKED A TURNING POINT. SUDDENLY IN the ascendency, Esslinger and his team had the confidence to deliver on the promise they had made to Steve Jobs back in the spring of 1983: to transform Apple's product development from the inside out. Like Sony and other world-class companies, Apple would become more of a design-driven organization, with frogdesign's designers and Apple's engineers working in a true partnership. Yet achieving cohesion would first require the designers and engineers to settle a basic conflict that exists in all high-tech organizatio

Even though designers and engineers are part of the same in try, do similar jobs and often work virtually side by side, their ing and personalities are often very different," says Lisa co-des Clive Twyman. "Designers are taught to be creative, think in a jective manner and push the aesthetic envelope. Engineers, co other hand, think in terms of metrics. Their work relies on ce ty. They measure and analyze everything, and tend to make servative judgments that designers like to go beyond. To turn a design into a real product, the engineer has to worry about the ities of strength, weight, structural integrity, reliability, manufability and cost—which forces him to be careful and not to prewhat can't be delivered. But frogdesign's job was much sim They wanted the products to look and feel good and didn't about what the engineers had to do to get there."

In particular, the engineers worried about frogdesign's tence on zero-draft tooling. "That was the big one," says Twy "All of sudden, every tool had to be a four-slide tool, which ripple effect throughout the product line. After SnowWhite into effect, we had a lot of high-level discussions inside the firr with outside suppliers, asking 'What's the one thing we sl change about the way we did business? Everyone said, 'Stop o zero-draft designs.' But the more the engineers worried, the frogdesign worked, giving each project such zen-like focus even their worst detractors were impressed.

"Unlike Apple's people, who spent a lot of time attending mee frog's people were *always* designing," says Jack Hokanson. "But the nature of consultancy. As in-house people, Apple's designers months to do a project. Hartmut, on the other hand, would get an and within two weeks have 20 high-resolution models to show

Always in a hurry, Esslinger rarely visited Mariani [the cor where Apple's engineers and product designers worked], prefinstead to let his designers Peart, Pfeifer and Guido perform the to-day work. Peart, in particular, took up the SnowWhite causeffected the most changes, going so far as to persuade Apple pr planners not to use a particular Taiwanese display that he consiinferior, "Usually, it's not a consultant's place to criticize a client a particular component," says Herbert Pfeifer, "but Peart did it way. It wasn't about SnowWhite anymore. Peart was upholding he saw as Apple's culture. He didn't want Apple's success to res inferior products that would disappoint its customers. When the house people heard that ..., they knew Peart was right."

Meanwhile, Apple's design staff was dwindling. As product d managers were forced to cover frogdesign's \$100,000 mc retainer, they could no longer afford to use Apple's in-house de ers. To solve that problem, younger designers such as David H and Brad Bissell eventually resigned from Apple and became employees. Mark Pruitt, a designer in the peripherals division thus paid from a separate budget, remained on Apple's payro id most of his work at frogdesign's studio.

Exodus. For Apple's top designers, however, the end was near. Ath Lisa designers Bill Dresselhaus and Ken Campbell already one, Rob Gemmell transferred to Apple Creative Services in July 984, where he designed trade show exhibits and signage. He left pple in 1985 and is now a partner and creative director of CKS artners, a Silicon Valley marketing and design firm. Next to go was erry Oyama, who joined Radius Systems, where he later designed he Pivot display, one of the most successful Macintosh peripherals f all time. He is now a senior designer.

That left Jerry Manock. After four years of effort, the completion if the Macintosh ended in the late fall of 1983 with the first boxed lacintoshes coming off the line a few weeks later. Standing at the hd of the line with a flat-bed truck was Steve Jobs, who collected hough of those early Macs for every member of the team, had a laque bearing the name of a team member fixed to the back of each machine and drove them over to the Macintosh Building, where he anded them out. Amid smiles and tears, Jerry Manock collected his pomputer and realized that a page was turning. A long and glorious hapter was coming to an end.

In the months leading up to the Mac's introduction, everyone on e team-indeed, everyone in the company-believed he held the ture in his hands. When the final operating system software revion was completed on January 16th, just eight days before the offial introduction, activity at the Macintosh factory was at a fever tch. Meanwhile, as January 22nd approached, all eves turned to the early sports ritual, the Super Bowl. Though few can remember the ams who played that day or where the game was played, everyone in remember the television commercial Apple ran during the third larter. Even though it was shown only once in its entirety on tional television, images from the commercial known as "1984" are rned into the minds of millions. Produced by Apple's advertising ency, Chiat-Day, and directed by noire filmmaker Ridley Scott, the -second spot included scenes of bald-headed drones being herded own a tube-shaped corridor by helmeted guards, and a theater with g Brother on a screen (representing authority and conformity, a thin--veiled reference to IBM) exhorting the drones:

- "Each of you is a single cell in the great body of the State ... We have created, for the first time in all history, a garden
- of pure ideology where each worker may bloom secure
- from the pests purveying contradictory and confusing
- truths... Our enemies shall talk themselves to death, and we will bury them with their own confusion..."

Suddenly, a solitary female appears, wearing a T-shirt with a acintosh logo, and heaves a sledgehammer toward the screen, nich vaporizes the Big Brother image, causing the TV screen to ssolve into five printed lines with a voice-over, which says:

On January 24th,

Apple Computer will introduce

Macintosh. And you'll see why 1984 won't be like '1984.'

The fact that the commercial never showed the product made it all the more memorable.

Two days later, Jerry Manock sat with the rest of the Macintosh team in the first four rows of the Flint Center at De Anza College, site of the annual shareholders meeting, as Steve Jobs took to the stage, recited a few lines from Bob Dylan's ballad "The Times They Are A-Changin'," then reached into a grey canvas bag and pulled out the Macintosh, at which point a synthesized voice that had been programmed into the machine said, "Hello ... 1 am Macintosh ... It sure is great to get out of that bag."

Once the demonstration was over, everyone agreed that the Mac was a monumental achievement. Small, attractive and easy to use, its on-screen interface with windows and icons offered a potent metaphor that the rest of the PC industry would inevitably follow. In its first 100 days, more than 72,000 Macintoshes would sold, far more than the 50,000 Jobs had predicted. This fact, plus the general euphoria surrounding the Mac, prompted John Sculley to fold the entire Lisa division into the Macintosh division, which was officially renamed the 32-bit SuperMicro division. While IBM used an odd Charlie Chaplin look-alike to sell its PC, Apple's high-concept advertising and resulting media attention gave the Macintosh a higher recognition factor than the Chaplin clone did Big Blue's product, despite the fact that Apple had a much smaller media budget.

As the Fremont factory ramped up toward full production. Manock had trouble balancing the conflicting demands of vanity and duty. Hardly a day passed without a frantic call from Fremont reporting some real or imagined flaw, the biggest headache being the joint where the Mac's front bezel met the back of the case, which still didn't fit right. Through it all, Manock endured and even managed to have his picture taken with the rest of the Mac team, for March 1, 1984 issue of Rolling Stone. But amid the glowing coverage, which featured Steve Jobs in soft focus hugging his Mac and group shots of engineers, designers and software writers grinning broadly, the only person not smiling was Manock. Still bearded and haggard from countless 80-hour work weeks, the looked burnt out. His remarks, delivered in the controlled voice of the engineer, didn't sound like the words of someone who had just made history. Once the photo session was over, Manock was the only member of the Mac team who didn't go off to celebrate. Instead, he got into his car and returned to the Fremont factory, where he ate his dinner standing up and worked long into the night fixing the last few bugs that remained in the Mac's design. Then he went home, took out his razor for the first time in nearly ten months and shaved off his beard. When he was done, he looked in the mirror but hardly recognized the face that stared back.

Weeks later, with Apple's publicity machine running at full tilt,

Manock attended a formal dinner at Apple headquarters, where Macs would be donated to leading artists, writers, architects and "cultural leaders" as a way of enhancing the product's word-ofmouth reputation. At the dinner, Manock found himself seated next to Maya Lin, who had just completed her design for the Vietnam Veteran's Memorial in Washington. Also seated next to Lin was John Sculley, who Manock had never met face-to-face. Several times that evening, Manock tried to gain Sculley's attention, but failed to make contact. "Sculley and Lin were so engrossed in conversation," he recalls, "they didn't even ask who I was." Without realizing it, Sculley revealed as much about Manock's future at Apple through his silence than he ever could have in words.

Manock realized that he had forgotten to enter the Mac in the three top industrial design awards—the Industrial Design Excellence Award, given out by Industrial Designers' Society of America, the German Industrie Forum award, and the *I.D. Design Review*, a juried competition that is *de rigeur* for any new industrial design—the deadlines had already passed. For this reason, the Mac received little formal recognition for its design until many years later. As a result, Jerry Manock and Terry Oyama's contribution to the Macintosh design, as well as their identity as its designers, faded into obscurity, causing otherwise knowledgeable people to answer the question "Who designed the original Mac?" by reciting the only name most people can think of, Hartmut Esslinger and/or frogdesign.*

As the spring of 1984 drifted into summer, the weight of events, made heavier by the frogdesign situation and realization that his best work may be behind him, caused Manock to slip into a funk so severe that even Steve Jobs noticed. Concerned that his friend was in trouble, Jobs asked Hartmut Esslinger to help. "Jerry had once had an important role at Apple," says Esslinger, "so when Steve asked me to help pull him back into the fold, I reached out... But [Jerry] knew he wasn't in the center anymore and reacted by going in another direction.." By October, 1984, Manock handed over his duties to the peripherals designer Jim Stewart, resigned from Apple and moved to Vermont, where he now works as a consultant. Within months, Jim Stewart left as well, returning to Hewlett-Packard and bringing an end to the first phase of Apple's industrial design culture.

As THE FUTURE WAS TAKING SHAPE AT FROGDESIGN, A SECOND REVOLUTION WAS occurring inside Apple. With frogdesign directing the design, every aspect of Apple's implementation—from engineering to materials to packaging—was reassessed and improved. Product designers now made an extra effort in areas in which they never had before. Toolmakers, forced to adopt zero-draft on every product, found ways to break down complex tools into easily managed elements that could be built in one-fourth the time, sparking a renaissance in American plastics industry that owed its origin to frogdesign's i tence on zero-draft. And every time frogdesign improved one as of a product, this had a ripple effect among dozens of suppl Harold Hoffman of Northern Engraving, which supplies the sixored badge, still remembers the "friendly chat" he had with Apple frogdesign in 1984. "They wanted us to continue making the babut we had to reduce the tolerances to no more than 0.002 inc circumference and no more 0.018 inch in thickness. The badge to fit inside a recess that frogdesign had designed, so that it we look like part of the surrounding plastic. Basically, they expected badge to be perfect and wouldn't discuss anything that wasn't."

Meanwhile, Clive Twyman and Bill McKenzie turned the situal with frogdesign into a challenge. "They told us, 'Design whatever' want, and we'll try to build it,' " says Steven Peart, "which was all wanted to hear." MacKenzie, in particular, attacked each frogdes design with gusto, reveling in details and zero-draft schemes that would have rejected a few months earlier. "Once we were all pull in the same direction, we did a lot of work," says Peart. "The blocka that had existed earlier was gone. It was like a dam bursting open In just over two years, frog's designers injected SnowWhite in every corner of Apple's product line: starting with a radically n dot-matrix printer, the ImageWriter II, released in 1984; followed the revolutionary LaserWriter printer and AppleTalk Connec Family, released in 1985; speculative concepts for portable comp ers, printers and expandable desktop machines in 1984 and 19 the Apple IIGS, released in 1986; the Macintosh II family (comp ing the Mac II, Mac SE, the LaserWriter II and a line of periphera released in 1987-88; and the Macintosh Portable, released after lo delay in 1989.

The rigor and consistency of the SnowWhite language, alo with its logo and six-color badge, made Apple's products amo the most recognizable in the world—each one acting as a thre dimensional corporate signature that said "Apple" wherever went. And as long as Steve Jobs remained at the helm, frogdesig power and influence continued unchallenged, says Stephen Pea "Somehow, we knew that situation wouldn't last forever. So w had to make the most of it while we had the chance."

IMAGEWRITER II

PLATES 66

Industrial Design: Apple Computer: Bill MacKenzie, Mark Pru frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger Dates of Design: January-May 1984 Introduced: September 1985

Awards: I.D. Design Review, 1986; Silver Industrial Design

Excellence Award, 1986

A collaboration between Apple, Tokyo Electric and frogdesign Stephen Peart, the ImageWriter II remains the most durable and or of the most expressive products Apple has ever produced. Its o

^{*} The confusion over "Who designed the Macintosh?" is so profound that even authoritative sources like *MacWorld* (September, 1996) and *I.D.* Magazine (November, 1996) both wrongly attribute the original Mac's design to frog. The fact that frog rarely corrects these errors only adds to the confusion.

ns date back to 1982, when Bill MacKenzie began work on the st ImageWriter with Owen Densmore, a former Xerox engineer ho joined Apple in 1983 to develop "a poor man's laser printer" low-cost dot-matrix that could print high-quality dots. Together acKenzie and Densmore met with Tokyo Electric in Japan, examed a printout from TE's existing dot-matrix printer, pointed out ots that were either too black or too light, and told them that Apple reded a mechanism with rock-solid dot placement and perfect horontal / vertical registration. "Suddenly, the oldest guy on TE's side 'the table, a mechanical engineer, said, 'Aaah...' That's all he said," ys MacKenzie. "A month later, he came up with the ImageWriter echanism. It was the most amazing feat of engineering we'd ever en." But its design, MacKenzie admits, "fell into the no-man's-land etween the Apple II and SnowWhite."

For the ImageWriter II, Stephen Peart gave the product a complete akeover, accentuating the platen (the central cylinder that feeds uper through the printer mechanism) with large cylindrical handles each end, controls to the front; and thick legs that raised the back the printer, creating a wedge shape that gave the product an gressive stance and allowed form-feed paper to be stored undereath. Influenced by Mario Bellini's Olivetti products from the late 970s, Peart recalls: "I asked myself, 'What if I was sitting in livetti's studio and Bellini asked me to design a dot-matrix printer? 'hat would I do?"

When Steve Jobs reviewed the final design, he looked at it for bout five seconds and said, "Has Bill MacKenzie seen this?" Peart odded, at which point Jobs said, "Looks great. Build it." The entire view took less than a minute. The next day, Peart and Bill acKenzie were their way to Tokyo with authorization to spend ore than one million dollars to put the design into production.

ten though one reviewer compared the Imagewriter II in a joking anner as "a cross between a lunar lander and a paper shredder," the oduct proved a huge success for Apple, convincing those who disissed the IIc as a fluke that the SnowWhite language could give ren the most humble product a sense of power and style. When ated with the optional sheet feeder, printing at full speed with formed paper flowing through, the ImageWriter II functioned as a piece "desktop sculpture. Ten years after its introduction, Apple still sells e ImageWriter II for applications that require an impact mechanism uch as printing on multilayered forms), making it the longest-selling ople product of all time and the first desktop printer of any kind to ceive multiple awards for its design. Yet according to Peart, "the hagewriter II was special not because it won awards … but because cople who knew nothing about design saw it and bought it because ey liked the way it looked."

TRING THE SUMMER OF 1983, HAVING FINISHED WORK ON THE MACINTOSH, ftware manager Bob Belleville wrote a memorandum outlining a rategy, called AppleTalk, to link two or more Macs into a simple office network. Though AppleTalk was slower than IBM's networks, Belleville designed AppleTalk to match standards being developed by AT&T for worldwide data communications allowing future users to plug their Macs directly into phone lines and send data around the world. By 1984, Belleville's networking proposal spawned a campaign known as The Macintosh Office, which would include a more powerful Macintosh, a new printer called the LaserWriter (which could print characters and graphics at 300-dots-per-inch), a revamped Lisa (now called the Macintosh XL) for use as a file server, and AppleTalk connectors that would link everything together. By connecting two or more Macs to a file server and a LaserWriter, Apple could offer an inexpensive alternative to IBM's more costly networking systems and position the Macintosh as "the second standard in business."

To get there, Apple needed a follow-up to the first Macintosh that would solve the machine's limitations: too little memory, not enough speed, no internal expansion, and no hard drive. The Mac also needed a new image. As a reviewer for *Infouorld* noted in 1984, "the Mac simply doesn't have the look and feel of a business computer." Recalling that early steam engines were made to be larger and noisier than necessary to impress their customers, the reviewer wrote, "Apple should have designed the Mac to look powerful, even if it wasn't" ... something that frogdesign was more than happy to do.

BIGMAC · BABYMAC

PLATES 69-70

Industrial Design: frogdesign (Campbell, CA): Hartmut Esslinger, Stephen Peart, Herbert Pfeifer, Brad Bissell, David Hodge Dates of Design: January-August 1984 (project cancelled) Among the July 1983 SnowWhite concepts was a large all-in-one design, code-named Doc, which frogdesign evolved into a high-performance Macintosh, called BigMac, giving it a faster microprocessor, an internal hard disk and a 15-inch portrait display with the same height-to-width ratio as the original 128k Mac. "From day one, frog's primary goal was to design and deliver an all-in-one Mac with a full-page display for the graphic arts and business markets," says Brad Bissell. "At the same time, Hartmut wanted a smaller BabyMac to fill the lower-priced segment." In their original form, BigMac and BabyMac resembled standalone displays with a simple Euro-modern look that was so clean and unadorned, it looks fine even by today's standards. With a gently curved bezel, each had a flush-mounted screen, 2-millimeter SnowWhite lines which functioned as vents on the back, and a centered floppy slot below the display, which extended the head-like metaphor by allowing the front to resemble a human face). Yet as BigMac developed under Rich Page, chief hardware architect on the Lisa, it evolved into a "3M machine"with a screen capable of displaying a million pixels, a microprocessor that could handle a million instructions per second and a hard disk capable of storing one million bytes (or one gigabyte) of data. In the process, BigMac absorbed more development funds than Apple's hardware and software designers could throw at it, becoming more powerful (and more expensive) than its target audience wanted. Even though funding was cut back in late 1984, BigMac developed a life of its own and remained a back-burner activity until mid-1985, when Jean-Louis Gassée (Steve Jobs' successor in the Macintosh division) cancelled the project, taking Baby Mac with it.

TurboMac. Another attempt to design a next-generation Macintosh, called TurboMac, was led by Burrell Smith, who designed the circuitboard on the first Macintosh. Working in a corner of Bandley 2, across the street from Macintosh headquarters, Smith took over a series of cubicles that he called TurboTown, where he developed an all-in-one concept that was roughly twice the size of the first Macintosh, with a faster microprocessor, two custom chips designed by Smith that would do the work of a dozen offthe-shelf components, a 12-inch gray-scale display, a built-in hard disk and a SnowWhite case designed by Stephen Peart. Without a full-page display, however, it would not be the product that Apple needed. Some urged Jobs to convert TurboMac into a modular CPU with a separate 15-inch display and formed a committee, packed with former Lisa engineers, to advise. Yet Burrell Smith, the mayor of TurboTown, vetoed that plan. "Since everyone on a committee wants to feel that they've made a contribution, committees will always undermine the best parts of an idea with an endless series of compromises," says Stephen Peart. As a result, TurboMac was cancelled, which prompted Burrell Smith to resign from Apple, declaring that he would never again drive his car through the intersection of DeAnza Boulevard and Stevens Creek Road, which cuts through the heart of Apple's campus.

At the time, the cancellation of BigMac and TurboMac seemed like a minor affair—the kind of decision that occurs regularly at fastmoving high-tech companies that evolve in response to market conditions. In retrospect, killing BigMac was a mistake, the first of many that would frogdesign and later Apple designers to scratch their heads. "The fact that Big Mac died in 1984 was a great loss, because in 1985 Apple needed a powerful all-in-one Mac with a large screen for the growing market in desktop publishing," says Steven Peart. Eight years would pass before Apple would rediscover the Big Mac concept and deliver a large-screen all-in-one Mac in 1993 called the Macintosh LC 520. Code-named Hook, it was a huge success, a fact that causes Peart to wonder: "How much *more* successful would BigMac have been if Apple had released it in 1985 instead of 1993?"

In the years to come, Apple would cancel a long list of projects with names like Jonathan, Laguna, Columbo, Figaro, BoomBox, Paladin, Nautilus and Sparky. Like BigMac, each combined exceptional technology and design, addressed itself to a particular market segment and, in some cases, could have changed the landscape of personal computing by keeping Apple far ahead of its competition. Like Big Mac, however, none of these concepts ever saw the light of day, adding fuel to those who wonder how different the Apple

story might have been had the decision making at the top of the firm been in sync with those who brought the products to life.

Macintosh XL. After its initial launch in 1983, the \$9,995 Lisa con puter was given a second life in 1984-85, when Apple reposition it as a Macintosh-compatible file server, capable of sharing doe ments with up to 30 Macs in an office network. Sometimes called t Lisa 2. officially known as the Macintosh XL, it came equipped w an internal hard drive and an updated case with horizon SnowWhite lines across the bezel (supplied by an unknown Apr employee), which violated the rule that SnowWhite lines show always run toward and away from the user, never from side to sa At frogdesign, the designers joked about the Macintosh XL, wond ing whether "XL" was short for "Extra Large," "Extra Late" or "Ex Lisas" (i.e., unsold inventory). Everyone assumed that with a wa house full of unsold inventory, Apple would have enough parts keep the Mac XI. going until a real Macintosh with a hard disk ready. But once the Mac XL was unveiled as part of the Macint Office in January 1985 at a price of \$3,995, it became an unexpeed success, causing sales to quickly exceed inventory. Since no r on Jobs' staff bothered to order additional parts, Apple discontinthe product when the last Mac XL was sold in April 1985

LASERWRITER

Industrial Design: Apple Computer: Bill MacKenzie. Mars P Don Porter, Terry Christensen, product design: frogen (Campbell, CA): Stephen Peart, Hartmut Esslinger, Anthon Sigmar Wilnauer, Peter Müller

Dates of Design: April-June 1984

Introduced: January 1985

The most intriguing part of the Macintosh Office began de a ment in 1983, when two former Xerox PARC engineers Warnock and Chuck Geschke of Adobe Systems, approached Jobs with a novel idea. Experts in an arcane form of software page description language, Warnock and Geschke proposed Apple develop a desktop laser printer using Adobe's PostScript ware, which could output typeset-quality text and graphics. spar the phenomenon known as desktop publishing-a term com Paul Brainerd, whose Aldus Corp. developed PageMaker ** sophisticated page-layout software package for the Macintosa 1 PageMaker, users could combine text with pictures, arrange the in columns, add borders and headlines, and print the final result a LaserWriter, virtually eliminating the need for documents to be a set and printed in a conventional manner. The same way that We helped make the Apple II a hit in 1978, PageMaker became the "killer application."

Even though Marketing argued that a \$500 daisy wheel prime be an easier sell than a \$7,000 laser, Jobs disagreed. "Once the what the LaserWriter can do, everybody's going to want **L**" be Thus he scrapped an ongoing printer program, licensed Posts Mac and told Hartmut Esslinger to get started on the design.

The best partner for developing the printer was Canon in man, which had just developed a 300-dpi laser engine. Yet to funcin the way Warnock and Geschke described, the engine needats own logic board [designed by Apple's Burrell Smith] with as uch memory and processor power as a full-blown Macintosh. coording to frogdesign's Stephen Peart, Canon's original design oked more like a photocopier than the product we know today. trially, they wouldn't give us any latitude to change the mechasm. Yet we needed to improve its function and appearance. So we oposed a low-profile design with a straight paper path, which and them thinking." They settled on a tall boxy design, 11-1/2 sches high, with a paper exit tray on the side, wrapped in a wWhite case with a flat top. When Canon saw frog's design, cople worried that the top would not remain flat if users stacked cocks or other heavy objects on it. Peart corrected the problem by ching the top just enough to prevent it from deflecting downand. To the casual eye, the top still appears totally flat.

The aesthetics would improve later," says Hartmut Esslinger, "but the first LaserWriter will always be my favorite, because it was our first ge zero-draft form and had a big impact on sales of the Macintosh." The its off-white color and "pure" SnowWhite details, the LaserWriter that belong to the same world as the Manock Mac or the Mac XL or was it the most the deftly handled product, hampered by the size of shape of the printer mechanism. Yet the product's true impact tasn't apparent until the first printed page came out.

After using the LaserWriter, it struck me that the printer was a reakthrough that in some ways overshadowed the Macintosh self." says frogdesign's Tony Guido. "The LaserWriter made me ink less about the drop-down menus, and other elements that take the Mac so different ... and more about what the Mac can *do*." by delivering the "what you see is what you get" that Jobs had first een at Xerox PARC, the LaserWriter with PostScript established a ew paradigm by turning the computer from a data processor into tool for creative expression.

AppleTalk Connector Family (Plate 73). As Apple's product ne evolved and plans for a new generation of Macintosh computrs with AppleTalk networking took shape, a family of hardware onnectors was needed to link everything together. Using appleTalk, up to 32 users can share information and peripherals on he same network. To make it work, an icon was needed at each onnection point so that users anywhere in the world could attach eripherals to their Mac, without reading instructions or even undertanding English.

"The goal was to develop a language for the connectors that would ork with SnowWhite but not be tied to it," says Brad Bissell, who esigned the connectors. "Since the products would evolve over me, the connector design had to be restrained. Yet the icons had function as a universal language. And everything had to be pleasing to both the hand and eye." Pleasing the user was easy; the hard part was pleasing Jobs.

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After weeks of research, Bissell presented designs for a small AppleTalk box, a series of icons and a group of thimble-sized connectors. Round on the sides and flat on top, each connector had a square icon near the tip and a grooved surface on which the user would place his thumb when inserting and removing the plug. The icons were derived from the German DIN (Deutsche Industrie Norman), a widely-used industrial design standard. But when Jobs saw Bissell's concepts, he smirked, "You're getting too industrial designee on me." Yet after weeks of research, Bissell still couldn't find a better solution. So he presented the same concepts again. This time, Jobs approved it without comment. "Steve needled people as a way of testing their convictions," says Bissell. "If you could defend your work, he would respect you; if not, you no longer existed in his eyes." Using AppleTalk connectors, as many as 32 users could communicate with one another and share peripheral devices such as printers and file servers in a single network. Thirteen years later, Bissell's connectors are still used on millions of Apple products around the world. No plans have been made to update their design.

The Apple Icon Family. Since 1983, freelance illustrator Rick Meadows has been responsible for developing product icons for all of Apple's desktop products, portables, Newton and peripheral products. In the process, he has evolved one of the most extensive symbolic languages found on any commercial product line. Prior to 1983, icons were either printed on the product (and could wear off) or applied using clear plastic labels (which could peel off). To make sure the icons would be permanent, frogdesign decided that all icons and explanatory graphics on products should be molded into the plastic. This required Meadows to design between 10 and 12 new icons every year.

Since Apple already had icons for the most basic functions (on/off, brightness, contrast, printer port, floppy port, etc.) from the Manock era, Meadow's first icons were fairly esoteric: the "degauss" symbol [a magnet with a diagonal line though it, found on the back of Apple monitors] and the "interrupt" symbol (a circle with a V-shaped line running through it) found on the back of all CPUs.

"In the early days, it was easy to represent functions by using common sense," he says. "But as functions become more abstract, the challenge increases every year." When designing an icon for a function that didn't exist until Apple invented it (such as "battery charger" or "infrared transmission"), it is not important that the symbol be instantly recognizable, only easy to remember. Like a traffic sign, the user should only need to see the symbol once to know it forever. The secret exists in finding a coherent visual metaphor that everyone in the world will understand, then simplifying the icon until nothing more can be removed. Each new icon is tested by Apple's Human Interface Group to ensure that average users will understand and remember it. The icon is then digitized, reduced to a diameter of 4.9 millimeters, tooled within a square 6 millimeters across, then inserted into the mold used to make the finished plastic.

AT THE JANUARY 1985 SHAREHOLDERS MEETING, JOBS AND SCULLEY WERE upbeat as they kicked off the Macintosh Office campaign, unveiled the LaserWriter and Macintosh XL and demonstrated the AppleTalk network by exchanging messages between two Macintoshes set up at opposite ends of the stage linked by a single glowing wire suspended overhead. When the board of directors met the next day, however, the mood was less cheerful. Even though Apple's shipments totalled \$698 million during the 1984 Christmas quarter, more than double the output for the same period the previous year, orders since Christmas had slowed because of excess dealer inventory. Until the unsold product could be cleared from store shelves, Sculley warned, the coming months would be "challenging." The Macintosh situation was particularly bleak: with \$100 million in unsold Macs were sitting on dealers' shelves and in Apple's warehouses, the high-concept TV commercial shown at the 1985 Super Bowl, titled "Lemmings," which compared the purchase of an IBM PC to walking blindly over a cliff, failed to tell customers that Apple was selling something called the Macintosh Office-which was just as well, since only the LaserWriter and AppleTalk connectors were ready to ship. A more powerful (and business-friendly) Macintosh was still months away. And the Macintosh XL lacked software to make it a server that would perform like competitor's products. Even so, sales of the \$3,995 Mac XL took off, only to end abruptly when Apple ran out of parts to build more. The result: Apple had lost its chance to enter the business market in 1985. Meanwhile, no one yet knew what the next Macintosh-the product on which Apple's future hinged-would look like. To recoup, the board asked Sculley to take charge of the company and asked Jobs to concentrate on shoring up the Macintosh division.

In March 1985, the belt-tightening began as Sculley shut down all factories worldwide for one week to clear excess inventory. Then he met with Jobs and explained that while he was serving as both chairman and Macintosh Division manager, it had become impossible for Sculley to manage Apple as CEO. To move forward, Sculley said, Jobs should give up his position as head of the Mac Division. To speed the transition, Sculley suggested that Jean-Louis Gassée, the president of Apple France, be transferred from Paris to help Jobs with Macintosh marketing. Reluctantly, Jobs agreed.

Jean-Louis Gassée. On the surface, Jobs and Gassée couldn't have been more different. Born in France, Gassée studied mathematics at the Sorbonne, waited tables at a Paris strip joint, learned the computer business at Hewlett-Packard and Data General, then took over Apple France in 1981, where he became known as "the King of France" for his success in outselling IBM. Under Gassée, more Mac software titles were produced in France than the United States. Meanwhile, his diamond ear stud and penchant for black leather once landed Gassée on France's "ten best-dressed" list. And his fanatical devotion to Apple led him to make visionar nouncements, such as the line in his memoir *The Third Apple*, noted that the Apple II "smelled like infinity." Legendary sense of humor, Gassée knew more funny stories than a E Belt comedian. During formal meetings, he could be very an ... or he could remain totally silent while his underlings fu around trying to figure out what "the King" was thinking.

"The toughest thing about working with Jean-Louis was not ing what he wanted," says product designer Richard Jordan. " Jobs, who had an answer for everything, Gassée wanted per come up with their own solutions. In a one-on-one sessi would often sit back and listen, then wait for you to make t so that he could agree with it. If he liked your ideas, he'd be If not, he would throw you out of his office." Convinced that ating a Mac "should be better than the greatest orgasm you have," Gassée liked to compare products to wine, won weapons. A good product might be like a fine Cabernet, machine gun, an F-16 fighter jet or a Stealth bomber (all fou names were used at various times). With his own power h France, untainted by the squabbles in Cupertino and post more chutzpa than he knew what to do with, Gassée was th est thing to Steve Jobs that Apple had in 1985. He could be upon to stand with John Sculley if the need arose. And, most tant of all. Gassée had a plan for saving the Macintosh that ! and Jobs could not ignore.

MACINTOSH PLUS

With corporate buyers eschewing the Macintosh for its I power and expandability, Gassée pressed the Mac division to op a product that was already being discussed-a revised Mad Plus with 1 megabyte of memory (an eight-fold increase or first Mac) for working with desktop publishing documents, board with cursor keys (which Jobs would not allow) and a numeric keypad for negotiating spreadsheet programs, a new ble-density floppy disk drive, plus a new ROM chip and syste ware to support a SCSI port on the back (another Jobs omission attaching the Plus to an external hard disk drive, image scar other high-speed peripheral. In a single stroke, the Mac Plus b a more powerful and 'open' system that business and profe users could introduce into the corporate suite. Unfortunately sales for the first Mac meant that Apple still hadn't recover nearly \$1 million spent in tooling the Manock/Oyama case. than invest in a new design, Gassée asked frogdesign to moc existing tools instead.

"When Hartmut heard the news, he was annoyed," says Peart, "not at Jobs or Gassée ... but at himself, for not insistin we redesign the original Mac in the fall of 1983 when he h chance." For months, frogdesign had a completed SnowWhit r the all-in-one Macintosh ready to go (Plate 74). Designed by Brad issell in the fall of 1984, it was similar to the drawing that Herbert eifer had made in May 1983, and bore a faint resemblance to the 84 BabyMac concept with its centered floppy disk slot below the splay, tightened relationship between the bezel and screen and fiveillimeter corners instead of chamfers. Even though hundreds of ours had gone into the redesign, it was now useless. Instead, Bissell odified the existing Macintosh tooling-eliminating the nameplate n the back, removing the smooth area on the left side of the case at guided the user's hand to the on/off switch, removing the backbattery holder from the rear (placing it inside the unit), redesigng the I/O ports (adding the SCSI port) and eliminating the plastic mier that Manock had introduced so that the Mac Plus could accept dustry-standard connectors. And, for the first time, product icons ere molded directly into the plastic. Despite these changes, the basic sign elements-the thick chamfered corners, top-mounted vents d brown color-remained intact. As a result, frogdesign declined cepting design credit for the product. Unlike its predecessor, the us had enough power and expandability to be useful for years to me and it helped establish the Macintosh as a viable alternative to e IBM PC. Instead of a Macintosh, the next frogdesign product ould be a new modular version of the Apple II, the workhorse of pple's product line, called the Apple IIGS.

PPLE IIGS

Plate 76-79

adustrial Design: Apple Computer: Richard Jordan, Adam Grosser, on Porter, Chris Novak, product design; frogdesign (Campbell, A): Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, Stephen eart, Jose Delhaes, Herbert Pfeifer

ates of Design: January-March 1985

troduced: September 1986

wards: I.D. Design Review, 1987

en though the Apple II, IIe and other variations on the product id garnered more sales than any other Apple product, both Sculley id Jobs agreed that Apple's first mass-market computer no longer presented the future. With IBM clones crowding out the lower end the market, Apple decided to reposition the Apple II as a midvel product at a slightly higher price. With more than two million inple II systems in circulation, there was huge demand for an odated product with a color display and stereo sound (for playing ultimedia CD-ROM disks), which the Macintosh did not yet offer. Is a premium product, a higher-priced Apple IIGS would fit neatly to Sculley strategy of extracting higher gross margins from everying Apple sells.

For frogdesign, the IIGS represented an opportunity to dust off an d concept that had been sitting on our shelf, since July 1983. Known the Apple IIs, it was similar to the original Apple II with an inteated keyboard fit into a wedge at the front. Yet it differed in one spect: instead of having a keyboard that fit flush with the CPU, the keyboard stuck out on the front and sides, a look that many compared to the hungry end of a hammerhead shark.

"Initially, Hartmut wanted to graft the II's form factor onto the Apple IIGS," says Tony Guido. "Yet some of us considered an integrated keyboard a backward step in terms of design, because if the keyboard malfunctions, it puts the entire unit out of commission." Another consideration was size. "As we examined the Apple II, we realized it had a lot of interior volume that we could eliminate. So we shrank the box down to the size of the motherboard and power supply, then developed two alternate versions—one with an integrated keyboard like the old IIs, and one with a thin detachable keyboard."

As expected, Esslinger held out for the hammerhead look. Yet Apple executives preferred a modular approach, which prompted the designers to shrink the CPU even more, packing the internal components together so tightly that the resulting box was *smaller* than the motherboard; in effect, the CPU appears to be sitting on a plinth (containing the motherboard), which sticks out slightly at the front.

Even though Guido wanted to make the IIGS clean and rectilinear, "Hartmut still liked the diagonal line on the side from the earlier IIs concept, "says Guido. "With the keyboard detached, I figured we no longer needed that diagonal line. But Hartmut insisted we keep it. He never told us why. He just said, 'This is what we're doing."

Once the final direction was set, Guido, Wilnauer and Jose Delhaes executed the CPU, floppy drive and keyboard, Stephen Peart designed the IIGS display and Herbert Pfeifer ran interference. The keyboard, derived from the 1982-83 Cassie concept (first shown at the March 1983 SnowWhite presentation) was the product of a lengthy and expensive development performed at Apple's Garden Grove keyboard facility near Los Angeles. where prototypes featuring a metal foil key switch mechanism were painstakingly built—only to discover that customers wouldn't accept a keyboard that was so thin and lightweight. To make the it seem more substantial, Guido designed a narrow frame around the Cassie mechanism (code-named Universe), with a nifty on/off switch at the top and electronics inside that used a new protocol called ADB (Apple Desktop Bus), which links CPUs to keyboards, mice and other input devices on all future Apple products.

MEANWHILE, DURING THE SPRING OF 1985, STEVE JOBS WAS PLANNING A TWOprong strategy: to revive the Macintosh by targeting business customers; and develop a battery-powered portable Macintosh that would capture the imagination of individuals and executives and return Apple to the cutting edge of PC technology. Jobs first shared his idea for a "Mac in a Book" with his Macintosh development team during an off-site retreat in January 1982. Covered in brown felt, that first portable concept looked like a desk diary, which opened like a clamshell to reveal a screen on one side and a keyboard on the other. "This is what we'll be making in the mid- to late '80s," Jobs told the group. In his mind, the first Macintosh was simply a prelude to the ultimate dream, a Mac that could be carried in a shoulder bag and used anywhere. This prompted the inclusion of a booksized Macintosh in the 1982 SnowWhite design brief, which fueled an unending series of concepts at frogdesign.

Between the fall of 1983 and the spring of 1985, when not pursuing other projects, frogdesign explored every conceivable concept, metaphor and analogy for a book-shaped, small tabletop or hand-held Macintosh-including flat panel ideas, slate-like concepts, etch-a-sketch concepts, Swiss Army knife shapes, concepts that resembled a notebook binder, an accordion, a collapsible telescope, a folding Polaroid camera, a travel alarm clock, and a canvas-covered concept with shoulder straps called MacPac. Reviving the Apple IIc form factor, Esslinger designed a slim black CD-ROM Mac (Plate 86) with an LCD display and on-board CD-ROM drive. Frogdesign's David Hodge designed a wallet-sized Pocket Secretary. which looked identical to the Casio Wizard that appeared several years later. Meanwhile, Stephen Peart took a different approach: repackaging the components from a standard desktop Macintosh into a slim portable product, replacing the CRT with a flat-panel display and positioning the Mac's circuitboard horizontally behind the screen. The result, called SkinnyMac and FlatMac (Plate 82-83), could be manufactured at little additional cost. "The bezel would have looked like a standard Mac," Peart says. "But instead of being 12 inches thick, it would have been two or three."

Two other concepts pushed the limits of technical feasibility to the limit: a tiny **24HourMac** (Plate 80) with a pen-sensitive LCD, keyboard and a stylus that stored in a flip-up 'inkwell'; and **TelephoneMac** (Plate 81). a combination telephone, electronic note taker and E-mail message center that Apple developed with AT&T. "Even then, we assumed that users would want to plug their machines into the telephone system and send data around the world," says Esslinger. Out of this, frogdesign settled on a concept called **BookMac** (Plates 85, 87), which resembled one of the March 1983 Bashful designs, having an integrated handle and a taut SnowWhite skin with tight corners and slots just like Apple's desktop products.

While these designs came together, Steve Jobs worked on the most important element of the plan: the liquid-crystal display. For months, he had been negotiating with Steve Kitchen, the owner of a local startup firm called Woodside Design. Kitchen had just invented a flatpanel display that was large and crisp enough for everyday use, thin and light and efficient enough to be used in a portable product. When Apple's engineers first heard about it, they said it couldn't be done. Yet Kitchen, who had dropped out of college to pursue his dream, proved the engineers wrong. If BookMac went forward, Jobs said, Apple could purchase Woodside and its technology, then build a new factory in Fremont to mass-produce the displays. At that point, it would be easy to develop one of frogdesign's concepts and deliver the first portable Mac. Esslinger was so convinced the flat panel idea would happen that he designed a desktop flat panel display, with an easel-like support, to show off Woodside's technology (Plate 84).

AT THE APRIL 11, 1985 BOARD MEETING, STEVE JOBS PRESENTED HIS PUR Macintosh by first unveiling what looked like a standard decomputer-an Apple II with a plastic shell on top taken from a ventional CRT display. He then lifted the shell to reveal a do four-by-five-inch flat-panel display with the words "Flat Mac" screen. In his pitch to the board, Jobs said that an efficient for a display would allow Apple to deliver a portable Mac in 1988 would leapfrog the competition and return Apple to undisputed ership in the PC market. With an initial investment of \$20 million promised delivery of 20,000 displays per month by the second a 1986. But after Jobs's performance as manager of the Macintos sion, no one believed he could get a flat-panel factory up and real on time and within budget. Thus, the board vetoed the idea effective the dream of a "Mac in a Book by 1986" in a single stroke. Proceed to the next item, the board agreed with John Sculley's recomm tion that Jobs step down as manager of the Mac division, giving effective control over the entire company.

Even though he would soon be out, Jobs initiated the sphase of his turnaround plan by calling a general meeting. Mac division in late April. As Tony Guido recalls, "we were working on the IIGS, when Steve called everyone together—keting people, engineering, frogdesign, everyone—and annual that we were changing our product focus.... Ever since the April Steve had wanted Apple to retain its California sensibility and person, one computer' philosophy by focusing its product consumer market. But Sculley wanted to broaden the Macs chise and position it as a corporate line, more like IBM." Acception Guido, "Jobs said we had to swing the company around after the business market ... *right away*. If not, he said, we lose Apple. That shook up a lot of people up." Yet for Hesslinger, it was nothing more than a design problem waiting solved. "For frog, it was a major moment," says Guido.

To overturn the image of the Mac as a "non-business" com Jobs said that Apple would develop a new, more po-Macintosh-larger and more expandable than the Macintosia with a modular design to compete with the IBM's new PGJ description would eventually lead to the Macintosh II). The a one Mac would also continue; but room would be found internal hard disk and a single expansion slot (which led to cre of the Macintosh SE). To do this, frogdesign would need to dea new SnowWhite design language, say goodbye to the E look of the Apple IIc and move toward a tighter, more profess appearance that would appeal to corporate America. "If we c get products into the office, Jobs figured they would then filter into the home," Guido recalls. "Apple's earlier strategy of se computers to schools hadn't created enough migration home. So Jobs decided that a business-oriented approach sense. For us, that meant designing a Mac that would fit im office without alienating our home and educational users."

NONTHS, FROGDESIGN HAD BEEN WORKING ON A CONCEPT THAT MIRRORED request for a more professional-looking industrial design. Dired for business yet also appropriate for first-time users, homes dischools, the new design combined technical simplicity and thectural flexibility with eye-popping aesthetics. Unlike every her computer of its day, which treated the CPU as a box with the imponents on a motherboard inside, frogdesign's new concept and the elements as building-blocks, allowing the user to set it up a simple home machine, a basic office computer, a high-end office tent a souped-up graphics, scientific or CAD/CAM workstation, or coss-platform computer running multiple operating systems, netrking options and peripherals galore. Adding new elements and be like adding books to a shelf.

Aesthetically, the new concept fit Jobs' idea of a new SnowWhite cuage. Yet from a strategic standpoint, it was risky. Fully exploitthe new concept would compete with Apple's existing desktop oputers. At the same time, it would eliminate the boundaries that mated Apple from the world of IBM and Microsoft, making all cuting systems, applications, peripherals and networking options cuble on single platform. As such, it could have been the soluto most of Apple's strategic problems. Or it could have to wost of Apple's strategic problems. Or it could have to designed, the new system neared completion just as Steve Jobs counced the Mac division's dramatic change in direction. Its code ne was Jonathan.

They were afraid of it." — Tony Guido – Tony Tony Guido

DNATHAN COMPUTER CONCEPT

PLATES 88-99

instrial Design: Apple Computer: John Fitch, product manager; **m** Toedtman, Ron Hocksprung, Joseph Friedman, Pat Jackson, **ind** Henkey, product design; frogdesign (Campbell, CA): **innut** Esslinger, Tony Guido, Sigmar Wilnauer, Stephen Peart, **innut** Pfeifer

mes of Design: November 1984-June 1985 (project cancelled)

on the moment frogdesign began work for Apple, Hartmut singer's ideas about personal computing were shaped by the ewheeling atmosphere of Silicon Valley and focused by the eyes d mind of Steve Jobs. Like Jobs, Esslinger believed that Apple was t merely a company. It was a philosophy with almost religious enones. Its main article of faith was a belief that technology could power the individual and thus act as a social equalizer.

In order to make the "one person, one computer" credo a reality, wever, Apple had to gain not only market share, but mind are—its main opponent being the IBM PC computer and crosoft's DOS operating system, which had just metastasized into new operating system called Windows, which bore an uncomfortle resemblance to the Macintosh graphical user interface. Even though IBM's hardware was inferior and DOS/Windows was primitive compared to the Macintosh, IBM/Microsoft represented the "safe" choice in the fast-growing business market—a situation that Apple had to turn around. By marketing the Macintosh as a proprietary technology, which ensured quality and consistency in applications, Apple found it difficult to gain market share in the face of IBM, which had nearly unlimited marketing resources and had created an "open architecture" for the PC, allowing competitors such as Compaq and low-end Asian makers to reverse engineer the PC and churn out millions of clones running licensed versions of DOS.

Despite the Mac's functional and aesthetic superiority, Hartmut Esslinger gave considerable thought to overcoming the IBM/Microsoft juggernaut. With Apple's percentage of the market hovering at 15 percent, "there was no obvious strategy for Apple to gain market share," Esslinger says. One solution was to slash the price of Mac hardware, maintain price parity with the PC world and pray that increased sales would make up for the lower gross margins earned on each unit. Jobs had always favored lower prices. His original preference had been to sell the Macintosh for \$1,000, which he raised to \$1,500 when the final cost of development and components was tallied up. It was Sculley who convinced him to price the Mac at \$2,500 so that Apple could afford a multi-million-dollar advertising campaign. By Christmas 1984, however, Jobs wanted to reduce the Mac's price by \$1,000 and spent a frantic weekend with his staff running the numbers as Sculley gave him a series of 'what-if' scenarios. Drop the price too much, Sculley warned, and only confirm suspicions that the Mac was a toy. Reduce it too little, and give up profits without a sufficient gain in sales. In the final analysis, Jobs agreed that Apple needed high prices and high gross margins to fund the R&D needed to develop new products.

Another option for decapitating IBM/Microsoft was to license the Macintosh to the same clonemakers who were building PC clones. The results of this strategy would be dramatic: clonemakers would immediately build cheap Macintoshes in a variety of shapes and sizes; customers would rejoice; and Apple would evolve away from an integrated hardware/software manufacturer into a software-only firm like Microsoft.

To many inside and outside the company, licensing the Mac seemed the obvious solution. But every time the issue was raised, and the consequences of "pulling the trigger" outlined in detail, John Sculley would always pull back. On June 25, 1985, Microsoft chairman Bill Gates sent a letter to Sculley offering to use his influence with the likes of AT&T, Xerox, and Hewlett-Packard, and convince them to adopt the Macintosh as a true industry-wide standard—if, and only if, Sculley agreed to license the Mac OS. Acquiring a license for the Mac would allow Gates to stop working on an improved version of Windows, which was proving more difficult than Microsoft had expected. But Sculley, who viewed the OS as Apple's crown jewels, said no. Why should Apple wrap operating system software in a cardboard box and sell it for \$100 when it could wrap it in hardware and sell the package for \$3,000?

"Apple had invested so much in hardware, both financially and psychologically, that they couldn't give it up," says frogdesign's Tony Guido. "But it didn't take a Ph.D. to realize that hardware had become a commodity game. The real genius of the Mac, after all, is the software. At frog, we thought, why not use that fact to reposition the company? So we asked ourselves: 'What would it take to put the Mac on as many desktops as possible, without licensing, in a way that would convince DOS and Windows users to migrate toward the Mac?' "

The challenge was three-fold:

- design a simple hardware platform that Apple could manufacture at low cost and publish the specs to ensure wide acceptance;
- configure the system so that beginners, mid-level and high-end customers could all use the same basic hardware and enhance their systems over time by adding modules using Apple's "plug and play" technology; and
- offer both the Macintosh and DOS/Windows on the same platform, giving PC users an opportunity to "cross over," sample the Macintosh and stay with it, or use Mac and DOS/Windows software on the same system.

Meanwhile, a hardware engineer in the Apple II division named John Fitch was thinking along the very same lines. Having just completed work on the IIGS. Fitch was worried by the lack of a followup product for the Apple II. "The fact that we had nothing on the drawing boards caused me to wonder about the future of the Apple II division," he says.

Fitch wanted to design a computer around a new microprocessor, the Motorola 68030, which would be powerful enough for business and high-end applications, but could also be packaged in a form that would work in the home. With the Macintosh division developing its own high-end concepts—Big Mac and a modular CPU that would eventually become the Mac II—Fitch's concept would need a totally different architecture to distinguish it from the Mac. As an Apple II product, it would have an "open" architecture. But rather than design another circuitboard-and-slots system, Fitch proposed a more radical approach.

The idea came to him in September 1984. "For weeks, I had been thinking about a small computer that users could put in their living room and slowly build into a full-blown machine as their needs increased," says Fitch. "But rather than do a standard motherboard configuration, I designed a backplane that contained the power supply and a few ROM chips in the base (which carry basic low-level instructions that keep the system running), I/O connectors on the back, and a track on top that connected directly to the bus (the backbone of the computer, which functions as a high-speed data highway).

Fitch's design called for the backplane and track to support bookshaped modules, each containing circuitboards and chips for running the Mac OS, Apple II software, DOS, Windows, or Unix operating sys-

tems, plus other modules for connecting disk drives, modems networking hardware all plugged into the same track. Since the baplane was horizontal, and the modules were small and slender, F imagined the system as a book on a shelf. "A basic system we have a short shelf with one or two books. A business setup we have three or four books. And a power system would have sever eight books on a wider shelf."

Pleased with his concept, Fitch named it Jonathan (after hims and asked frogdesign to help him design a hard model to preto management. "Hartmut was skeptical about Jonathan at fi Fitch recalls, "which was understandable considering Jobs' affect for the Macintosh." Yet the more Esslinger thought about Fit books-on-a-shelf metaphor, the more he liked it.

A whole New Idea. To spread the concept quickly, Fitch a gested that Apple manufacture the backplane, containing the posupply, I/O ports and track at cost; publish the specs for that pathe system so that Asian vendors could manufacture it in volume sell it in discount stores, and package the intelligence (and value the system in the book-shaped modules, which would contain circuitboards and software and could be upgraded over time.

"Hartmut suggested that we design a basic set of book modu get them tooled, then rent the tools at low cost to other manu turers so they could offer their own Jonathan modules," Fitch rec "At that point, Hartmut really got into the idea."

First they designed a narrow shelf unit with one or two mod and called it HIT (short for "Home Information Termin According to Fitch, "HIT was a Trojan horse for getting the comp into the home ... it was the minimum system one needed for de simple word processing and E-Mail. Later, using connector hardw built into the base unit, the user could snap two or more b together, like Lego toys to create a larger shelf for inserting a tional modules."

As Tony Guido recalls, "one problem with conventional CPUs is they all look the same. There's no way of knowing how power system is by looking at it. The whole pride-of-ownership thir missing." By turning the conventional CPU inside out, Jona would look more impressive as its performance increased. "S every module was compatible, businesses could run DOS and Mac OS side-by-side on the same machine, allowing users to t their system ... buying only the modules they needed and swap them from one desktop to another."

The design also explored the symbolics of the computer. "U industrial design, we could give users the ability to start with so thing small and build something powerful over time," says Guid turning the computer inside-out, "Jonathan showed that the valu computers is the software, not the hardware. That realization w have made Jonathan a marketing person's dream ... because the r a buyer spent building his or her system, the more visually impreit would become ... Adding a another book to the shelf woul É

ore gratifying than plugging an expansion card inside a CPU.

By patenting the hardware and licensing it cheaply, Microsoft ould manufacture its DOS modules, AT&T would supply Unix odules, and Apple would sell its Macintosh and Apple II modes—thus toppling the barrier that separated the Macintosh and PC orlds. "DOS users could 'cross over' ... sample the Mac ... and not oss back," says Guido. Fitch and Esslinger both assumed that more ople would move from DOS to the Mac than the other way bund. "But as we found out later, Apple's top management wasn't sure," says Fitch.

The first hint of resistance came when Apple's Marketing Group got nd of the project. "First they complained about the size of our modes and told us to make them larger to accommodate industry-stanrd expansion cards," says Fitch. Then a new concern appeared: that nathan would compete with the follow-up to the Macintosh, the Mac According to Fitch, "the more Marketing thought about it, the more ey worried that Jonathan and the Mac II would compete against one ner. But if you put the two concepts side-by-side, they couldn't have en more different. The Mac II was a motherboard with expansion ots, like the IBM PC. The basic configuration was fixed. But nathan allowed you to upgrade the system incrementally. It was a ally different idea."

To differentiate Jonathan, frogdesign gave it a powerful, almost litaristic look with smooth surfaces, sharp corners, vertical ribs bund the base to carry venting and a dramatic black color with hite product graphics—unlike anything Apple had done before.

ter eight months of development, John Fitch and frogdesign weiled Jonathan to the executive staff in June 1985. "We kept the sign a secret to give it a dramatic presentation," says Tony Guido. began with slides, after which the lights came up and Hartmut slinger removed the cloths from models that had been scattered bund the room.

It was a real Apple moment," says Guido. "But when Hartmut pulled vay the cloth, the executives' reaction was stone cold. The black for really shocked them. One VP said it reminded him of the black ab in the film 2001. It's not that they didn't like the idea. They were braid of it."

Then came the criticism. Jean-Louis Gassée delivered the first hit by oserving that Apple would have to sell two or three Jonathans to jual the profit on a single Mac II. Others complained that Jonathan ould compete with the Mac II. Then Sculley delivered the *coup de âce*—voicing the fear that once the Mac and DOS were offered on e same platform, more Mac users might move to DOS then DOS ers would move to the Mac. "That reasoning floored us," says Fitch. pparently, Sculley had less faith in the Mac than we did."

In retrospect, Hartmut Esslinger considered the rejection of Jonathan notional rather than intellectual. "The idea was logical, and the chitecture was quite cheap," he says. "It worked in every way, ccept one: it revealed the flaw in Apple's core strategy, which was to sell the Macintosh as a proprietary system for as long as possible. Exclusivity meant high profits, which was fine. But over the long term, Apple needed to gain market share and build a bridge to the PC world, which meant licensing their OS along with everyone else." Even though the project was cancelled, says Guido, "the executives did like one aspect of Jonathan ... our industrial design." One executive said that the Mac II should adopt a similar look ... only not black. He called the look ABM, short for 'Apple Business Machines.' Later, Esslinger decided to use Jonathan's tighter corners and narrowly-spaced vertical ribbing (which contained venting) around the base on all future SnowWhite products, whether they had vents in the base or not.

In an interesting postscript, Apple later used Fitch's work with the Motorola 68030 in a top-of-the-line Mac II, known as the Mac IIfx, introduced in 1989, which became the highest performing Macintosh until the advent of the PowerPC.

PRIOR TO THE JONATHAN PRESENTATION, A PLAN HAD BEEN FORMING IN STEVE Jobs' mind that he hoped would solve both his and Apple's problem. Still smarting from the April 11th board meeting, the rejection of the BookMac and endorsement of Sculley's decision to move Jean-Louis Gassée into the Macintosh division, Jobs hatched a plan to turn the situation around.

For months, Apple had been working out a deal to sell computers in China. On May 24th, Sculley was scheduled travel to China to close the deal, which would keep him away from Cupertino for an entire week. Knowing this, Jobs quietly met with key executives in an effort to line up support and ask Sculley to step down. Eventually, John-Louis Gassée learned of the plan and alerted Sculley, who cancelled his trip and attended the Friday morning executive meeting on May 24th to force a showdown with Jobs.

By meeting's end, the executive staff supported Sculley, and Jobs agreed to give up his operational role. Mired in one of the worst slumps in computer history, Sculley then announced a reorganization, appointed Del Yocum to replace Jobs as general manager of the Macintosh division, and named Jean-Louis Gassée to lead Macintosh R&D, which put him in charge of Apple's product design and industrial design. Thus frogdesign would now report to Gassée.

As NEWS OF THE SHAKELP SPREAD ON THE FRIDAY BEFORE MEMORIAL DAY, and hit the newspapers the following morning, an eerie calm settled over the designers at frogdesign. "We all acted as if nothing had happened," Tony Guido recalls. "Hartmut closed his door and had a long talk with Jobs on the phone." But he said little to the designers, leaving them to ruminate,

From the day they had arrived in August 1983, everyone at frogdesign considered Jobs the taproot, the *force majeure*, the foundation on which Apple's entire industrial design culture was built. Even Esslinger, for all his importance, realized that without Jobs he would still be toiling away in the Black Forest, and Apple's products might never have progressed beyond the Apple II.

"Jobs was unique because he just *had* to develop great products. He was *driven* to do it," says Tony Guido. "That made him our best ally in the firm. He shared our dreams and understood what we were trying to do." But once Jobs was gone and the company in crisis, no one at Apple wanted to see sexy concepts anymore. "Suddenly, our role was to do the work and keep our heads down," says Guido.

THE FIRST VISIBLE SIGN OF CHANGE IN THE WAKE OF STEVE JOBS' DEPARTURE occurred not in the offices at Apple or the drawing boards at frogdesign, but in the parking lot outside Mariani 2. There, instead of his old Datsun 280Z, Jean-Louis Gassée was driving a brand-new Mercedes. On the back, there was a new vanity plate: it read "OpenMac."

For more than a year, battles had raged within Apple to determine the shape of the next Macintosh. Ever since the first Mac, various hardware artists had tried and failed to hatch a sequel worthy of the name. First there was Burrell Smith's TurboMac, then BigMac, the upright all-in-one with a 15-inch display. Then there was Jonathan, Granny Smith (a box-like CPU concept) and Tommy (an all-in-one Jonathan look-a-like), none of which caught fire.

Before it died, BigMac spawned a smaller modular CPU concept known as **Little Big Mac**, developed by engineer Mike Dhuey and product designer Brian Berkeley. It contained four expansion slots inside and a 12-inch display on top. Because of Steve Jobs' distaste for slots, Little Big Mac remained an underground project for months while Dhuey and Berkeley wrote memos to executives discussing the project without ever using the 's' word. Then, just before the May 1985 showdown with Sculley, Jobs visited Dhuey and Berkeley with Alan Kay, asked Kay whether slots were really the way to go (Kay said yes) and gave Little Big Mac his blessing. Then, after Jean-Louis Gassée took over Macintosh R&D, he raised his starter's pistol over Little Big Mac and fired.

Though Gassée knew little about technology, he did know the ingredients that go into a great product. In his view, the Macintosh lacked two features that made the Apple II successful: a color display and expandability (i.e., slots).

Everyone assumed that the Mac would one day have a color display. But slots—those innocent-looking sockets on the logic board that provide access to the bus, the data pathway that forms the computer's spinal cord—were another matter. With slots, a user could insert custom circuit boards to give the computer enhanced video, more processing speed, and other functions. "An open system expands the technical life of the product because upgrades can be accomplished with add-ons as technology advances," says Gassée. "Closed products like the original Mac are frozen in time. By 1985, several third-party developers had turned their backs on Apple because the Mac and the IIc were closed boxes. We had to turn that situation around."

In June 1985, when Gassée gave Dhuey and Berkeley the green

light, he noticed a photograph of Dhuey's hometown in his cub and called the project Milwaukee. Later, to keep the press guess the name changed to Reno (a reference to its slots), Paris (Gass hometown) and finally Cabernet (Gassée's favorite wine).

Unlike the first Mac, which adhered to a single unwavering vis the Mac II evolved as the project went forward: replacing. Motorola 68000 microprocessor used on earlier Macs with a fa 68020 (needed to support a color display) and a 68881 coproce for serious number-crunching; growing from four slots to six: evolving from a small unit (with the CPU's power supply loca inside the display, an odd arrangement) to a very large one (with power supply inside the CPU).

As the project accelerated, Gassée, Dhuey, Berkeley and prodesign manager Richard Jordan gathered a veritable army of eneers, software designers, ROM specialists and others to give the II the power of a workstation at a desktop computer price. And the first time since the original Apple II, they designed the profor the customer, not themselves. On the first Mac, Dhuey said. " thought he was right about everything... . It's like he thought eone wanted to buy a size nine shoe. But the Mac II was a *ma* driven machine. It didn't matter what we wanted ourselves... It's of like musicians; if you make music only to satisfy yourself, y lose your audience." And the Mac II's main audience—corporate chasing managers—wanted power, color displays, lots of slots, a pop-off lid to make the slots accessible.

Meanwhile Gassée leveraged the Mac II into a constellation products: an all-in-one Macintosh SE, two new keyboards, a me designed mouse, monochrome and color displays, an upgra LaserWriter, two ImageWriters, a flatbed scanner, smaller follow versions of the Mac II and (eventually) the Macintosh Port Wrapping the Mac II family in frogdesign's new "corpor SnowWhite language proved so successful it spawned a look would dominate Apple's product line for the rest of the decade rack up sales in the billions of dollars.

A Change of Color. But before the Mac II could go forward. a simmering dispute had to be settled: the color of Apple's future 1 ucts. Even though SnowWhite products had been in the market or year, there was still no common color for all Apple products a spring of 1985. The Apple IIc, ImageWriter II, LaserWriter and IIc peerals were covered in a creamy white color known in-house as For the Macintosh, Mac XI, and parts of the Apple II family still uses same beige color that dated back to the original Apple II.

"When Hartmut suggested that Apple unify the color of its proc it set off a huge battle within the company," recalls Stephen Pear faction preferred beige ... Hartmut wanted everything to be off-white the IIc. Gassée, on the other hand, wanted everything to be *bright* w But implementing a new color for every Apple product every in the world—scraping existing plastics in the pipeline. ord new colors and making sure they all came on-line at the ime—would be hugely expensive. And once a choice was made, here would be no going back.

"During the spring of '85, with the company at loggerheads over olor, Hartmut persuaded Gassée to adopt a light neutral gray color hat we called platinum," says Peart. "It was good for us, because platinum made our corners and lines look more precise," It was also good for Gassée. "Jean-Louis scored a major coup by championing he new color and managing the changeover." First used on the upple IIGS, platinum became the standard color for all Apple hardtare (except for the PowerBook and Newton) until 1996, when larker shades tailored for the home and home-office markets were ntroduced.

"While it seems like a minor detail, the switch to platinum made he transition to the new "corporate" SnowWhite language easier," ays Guido. "It focused our thinking, pulled everything together isually and reinforced the idea that Apple sold not only individual roducts but whole product solutions."

CABERNET MACINTOSH II

PLATE 100

industrial Design: Apple Computer: Richard Jordan, John Medica, aroduct design; frogdesign (Campbell, CA): Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, HansPeter Leins, Herbert Pfeifer Dates of Design: January-December 1985

introduced: January 1987

tong before the internal layout for the Macintosh II was finalized, rogdesign had already developed concepts that anticipated the harder" version of SnowWhite that Steve Jobs requested in April 985. During the winter of 1984-85, a number of CPU concepts ame about in response to in-house requests. The concept known is Granny Smith was typical—a simple desktop box with 2-milmeter-wide lines on the top and sides, small footprint, a verticallynounted floppy drive (à la Jonathan), plinth-like treatment around he foot (also from Jonathan) and enough room inside to fit a hard lisk and four expansion slots with a 13-inch display on top.

"While Jobs was in charge, we made the CPUs smaller and taller, because Steve liked products with a small footprint," says Peart. But once Jean-Louis Gassée took over, Granny Smith merged with Little Big Mac and grew to double its original size.

"Sculley and Gassée wanted the Macintosh to compete with IBM, which neant it had to be *big*," says Stephen Peart. By the summer of 1985, apple engineers determined that the Mac II would need two internal loppy drives, an internal hard disk, eight memory expansion slots on the ogic board (a huge number for computers of the time), six NuBus slots ind a 120-watt power supply. "If the original Mac was a canoe and a paddle," says Peart, "the Mac II was a nuclear-powered battleship."

Because of its importance, Hartmut Esslinger assumed a major role in the Mac II's design by combining the best elements from his earer SnowWhite products and concepts into a definitive SnowWhite tyle. These included:

- a rigid zero-draft case with evenly-spaced 2-millimeter-wide lines, precise corners and a wide horizontal groove across the front, first used on the July 1983 concepts;
- a stiff boxy shape, from the Apple IIGS design;
- vertical ribs around the base that function as vents, from Jonathan;
- · a diamond-cut Apple badge set in a recess with zero clearance;
- and a lightly textured surface and platinum color that Esslinger recommended for all Apple products.

These elements formed the language first used on the Macintosh II, then frozen like a snapshot and injected into more than a dozen products (displays, printers, keyboards, a scanner, smaller CPUs and, later, a portable Macintosh), each one as rigorous and unyielding in its perfection as the original Mac II.

Even though the design seems fairly simple from the outside—little more than a decorated box with interior fittings that allow the circuitboard and components to be snapped into place—the investment in time and labor was staggering. "Whenever we presented a new CPU to Apple, we wouldn't give them a single solution. We would design 10 or 20 hard models, each with a minor change in detail, and present them to a dozen marketing people, half a dozen vice presidents, plus Sculley and Jean-Louis. Then we would listen as everyone gave us their opinion," Peart recalls. "Since CPUs were Apple's main business, the executives would keep throwing money at a project and ask for more and more versions until they knew they had it right."

By comparison, peripheral products such as printers and displays were dismissed as being too ... peripheral. "Even though printers gave Apple more bang for the buck than CPUs, no one ever turned up to review a printer design," says Peart. "They weren't considered a central part of Apple's business. But whenever we presented Mac II concepts, it was standing room only."

For frogdesign, the length of the project [a full calendar year] and the endless task of generating nearly-identical versions of the same design was mind-numbing, particularly for the model makers, who can still recite the details to this day. As Apple ordered more models, Esslinger began to alter the corner treatments—changing the R3 corners to R2.5 or R3.5—just to see how they would look. After all, who was in a better position to change the language than the person who invented it? In a sense, Esslinger *was* the language. If Picasso could put an African mask on someone's face and call it a portrait or Miles. Davis could add a few extra licks during a live performance, why couldn't he change an R3 to an R2.5?

"Sometimes we would get totally manic because of Hartmut's changes and deadlines," says Guido. But Herbert Pfeifer, who served as studiomanager-cum-therapist, had a calming effect. "Herbie was our zen master. More than once, he would see us bouncing off the walls and just sit with us. After ten minutes with Herb, we would return to normal... almost."

Once the final direction was set, months of back-and-forth resulted in a design that frogdesign delivered to Apple's product designers in December 1985—only to discover that the CPU's lid would not support a large-screen display. "Everyone assumed that someone else had tested the lid," says Peart with a laugh. "Hartmut thought the PD guys had done it. They thought we'd done it. Then, just before the case went to tooling, Richard Jordan [Mac II's product design manager] dropped a pillar down the center of the product, right through the motherboard, to make sure the top wouldn't cave in."

BEGINNING WITH THE MAC II, APPLE BECAME THE FIRST PERSONAL COMPUTER maker to develop a coherent design statement from the largest product to the smallest. "The idea was to make everything look strong and uniform," says Guido. In the process, frogdesign pushed Apple's engineers to the limit on details such as the vertical ribbing at the foot, which allows air to enter around the bottom and exit through the top. "The foot detail was difficult to achieve during tooling," says Guido, "but it allowed us to hide the vents and control the deformity that can happen when molding a large plastic part. Many people think of SnowWhite's details as being appearance-driven. But every detail served a structural or functional purpose." The Mac II case design was also used in the Mac IIx and the Mac IIfx.

CHABLIS MACINTOSH SE

Industrial Design: Apple Computer: Terry Christensen, Bill Bull, product design; frogdesign (Campbell, CA): Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, Herbert Pfeifer

Dates of Design: January-August 1985

Introduced: January 1987

Awards / Collections: Permanent Collection, Museum of Modern Art, New York; The Design Museum, London

Another project in play when Jean-Louis Gassée took charge of Macintosh R&D was the long-awaited follow-up to the Macintosh Plus, code-named PlusPlus. Based on a 1984 model by Brad Bissell, the new Mac would resemble the original Manock/Oyama design on the outside (same footprint, head-like shape and nine-inch monochrome display); but inside, everything would be new. To give it greater processing speed, the motherboard was redesigned with a faster 68000 microprocessor, more memory expansion and a custom sound chip, support for two internal floppy drives (or one floppy and one hard disk), an internal fan (which Jobs would never have allowed) and an expansion slot for installing an accelerator or video board for driving an external display. Once the internal specs reached frogdesign, the project was then reset with a new code name, Chablis, and given its official name, the Macintosh SE.

Along with the new name, Tony Guido and Sigmar Wilnauer gave the SE a more rigid corporate look, enhancing the gentle curve that Brad Bissell had given to the bezel on his 1984 concept with two wide and three narrow horizontal grooves that run below the display, establishing a visual linkage with the Mac II. Following Bissell's example, Guido substituted the wide chamfers on the corners of the Manock/Oyama Mac with a simple 3-millimeter cor radii all around. Finally, instead of Manock's louvered vents on t Guido gave the SE the same vertically ribbed intake vents at base and a single exhaust vent on the back, giving the producleaner, more sophisticated look.

For Guido, the urge to simplify the SE was both an aesthetic g ture and a cultural statement. "If you look at the first Mac and nor all the complex detailing around the floppy slot, you have to as why? Does the user need those curves? We didn't think so... Mane and Oyama had embellished that area, because they weren't will to let a slot be a slot. The same is true with the chamfers. When p ple saw the SE, they asked us: 'Why remove the chamfers?' But asked: 'Why were the chamfers there in the first place?' "

Chamfers and detailing around the floppy slot and the textured s face under the handle on top were all symbols of the old school. Stanford Product Design formula for design, which Guido (and eve one else at frogdesign) considered outmoded. "SnowWhite represe ed the 'new school' of design," says Guido, "which replaced com cation with simplification and did away with the usual concept 'styling." At its heart, SnowWhite proposed a future in which progr could be achieved through subtraction rather than addition. For t reason, we reduced the visual weight of the SE, the Mac II and other SnowWhite products as much as possible."

WHEN THE FINISHED DESIGNS FOR THE SE, THE MAC II AND THE REST OF family came together toward the end of 1985, the impact of the "c porate" SnowWhite language came into focus. "Though we were aware of it at the time," says Guido, "it's now clear that the purpe of the second SnowWhite language was to make Apple's produ appear elitist," to elevate them through the use of very refit European aesthetic. "Like the first phase of SnowWhite, the SE a Mac II were logical and rigorous. But all of the fun and livelin had been drained out."

If the "pure" SnowWhite of the Apple IIc and ImageWrite embodies the friendly logic of early modernism, the "corpor-SnowWhite of the Mac SE and Mac II reflects the mature and slip ly hard quality late modernism. The spice and verve of frogdesis earlier products had become powerful, the ideal symbol for an ev expanding corporate world. Beautiful as works of art, "corpora SnowWhite looked great from a distance, whether in a museum : ting or an executive's desk. But was it truly user-friendly? "Ev though its roots lay in the aesthetics of the Bauhaus and the sch of Ulm, which favored an approach to design that served the u above all else, something was lost in the translation from Germany California," Guido observes. "By transplanting SnowWhite me ernism from Europe to America, Hartmut gave Apple what it wan ... the perfect corporate language that would differentiate App products and make them instantly recognizable." But once perfect had been achieved, changing it in even the smallest way beca

PLATE 101

anthinkable. As they would soon discover, the designers had painted themselves into a corner. "Later versions of the Mac II and Mac SE were replicas of our 1985 designs," says Guido. "It was easier to play with the language when designing printers and peripherals. But the CPUs became like tombstones. Once we finished them, we couldn't change the design at all." In addition to the Mac SE, the Chablis design was also used on the Macintosh SE/30, released in January 1989.

EASTWOOD . SARATOGA

 APPLE STANDARD KEYBOARD AND EXTENDED KEYBOARD
 PLATE 103

 Industrial Design: Apple Computer: Don Porter, Adam Grosser,

 Droduct design; frogdesign (Campbell, CA): Stephen Peart, Hartmut

 Esslinger, Anthony Guido, Sigmar Wilnauer, Brad Bissell

Dates of Design: May-November 1985

ntroduced: January 1987

To support the new design language and take advantage of Apple Desktop Bus (ADB) technology, frogdesign designed two new keypoards: an 81-key standard keyboard, code-named Eastwood, with domino-shaped power switch on top and a 10-key numeric keypoad to the right; and a 105-key extended version, code-named aratoga, that had 15 function keys at the top (for those using a nonlac operating system such as UNIX) and four cursor keys laid out n a T-shape at the side.

DB MOUSE

ndustrial Design: frogdesign (Campbell, CA): Herbert Pfeifer (initial oncept); Stephen Peart (final design); Apple Computer: Bill Bull, product design

Dates of Design: May-August 1985

ntroduced: January 1987

During one of their visits to Germany in late 1982, Herbert Pfeifer ecalls Rob Gemmell spending hours in frogdesign's model shop esigning foam models for an ergonomically shaped mouse. "He sat n on meetings as we discussed ideas for the mouse" but we did not rogress very far. Weeks later, when the pressure was on to comlete the models, I noticed the model makers had done about 20 ersions of the mouse but were still not happy. So I spent a night n the model shop by myself and made two foam models. One of nem had a flat faceted cover, with a button that extended across the ont of the mouse." Two years later, it became the model for the linimal Mouse, which Stephen Peart implemented by tightening the hape, retaining the large button that Pfeifer had proposed and posioning the cord in the center for better symmetry (the cord on feifer's concept was positioned at the side). First offered with the lac II and Mac SE, the Apple ADB Mouse was included with every lacintosh sold between 1987 and 1992. "When you consider the nillions of frog mice now used around the world, it's fun to think yout that night in Altensteig when Herbie designed that first foam oncept," says Guido. "That was the mouse that roared."

APPLECOLOR 13-INCH DISPLAY

PLATE 104

Industrial Design: frogdesign: Stephen Peart, Hartmut Esslinger Dates of Design: June-September 1985 Introduced: January 1987

When the time came to develop displays for the Mac II, Steve Jobs suggested that frogdesign work directly with Apple's Asian vendors. Toshiba and Sony, and let them do the engineering, the same way frogdesign developed printers with Canon."We used the off-the-shelf components to keep costs down and designed SnowWhite cases around them.," says Esslinger The first of these products, a 13-inch high resolution color display offered with the Macintosh II, was designed by Stephen Peart and engineered by Sony. In his design, Peart maintained a tight relationship between the screen and bezel, treating them as concentric shapes, and adding a small foot underneath to lift the screen to the proper angle. On the back, the zero-draft bucket had SnowWhite slots all around that functioned as vents, with brightness/contrast controls tucked behind the bezel on the right. Peart also designed a 15-inch gray-scale portrait display and a 19-inch two-page display in the same manner.

LASERWRITER II

PLATE 105, 107

Industrial Design: Apple Computer: Mark Pruitt; Jim Huth, product design; frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger, Herbert Pfeifer

Dates of Design: May-November 1985

Introduced: April 1987

PLATE 102

Awards: SMAU (Italy), 1988

The successor to the first LaserWriter made use of the smaller, more efficient Canon SX laser engine, which gave Stephen Peart more opportunity for expression than the earlier model. Using the same design vocabulary as the Macintosh II, Peart had two main objectives: to ensure that the printer's footprint matched the Mac II exactly (allowing the printer to fit on top of the CPU to preserve desk space) and not to repeat the basic box construction that Hewlett-Packard had used for its LaserJet printer (which used the same Canon SX engine). As Peart explains: "A printer is one of the few computer-based products that actually does something-it scoops up paper, applies text and images, and delivers the paper to the user. So rather than package the machinery in a conventional way, I concentrated on what the printer does, accentuating the paper path and creating an image of the machine processing paper in the upper part of the product." One feature of Canon's engine was a large curve on top of the engine that forces the paper around a 180degree arc. "Hiding that curve would have made the printer enormous," says Peart. Instead, Peart used the three-dimensional shape as a decorative element, making the product shorter and smaller than it otherwise would have been.

Visually, the case is composed of a flat base with vertical ribbing around the foot; a squarish box above with a curve at one end and a paper exit tray on top; and two smaller rectangular boxes on the side and at the back. Treating these parts like building blocks, Peart joined them together, but left them slightly ajar—a nice touch. "With fewer managers in the Peripherals division, I could avoid the politics that engulfed projects like the Macintosh II and push my vision with a LaserWriter farther than I could by working on a CPU," says Peart. The LaserWriter II's trim proportions (8.5 inches high versus 11.5 inches for the LaserWriter I) and bold profile showed that an office product could be strong and competent without appearing dull. Meanwhile, its performance set the standard by which all other laser printers were judged. The IINTX model in particular, which could accept a hard disk for downloading PostScript fonts, had the power and flexibility of a dedicated typesetting system.

IMAGEWRITER LQ • BUSINESSWRITER

Industrial Design: Apple Computer: Mark Pruitt; Bob Elliman, product design; frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger

Dates of Design: September-December 1985

Introduced: April 1987

To buttress Apple's position in the business market, where impact printers are needed for processing multi-part forms, frogdesign worked with Tokyo Electric to develop the ImageWriter LQ, a widecarriage printer that could produce razor-sharp text and graphics at high resolution for a dot-matrix (320-by-216-dots-per-inch). Stephen Peart nestled the mechanism inside a zero-draft box with a wide horizontal groove around the sides, a vertically ribbed base and SnowWhite slots behind the carriage. The sheet feeder, developed by the German firm BDT, echoed the curve on the LaserWriter II.

APPLESCANNER

PLATE 109, 110

PLATES 106, 108

Industrial Design: Apple Computer: Mark Pruitt; Robert Elliman, Dexter Francis, product design; frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger, Herbert Pfeifer

Dates of Design: September-December 1985

Introduced: June 1987

Another frogdesign/Tokyo Electric collaboration, the AppleScanner is a modern classic. Its low profile, extremely graphic SnowWhite lines, vertically ribbed base and lid that wraps around the hinge works beautifully with the Macintosh II family yet has a personality all its own. The curve around the hinge beautifully echoes the larger curve on Peart's LaserWriter II. "The Scanner expresses SnowWhite better than the other products, because it is so simple and elegant," says product designer Robert Elliman. "The lines cover such a wide expanse, they look like pinstripes on a banker's suit, which makes sense. It had a very 'corporate' look, but was also appealing. The curved element around the hinge tells the user, 'Look, I turn here.' Function and aesthetics become one." COMPARED TO THE FREE-WHEELING ATMOSPHERE DURING THE JOBS ERA, summer and fall of 1985, when frog designed the Mac II family, the most trying period in Apple's history. "Even though the com ny was in chaos, we were in full swing." says Tony Guido. without Jobs, there was no spark. The visionary spirit that had c acterized our earlier work was gone. It's like we woke up one m ing, rubbed our eyes and realized that everything was different

Two years earlier, frogdesign's designers had been as close cooperative as any team of talented ego-driven people could be by the end of the Mac II development, they became mired in r bickering. "Stuff that had never bothered us before suddenly drow crazy," says one. "A big issue was Hartmut claiming our ideas a own. If he saw a drawing on someone's board that he liked would take it into his office, close the door, turn up his stereo emerge two days later saying, 'Look at this great design I did...' w all he had done was make a few modifications to someone e work. Technically, it was OK for Hartmut to take credit for everyth since frog was his company. He wanted the world to view frog as just another design firm, but as a kind of brand name, with a losophy that he called 'frogspirit.' In Hartmut's mind, we were all big happy family. He controlled the message and became a star ir process. But we weren't a happy family, because Hartmut didn't us the respect we deserved. Even though out work was becon famous, the outside world didn't even know our names. That k our motivation. We felt like our souls were being eaten away."

The defining moment occurred during the 1984 Christmas holid when Esslinger ordered his designers to destroy frogdesign's arch of Apple models. "Space had become very tight in the studio. Hartmut needed some room to design a motorcycle for a comp tion that was being sponsored by the magazine *Autorrad*," says participant. "So he told us to clear out the room containing Apple models," where dozens of foam and RenShape concepts of prising a history of Apple's design from the spring of 1983 to end of 1984 had been carefully laid out, labeled and in most of dated. In the universe of SnowWhite design, this was ground z the Queen Bee's chamber, the seed inside the heart of Apple.

"The collection was amazing. It showed how Apple's endesign language had been crafted, step by step. It really belon, in a museum. But confidentiality agreements prevented us firstoring the models off-site," says one of frog's designers. Esslinger ordered the very people who had labored over the mels to destroy them. "He told us to turn on the band saw and each model into pieces. Then we formed a human chain a passed the cut-up chunks from the band saw outside to dumpster. I couldn't believe we agreed to that, but we did, was like some weird ritual. Later, it felt even weirder ... as thou part of our history had being erased."*

*Once the SnowWhite models were gone, Esslinger finished his motorcycle, we the competition and saw the design put into limited production. Unlike writers, architects and other creative people, most of whom neve credit for their work, those who design manufactured prodors are rarely known to the millions people who use and their ork. Even when a product becomes famous and impacts millions fives, tradition dictates that any recognition or credit be conferred in the corporation that built or sponsored the product rather than form-giver, the engineers and others who brought the product being. This is why few people know who designed even the or famous products of our time, such as the Sony Walkman, the toda Miata or the original Coca-Cola bottle. It also explains why any people in the computer industry, even some who work at pple, cannot remember who designed the original Macintosh, mong professional designers, this sad fact breeds not only a cerninsecurity, it often fuels a desire for recognition whenever their ork achieves some measure of success.

Being a designer means living on the edge of things," says Tony uido. "The work we do isn't quite art and isn't quite engineering. It's mewhere in between. That makes it hard to describe what we do." since product development depends on teamwork, apportioning edit for the industrial design can be tricky, particularly in cases then the designer inspires a product or produces the initial concept at does not determine how the final product will look. Between time a designer finishes his or her work and the final product omes off the assembly line, the product can be altered and proved by any number of engineers, toolmakers, product planers, ergonomics experts and others, each of whom apply conraints in a way that results in a more efficient, economical or leable product. For this reason, one can only single out the indusal designer as one of many authors. But attempting to make a roduct without a designer would be like staging a play without the avwrite. As Steve Jobs realized early on, whether the product be Walkman, a Miata or a Macintosh, it is the designer who gives the roduct its form and meaning, The least the designer expects is cognition for his or her work.

Rather than give credit to individual designers, Hartmut Esslinger elieved that all of frog's work should be credited to the team as a hole. As a result, the only person at frogdesign the public ever eard about was Esslinger, who leveraged this fact in 1985 and 1986 become that strangest of all creatures, the "design celebrity," tracting coverage on German television, sitting for interviews with *layboy* and profiles in *Connoisseur* magazine—even posing for a ortrait that ran on the cover of *Business Week* showing Esslinger in leather jumpsuit sitting on a motorcycle.

"By keeping us in the shadows, Hartmut made himself the center attention," says one frogdesigner. "Eventually, we expected him give us the recognition we deserved. But he never did." Instead, considered it "stupid" for designers to want individual credit. ears later, Esslinger would mend his ways and apologize, both in ablic and in print, for practices that he now terms "abusive." But in 1985, with Apple in the headlines and frogdesign riding high, any staff member who dared question Esslinger's methods had to look no further than the slogans and "visual snacks" that he displayed on his office wall, one of which said in bold letters: "Design is not a MATTER OF DEMOCRACY!"

WHILE THIS DRAMA PLAYED ITSELF OUT, A MUCH LARGER PLAY ON AN EVEN LARGER stage was entering its final act. On June 14th, 1985 two weeks after the Memorial Day showdown between Jobs and Sculley, Apple announced layoffs that totaled a fifth of its work force. Factories in Dallas and Ireland were closed, and the Garden Grove keyboard facility was sold. In mid-July, Apple posted its first-ever quarterly loss of \$17 million. But the question on everyone's lips was: what would happen to Jobs? Though he asked for an office at corporate headquarters, Apple's new chairman was instead given space at Bandley 4, a cavernous building that was occupied by only people: Jobs, an area associate and a security guard. Insiders called it Siberia. In mid-July, when Sculley told reporters that Jobs would have no role in Apple's operations "now or in the future," Jobs decided to stay at his Woodside estate to assess his options. He considered politics. turned down an offer to join the NASA civilian space program (which could have put him on board the ill-fated Challenger spacecraft). spent July and August touring the hill towns of Tuscany and Paris. then returned to Cupertino before Labor Day to begin talks that would lead him to start a brand new computer company.

Meanwhile, it had not been a good summer at Apple. Torn down the middle over the Jobs issue, a power struggle had broken out between pro- and anti-Jobs factions. "The result," says Hartmut Esslinger, "was that Apple became the victim of Machiavellian intrigues by 'politicians' who wanted to get even with Jobs and anyone who supported him." For that reason, Esslinger hunkered down and focused on completing the Mac II family, a smaller Mac II follow-up product and the long-awaited Macintosh Portable. But as Jobs' personal friend, he says, "it soon became clear that I would lead a dangerous life at Apple."

With the entire company restructuring, Jean-Louis Gassée took over Macintosh R & D in June, quickly ousted the Mac division's Engineering manager Bob Belleville (a Jobs supporter) and divided hardware development into two parts: an Engineering Group to handle circuitboard and chip design, power supplies and other internal components; and a Product Design Group to build the enclosures that housed the electronics and interfaced with the user. Though Gassée knew how computers should look and what features they should have, his scant technical background forced him to delegate day-to-day decisions to his senior mechanical engineers, who eventually got together and recommended that Richard Jordan manage the new Product Design Group, a move that placed Jordan in direct authority over Hartmut Esslinger and frogdesign.

Richard Jordan. Trained as a mechanical engineer at Stanford,

Jordan spent the first part of his career at Hewlett-Packard designing hand-held calculators. "At first, I had the time of my life," he recalls. "Then, I realized that there were two kinds of people at Hewlett-Packard, those who loved the cafeteria food and cried every time they heard the company song, and those, like me, who plotted the day they would leave, as though they were busting out of prison." Jordan made his move in 1978, joining Apple when the company still had fewer than 100 full-time employees. Tall and sinewy, with a hearty laugh and clear blue eyes that can turn steely in an instant, Jordan had seen it all: stupendous growth in the wake of the Apple II, sudden wealth after the initial public offering, neardisaster with the Apple III and Twiggy, and a long string of Apple II products that culminated in the IIGS, which Jordan had just completed when he was chosen to manage the Product Design Group.

Having spent seven years at Apple (the equivalent of two lifetimes in the PC industry), the work-hard party-hard engineer from H-P had evolved into a tough results-oriented manager, determined to end the tumult and dislocation that Jobs had wrought, reverse the slide that had sent Apple's stock price from \$55 in 1982 to \$14.75 during the summer of 1985, and turn the PD Group into a well-oiled computer-making machine. No one at Apple knew more about how products are built than Jordan. Yet his knowledge of industrial design was, by his own admission, limited.

"As an engineer, I saw product development in very simply terms. There were mechanical engineers doing their work over here and industrial designers doing their work over there. Occasionally they met across the table. And when it worked, it was nice; but when it didn't, it was war." Though Jordan had always considered frogdesign's work fine on an aesthetic level, "Hartmut did everything at extreme cost, both to our people and to his own ... and his take-noprisoners attitude made him very difficult to work with."

After Steve Jobs left the Mac division in June, 1985, "Hartmut made it clear that he would only work with people at the Very Top," says Jordan. "He didn't want to deal with me at all. I don't even think Jean-Louis was senior enough for him. Basically, Hartmut's position was that he would talk to Sculley directly, or there was no discussion." But Sculley was not Steve Jobs. He had no time for long walks on the beach or lengthy discussions about design, and had even less time for anyone who was a friend of Jobs.

Rather than focus on Esslinger, Jordan instead developed a rapport with his new boss Gassée. But what he discovered surprised him. "With most people, Jean-Louis had a very French, in-your-face personality. But when we talked about engineering or design, our conversations would evolve into therapy sessions, where I asked questions but never got any answers. Eventually, I realized that Jean-Louis wanted me to become an advocate for Industrial Design, but he never told me how. All he would do was sit there and show mild dissatisfaction. Sometimes, he wouldn't say anything at all. He would just throw you out of his office." As time wore on, Jordan would find working with Gassée one of the stranger episodes in his career.

PUTTING THE PAST BEHIND HIM, STEVE JOBS APPEARED AT THE SEPTEM 12th board meeting to announce that he would be leaving Appl start a new company that would develop a computer for the ne versity and research market. The following day, Jobs handed Jo Sculley a letter stating that five top Apple employees would be jo ing him, including George Crow (an engineer on the first Mac). Be Page (the engineer behind BigMac), Bud Tribble (head of softwa and Dan Lewin (head of education marketing), who wold all wo submit their resignations immediately. Jobs resigned on Septem 17th. On September 20th, he announced that his new compa would be called NeXT. On September 23rd, Apple's board filed s against Jobs, asserting that he had staged a raid on the compa while still a member of the board and had taken trade secrets t could be used in his new venture.

In the weeks that followed, the suit was dropped and the mat settled out of court, after which Apple close ranks. Those who favor Jobs either resigned or renounced their former leader and rejoined to fold. The exception was frogdesign. Because of his ironclad contriwith stiff cancellation penalties, Hartmut Esslinger assumed that could continue to work for Apple with or without Jobs. But changwere coming that even Esslinger could not have predicted.

Within a week of Jobs' resignation, Herbert Pfeifer recalls, "we g a call from Richard Jordan suggesting that we renegotiate our co tract." During a tense meeting in early October, says Jordan, "Essling showed no interest in discussing matters that he felt had been settl long ago." Instead, the designer suggested that the retainer and excl sivity agreement remain intact, and that frogdesign's hourly rate frozen, subject to certain conditions but not lowered, at which poi Jordan said he would think about it. As the meeting disbande Esslinger considered it a victory. Whatever problems remained cou be solved by giving Apple even greater design than before. But, the weeks that followed, says Pfeifer, "we noticed that not as man people from Apple were calling us anymore ... and when we calle them, it took a long time to get an answer. That was not a good sigr Earlier interest in promising new products suddenly turned cold. Fe example, during the summer of 1985, with the LaserWriter II under development, Apple Marketing conducted surveys and learned th business customers preferred laser printers that stand on the floor away from the desktop for more efficient use of space. Sensing a opportunity, frogdesign went to work. But before the design could b finished, Gassée cancelled it with no explanation, leaving frogdesig to wonder about its future with Apple.

VERTICAL LASERWRITER CONCEPT

PLATES 111, 11

Industrial Design: frogdesign: Stephen Peart, Brad Bissell *Dates of Design:* August–December, 1985 (project cancelled) As high-performance laser printers grew larger and heavier, Apple arketing surveyed business customers during the summer of 1985 ad learned that the 'ideal' office printer would be positioned on the for (to preserve desk space) yet deposit printed output directly ato the desktop (to prevent repeated bending and stretching to ach the output tray. Working with Tokyo Electric, frogdesign came of with a novel solution, a tower-like printer design with the laser gine mounted sideways, with multiple paper trays near the base of a patented delivery system that shunted each page upward and a narrow column and delivered it at desktop height.

Word came down to us that Jean-Louis wanted to see business inters and, CPUs positioned off the desktop," says Stephen Peart, he developed the Vertical LaserWriter with Brad Bissell and conlted with Tokyo Electric, who perfected the gravity-defying paper divery mechanism until that it was nearly jam-free. But before the neept could be completed, Jobs' departure and the resulting backth at Apple caused Gassée's interest to fade. "Mid-way into the oject, we gave a presentation to Jean-Louis," says Bissell, "but he aerupted the discussion after only a couple of minutes. He comained that the Apple logo was in the wrong place, which meant chated the whole idea. That ended the presentation and the prort. After all the work we had done, we were shocked."

Since the October meeting with Jordan, Herbert Pfeifer's chief sponsibility had been to shore up the relations with Apple and dress problems like never before. But after Gassée cancelled the rtical LaserWriter, Pfeifer says, "We all knew there was danger in air. What we didn't know was when the ax would fall."

THE JANUARY, 1986 APPLEWORLD EXPO IN SAN FRANCISCO, THE SIRFSS the previous year seemed to vanish amid a wave of new prodts. highlighted by the long-awaited Macintosh Plus, which feared more memory and upgraded system software and ROM to pport a high-speed SCSI port on the back. After two years of shutag floppy disks on their old Macs, users could finally attach a hard sk that was equivalent to a hundred or more floppies. Connecting e Mac Plus to the new LaserWriter Plus created a powerful comnation that would soon kick the desktop publishing revolution to high gear. Orders for the Mac Plus were huge, fueling predicens of a strong recovery in the coming year. Meanwhile, as the emory of Steve Jobs faded, Jean-Louis Gassée solidified his cond over Mac product development and gave Richard Jordan his first feet order. As Jordan recalls, "Jean-Louis said it was time to do mething about frogdesign."

For weeks, Jordan had spent two hours every day going over ogdesign's original contract and invoices for the past year, then ecking with his product designers to determine how much work d actually been done. What he found depressed him. "Even ough we were paying more than \$2 million per year for frog's sign, plus an extra charge for aggravation that never showed up the books," says Jordan, "we could have been getting the same work from another consultant for half that amount or doing it inhouse for even less. But I couldn't hire another designer or even use our own people without violating frog's contract and paying them a huge penalty"—something that Jordan did not want to do.

Jack Hokanson, who had left frogdesign yet remained in touch with Apple, says that anti-frogdesign sentiment among Jordan's product designers, which had increased steadily during the Mac II development, shot off the scale following Steve Jobs' resignation. "Once frog had finished the Mac II," says Hokanson, "the in-house guys turned on them, telling Jordan that the new 'corporate' design language had been fully defined and could be implemented inhouse. That meant they didn't need frog any more."

Rather than act on his own, Jordan relayed this information to Gassée and Apple's in-house legal counsel Al Eisenstadt to receive their input, then hatched a plan to unwind the Apple-frogdesign relationship while building a new Industrial Design Group within Apple that could craft a language that would eventually replace SnowWhite. In light of frogdesign's contract, Jordan assumed that getting rid of them would be the hard part. Assembling a new design team and coming up with a new language would be easy. But as he later realized, the opposite was true.

The end game with frogdesign was about to begin.

THE MIDDLE YEARS

"...and the frogs shall depart from thee, and from thy bouses and and from thy servants and from thy people." Exodus 8 : 11 WITH THE CHAOS OF 1985 BEHIND THEM AND THE DESIGN OF THE MACINTOSH II family nearly complete, Richard Jordan gave his Product Design Group instructions that were as simple as they were effective. As frogdesign's final models came in, Jordan said, PD was to implement them straightaway, a process that would take several months to complete. They should also pursue two additional projects- a smaller, less costly version of the Mac II, code-named StingRay, and the long-delayed Macintosh Portable-both of which were already in the pipeline. But once those models were delivered, Jordan said, all further contact with frogdesign should cease. All correspondence from frogdesign should be forwarded to Jordan. And no one from Product Design should return frogdesign's telephone calls without Jordan's express permission.

As Jordan's strategy became clear, Hartmut Esslinger reassessed his position. Perhaps it had been a mistake to refuse Jordan's suggestion back in October that frogdesign's contract be adjusted downward. "At a certain point, Hartmut was willing to adjust," says Stephen Peart. "He would have given up \$100,000 or \$200,000 a year. But Jordan wouldn't negotiate. He just stopped using us." In just a few months, frogdesign's billings dwindled from more than \$2.4 million a year to just over \$1 million, the minimum retainer that Jobs had guaranteed back in 1983. Then, in the spring of 1986, at the behest of Al Eisenstadt, Jordan stopped paying frogdesign's monthly retainer. Every month, frogdesign would send an invoice, and every month Jordan would put the invoice aside and never look at it again.

"Eight months went by without a penny," says Peart, "and there wasn't anything we could do about it."

AS RICHARD JORDAN UNWOUND THE SITUATION WITH FROGDESIGN, HE BEGAN the long slow task of resurrecting Apple's Industrial Design Group. The problem was where to begin. After three years of frogdesign, it would have taken an archeologist to locate the remnants of Apple's old ID Group. As far as Jordan could determine, only one designer from the pre-frogdesign era, Mark Pruitt, was still on Apple's payroll in 1986. That meant he would have to build a totally new Group from the ground up. But after 13 years as an engineer, Jordan knew only two kinds of industrial designers: the technically proficient ones like Jerry Manock, who were easy to work with but produced ho-hum designs; and the more racy, aesthetically interesting types such as Esslinger, who gave Apple sexy design but made his PD guys miserable. What he needed was someone in between. Yet as Jordan thumbed through his Rolodex-crammed with the names of every engineer, fabricator and toolmaker on the West Coast, he realized that he could never recruit the kind of industrial designer Apple needed to turn the situation around. He wouldn't even know where to begin.

While pondering that issue, Jordan had a more immediate problem. For months, the Advanced Technology Group had been working on a new high-speed desktop architecture and needed design concepts around which they could build a prototype. Since he couldn't call in frogdesign, Jordan returned to his Rolodex, stopped at the letter 'D' and telephoned Bill Dresselhaus, the Stanford-trained designer who had joined Apple in 1979, designed the Lisa, and later pursued a freelance career. "Bill managed to keep one foot in the engineering world and one foot in the aesthetics world," says Jordan. "That made him an ideal candidate for the ATG job." But when Dresselhaus heard the extent of the project, he decided to call in Lunar Design, a three-man firm that had just opened for business in Palo Alto. Like many small design shops that grew up in the shadow of giants like Apple and Hewlett-Packard in the early 1980s, Lunar's founding partners Bob Brunner, Jeff Smith and Gerard Furbershaw worked together at GVO, the largest design house in the Valley at that time. They left GVO in 1983 to start a four-man design office with Peter Lowe called Interform. They split off again in 1984 to form Lunar.

"Jordan had never heard of Lunar Design," Dresselhaus recalls. "Yet soon their lead designer Bob Brunner would have a big impact on Richard and steer Apple in an interesting new direction."

Bob Brunner. Born in 1958, raised in the comfortable suburbs of San Jose, the son of a disk drive engineer at IBM, Robert Brunner first studied engineering at San Jose State, then transferred to the industrial design department. "I saw what the designers were doing, and realized that it made sense to me," he says. "In high school shop class, the electronics I made never seemed to work. But the walnut

boxes I put them in were always the best in the class."

In 1979, during his junior year at San Jose State, Brunne ed his first design job as a part-time assistant at GVO. the growing ID firm in the Valley, the kind of firm whose the perwas the number of qualified people they could find to hire

Like most young recruits, Brunner started out in the model then quickly advanced to design his first product—a small job that had laid around the studio for weeks called a boom mone implanter (a device for injecting medication into a defor Synovex Agribusiness (Plate 115). Like most firms the medicine to the livestock and dairy industry, Synovex includecially-designed injector gun with the sale of its bovine group mone to insure that the product is properly administered. The tor has a spring-loaded mechanism with a razor-sharp tip the a tiny pellet behind the cow's ear. Once implanted, the pellet ly dissolves and releases the hormone at a steady rate. Becomedication is expensive and potent (a broken pellet could a 1,000-pound animal), the design had to be precise and re-Brunner also wanted it to look and feel unique.

Because the injector is used with heavy gloves, Brunner desite the handle and trigger to be as large as possible, which also plenty of space for expression. "The product had to be seen a cision instrument," he recalls, "but at the same time, I wanteer it a weapon-like quality as well. It also had to be durable s wouldn't break if a cow stepped on it." To test the final destruction of the prototype didn't break.

After graduation in 1980, Brunner joined GVO full-time, desail manner of equipment, including a computer for Mindset "Even though Mindset was a startup firm, they understood good design could do for them and were willing to invest says Brunner, who gave the Mindset computer a look that and precise with two distinctive concave elements on the guided the user's hands to slots where ROM cartridges and disks were inserted and removed (Plate 113). "Since the phad a powerful graphics engine, I wanted the design strong graphic identity that also helped the user find the new tion points," he says. Years later, Brunner's design was the Museum of Modern Art (his first).

The following year, Brunner joined two other GVO end Gerard Furbershaw and Jeff Smith, with the intention of start own firm. Instead, they joined up with designer Peter Lone Interform, with the ambition to become a smaller, more intesion of GVO. When that didn't work, the three friends put ings, which totalled \$5,000, together in November 1984. The space in a former helicopter factory in Menlo Park, rented a copier, purchased a single Apple IIc computer and set up the business called Lunar Design (a name that Brunner had alread using for his moonlighting work). ×.

by this time, Brunner's design had matured into a personal style stressed clean forms and a purist approach that mixed California dern with International Style. "I like designs that are simple yet to some element of life to them," he says. "Often, I start a design that very simple shape, then throw in a funny angle or a bold and exaggerate the scale of one element to make it pop out or the contrasting color to one detail as a way of throwing the design of balance. I've always wanted to give modernism a sense personality and fun, without sacrificing its underlying purpose." Inner's aesthetic inspirations came from two directions: Mario ini's work for Olivetti from the 1970s; and architecture that had ered, cantilevered or intersecting forms. "I admire Bellini's purity of and its dynamic quality. Each design suggested a sense of toon. It was either about to take off, or had just landed. It never ened static or stale."

Over the years, Brunner had followed Apple's industrial design, but s more impressed by the graphical user interface and on-screen ins designed for the Macintosh. "I also liked the packaging and whic design used on Macintosh boxes and manuals. The ceremoaspect to unpacking the machine and setting it up was incredibly an. The first Apple product to impress him was the IIc. "The scale es components, its design vocabulary, size and white color made Efferent from everything else on the market," he says. "The first e 1 saw the IIc in person, with the monitor cantilevered over the with the little brick-shaped Scribe printer sitting there, it really hit - Finally, Apple had designed all the components to work as a Then came the ImageWriter II, which he liked even more. Yet soon as publicity about the new design language, called white, spread around the design world, Brunner learned that ple was changing the color of its product to something called plat-"When I first heard that I envisioned a metallic-looking skin," says. "But when the Apple IIGS came out, it had the same warm ey that we'd been using at Lunar. They just gave it an exotic name." en came the later "corporate" SnowWhite products, which were oler and more controlled than the playful IIc.

By 1986, it had become clear that small design firms with high pertise could effectively compete with large firms such as frogdeand GVO. "For months, we had heard rumblings inside Apple out the fallout with Steve Jobs and frogdesign, but didn't know hat we could do about it." Then Bill Dresselhaus called to ask for mar's help on Aquarius.

To bypass frogdesign's exclusivity agreement, Dresselhaus suggested evidescribe Lunar's work as product design (i.e., engineering) rather an industrial design. "While frog's contract remained in force, Apple's counts payable department wouldn't pay an invoice for industrial sign without frog's name and vendor number on it," says Gerard rebershaw. "But no one at Apple had ever heard of Lunar, so they didknow what we did." The invoice went through without a hitch.

Once the Aquarius project began, a series of sketches led to three

foamcore models that ATG's engineers liked very much (Plate 114). Then, like so many back channel projects at Apple, Aquarius was cancelled. Yet it was not a total loss. "Apple seemed to be testing us," Furbershaw says. "We had a feeling that we would be getting more work from them in the future."

MEANWHILE, AT FROGDESIGN, THE TREND WAS MOVING IN THE OPPOSITE direction. Prior to the release of the Mac II and Mac SE in 1987, the Product Design Group worked on three follow-up products—a smaller, less pricey CPU called the Macintosh IIcx, a more powerful all-in-one Macintosh SE/30 and a high-end Macintosh IIfx—all using the same 'corporate' SnowWhite language. Rather than work with frogdesign, Jean-Louis Gassée ordered that the IIcx be designed in-house, and the SE/30 and IIfx use frogdesign's existing Mac SE and Mac II enclosures.

Gavin Ivester. Most of these SnowWhite 'skin jobs' were designed in 1986-87 by Gavin Ivester, an intense young apprentice who worked in the Product Design Group part-time while completing his industrial design degree at San Jose State. A native of San Jose, Ivester began his career two weeks out of high school, unloading trucks on Apple's Mariani receiving dock. He spent 1982-83 working in the Engineering Group. In 1984 he crossed the little pedestrian bridge that links EE with PD and was assigned a cubicle as a beginning designer. There, Ivester taught himself computer-aided design ("Anyone who can think in three dimensions can learn CAD," he says), performed background tasks on the Jonathan concept and designed foam models for various projects with which Richard Jordan did not want frogdesign to handle. Ivester was also present when the last frogdesign concepts came in during the summer of 1986. "By that time, frog was on the outs. The work was late ... and so bad it was contemptuous. Every time frog sent a model over, you could almost imagine them giving you the finger."

Skilled at designing SnowWhite boxes, and not afraid to voice his opinions, Ivester became the ideal candidate to design Apple's next mass-market CPU, code-named StingRay.

STINGRAY MACINTOSH IICX / IICI

PLATE 117

Industrial Design: Apple Computer: Gavin Ivester; Pat Jackson, Tom Toedtman, Grant Ross, Jr., Jimmy Melton, Bob Wales, product design

Dates of Design: August 1986-April 1987

Introduced: January 1989

Smaller than the Mac II in size and price—with three expansion slots instead of the Mac II's six slots—the Mac IIcx was Apple's attempt to segment the Mac II by offering a compact version with medium performance (IIcx) for business applications and higher performance model (IIci) for the graphic arts industry. Its shape and details allowed the IIcx/IIci to be used horizontally with a monitor on top, vertically on its side, or suspended under the desktop (with special hardware). The IIcx also marked the debut of Gavin Ivester, the youngest industrial designer ever to handle a shipped product. Ten years later, Ivester is still amazed he was ever allowed to design the IIcx. "During the summer of 1986, between my junior and senior year at San Jose State, I had been working with Product Design, defining the component placements and other details on the IIcx, when frogdesign's ID concepts came in. They were so bad that PD asked me to make some proposals ... which I did by translating elements from the Mac II and SE onto the shape that we had already laid out." When Richard Jordan put Ivester's concept next to frogdesign's, he decided to go with the college kid instead of Apple's million-dollar-a-year consultant. When Ivester heard the news, he said to Jordan, "You're going to let me do *that?*"

With the IIcx, Ivester extended the off-the-desktop theme (first explored on the Vertical LaserWriter) by giving the CPU tiny rubber feet that could be mounted on the bottom (allowing the computer to be used horizontally with a monitor on top) or on the side (as a minitower). The idea of positioning a CPU on its side began with John Sculley, who asked an engineer to design a stand for his Mac II so that he could mount it vertically on the floor to free up desk space. "Once users began to work with the Mac II, the three-dimensionality of the box became a hindrance," says frogdesign's Tony Guido.

Going further, Ivester cut small grooves into the SnowWhite slots and designed a metal bracket (code-named Batfoot) that allowed the CPU to be suspended under the desktop, where it would remain out of sight. To make it easier to slide the CPU into Batfoot, Ivester also designed a chamfered corner where the top of the IIcx meets the back. (Though Batfoot never shipped, many users mounted their IIcx under the desktop using their own brackets.) Echoing the design of the Macintosh SE, Ivester gave the IIcx horizontal grooves across the front, drew SnowWhite lines on the top and sides, but eliminated the horizontal line that defined the 'setback'—giving the IIcx a cleaner, less fussy appearance. Design issues aside, the IIcx was a huge success, delivering more punch than the Mac II at a lower price, making it the platform of choice in the graphic arts industry.

By 1987, THE YEAR GAVIN IVESTER FINISHED THE IICX, APPLE HAD EFFECTED a stunning turnaround, shipping an average of more than 50,000 Macs per month with gross margins of 50 percent or more, thus raising the company's market value from \$900 million in the summer of 1985, when John Sculley took the reins from Steve Jobs, to more than \$5.5 billion in April 1987. As a result, R&D spending also soared: from a paltry \$40 million in 1983 to \$185 million in 1987. Though only a tiny percentage of this figure was devoted to industrial design, Richard Jordan would need every penny of it to effect a transition away from frogdesign, build an in-house design group and develop a new generation of products that would maintain Apple's lead in design and technology.

The unwinding with frogdesign was nearly complete. Even though

concepts continued to flow and the final design for the Macinto Portable was nearly complete, seven months had passed sin Richard Jordan's last conversation with Hartmut Esslinger. Thou he couldn't be certain, Jordan thought he knew the reason.

The NeXT Connection. For months, Jordan had heard rumors of frogdesign was secretly working for Steve Jobs' NeXT Compudesigning a computer with workstation-like performance and a Ma price for the university market. Since NeXT and Apple were obvice by competitors, frogdesign could not work for NeXT without breaing its contract with Apple. Yet there were no conclusive indicatithat frog was doing anything amiss. Still, the rumors continued.

As usual, the truth was both simple and complicated. "Si December of 1985, Steve Jobs had wanted frogdesign to design first NeXT computer," says Herbert Pfeifer. "But Hartmut Esslinger I itated at first. He assumed that frogdesign could not get away v working for Jobs and Apple at the same time. So he and Jobs tall back and forth for months." To keep Jobs happy, Esslinger sugges he work with BIB, which had created some flashy concepts for 1983 SnowWhite presentation. Yet Jobs and BIB's Nick Butler couldn't see eye-to-eye. So Jobs went back to Esslinger.

"Finally, Hartmut asked me to quit frog and become a Ne employee so that I could design Steve's computer," Pfeifer con ues. "When the design was finished, I could return to frog ... When I visited Steve's office, he said it was his dream for me to worl NeXT. Then he asked me: 'What would be the strongest shape a new computer?' I told him that the strongest shape would b cube ... a black cube." At that point, Jobs pulled out a foam mo of a black cube with the word 'Pixar' on the front. Earlier that ye Jobs had acquired the computer animation firm Pixar, which just released a high-priced graphics workstation in a black cubeenclosure. According to Pfeifer, "Steve was thrilled that I had s the word 'cube' and was sure I could do a better cube than the Pi product. So he asked me to come work for him." When Pfe refused, Jobs went back to Esslinger and offered to pay frog \$350, per year plus a two-percent royalty if frog would agree to design NeXT. At \$6,000 per system, sales of 10,000 systems (Jobs' estim of NeXT's first-year sales) would net frogdesign a tidy \$1.2 milli

"With the Apple/frog situation in tatters, the numbers seemed i sistible," says Peart. Yet he and Pfeifer were still against it."I remi ed Hartmut that we could still mend the relationship with App says Pfeifer. "Long term, it was better to remain with Apple in a duced capacity than to go with NeXT." But this time Esslinger said

"Hartmut felt that his first loyalty was to Steve. We *oued* it to St to design the NeXT machine," says Peart. Yet Esslinger would ne do it behind Apple's back, as has often been alleged. Instead, he is with John Sculley in late November and asked his permission design for NeXT. "Hartmut had to handle the NeXT situation corr ly ... even though asking Sculley's permission was like saying, 'ple fire us.' When Hartmut left that meeting, we were history as fai ople was concerned." As word of the Sculley/Esslinger meeting filred down to Richard Jordan, he and Al Eisenstadt visited frogdegn in December, offered to pay for the work frog had done on the ex and the Mac Portable and suggested they both call it quits. To rdan's surprise, Esslinger agreed—thus bring the first golden age of ople's industrial design to an end.

E SAME WEEK APPLE ENDED ITS RELATIONSHIP WITH FROGDESIGN, RICHARD rdan hired Jim Stewart to rebuild and manage Apple's new dustrial Design Group. Quiet, conservative and virtually unknown tside the fluorescent-lit halls at Apple and Hewlett-Packard. ewart couldn't have been more different than Esslinger. A difornia native and 1970 graduate of San Jose State, Stewart spent vears designing telecommunications gear for GTE, four vears as industrial designer at Hewlett-Packard (where he first met chard Jordan), and joined Apple on April Fools Day 1980, where was assigned to the Peripheral Products Group. During the owWhite project. Stewart served as in-house contact for BIB, perrmed background tasks on the Macintosh during the final ramp up 1984, took over Jerry Manock's responsibilities after Manock's resnation in October 1984 and returned to Hewlett-Packard to lead a am developing a new 32-bit color workstation (a high-end version the Mac II). When Richard Jordan hired him back for Apple in ecember 1986, Stewart realized that his first task would be to idge Apple's design from the frogdesign years to an era in which pple would handle its own design in-house. Thus began the periin Apple's design history that insiders call "the middle years."

At the time, Stewart arrived in January 1987, the few industrial esigners still on the payroll at Apple were stuck on lonely outposts roughout the company and needed to be brought together. They clude: Mark Pruitt, who had been holed up in the Accessories oducts Group; Adam Grosser, a Stanford product design graduate, ho had been floating around Richard Jordan's Product Design roup; and Gavin Ivester, who also worked in the PD Group had st completed the Mac IIcx. Stewart also brought in Grant Ross, Jr., idesigner who had previously worked for Bell & Howell and perrmed background tasks for PD at Apple. From these disparate ements, Jim Stewart formed the Industrial Design Group in a series cubicles next to PD's design managers and tooling engineers.

With frogdesign now gone and the future an open question, ewart's first assignment was a delicate one: to analyze the next eneration of PC technology and propose a new design language at would gradually replace SnowWhite and ensure that Apple's oducts would have a distinctive look well into the future.

OLDILOCKS AND THE THREE BEARS

cording to Jim Stewart: "When a company has a lousy image, it's sy to change the design of its products and encourage the market to forget the past. But when your image leads the industry by a wide margin, as Apple's did in 1987-88 with SnowWhite, it's an entirely different matter. Since 1983, Apple had invested a lot in SnowWhite and received a very high level of design expression and worldwide identification. The Macintosh SE and Mac II, LaserWriter II and peripherals such as the AppleScanner were the strongest designs a personal computer maker had ever offered. And the market accepted them with open arms. Yet many designers outside of Apple felt that SnowWhite was becoming cold and stiff, and predicted that the language would soon lose its distinctiveness as other manufacturers borrowed SnowWhite elements for their own products." By 1987, manufacturers were beginning to release products with variation of the SnowWhite design language, and more would surely follow.

In Stewart's opinion, "the most successful companies should obsolete their own design language, on their own terms, before their competition does it for them. Once you're successful with design as Apple was in 1987—it's important not to take that success for granted, because nothing fails more completely than staying with a successful design idea too long. For this reason, we had to start thinking about our next design language as soon as possible."

During the spring of 1987, just as the Mac SE and Mac II were being introduced, Stewart wrote a short design brief that outlined a three-step transition from pure SnowWhite to a new design language. Predicting that components would shrink over time, he envisioned three generations of CPU products, each smaller (and less SnowWhite) than the preceding one, ending in a portable CPU that would be the size of a book and have no trace of SnowWhite.

Because of the size relationship between the various CPUs, Stewart called the project Goldilocks and the Three Bears (G3B), with the first generation representing 'Papa Bear,' the next (slightly smaller) called 'Mama Bear,' a third product (even smaller) called 'Baby Bear' and a final book-sized unit called 'Goldilocks'.

Convinced that G3B would give Apple a whole new design language, Stewart received funding to conduct a SnowWhite-style investigation, and sent his G3B design brief to a number of design firms around the world requesting bids. Among the responses, he selected five: ex-frogdesigner Stephen Peart of Vent Design in Campbell; Bill Moggridge of ID Two in San Francisco; Nick Butler of BIB in London (who participated in the 1982-83 SnowWhite project); Product First (a small British firm); and Doug Patton of Patton Design in Irvine, California. Apple's in-house designers Mark Pruitt, Gavin Ivester and Adam Grosser also agreed to submit proposals for G3B after Stewart agreed to pay the cost of hard modeling.

As soon as the design brief went out, however, most of the participants disagreed with its central premise. "Jim believed that a visual design language should focus on boxes," says Bill Moggridge. "We, on the other hand, felt a design language should focus on the user ... what does the user need, and what does the user respond to. Jim's final concept, Goldilocks, which we interpreted as a portable, was

PLATES 118-124

described in the brief as a box without a keyboard or display, which made no sense to us. We told Jim that we couldn't do just boxes, since users judge computers in terms of inputs and outputs, which meant the portable had to have a keyboard and display. So Jim allowed us to ignore that part of the brief."

Those who didn't question the brief received no such advice. Vent Design followed the G3B program with two proposals that had SnowWhite-style zero-draft enclosures and perpendicular horizontal and vertical lines all over each product, allowing a vent to appear anywhere without disturbing the overall look. Says Peart: "One problem with SnowWhite was that CPUs tended to run hot. Since heat is the enemy of electronics, we decided to give the product as much ventilation as possible without sacrificing the aesthetics, while providing a logical path toward smaller and smaller products. But Stewart just couldn't see it." According to Peart's partner, Brad Bissell,: "Jim had no clear strategy for Goldilocks. First, he asked us to transition away from SnowWhite, then the guidelines seemed to change."

Like Moggridge, Nick Butler at BIB ignored the transition strategy inherent in the G3B design brief. "We don't believe in making transitional statements," says Butler. "Instead we proposed a 'visual joke' that had a post-modern architectural look with horizontal and vertical lines on the surface for ventilation." The peaked roof lifted up for storing a split keyboard inside.

Of all the Goldilocks concepts, Stewart favored the Gavin Ivester/Adam Grosser proposal, which applied SnowWhite aesthetics to a series of interlocking boxes a soft curve on the front. According to Stewart, "they departed from SnowWhite yet still managed to look like an Apple product." Another strong contender was the ID Two portable concept, designed by Daniele De Iuliis and Robin Chu, which had a folding butterfly keyboard, a thin display and innovative detailing, such as vents that closed up when the unit was off to prevent dust from entering the machine. Years later, ID Two's Goldilocks concept would receive an Industrial Design Excellence Award and influence the creation of Apple's next industrial design language. But in 1987, it was all but ignored.

As the G3B concepts poured in, Stewart advised each participant that, contrary to usual practice, he or she would not be allowed to present his or her work to Richard Jordan and Jean-Louis Gassée— a decision that made most of the designers suspicious.

"The atmosphere was extremely political," recalls Daniele De Iuliis. "We never knew what was happening. We were asked to drop our work on a table and leave, which seemed very strange to us." As Nick Butler of BIB says, "it's ludicrous for a client to judge a design without hearing the philosophy behind it. The work needs to be explained, and the only person who can do that is the designer."

By presenting the designs himself, Stewart hoped to avoid a repeat of the SnowWhite experience, when Hartmut Esslinger parlayed his concepts and an hour-long lecture into a million-dollar contract. Just a few months into his new job, Stewart couldn't afford to be upstaged by Bill Moggridge, Stephen Peart or Nick Butler, whose razor-s intellect and smooth English manners could easily draw atter away from the quiet workmanlike Stewart.

When the time came to present G3B to Jordan and Gassée reception was distinctly chilly. According to Jordan, the main the behind the program was to create an "elegant transition" for SnowWhite to the new Goldilocks language. The only problem that Gassée didn't like "elegant transitions." After Stewart conceed, he was asked to leave. Then, Jordan says, "Jean-Louis tore me big time, telling me that the whole Goldilocks premise flawed." According to Gassée, "elegant transitions' is the kind crap designers talk about at conferences. If a designer has so thing to say, he should say it *now*, not five years down the roa But five years would indeed pass before the design language G3B failed to deliver would finally come about.

IN THE WAKE OF THE GOLDELOCKS DEBACLE, JEAN-LOUIS GASSÉE AND A Marketing proposed a new series of business-oriented compuknown in-house as the "Tops and Bottoms" strategy—so narbecause Apple still did not yet offer a powerful file server for b ness applications or a small low-cost modular Macintosh for b ness, education and home applications. Gassée wanted the "to product to be a floor-standing tower-shaped CPU with mass expansion options and a friendly exterior. The "bottom" proc would be a slim pizza-box CPU that would support a color disp yet be very cheap to make. In between, Gassée wanted a mid-siz business computer with aggressive price/performance. With pizza-box and mid-sized unit linked to the tower unit in an offi network, the "Tops and Bottoms" strategy would allow Apple compete head-on with IBM in the business market as well respond to the growing demand for a low-cost modular Mac.

Larry Barbera. To fulfill this demand, Jim Stewart recruited La Barbera, a 1972 graduate of Ohio State University. Barbera h worked for the design firm Richardson-Smith, joined Hewle Packard's Corporate Identity Group in 1980, and met Jim Stewart 1985. Intrigued that Stewart would return to Apple to rebuild its house design group, Barbera agreed to follow him in Noveml 1987. But what he found did not inspire confidence. "H-P's desi group was huge," he says. "Yet at Apple, Jim presided over a a h dozen cubicles. It was tiny. But I could see the potential. App needed new products"—the first being the tower component to t "Tops and Bottoms" strategy, code-named Columbo.

COLUMBO COMPLTER CONCEPT

PLATES 125-1

Industrial Design: Apple Computer: Larry Barbera; Matrix Product Design (Palo Alto, CA): Mike Nuttall; Pat Jackson, Steve Chase, B Lewis, Ben Pang, Terry Christensen, product design *Dates of Design:* January–June 1988 (project cancelled) Looking over the G3B concepts, Larry Barbera could see why th rogram had failed. "Most of the work had no connection to Apple's ast and little understanding of what computer users actually need," e recalls. "With Columbo, I wanted to avoid those mistakes, packge the technology in a way that people could understand ... and esign something that was new, yet still recognizable as Apple."

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Unlike the first Macintosh, which had evolved in a cult-like atmoshere led by the visionary Steve Jobs, or the Macintosh II, which egan as an "underground" project among a small group of technians who developed their concept to a fairly advanced stage before owing it to management. Columbo was a "top-down" development mmanded from above and managed under a new Gassée-inspired rmula that Columbo's product designer Terry Christensen describes a "steering committee... the exact opposite of the small-teams proach that had created the first Macintosh. A lot of people consided Jobs' approach tyrannical and misguided. Funneling an entire oject through one person, be it Jobs or another visionary leader. evitably resulted in lop-sided products that exhibited all the strengths id weaknesses of its creator, like the first Mac. Instead, the steering mmittee approach brought every discipline involved in a project gether-engineering, software, marketing, product design, industrial sign, manufacturing-and required discussion and consensus at ery stage of development." Instead of a Jobs-like figure leading the oject with a single vision, the new approach was democracy in the treme. To prevent chaos, a "champion" (usually a product designer signed to Marketing) was appointed to keep the project on track, ten with mixed results.

Before Columbo, a lot of time and money was wasted on projects at would go all the way to tooling and then be cancelled at the last inute," says Christensen. "But the steering committee encouraged ch member of the team to maximize the product from their own dividual perspective." Under this scenario, Larry Barbera and Mike attall of Matrix Product Design developed a tower-shaped CPU that as much larger than the Mac II, with a vertically mounted circuitard and fixed hard drives inside the cabinet and removable hard dris. CD-ROM and floppies that could be accessed through the front.

We wanted Columbo to move beyond SnowWhite to make it more sually interesting," says Nuttall. "After looking at the components, it emed logical that a floor-mounted computer should assume an chitectural look. We divided the hardware into two intersecting exes with a 'tower' section, pushed back on the right, containing the cuitboard and fixed components that users rarely touched, and a cople' section brought forward on the left, housing floppy drives and movable hard disks, which required constant user interaction. The ⁵-centered design made the box seem less massive and gave it a ore visually interesting facade."

Though Nuttall was happy, Barbera saw a problem. "Columbo as so large and had so many flat planes, it needed to be softened." do that, they applied a 50-inch radial curve to the front of the ex and attached a door to hide the hard disks, floppy and locking mechanism, yet highlight the point of interaction with a curve that draws the user's hand to the most often-used functions.

Inside, Columbo was shaping up to be Apple's most powerful computer, with dual Motorola 68030 processors delivering workstationlike performance. On the outside Nuttall and Barbera made it seem calm and elegant. "The design raised a lot of eyebrows at Apple," Nuttall recalls "No one had thought about hiding drives behind a door or ideas like cable management, which we'd designed behind another door on the back. Everyone liked its sculptural quality. It referred to SnowWhite, but moved in a new direction."

With Columbo representing the "Tops" of the "Tops and Bottoms" strategy, Barbera and Nuttall developed a "Bottoms" product, by designing a desktop box with the same 50-inch radial curve on the front and a slotted top that allowed a specially-designed display (that matched the CPU in shape and size) to fit tightly on top, giving the display and CPU an all-in-one look.

During the summer of 1988, many people at Apple predicted that "Tops and Bottoms" would succeed the Mac II family and that the Columbo aesthetic, which Larry Barbera called "New Look," would replace SnowWhite. To reinforce this idea, Jim Stewart used the Columbo motif to fashion a "New Look" showing a square (representing technology, the "hard" side of computing: speed, power and expandability) with an interlocking circle (representing the "soft" side: the windows, icons and look and feel of the interface). But like so many projects during the Middle Years, both New Look and Columbo were eventually dropped.

H20 PORTABLE COMPUTER CONCEPT PLATES 135-136, 138

I*ndustrial Design:* Lunar Design (Palo Alto, CA): Robert Brunner, Ken Wood

Dates of Design: March 1988

With Columbo under way, Jim Stewart hired Lunar Design to conduct two smaller design explorations. Impressed by their work on Aquarius the year before. Stewart asked Lunar's lead designer Bob Brunner to come up with a small transportable Macintosh, similar in size to the Apple IIc, that users could carry in one hand, plug into a computer display at school or a TV at home. Basically a flat slab shape with SnowWhite lines on the side, the concept sat upright, allowing the user to clip the keyboard to the side during transport. "We were expected to play around with SnowWhite to see how far we could push it," says Ken Wood, "making it less stiff and more friendly than the products Apple was shipping. With frogdesign out of the picture, every design firm in the Valley was jumping at the chance to work for Apple, so we decided to give it our full attention." According to Wood, Bob Brunner performed the design himself in a single round-the-clock session. "I remember we began in the morning. Then I got sick during lunch and had to go home," says Wood." By the time I came back the next day, it was done. Since it came right after Aquarius, we continued the water theme and called it H₂O."

 Q-BALL
 THREE-DIMENSIONAL MOUSE CONCEPT
 PLATES 137, 139–140

 Industrial Design:
 Lunar Design: Robert Brunner, Ken Wood

 Dates of Design:
 April–June 1988

For the next project, Stewart asked Lunar to design concepts for an experimental 3D mouse, called Q-Ball, which simultaneously referenced the x- (horizontal), y- (vertical) and z- (depth) axis thanks to a mysterious coil-shaped gizmo supplied by Hughes Electronics. The coil, valued at \$10,000, had been developed to keep satellites in zero-synchronous orbit. As Ken Wood recalls, "someone from Apple's Advanced Technology Group showed up with a cardboard box full of parts. He took out the coil, which was the size of a ping pong ball, handed it to me, and said, 'Here. Don't lose this.' "

When attached to a 3-D graphics workstation, the coil could track up to several feet in any direction, enabling the user to make threedimensional drawings, play 3-D video games, or expand the Apple desktop metaphor into a cube with six sides, with each side having its own desktop, files and tools. "Apple felt the technology had promise, but didn't know how to package it," says Brunner, "so we explored a series of pen, wand and golf-ball shapes that could hold the technology, made nearly a hundred models (Ken Wood suggested they change the code name from Q-Ball to Screw Ball) which they boiled to four prototypes."

The challenge was to design a shape that felt natural in the hand and appear serious enough for professional applications, yet be simple enough for casual users. "The design didn't have to follow SnowWhite or any existing product type, which meant we could do our own thing," says Wood. The downside was that Brunner would have to explain their approach to Richard Jordan.

"Q-Ball was the first presentation I had ever seen Bob deliver," Jordan recalls. "By the time they delivered their work, we had already decided not to pursue Hughes' technology. But that didn't matter, because the designs were fabulous.... I had already decided that we should do more work with Lunar in the future."

KNOWLEDGE NAVIGATOR

PLATE 130-133

Industrial Design: Apple Computer: Gavin Ivester, Adam Grosser Dates of Design: May-June 1987

Awards: I.D. Design Review, 1988

During the spring of 1987, John Sculley's best-selling memoir *Odyssey*, which charted his rise in the business world and tumultuous early years at Apple, made him a regular guest on TV talk shows, elevating him to the status of media celebrity. Apart from its historical value, the book showcased Sculley's ideas on the future of computers, the proliferation of on-line services and predicted the emergence of a next-century computer called the Knowledge Navigator that would make the coming phenomenon known as "cyberspace" available to the average user. "Individuals could use it to drive through libraries, museums, databases, or institutional archives," wrote Sculley. "Imagine [it] having two navigational joyTo promote the Navigator concept, Apple Creative Services a the Industrial Design Group to build a foam model for use in a that would accompany Sculley's lectures on the topic. Gavin he and Adam Grosser complied with a portable book-like design folded flat with a stand that tilted the product at the correct angle doubled as a carrying handle, and an all-seeing eyeball above screen for teleconferencing. As a voice-activated terminal, there no need for a keyboard or disk drive, says Ivester. "We were to exaggerate the details so that they would read on video."

LAGUNA MACINTOSH PORTABLE PLATES IN

Industrial Design: Apple Computer: Jim Stewart, Gavin Jye Terry Christensen, Eric Grunberg, Don Porter, Troy Hulick, Philips, Jim Halico, Rich Frances, product design; frogde (Campbell, CA): Hartmut Esslinger, Tony Guido, Sigmar Wilro Herbert Pfeifer

Dates of Design: January 1986–November 1988 Introduced: September 1989

The inspiration for a portable Macintosh dates back to the 1970s, when the computer visionary Alan Kay first articulated idea for the Dynabook, which Kay described as a "self-contain knowledge manipulator in a portable package the size and share an ordinary notebook" no more than one inch thick, with an I screen and a total weight of no more than one pound. Though didn't think Dynabook was technically possible until the 19 Steve Jobs carried the torch in 1982, included a BookMac in the inal SnowWhite design brief, and exhorted his Macintosh team think of the desktop Mac as only an interim goal. The ultim dream, Jobs said, was a "Mac in a Book by 1986." Throughout I frogdesign spent hundreds of hours designing portable concern fulfill Jobs' goal. In April 1985, Jobs showed a recently-invented panel display to Apple's board and proposed that Apple build a tery-operated BookMac for delivery in 1986. But the board decline By the fall of 1986, Jean-Louis Gassée revived the concept. co named Laguna, "Our goal was to recreate the Mac SE in a pom measuring 8.5 by 11 by 1.5 inches, weighing about six pounds. Terry Christensen, a five-year Apple veteran who had just mana product design on the Macintosh SE. "But having no experience " portables, we didn't know where to begin."

Six months earlier, frogdesign had delivered a concept for notebook-sized Macintosh Portable, code-named Malibu, which a basic clamshell design and a simple hinge mechanism for the play. Christensen's team used this concept as a goal, hoping to could fit all the necessary components inside. But first, the team to learn how to build a portable. To do that, Christensen purchaevery portable computer on the market, tore them apart to see b É.

ey were assembled, and wrote a detailed specification for the deal" portable—one that would pack the most function and utility to the smallest possible space.

Then, in October 1986, Jean-Louis Gassée stepped in, insisting that guna's target audience—business executives, who also owned a esktop Mac—would want a portable to deliver the "complete" acintosh experience. Thus he steered the team to create a "no empromise" portable with a desk-sized keyboard and cursor conoller and a full 640- by 480-pixel Macintosh display (higher resotion than screens on IBM-compatible portables). Later he wanted aud output (which no other portable had at the time) and, after at, a long-life battery and an internal hard drive (even though iniature drives did not yet exist).

The Mac Portable was a classic example of not having a firm goal clear path to get there," says Christensen. "Every time we thought e feature set had been fixed, the goal would expand," forcing ople to scrap frogdesign's original design.

The most vexing issue was the display. "Not only did we need 640-480-pixels, which no display vendor was making, we decided to use tive matrix technology," in which each pixel (all 307,200 of them) is introlled by its own transistor—resulting in a sharp, black-on-white splay which was highly responsive with no ghost images or "submane effect" (in which the cursor disappears for a brief instant when oved quickly across a less expensive passive-matrix display.

Another problem was the issue of "dead" pixels. In 1988, no manacturer could turn out screens in mass quantities with fewer than "dead" pixels, which show up on the display as permanent black ots. "We demanded that screens have no more than 6 'dead' pixs," says Christensen, "which forced our vendor [Sharp] to create a "dicated factory." Perfecting the screen was a breakthrough in chnology from which the rest of the industry soon benefited. Yet delayed Laguna's release by nearly a year.

The another problem was the battery. Some wanted to use nickel-cadum, which recharges quickly. But Marketing wanted the longest posble battery life and a "fuel gauge" on the screen to indicate how uch power remained. Since ni-cad cells can lose power suddenly, aking the 'fuel gauge' unreliable, the product designers had to use lead acid battery, which is predictable, but added even more eight to the product.

When assembling Laguna, Apple PD decided not to use the izens of screws found on competing products, which allowed eater portability but required a lot of hand assembly at the facto-

"Manufacturing suggested that we make Laguna a showcase oduct, designing it so that everything would snap into place," says oduct designer Don Porter. "That way, the final product would ve only three or four screws, and could be assembled with robots an automated assembly line. It also meant adding space around ch part to allow for the snaps," as well as space for robot fingers drop each component in place. "If we had used screws, Laguna would have been harder to assemble, but it would have been fifteen percent smaller."

In the late 1980s, says Richard Jordan, "Apple assumed that everything we made would sell in huge volume and had to be designed for automated assembly, which meant using many of the same components and standards as our desktop Macs, down to the same 4mm wall thickness used on the Mac II." Time and again, Jordan battled with his own product designers to make Laguna smaller or more personal. One example was a hinge designed by product designer Eric Grunberg to support the active-matrix display. The hinge had an internal slip-clutch mechanism that was 3 inches long and 1.25 inches in diameter, resulting in a hinge the size of a rolling pin. Ultimately, Richard Jordan convinced Grunberg to make it smaller, yet he admits, "some people couldn't understand that a portable computer should be small."

To encase the product, frogdesign discarded its earlier concept and wrapped the components in a wedge-shaped clamshell enclosure, which enabled thick components such as the battery and disk drives tobe positioned at the rear and the keyboard to be angled at the front for better ergonomics. To accommodate left- and right-handed users, the trackball could be placed on either side of the keyboard, with large notches cut into the plastic on both sides of the display to ensure clearance for the trackball when the lid was closed.

When IDg's Gavin Ivester saw the design, "it looked more like a desktop product than a portable." After the cool laptop concepts that frogdesign had designed in 1984 and 1985, he couldn't understand it. "The slots, which function as vents on the desktop products, made little sense on a portable, because portables generate very little heat. Sharp corners seemed inappropriate for a product that is constantly handled. And the platinum color attracted finger marks like a magnet. The SnowWhite language just didn't work."

As a high priority product, responsibility for Laguna's design fell to IDg's manager Jim Stewart, who wanted the Mac Portable to be "the best" to overcome the fact that it would be late to market. But as Gavin Ivester watched it from a distance, "months passed with no discernable progress." Curious about the delay, Ivester took a closer look in early 1988 and was stunned by what he found: tooling errors, parts that didn't line up and details that looked bad. Fearing that Laguna would make Apple look bad, Ivester spent an entire afternoon with Jim Stewart, listing what was wrong with the product and how to fix it. "When I finished laying it out, Jim smiled and said, 'OK, now it's your project.' "

According to Stewart, "at a certain point, everyone knew the Mac Portable was not destined for greatness... There is an odor that emanates from such a project. People tend to distance themselves from that odor. Some succeeded." But Gavin Ivester did not. For the next year, he functioned as Laguna's baby sitter, fixing one mistake after another with a pager hung from his belt, which kept him in touch with the Fremont factory 24 hours a day. Dozens of changes were made. But one thing Ivester couldn't change was the design itself, which was too large (15-by-14 by 4 inches) and heavy (16 pounds) to be considered a portable. Even so, the Mac Portable sold reasonably well due to the pent-up demand for a battery-powered Mac. Yet two years would pass before Apple had a genuinely portable computer with all of the features that users have come to expect. the PowerBook. In the meantime, Richard Jordan rewarded Gavin Ivester for his work on Laguna by making him IDg's in-house portables expert, a decision reflected as well on Ivester as it did badly on Jim Stewart, about whom Jordan was beginning to have doubts.

WITH STRONG SALES FOR THE MAC II LINE SWELLING APPLE'S BOTTOM LINE, as well as its R&D budget, Jean-Louis Gassée went on a spending spree, ordering concepts for more new products than at any time in Apple's history. First on his list was a follow-up to the Apple IIGS, code-named Centossa (Plate 144), which Jim Stewart gave to Lunar Design. As Ken Wood recalls, "the redesign would be laid over the existing IIGS chassis, so there wasn't a lot we could do." Even so, the opportunity to design something with the potential of becoming a real product persuaded Bob Brunner to marshall all of Lunar's resources, hoping that Gassée would notice. "When Jim Stewart heard about it, he advised against it," says Wood. "He said. 'If you jump through the hoop this time, Gassée will make you jump through a flaming hoop next time ... then after that, a flaming hoop with broken glass on the other side ... ' But Bob wouldn't listen." The end result was a smooth, beautifully proportioned CPU box tweaked to within an inch of its life. Brunner loved it. But when Gassée had a look, "he pissed all over it," says Brunner with a laugh. "We never did figure out what he wanted."

Inspired by Larry Barbera's "New Look" approach, Gassée also requested concepts for a high-performance "New Look" office printer, code-named **Sequoia** (Plate 145). "With Mac II sales going through the roof, Jean-Louis felt that Apple could compete with IBM by developing powerful enterprise-wide systems," says Brunner. To function in a busy office, Sequoia would offer multiple paper trays for duplex printing, collating and other high-end functions with a footprint only slightly larger than the LaserWriter II. But packaging the product was difficult. To get different takes on the theme, Jim Stewart asked both Lunar Design and Stephen Peart at Vent to develop competing versions.

Rather than labor over the design as he had done with Centossa, Brunner decided that a \$10,000 office printer should be less expressive than a \$3,000 laser or a \$300 dot-matrix. Thus, with Sequoia, he took a quiet approach by interlocking smooth and textured forms and and adding visual touches that would link it with Columbo. Meanwhile, Peart's concept took a more aggressive tack: applying a curved Columbo-like fascia to the lower section and tilting the paper trays upward at an oblique angle, similar to his design for the ImageWriter II. "We noticed what Steve was doing, and pushed our paper trays downward," says Brunner, "so that our printer we resemble a small building rather than a piece of sculpture."

Next, Gassée ordered up concepts for an all-in-one of Macintosh, code-named **White Jade** (Plate 148), that would rep the Macintosh SE, asking that the glass on the display fit flush w the surrounding plastic. "A lot of people wanted to give the flush-mounted glass," says Brunner. "But as we researched it, discovered that the reject rate was very high, because any devia in the glass meant that it wouldn't fit the plastic." Even so, Brur showed Gassée various designs, hoping that technical proble could be solved later.

With Apple's R&D budget hovering at \$200 million—with just of one percent of that figure devoted to industrial design—Jean-La Gassée joked to reporters at the annual MacWorld gathering in 1 that he had trouble finding enough projects to spend all the mor Jim Stewart helped by pursuing a series of blue-sky projects with c names like "WorkSpace 2000" (to design the office of the futu "Teacher Teacher" (the classroom of the future) and "Home on Range" (the home of the future), none of which progressed beyo the model stage.

Amid this activity, the always-practical Richard Jordan worried too little time was being spent on real-world projects. "We had lot blue-sky concepts but no coherent design language to rep SnowWhite," he says. "Meanwhile our factories were still churning older products. We needed new ones." Aware of this fact, design c sultants up and down the Valley were in a feeding frenzy. "With frog sign no longer involved and the company's design still unresolv everyone was scrambling to get their foot in the door at Apple," s Vent's Stephen Peart. "In the end, only one of us succeeded."

By THE END OF 1988, Gassie's SPENDING SPREE CAME TO AN END, FOLD ed by a round of cancellations. First to go was Centossa (Gassée of n't like its look; Marketing said that Apple II sales didn't justif redesign). Next came Sequoia (which was too powerful and exp sive for Apple's traditional market), then White Jade (which protoo difficult to manufacture). More surprising was the cancellation Columbo, which grew from a Mac II successor into a dual-proces workstation; as such, it competed with similar workstations suppl by Sun Microsystems and Hewlett-Packard, which was not App traditional market. In addition, says product designer Bill Bull, "Je Louis decided he didn't like the curved door on the front anymo Three years later, Apple would release a smaller version of Colum with a SnowWhite design, which shipped in 1991 as the Quadra 9

Such cancellations are common at companies like Apple, wh management prefers to develop product ideas at the same time t Marketing does its research to gauge potential demand. Since design is often completed before marketing completes its resea (at which point the project is approved or given thumbs down), c cellations are a common occurrence. But after three cancelled p cts in a row, Bob Brunner was frustrated: "All we wanted was to esign something, *anything*, that would reach store shelves and ave an Apple logo on it."

The only survivor was Larry Barbera and Mike Nuttall's desktop olumbo design, which would evolve the following year into the acintosh IISI, part of a new successful low-cost computer line.

Ray Riley. Pleased by Larry Barbera's performance, Jim Stewart red his second in-house designer, Ray Riley, in November 1988. A 984 graduate of the University of the Arts in Philadelphia, Riley rorked in New York at Human Factors for two years alongside iture Apple designer Tim Parsey, and visited Silicon Valley in 1986, here met Bob Brunner at Lunar Design and joined Tandem omputer to work on refrigerator-sized mainframe computers. Two ears of networking allowed Riley to meet every designer in the alley, including Larry Barbera, who mentioned that a design posion had opened up at Apple. In the spring of 1988, Riley started a ialogue with Jim Stewart and was hired in November with the romise that half of his time would be devoted to conceptual work and the rest to designing products.

As Christmas 1988 grew near, Riley expected Stewart to give him an ssignment. Instead, he got a surprise. Come January 1st, Stewart said, ichard Jordan would be taking over the Industrial Design Group, makng Stewart a studio designer like Riley. Stunned by the news, Riley sked Stewart, "Was I the last guy hired under the old regime or the first uy hired under the new?" Stewart thought for a moment, then said he idn't know.

THEN RICHARD JORDAN TOOK OVER MANAGEMENT OF THE INDUSTRIAL DESIGN aroup, it was not by choice. As friends for nearly a decade, dating ack to their earliest days at Hewlett-Packard, Jordan wanted Stewart o succeed at IDg. His ability to recruit designers like Larry Barbera and Ray Riley more than offset the embarrassment of the Goldilocks ebacle. The problem was Gassée.

"As 1988 came to an end, Jean-Louis was constantly on my back, emanding to know why our design wasn't evolving more quickly," ays Jordan. "At the time, Apple had three factories working 24 hours day, consuming 40 million pounds of plastic with nearly twenty roducts in various stages of development. But we still hadn't develped a new industrial design language to replace SnowWhite and eep Apple ahead of the competition. So I had to take charge and nd someone who could. Otherwise, a crisis would develop."

Solving the design language problem and recruiting a new direcor for IDg would be the most important decision of Jordan's areer—and probably his last if he made another mistake. To assist im, Jordan hired the corporate headhunter Gene Kunitomi to idenfy the top 25 design managers in the U.S. for Jordan to interview. I wanted Gene to send me only the very best people and not to ake any prisoners, even if we it meant hiring someone away from ord, AT&T or IBM."

FINDING A SUPERSTAR

Richard Jordan's second task was to find someone who could develop Apple's new design language. He had seen Larry Barbera's "New Look" concepts and initially felt they had potential. But now they seemed too easy. They were not dramatic enough. At this stage in his career, Jordan had no patience for easy solutions. He wanted something dramatic, something that everyone would point to and say: "*That* is great design." But rather than stage another competition, Jordan would hire a "superstar" designer to redefine Apple's product line without cutting all ties to its past. But how would Jordan find his superstar? He didn't trust anyone in the ID group to advise him. Instead, he secluded himself for a week to plan his strategy and write a proposal for Jean-Louis Gassée outlining his intentions.

"Frogdesign had given Apple good results, but the results had been short-term with a lot of dislocation because of the way Hartmut Esslinger worked," says Jordan. "This time, I wanted the same international style, but one that would serve Apple for the next ten years, while avoiding the agony that frogdesign had caused." Jordan's method was predictable: identify the world's top 25 designers, interview each of them, and pick the "best of the best" to be Apple's new design guru. It wouldn't be easy, and it wouldn't be cheap. But, more important, there would be no wasted time and no disappointments.

At Jordan's request, Larry Barbera made a list of ten American, five Japanese and ten European designers whom everyone agreed were the best in the world. Then Jordan and Barbera would conduct a "world tour" and visit every designer personally. "I didn't want to be myopic," says Jordan, "I wanted Larry to challenge my preconceptions and not ignore anyone I might think was too way-out."

Taking Jordan at his word. Barbera's first suggestion was the Japanese designer Shiro Kuromata, who at the time was making chairs using slabs of cast resin impregnated with flowers. "Larry knew how I felt about that kind of stuff," says Jordan, "but he wanted to push my sensibilities so that anything else I saw would seem tame by comparison."

After visiting Kuromata, Jordan returned to Cupertino for the first round of ID manager interviews. By that time, Gene Kunitomi had contacted nearly everyone in the design field, from Ford's VP of Design Jack Telnack to managers at the bottom of the Fortune 500, from top consultants to academics. He even called Hartmut Esslinger by mistake. Every referral was followed up and every candidate who expressed interest resulted in a dossier on Jordan's desk.

Among the dozen or so meetings that took place during late 1988 and early 1989, two candidates stand out in Jordan's mind. One was consultant David Gresham, a partner in Design Logic, a Chicago firm whose work employed the kind of design theory that engineers like Jordan found hard to take. "He was designing obtuse things that no one would ever buy," Jordan recalls. "He had good intellect, and I liked his personality. But his work looked like design for a museum, not for the masses. He showed me a telephone answering machine with a dorsal fin on top and called it 'product semantics.' I called it something else."

Another prospect was Arnold Wasserman, VP of industrial design and human factors at the computer company Unisys, who Gene Kunitomi introduced by saying, "This is your man." But the interview set off alarm bells in Jordan's head. "Wasserman said his first goal was to make a connection with John Sculley, set up his own fieldom, and report to Sculley directly instead of Marketing or Product Design," Jordan recalls. "That told me everything I needed to know. So I thanked him and said goodbye." As Wasserman left, Jordan thought he heard Hartmut Esslinger's footsteps trailing off into the distance.

After a dozen more interviews, Jordan worked through every dossier that Kunitomi gave him, all with the same result. As it turned out, finding the right person to take over Industrial Design would be more difficult than he had ever imagined.

ANXIOUS TO RESUME HIS WORLD TOUR, JORDAN HAD ONE LAST DECISION TO make. For months, Apple had been wrestling with the issue of producing its first low-cost Macintosh. For years, customer demand for an inexpensive Mac had been so intense that Apple's engineers developed concept after concept. Yet John Sculley and Jean-Louis Gassée cancelled every one of them, unconvinced that increased sales from a low-priced Mac would make up for the high gross margins earned from their current line of Macintosh IIs.

The Low-Cost Computer Family. Between 1987 and 1988, programs with names like White Jade, Dragon, Charm and Strange had been pursued and cancelled. The fifth attempt, code-named **Erickson**, had grown out of the desktop Columbo concept that Gassée had cancelled in June 1988. Despite Gassée's cancellation, Apple engineers Paul Baker and H. L. Cheung had taken the guts of this machine, built 20 working prototypes in the fall of 1988 and distributed them to executives throughout the company. Reactions to the inexpensive new machine were positively glowing. Yet Sculley cancelled Erickson as well—only to reverse himself a week later, after facing a roomful of stock analysts who demanded to know when Apple would finally produce a low-cost Mac.

In a stunning turnaround, Sculley and Gassée decided not only to revive Erickson under the code name **Spin**, giving it a matching color display, which would eventually ship as the Mac IISI, they revived two other low-cost Macs whose development had been stalled: a small entry-level color CPU with a matching display, code-named **Elsie**, which would ship as the Macintosh LC, and a low-cost replacement for the Macintosh SE, code-named **X.O.**, which would ship as the Macintosh Classic. To round out the low-cost line, Sculley and Gassée also approved a new personal laser printer, code-named **Capriccio**, and an inexpensive ink-jet printer code-named **Franklin**, that would take up very little desk space.

To get the program moving, Richard Jordan had to select the designers for the Macintosh IISI and the Mac LC right away, since they would require the most time to develop. The first decision easy. Since Larry Barbera and Mike Nuttall had created the d Columbo concept on which it was based, they would design which Barbera could manage while travelling with Jordan world tour. But Elsie was another matter entirely. After Mar had crunched the numbers, Jordan was told that the Ma price/performance ratio could well make it the top-Macintosh of all time. Because of this fact, Jordan suspector Sculley would take a personal interest—perhaps even collabor on the design himself.

For months, Jordan had heard rumors that Sculley-who had ied industrial design in college and worked as a designer in York one summer before enrolling in business school-was i to participate in the design of one of Apple's CPUs. Yet the thought of "Big John" rolling up his sleeves, sharpening his m two pencil and casting himself as the next Steve Jobs was en to make Jordan's stomach churn. Even though Sculley had I Jobs in the boardroom, engineered Apple's turnaround, authority best-selling book and emerged as the most recognized C American industry, he still chafed when people compared 1 Jobs in the vision department. One thing that distinguished from Sculley was all too obvious: Jobs had actually done the lifting required to deliver a great product and Sculley had no the more reason for the chairman to involve himself with LC, was shaping up as the most important (and career-enhancing ject since the Mac II.

For Jordan, this made the choice of designer for LC a critica Giving it to his in-house people with no outside assistance w of the question. But, aside from Mike Nuttall, the only consu Jordan could trust with such an assignment were Steven Pea Bob Brunner. Since Peart had already designed several Apple ucts, including blockbusters like the ImageWriter II and LaserWriters, he was clearly the more experienced. Yet his fr sign connection also made him risky. The mere mention of fr sign or its founder Hartmut Esslinger in Sculley's presence coul the whole program, which would reflect badly on Jordan. Th Brunner. Even though none of his Apple designs had ever gon production, Jordan liked the H₂O and Q-Ball concepts and like attitude even more.

Often Brunner would attend design meetings with Apple's consultants and stay behind after the meeting was over to Jordan and Jim Stewart concepts he had done on his own, sug ing ways to transition away from SnowWhite toward a new d language that would better suit Apple's evolving product line. Undecided, Jordan asked Ray Riley what he thought about Bru working on LC. Riley called the decision a "slam dunk" and v teered to collaborate as well as run interference with Gassée Sculley should that become necessary. Suddenly, the decision made. Crossing his fingers, Jordan told Riley to get started o with Brunner, asked Jim Stewart to oversee Capriccio (which would be designed by IDg's ace-in-the-hole Gavin Ivester) and told Larry Barbera to pack his bags. He and Jordan would soon continue their bund-the-world search for Apple's next design guru.

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Between FEBRUARY AND MAY 1989, JORDAN AND BARBERA JOURNEYED TO hree continents, visited more than a dozen cities and interviewed nore designers than they cared to remember. In Boston, they met with Gianfranco Zaccai at Design Continuum (famous for designing he Pump athletic shoe for Reebok). In Cincinnati, they visited tichardson-Smith (the largest design firm in the U.S.). In Tokyo, they bured IDEC (a 100-person design powerhouse) and GK Design (a boutique consultancy). In London, they sampled the work of Nick Butler at BIB and Kenneth Grange at Pentagram. In Germany, they aw the work of Porsche Design as well as Phoenix, a small consulancy founded by ex-frogdesign partner Andreas Haug.

"If we had stopped looking at that point, I would have chosen Phoenix," says Jordan. "Their attitude seemed perfect for Apple." During the interview, Haug seemed to be even more astute about lesign than his former pondmate Esslinger. Yet he was so soft-spoten and modest that Jordan wondered how this man could have bossibly worked with Esslinger. "Haug talked about design like it vas fine wine, and their products were the most user-centered work had ever seen. There was no doubt that he could give Apple the lesign language we needed."

But Jordan worried what Sculley and Gassée might think. Was the rogdesign connection a problem? Would they consider Haug important" enough to become Apple's next superstar? "In his heart, tichard preferred Haug. But his engineer's brain was telling him somehing different," says Larry Barbera. "So I suggested we go to Italy, nterview the last three names on our list and then make a decision." In Milan, they interviewed the same two designers that Manock, Gemmell and Oyama had contacted seven years earlier: Ettore Sottsass, whose eccentric postmodern designs made Jordan nervous; and Mario Bellini, the crown prince of Italian design, who dismissed Jordan the ame way he had done Manock and company seven years earlier.

Stung by Bellini's response, Jordan and Barbera headed for Bellagio, near the Swiss border, checked into the Hotel Belvedere overlooking ake Como and spent the weekend gazing at the Italian Alps before conlucting their final interview in Turin. There they would visit Ital Design and meet the most famous car designer in the world, Giorgetto Giugiaro.

The meeting began with a tour of Ital's large fortress-like headquarers. The tour was given by Giugiaro's English-speaking business manger Giuliano Molineri. With no exterior windows and security cameras positioned at various points, Giugiaro's operation looked more like the Central Intelligence Agency than a typical design studio. Yet inside, it was light and airy, with concept cars on display in a large showroom, ramed sketches and design awards on the walls, enormous studios where designs for European and Asian carmakers were taking shape and a second viewing area on the roof, which was ringed by a high wall so that car concepts could be photographed in natural light without people in adjoining buildings being able to see.

"When we walked into Giugiaro's office," Jordan recalls, "he was seated at an enormous desk, sketching a car with one hand, negotiating some deal over a speakerphone and shaking hands with me all at the same time. I looked at Larry Barbera and thought to myself, 'This is a long way from Cupertino.'"

Already familiar with Giugiaro's car designs for Maserati, BMW, Volkswagen, and Fiat, Jordan was less familiar with "Il Maestro's" product design—which included cameras and binoculars for Nikon, wristwatches for Seiko, telephones for SIP (the Italian telephone company), corporate identity schemes for Berlusconi, household appliances, motorcycle helmets, office furniture, menswear for the Japanese market and packaging of all kinds. To leverage his fame as a car designer, Giugiaro had formed a separate product design firm in 1974 with a studio near downtown Turin and 14 designers working under his direction. Though the quality of their work was uneven, the best of it, such as the Nikon F3 camera and the just-completed F4, was considered the finest of its kind.

"It was obvious that Giugiaro knew how to design complex machines that a layman can use," Jordan says. "And his cars proved that he could design for manufacture. And I liked Giugiaro's attitude ... even though I didn't understand a word he said."

After thousands of miles of travel and dozens of interviews, Jordan finally had a superstar in his sights. As Molineri translated, he made his pitch, telling Giugiaro that Apple already had great industrial design for its products, but needed to reach the next level, to become the best in the world. To replace the existing SnowWhite language. Jordan said, Apple needed a new industrial design language.

Unlike frogdesign, which designed the language as well the products as, Giugiaro would only be expected to design the new language and one or two signature products. After that, Apple's inhouse design team and local consultants could fill out the rest of the product line using Giugiaro's work as a guide.

"That means we want the new language and sample products to be *your* design," Jordan emphasized, "not your assistants'. If you can't give me your time, tell me now, and we won't pursue the discussion any further." As Giugiaro and Molineri whispered furiously back and forth, Jordan sat back. Then Molineri leaned forward and said, "Giorgetto will be there for every critical decision and strategy session, and will oversee the design personally."

The only thing left to discuss was the fee. "I realized that someone like Giugiaro would not be cheap, but I was determined not to offer as much as we had paid frogdesign," says Jordan. "So I made them a firm offer of \$900,000 to create the new language and design a high-end, mid-level and consumer-oriented desktop computer plus a laptop computer using the new language ... four designs in all."

Rather than haggle, Molineri agreed to the terms, whereupon Larry

Barbera handed the Italians a non-disclosure agreement, which they signed. Contracts would follow in the coming days.

During the flight back to Cupertino, Jordan was elated. Larry Barbera, however, was skeptical. Though he and Jordan had seen cars, cameras and pasta, they had not seen any computers, because Giugiaro had never designed one. Nor had they visited Giugiaro's product design studio, met any of the designers who worked there, or conducted any due diligence.

"After visiting Andreas Haug in Germany, Richard decided that having a great designer wasn't enough," says Barbera. "He needed a trophy, someone so famous that Sculley and Gassée couldn't criticize."

When he heard the news, Gassée was happy, agreeing anyone who could design for Toyota, Nikon and BMW could design for Apple as well. Though he would never admit it to his American colleagues, Gassée liked the fact that Apple's superstar would be a European like himself. Jordan was happy, because he had looked Giugiaro in the eye thought he understood him, and assumed he had a deal. "At the very least, I assumed that we would have Giugiaro's undivided attention," says Jordan. "Boy, was I naive."

ELSIE MACINTOSH LC

PLATES 146, 147

Industrial Design: Apple Computer: Ray Riley; Eric Xanthopoulos, John Howard, Bob Riccomini, Pat Jackson, Betsy Diaz, product design; Lunar Design (Palo Alto, CA): Robert Brunner, Ken Wood *Dates of Design:* January–July 1989 *Introduced:* November 1990

Awards: I.D. Design Review, 1991

APPLE MICROPHONE

PLATE 149

Industrial Design: Apple Computer: Ray Riley; Ken Weber, product design; Lunar Design (Palo Alto, CA): Ken Wood

Dates of Design: June-July 1989

Introduced: November 1990

Awards: I.D. Design Review, 1991; Silver Industrial Design Excellence Award, 1991; Industrie Forum Design Award (Germany), 1991 By May 1989, managing Apple's Industrial Design Group made Richard Jordan feel like the "plate spinner" on the old Ed Sullivan variety show. "First he would spin one plate on a stick, then another and another..." Jordan recalls. "That was me in 1989. Overseeing important products. Looking for an ID manager. And figuring out what to do with Guigiaro.

I had a lot of plates spinning at one time and didn't want any of them to fall on the floor." Two of those plates were the low-priced color computers: the Macintosh LC known as Elsie and the Macintosh IISI, aptly code-named Spin.

As in-house designer/program manager for LC, Ray Riley had been working with Bob Brunner since January 1989 to develop its basic shape, mindful of the fact that Apple's future as a company was at stake. "In 1989, everyone knew that Apple would be in trouble if we didn't come up with an inexpensive color computer," Riley reca "After years of building powerful machines, pulling in gross marg of 50 and 60 percent, we failed to notice that the computer mar was changing. Suddenly, everyone was demanding cheaper proucts at a time when each new Macintosh was *more* expensive th the last." The day Riley began work on the Macintosh LC, Apreleased its latest CPU, the Macintosh IIfx. "The day the IIfx ca out, there was a lot of celebrating," says Riley, "because it was a only the fastest Macintosh ever ... it was bigger and meaner than a IBM had at the time ... The box was the same old Macintosh II desi recycled from two years earlier. Because it was fairly cheap to ma profits on the IIfx were huge. But at \$10,000 each, how many them could we sell? With the PC side of the industry churning of millions of cheap clones, Apple's market share was falling. To redr the balance, we needed an entry-level color computer."

For Riley and Brunner, the primary focus was the CPU box, which contained the motherboard, drives and other components in a colpact array, and thus had to be as small as possible. Initially, the explored many different directions. "I've always felt that once y explore one idea, you should put it aside and develop another, the another, pushing yourself until you can't come up with anything els says Brunner. "That way, it's unlikely you'll stop before you discout the right answer." Among the concepts were: an "intelligent" keyboa with the motherboard tucked inside; a flat luggable design similar H₂O; a simple book shape; and a boombox with a handle on top.

As work progressed, Ray Riley would update Jean-Louis Gass on Elsie's status: "If Jean-Louis liked what he saw, he would pull r into an executive meeting going on next door. February and Mar were the wackiest time, because the executives were sweating a going crazy ... telling us that LC was the most important product Apple's history and would drive Apple's entire product strategy I years." At that point, Sculley got involved. "I would get phone ca from John Sculley, faxes from Sculley, sketches from Sculley, whi led to three-way conversations between Sculley, Brunner and m says Riley. "At first, it was great working with the CEO ... but, later o I realized that Sculley was so in love with the process, he had troub deciding which direction to pursue."

Every two weeks, after Sculley, Riley and Brunner had go through another round of discussion, a meeting would take pla with the other executives, at which point, Sculley would become ne vous and the focus would shift: from pizza box to smart keyboar from smart keyboard to transportable; and back to pizza box agai

"At one point," says Riley, "Jean-Louis Gassée told me that the pizza box 'sweats too much.' I had no idea what that meant, be there was no sense in asking, because Jean-Louis often made weil remarks just to shake things up." Compared to the wishy-was approach of most executives, Gassée's spirit impressed Rile "Having already climbed the executive intimidation curve, I liked I in-your-face attitude. Unlike Sculley, Jean-Louis enjoyed slugging

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at verbally." Like Steve Jobs, Gassée viewed conflict as part the creive process, as necessary as a negative pole is to a battery. "Jeanbuis understood that when you take a good idea and apply some ressure, a great idea often pops out the other end. He always disusted first impressions, even his own. So he would push people ith good ideas again and again." Yet the results could be stressful.

As the program neared completion, the dynamic among the exectives became really intense," says Riley."At one point, during an gument over which concept was more portable, Alan Loren [the ewly-named president of Apple USA] got up, grabbed the pizza ox model and started waving it above everyone's head shouting, ook, this is portable!' I think Gassee was worried that Loren was bing to hit him with it. At that moment. I half expected the guys in thite coats to burst in and take us all away."

Eventually, Brunner and Riley boiled their work down to three oncepts: a small book-shaped CPU that could stand upright next to display; a rectangular boom box with a shoulder strap on top; and pizza box with SnowWhite lines on the top and sides. "It was ovious which design was best," says Riley. "But John just couldn't take the decision. So he did something that I'll never forget. He taked up the three concepts, put them on his secretary's desk outde the conference room and asked her to choose. She looked at term for about three seconds and said she liked the pizza box. So nat's the one we pursued."

PIN MACINTOSH IISI

PLATES 150-153

idustrial Design: Apple Computer: Larry Barbera; Eric Xanthopoulos, ike Milo, Ken Weber, Les Anderson, Chris Novak, product design; atrix Product Design (Palo Alto, CA): Mike Nuttall, Mark Biasotti *ates of Design:* January-June 1989

troduced: November 1990

naware of the design Brunner and Riley were creating for the acintosh LC, Larry Barbera and Mike Nuttall designed the Mac IISI is a scaled-down version of their earlier desktop Columbo concept. The two key elements of that earlier design—a curved front and a ght relationship between the CPU box and the display—were inplemented and simplified. The challenge was to integrate the CPU and display so that they would work visually like an all-in-one unit et remain separate components.

The relationship of the CPU and display were the signature stateent," says Nuttall. "We designed them as a pair. But instead of aking them tightly integrated, we relaxed the relationship just a t. The monitor and CPU conform on the front and sides, but they on't look like they're permanently attached. If you line up the disay and CPU, then stand back and squint, they *almost* look like an cersized all-in-one Mac." To give the screen a more comfortable ewing angle, both the front bezel on the SI display and the front "the SI box tilt back 5 degrees. The most interesting part of the splay is the oversized "bubble" on top, which links the back of the bezel to the monitor's rear bucket, giving the product a sense of movement that breaks the monotony of the SnowWhite lines.

AFTER MONTHS OF SEPARATE DEVELOPMENT, THE COMPLETED MACINTOSH LC and Mac IISI designs were finally put side by side in June of 1990. "By that time, management decided that the two products should look like they belonged together," says Ray Riley. "So we tweaked the LC to make it conform to the SI box and made LC's monitor fit more tightly on the CPU." Since the SI box has a 50-inch-radius curve across the front, Brunner and Riley gave the LC the same curve, which made it seem even more friendly than before. When Gassée saw the curve, however, he vetoed it—only to have his ruling overturned when the rest of the Elsie team took a vote. The result was 23 to 1. When Sculley was consulted, it was 24 to 1. So the curve remained.

Brunner and Riley then borrowed drawings for the SI's color display from Mike Nuttall to design a small black-and-white display for Elsie, code-named **Jersey**, and a color version, code-named **Rubric**. Because the rear bucket on Jersey/Rubric is smaller than the bucket on the SI display, the "bubble" on top of the LC display is exaggerated, which makes it seem more playful. In exchange for the drawing, Riley allowed the SI designers to use the pebble-shaped microphone that Ray Riley and Lunar's Ken Wood had designed for the LC/SI's built-in sound recording circuitry.

"Even though the microphone was the smallest thing we designed"—there was no code name—"it set the tone for the program better than the CPUs or the displays," says Riley. Coming at the end of the project, neither Riley nor Wood had the time or energy to design the microphone from scratch. Instead, Riley gave the dimensions and some rough ideas to Mark Edwards at Satellite Models (a local model shop that does work for Lunar) and asked him to make some foam sketches. A day or two later, Ken Wood picked a spherically-shaped form, and added details that allowed the microphone to hang from a monitor, clip to a user's shirt or function flat on the desktop. Eventually, the microphone received more design awards than Elsie or Spin.

'Two new keyboards completed the ensemble: the Extended Keyboard II (code-named **World**)—designed in 1988 by Stephen Peart, Brad Bissell and Stephen MacDonald of Vent Design; and the Apple Keyboard II (**Putter**)—designed by Riley and Brunner which remains Apple's standard entry-level keyboard to this day.

FOR APPLE, THE DESIGNS OF ELSIE AND SPIN WERE NOT ONLY A HUGE SUCCESS in monetary terms, but they also represented the first step toward a new design language that Bob Brunner would spearhead in the years to come. Though still rooted in the SnowWhite vocabulary, the designs avoid the rigor mortis of frogdesign's "corporate" SnowWhite designs by mixing Germanic purity with a California sense of liveliness and, in Elsie's case, humor. "The slots are still there, the groove across the front is still there, and the color and texture are the same. But the attitude is completely different," says Ray Riley.

A key element of the Elsie design was the tiny plastic foot that lifts the front of the box by five degrees, giving it the quality of a small friend or desktop pet looking up at you. "Raising the pizza box on a foot became the icon statement."

In one way or another, the upward tilt on the front of Elsie would inform every Apple CPU for the next five years. Yet Lunar's Ken Wood says the real reason for the foot was neither philosophical nor aesthetic: "We needed the foot to allow enough space for a floppy disk to be inserted over the keyboard. We were so focused on making Elsie flat, we forgot to allow enough clearance for the floppy when a keyboard is pushed up against the unit." Bob Brunner agrees. "We weren't trying to create an overt metaphor," he says. "We wanted to give Elsie an animated quality that most computers lacked."

A New Icon. On a formal level, the Macintosh LC became the fourth Apple CPU to reach true icon status: a group that includes the Apple II in 1977, the Macintosh in 1984 and the Macintosh II in 1987. But if the Mac II represents the ultimate modernist statement, Elsie is postmodern. "It's not just a box," says Ray Riley. "It's a box with attitude." In the process, Apple made a crucial turn away from low-volume/high-margin products to low-margin computers geared for the masses. And Bob Brunner was on his way to becoming Silicon Valley's next design star.

The Giugiaro Memo. Following Richard Jordan's meeting with Giugiaro in May and the signing of contracts in June, Larry Barbera sent a lengthy design brief (stamped "Apple Confidential" in bold red letters) to Giugiaro in late July. Titled "Apple Strategic Industrial Design Program," the paper outlined Apple's future product strategy and described the work that Giugiaro was expected to perform in the fall. The main task was "to create a new design language for Apple Products that encompasses and extends the current design language into three product categories: a 'power products' category that will introduce RISC architecture into Apple product offerings; a 'mid-range' category currently described as the Macintosh family; and a portable products range based on utility and performance characteristics."

"The New Language must create visual differentiation between product families while maintaining a strong corporate image."

The "power product," code-named **Jaguar**, was described as "a new hardware platform that Apple had been developing to replace the existing Macintosh architecture ... Jaguar is sophistication, power and elegance ... for users who take pride in what they do, who they are, and how they think and communicate. Users will be discriminating people who redefine the limits their world. Therefore Jaguar must have extremely high 'object' value to appeal to one's sense of beauty, power and accomplishment, much like a fine automobile ... [and] express the marriage of high technology and fine art."

The "mid-range" design exercise, called for Giugiaro to create the new Macintosh design language, giving the Mac "a distinct visual element all their own that says 'Apple.' This distinction is in color, form, attention to detail, and quality commitment to tech ogy and engineering, to give the customer the very best. As product line matures over time, words like 'familiar.' 'stable.' 'intuitive' come to mind; but never boring! Always pioneer People develop friendships with these machines, and they car counted on to always be there for you. ... [The Mac design langua is our hardware 'look and feel' just as our user interface is kno as the Apple 'look and feel.' "

FIGARO

Shortly after Richard Jordan met with Giugiaro in May, anot Apple designer named Sue Booker visited Turin on a different r sion. A human interface designer assigned to Jean-Louis Gasse Special Projects Group, Booker had been working for more tha year on a product unlike anything Apple had ever attempted hand-held computer shaped like a tablet, allowing the user to in data using a pen rather than a keyboard. The machine would tl translate the user's handwriting into computer code and store it j like a desktop computer. Directed by engineer Steve Sakoman a a small army of technicians and software writers, the goal was create a "personal digital assistant," a real-world version of Jo Sculley's Knowledge Navigator.

Code-named Figaro, it was designed to be a "no-compron product," says Booker, "dark and sensuous, with a touch-sensit active matrix screen, a pen for controlling the user-interfiinputting data using handwriting recognition software, a miniat hard disk, an infrared transmitter and receiver for beaming data fr one unit to another and a spread-spectrum attachment for beam data across town or across the country.... very cool"—and expensi with a target price of \$6,000, as much as a fully-loaded Macintosł Yet if it was successful, Figaro would transform personal comput in the 1990s the way the Macintosh did in the 1980s.

In May 1989, after two years of exploratory research, SPG's en neers settled on the basic size (8.5-by-11 inches), shape, screen s and internal components. Yet no one knew how the machi should look.

"As a totally new product, Figaro's industrial design was as imptant as the hardware and software," says Sue Booker. "But we h no confidence in Apple's in-house design group and didn't liked t "Silicon Valley look' that most computers had at that time. In fact, w didn't want Figaro to look like a computer at all. In our minds had to be personal and unique. So we arranged a friendly competion and sought out top designers who had done great work. In never designed a computer before, to see what they would do

After a brief search, Booker invited three consultants to supp concepts—Milan designer Ettore Sottsass, the New York firm Sm Design, and the Los Angeles-based designer Doug Patton. Each w given the basic dimensions and specifications and asked them oduce two finished hard models. Then, to give the field a more ternational flavor, Booker invited Giorgetto Giugiaro to participate, naware that Richard Jordan had just signed him to create Apple's windustrial design language. After hearing the scheme, Giugiaro reed and signed a contract in July, just as Larry Barbera's "Strategic Program" reached his desk.

DWAY THROUGH THE FIGARO COMPETITION, DOLG PATTON, TRAVELLED UP om Los Angeles, consulted with Booker, then sauntered into chard Jordan's office to discuss another matter—carrying one e Figaro concepts under his arm. Since few people outside the becial Projects Group knew about the project, Jordan took a ng look at Patton's model and was so impressed he gave him to 'quickie' projects that had just crossed his desk: the entryvel product in Apple's low-cost computer family, code-named O., which would ship as the Macintosh Classic, and a small ink printer, using a recently-perfected Canon mechanism, codemed Franklin, which would become the StyleWriter.

O. MACINTOSH CLASSIC

dustrial Design: Apple Computer: Mark Pruitt; Bill Bull, Scott mpbell, Terry Smith, product design; Patton Design (Irvine, CA); pug Patton, Rick Jung, Dennis Grudt

ites of Design: August-December 1989

troduced: November 1990

sed on a new low-cost chip set conceived by engineer Paul ker, the Macintosh Classic replaced the Macintosh SE with a simer enclosure closer to the original Macintosh than the SnowWhite nguage it replaced. As the entry-level product in Apple's lowaced computer family, it had the same upright stance, head-like esence and 9-inch black-and-white display as the previous all-ines. Yet the Classic's design had one key difference: it was so costfective that the standard version would be available for just \$999. esigned for automated assembly at Apple's Singapore factory, the oduct had a smaller motherboard, no internal expansion slot, no iversal AC power supply (it only worked with voltage in the untry for which it was sold) and no case-mounted controls except a simple on/off switch (display brightness was controlled by tware on the screen).

With little time and a small design budget, Doug Patton simplified e basic Mac SE shape, preserving the original part line between the zel and rear bucket and groove across the front, and removed or oothed out the SnowWhite details that no longer fit with Apple's w look. The tight vertical ribbing at the foot of the SE was blaced with soft horizontal vents. To establish kinship with Elsie d Spin, Patton also softened the front bezel, giving it the same 50th radial curve—in the process creating an enclosure that looks markably (yet unintentionally) like the frogdesign concept for the cintosh Plus that Apple rejected back in 1984. Few enjoyed the X.O. design more than Apple's marketing staff. "The Classic was great, because its design returned the Macintosh to the original icon," says worldwide marketing chief Satjiv Chalil. As the launch date approached, advance orders were so immense that Apple—in a clever a marketing stunt—parked a fleet of Boeing 747 cargo jets near its Singapore facility, filled them nose-to-tail with Classics and flew the first shipment to North America amid a wave of publicity.

FRANKLIN STYLEWRITER

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PLATE 157

PLATE 155

Industrial Design: Apple Computer: Mark Pruitt; Azad Khodai, John O'Brien, product design; Patton Design (Irvine, CA): Doug Patton, Rick Jung, Dennis Grudt

Dates of Design: August-December 1989

Introduced: November 1990

Awards: I.D. Design Review, 1991

Unlike the Macintosh Classic, the StyleWriter was totally new technically, aesthetically and spiritually. Using a small low-power ink-jet mechanism invented by Canon, Apple's printer would be the first to incorporate it, which gave Apple wide latitude in terms of design. Phase One consisted of a dozen sketches and foam models, one of which showed a narrow box standing upright on a slim platform. "That idea seemed the most compelling," says Patton, "but Apple and Canon didn't like it, so we continued exploring." Designing the product required Patton to work all week, deliver a concept on a Friday, "then get a message from Apple on Saturday that a specification had changed and work all day Sunday so that Apple could see a new concept on Monday," Patton says. During one of these round-the-clock sessions, Patton became disenchanted with the direction the design was taking and changed the entire look of the product on his own. "I noticed that the printer's circuitboard could be stored flat in the base, and that the printer engine could be turned 90 degrees, resulting in an upright design that looked like my early sketch," he says. Suddenly excited, Patton then treated the printer and sheet feeder/base as separate parts that docked together, allowing the paper to feed in at the top and flow out the front. Initially, the product designers were perplexed. But when Gassée saw the design, he approved it. Patton also designed a battery-operated Stylewriter concept that could be folded into a compact shape and carried in a briefcase. But the product designers rejected it. Ironically, John Sculley later wondered why no one had thought to do a portable StyleWriter. The product designers didn't dare show him Patton's model.

Because of its slim profile and low price, Apple sold more than one million StyleWriters in its first year, an astonishing number at that time, and racked up total sales of more than three million before the design was updated. As a design icon, the StyleWriter's proud upright stance exudes a sense of confidence that few low-priced printers can match, even today. Like the LC, it had attitude, setting the pattern for an entire line of Apple ink jet printers that would look and feel unique.

CAPRICCIO PERSONAL LASERWRITER

PLATE 154

Industrial Design: Apple Computer: Gavin Ivester; Danny Pratt, product design

Dates of Design: October 1988-May 1989

Introduced: September, 1990

Awards: I.D. Design Review, 1991

The final component in the low-cost computer family, the Personal LaserWriter, intended for home and small business use, may be the most distinctive product in the entire group. After the tedium of designing SnowWhite boxes in 1987 and hand-holding the Macintosh Portable in 1988, its designer, Gavin Ivester, wanted to take the printer in a bold new direction. Inspired by the work Larry Barbera and Mike Nuttall had done on the Columbo tower, Ivester divided the printer into two parts, with the user interaction components pushed forward, and the other volume, containing the machine components, pushed back. The size and shape of Canon's engine governed the angle of the paper exit tray. Yet the odd angle made the printer look massive. To relieve that problem, Ivester cut a notch on the side of the case in an area that Canon didn't expect. "The notch became a big issue until we persuaded Canon that it helped to balance the design." Another point of interest is the exit tray, which features a 'swimming pool' that prevents the paper from sliding off the back of the printer. On earlier printers, Canon had used an adjustable peanut-sized stopper at the end of the exit tray to hold the paper in place. Yet very few people ever adjusted the stopper when changing from letter- to legal-size paper. "The stopper idea makes no sense for Macintosh users, because all printer functions are controlled from the computer," says Ivester. "With the Mac, you shouldn't have to touch the printer except to turn it on and occasionally refill the paper. So I designed the 'swimming pool' to collect letter-sized paper in front of the pool and allow legal-sized paper flows into the pool area and bumps up against the high wall at the far end. This prevents the paper from being pushed out the back. It's unobtrusive. It works every time. And it requires no intervention or adjustment."

ONCE THE MAC LC, IIst, MAC CLASSIC, THE STYLEWRITER AND THE PERSONAL LaserWriter were finished in the fall of 1989, the reaction within Apple was enormous. A year earlier, the company's back had been against the wall. Now it had five new products that would turn things around.

Yet Richard Jordan was unhappy, Eight months into his search, he still hadn't found a new manager for the Industrial Design Group. "I was depressed that none of the people I'd interviewed seemed right. Then I realized that all the best candidates were right under my nose. They all worked here in the Valley." His favorites were Mike Nuttall at Matrix and the guys at Lunar Design. "Every time I visited Lunar I saw something great. But I didn't know who was making it happen. I asked Gene Kunitomi to find out." Quickly, Kunitomi set up a meeting between Jordan and Bob Brunner.

At the meeting, Jordan skipped the formality of an interview soffered Brunner the job. "I told Bob that he would have a free has to run the department and do anything he wanted. I expected him accept right away, Instead, he looked me in the eye and said m was astonished."

So was Brunner. "Richard had spent months courting Giugiaro talking to everyone in the world about the ID management jo assumed the decision had already been made. So his offer really prised me. Since Apple had only five in-house designers at the ti and did 90 percent of its work through outside consultants, I saw job as maintaining the status quo. I didn't see any chance to set a r direction, so I passed. Besides, I was having too much fun at Lu to take a corporate job."

Wondering what went wrong, Jordan assumed that word of offer had leaked out prior to the meeting, decided the leak n have come from his own design staff and promptly chewed th out. For some reason, he singled out Mark Pruitt, telling him "Watch out or you'll be outside painting stripes in the parking As it turned out, there had been no leak. But as word of Jord eruption rippled though Silicon Valley, Bob Brunner realized Jordan's interest in him would not soon go away.

PLATES 158

THE FIRST FIGARO COMPETITION

By September 1989, Giorgetto Giugiaro, Smart Design, Pa Design and Ettore Sottsass delivered their Figaro concepts to Booker. As she had hoped, the ideas spanned a wide range. most unusual concepts were by Smart Design. One was wrapped a subtly-shaped aluminum skin with a stylus that looked like a p of weathered ivory. The other was a slate computer suspen inside a shiny round hoop that encircled the product, with the between the hoop and CPU filled on the left with a fabric-cove speaker and battery. Above and to the right, the space was open, allowing the hoop to function as a handle, or pivot and into place, allowing the computer to stand upright on a deskto

Doug Patton's concepts reflected southern California high-t slick and tightly conceived with a soupçon of color and tight de ing. Sue Booker described them as having "more details per sq inch than the other three designers combined."

By contrast, Ettore Sottsass' work was very simple with little d or thought given to Figaro's metaphorical possibilities.

Between these extremes, Giugiaro proposed three straightforv slate concepts, including a black model with straight sides, a thir vertical stripe, and a soft bulge at the top, which contained battand served as a handle, similar to the handgrip/battery pack or recently-completed Nikon F4, which also had a single red verstripe. Booker described it as "basically the Nikon F4 wrapped are a Figaro form factor. There were no pens or buttons or speaker h And the display has just a plain painted background. Compare Smart and Patton, Giugiaro knew very little about computers, w helped him, because he had fewer preconceptions. As a lesigns were less threatening." After an internal review and up testing, the result was unanimous. "Everyone we conferred Giugiaro's work," says Booker. When Richard and the news, he was pleased, since it confirmed his decire Giugiaro for Jaguar and the Mac design language pro-December, Giugiaro began work on a new set of Figaro for further testing, which would then lead to production.

PLATES 164-167

rst attempt to develop a RISC-based architecture, codeguar, was conceived by the computer scientist Hugh obs-like visionary who held enormous sway within Apple e late 1980s, and Tom Bentley, a Stanford-trained product and ex-PARC researcher. Previously used in high-end worknd minicomputers, RISC (short for Reduced Instruction Set ag) microprocessors handle data differently than the CISC a Instruction Set Computing) chips used in earlier Macs. g at much greater speed and processing data in smaller RISC processors could give desktop computers enough or high-end applications such as videoconferencing, 3-D and real-time video editing.

ping RISC for Jaguar required Apple to coordinate three parrts: chip research, software and engineering/design; with artin directing the first part, Apple's software chief Roger randling the second and Tom Bentley managing the third. planned their strategy, Martin and Bentley realized that the ntosh had become a classic not because of its performance, use of its user interface and friendly design. By developing s industrial design, engineering and software concurrently an as separate elements, Jobs and the Macintosh team had in icon that Martin and Bentley wanted Jaguar to emulate. e. Jaguar's ID and engineering were developed in parallel, m Bentley given carte blanche to develop designs that isually express the performance and expandability that the form would deliver.

component on Jaguar had to combine original invention at industrial design, the same ingredients found on the origintosh," says Bentley. That meant the team needed the most product design horsepower in the Valley"—such as Bill Matt Herron and Lorenzo Dunn—"plus the best ID Apple nd"—such Bob Brunner at Lunar Design, Mike Nuttall at Ray Riley working at IDg, Design Edge in Austin, Texas and, orgetto Giugiaro in Turin.

g each designer a theme. Bentley managed the effort with fficiency. "Basically, we would get Bob, Mike and Ray r, and say, 'Bob, your work isn't quite as good as Mike's here re,' then we would say to Mike, 'Bob's work is more powthese other areas,' then say something to Ray Riley and

hope that the three of them would juice each other up and produce better designs working against one another than they would working on their own..."

For Mike Nuttall, the goal was to "develop a new icon for a powerful computer. We explored a lot of ideas, from brainy-looking black cubes to displays that had a sense of mass and groundedness with a floating control panel on the front. Around the back, the designs had simple forms with strong graphical vent treatments."

One concept featured triangular freestanding units with a CPU and loudspeaker in one, matching loudspeaker in the other and a monitor in the center, with perforated holes that suggested heat rising from the desktop. The black cube, which contained a liquid cooling system that allowed it to be completely sealed, had a monitor that contained the entire user-interface (switches, speakers, floppy, CD-ROM) beneath the display. "With Jaguar, we never saw our work in terms of 'What's the right idea?' Bentley wanted to have many alternatives on the table, which was very unusual at that time." Nuttall's best Jaguar concept was a white display that had a bellows treatment at the base around the back and a sweeping surface behind the bezel that latched onto the display bucket in a very sculptural way.

Emulating the NeXT Computer, Ray Riley made a series of black and purple concepts with smooth surfaces and clean edges.

At Lunar Design, Bob Brunner generated a number of foam concepts, which led to two finished designs: a white concept with a tower-shaped CPU, a large screen display with stereo speakers tucked into the base and a satellite unit on the right containing I/O ports and a slot for mouse storage. The expressive rear profile bore a vague resemblance to the sweeping bezel-and-bucket treatment on Mike Nuttall's white display, yet conveyed a sense of total domesticity. "It reminded me of a Krups coffee maker," says Riley.

Brunner's black design was something else again: an all-in-one unit with monitor and CPU mounted on a tilt/swivel base and loudspeakers, floppy/CD-ROM drives and mouse storage slot mounted on a floating 'chin' beneath the display that Brunner angled toward the user, balancing the effect by tilting the bezel above the chin backward a few degrees. Round bulges over the speaker elements on the chin visually convey the idea of sound pushing out. Meanwhile, around the back, sharp saw-tooth venting on top played counterpoint to soft, rounded shapes at the bezel's rear. Bold in concept and execution, the Brunner black concept would play a pivotal role in shaping Apple's next industrial design language.

As THE FIRST ROUND OF JAGUAR DESIGNS CAME IN, TOM BENTLEY AND HIS cohort Bill Burnett decided to "turn up the volume," says Bentley, by hiring the Austin-based firm Design Edge. Operating far from Silicon Valley, Design Edge had a completely different take on desktop computing and produced a series of concepts that mixed postmodern wackiness with details, such as a display mounted on a shiny metal rocker, that could have served as props in the futurist film *Brazil.* "The work was interesting," says Bentley. But interest ceased the moment John Sculley had a look.

"John had a habit of visiting early in the morning to check our progress," recalls Bentley. "One morning, he popped in, saw the Design Edge stuff and said, 'Tom, do you like this stuff?" Without thinking, I replied, 'Not really...' Sculley shot back, 'Then why are you showing it to me?' " While Bentley fumbled for an answer, Sculley walked out.

"We stopped using Design Edge at that point," says Bentley. Meanwhile, the rest of Jaguar remained on track, with Nuttall, Brunner and Riley working on parallel paths toward a goal that no one could predict.

BOOMBOX PORTABLE COMPUTER CONCEPT PLATES 174, 175 Industrial Design: Apple Computer: Ray Riley; Lunar Design (Palo Alto, CA): Robert Brunner and Ken Wood

Dates of Design: September-November 1989

After the success of the Mac LC, Ray Riley and Bob Brunner designed another series of concepts that were similar to LC but smaller, giving the product a more interesting shape. Depending on user preference, the concept could be used with an external monitor. TV or detachable flat-panel display. Calling their design BoomBox, Brunner and Riley showed how existing LC components could be used to target buyers who would never consider using a desktop Mac. One idea was for a small "fun box" similar to a portable radio/cassette player. Another concept had an integrated flat panel display with a keyboard that snapped to the side. Another concept had a vertical orientation with a jet black finish and bright yellow feet. As support for the pizza box LC grew within Apple, interest in Boombox faded. Yet Richard Jordan's interest in Bob Brunner would not go away.

IN NOVEMBER 1989, WITH THE ID MANAGEMENT JOB STUL OPEN, RICHARD Jordan hatched a plot to convince Bob Brunner to change his mind. As Brunner's partner Gerard Furbershaw recalls: "Jordan convinced the headhunter to call Bob's wife Carrie at home, telling her that turning Apple down would be the biggest mistake of Bob's life. When Bob heard about the call, it really shook him up. So he called the headhunter and gave him a definite No. Then, before Bob could get off the phone, the headhunter asked, 'Why don't you come down to Apple and give us some names of other candidates for us to interview?' "

Brunner agreed. As soon as he arrived to give Kunitomi his list, however, Richard Jordan appeared and made one final offer, adding that he wouldn't take "no" for an answer.

For Brunner, turning down Apple twice wouldn't be easy. "By November, Richard was desperate," he says, causing the offer to rise accordingly. "But I still had no interest in joining Apple just to manage a bunch of consultants, especially Giugiaro. Being a consultant myself, I realized that managing a 'superstar' could be tricky if design wasn't exactly what Apple needed."

This left Brunner in a quandary. "I could see that no one was t ing advantage of Apple's design potential. The company had gr products and was driven by product design. But its industrial des was adrift." Nothing had yet been done to replace SnowWhite.

"Adaptations of SnowWhite, like the LC, couldn't go on forevasays Brunner, "particularly since Apple was developing whole nlines of business—portable products, consumer Macs, high-eproducts like Jaguar and palmtop computers—for which SnowWh wouldn't work." With so many new products under developme "Apple's design would sink into chaos without a new language replace SnowWhite." To do that, Brunner suggested that Apple u its in-house design group to rediscover its identity and not rely superstars like Giugiaro to save them.

After dozens of interviews with high-flying design managers a consultants, Jordan had grown weary of advice from designers. Y for some reason, he believed what Brunner was saying. Was because Brunner had already turned down the job? Was it becau Brunner had designed LC, which everyone said was superb? Or w it that Brunner had explained in five minutes what it had tak Jordan a year and a half to discover?

Whatever the reason, Jordan decided that Brunner was the rig choice, and laid it on the line. If Brunner agreed to join App Jordan said, he would have a free hand to remold the Industr Design Group however he saw fit. And, if necessary, Jordan wou "give" Giugiaro's contract to Tom Bentley for use on Jaguar so th Brunner would not have to manage Giugiaro directly.

For Brunner, it was an amazing offer. He knew that Apple's desi culture was second to none. Even though Hartmut Esslinger h been gone for nearly four years, a foundation was still in place th Brunner could build upon, a level of taste unlike that of any oth company, a passion for quality, a respect for the user and a willir ness to give products detail that bordered on the obsessive. At App there would be no arguments with engineers over drafted enclosure ugly box construction or dull colors and textures.

"I recognized that the people who cared about design at App weren't only at IDg. They existed throughout the company," sa Brunner. The opportunity at Apple was so huge that Brunner deci ed quit Lunar and begin work at IDg in January, 1990.

Mr. Bentley Goes to Turin. (Plates 168–173). After meeting wi Bob Brunner and hearing his misgivings about Giugiaro, Richa Jordan then met with Jaguar's design manager, Tom Bentley, to mal him an offer he could not refuse. As Bentley recalls: "Richard came ov to look at the Jaguar models, then shrugged a little, and asked me, 'Car you up the ante a little?' I told him that we had three design teams and that we were spending \$100,000 a month on ID alone. But Richa said that we needed to get an international perspective and suggeste that I contact Giorgetto Giugiaro." ŧ.

Since Apple already had Giugiaro under contract, there would be no oblem with Bentley working with him. Jordan would handle all the perwork and offered to have Larry Barbera accompany him to Italy and ake the introductions. "Richard never said what percentage of Giugiaro's ne we were supposed to use. So I decided to go to Italy and work until meone told me to stop" —which was exactly what Jordan wanted.

Compared to the engineers he had dealt with in Cupertino, Bentley nsidered working with Giugiaro the thrill of his life. Yet he found the ce in Turin a little ... different. "Instead of arriving at six or six-thirty the morning, I was told not to arrive until ten," Bentley recalls, "We buld work for an hour. Then break for coffee at eleven, work for other two hours, have a long lunch, then work for another two hours til four-thirty, when Giugiaro would head off for Ital Design, to work his car projects."

The biggest surprise for Bentley was how different Giugiaro's design ethod was from Mike Nuttall's and Bob Brunner's. "Instead of using ancore or RenShape to make models, they used clay. When I asked in about it, Giugiaro explained how he designed cars, using clay to velop a feeling for form, then sketching ideas on enormous sheets of per using a big fat pencil."

Instead of working from the inside-out, starting with the circuitboard d other components and building the design to fit, the method that ost designers in the Valley use without even thinking, Giugiaro signed from the outside-in.

With a Mike Nuttall or a Bob Brunner you always had some idea of the sign you would get," says Bentley, "because the two of them had probly designed something like a hundred computers between them. perience is good, but it also results in work that is sometimes ... pretable. Giugiaro was different, because he had no preconceptions. Since had never done a computer before, he might design something that ould change the world.... Or he might do something that was useless." While in Turin, Bentley saw final designs for the Nikon F4 camera and oncept car for Bugatti that he considered a masterpiece. "If we could t get Giugiaro to do that kind of design for Apple, our products would the best in the world." The problem was how Bentley would work h him. "I didn't want to travel six thousand miles and not get someng better than I could have gotten from Brunner or Nuttall." So Bentley ndled Giugiaro in the only way he knew how: by pushing him-hard. According to Larry Barbera, who accompanied Bentley to Turin and served the November sessions, "Tom tried to tell Giugiaro how to sign the concepts... He would say, 'No, you can't do it that way. Do it s way ... put a curve bere ... a straight edge there ... Do this... Do that.' nenever Tom saw something he didn't like, he threw his weight around. ing 'No ... This is for Apple Computer! We do things this way ... '"

The clash was too painful for Barbera to watch. "Even though agiaro was doing his thing, he didn't seem to be working the way ntley thought he should.... But Tom is an engineer and was in no sition to judge To get things moving, Tom really laid into agiaro. In the process, he sent Giugiaro down the wrong path during the concept phase, which is critical to the final design."

At one point during the November sessions, Giugiaro and Molineri pulled Barbera aside. "They wanted to know what was going on ... why Bentley was interfering ... and what did I intend to do about it." But there was little Barbera could say, since Bentley outranked him by a wide margin. "I told them that Tom was managing the design on Jaguar .. that he was an engineer, not a designer ... and that he has a big ego. He's determined to put his mark on *your* work." The result was a disaster.

"I told Giugiaro that I would try to help him, but that I couldn't do much more," says Barbera. "He just shrugged his shoulders. He seemed turned off by the whole situation, and the work showed it."

According to Barbera, "Giugiaro's first models looked like old-world Italian automotive design colliding with California high-tech. Since the two don't mix, the result looked really strange, which is not surprising when you consider the input Giugiaro was getting from Bentley."

Back in Cupertino, Barbera asked Richard Jordan about Bentley's behavior and was told not to interfere. "Even though I had helped negotiate the deal with Giugiaro and drew up the design brief myself, Richard told me that Bentley now owned the Giugiaro situation ... and that I shouldn't talk to the Italians anymore." This news stunned Barbera. After travelling around the world to locate Giugiaro and watching as Jordan signed over \$900,000, Barbera couldn't believe that Jordan would waste such a valuable asset.

"After listening to Richard, I assumed the Macintosh design language project that I'd outlined for Giugiaro in July was now dead," says Barbera. "Since Giugiaro's designs for Jaguar were also in doubt, our whole reason for hiring him was about to go down the drain."

Then Jordan dropped another bombshell in Barbera's lap. While he and Bentley were in Turin, Jordan said he had finally hired Apple's new Industrial Design manager, but couldn't announce the name until the end of the year. As Barbera absorbed this news, he recalls, "I tried to figure out who my new boss would be. But after what I'd just heard about Giugiaro, I wasn't thinking too clearly."

THE APPLE INDUSTRIAL DESIGN GROUP

"Be careful what you wish for." —Old Spanish Proverb

On January 3, 1990, the day Bob Brunner joined the Apple Industrial Design Group, a new era began. As Gavin Ivester recalls: "The day Bob walked in, he knew exactly what he wanted, which was a new experience for us. He laid down three ground rules. He wanted the Design Group to function like a consultancy, responding quickly to requests and operating with maximum efficiency, the way Lunar did. But as a consultancy, we would have only one client: Apple. Bob also wanted to create a new design language to replace SnowWhite, which we all saw as a good thing. And he expected to do at least part of the design work himself, which is something most design managers wouldn't even attempt."

Brunner then set two goals for his new design team to work on

simultaneously. With Tom Bentley insisting that RISC represented the future of computing, the first priority was to finish the Jaguar concepts. Then, listening to John Sculley, who insisted that laptop computers, not desktop boxes, represented Apple's future, Brunner wanted to pay close attention the PowerBook. Already shaping up to be the most important project since the original Macintosh, the PowerBook would not only steer Apple away from its dependence on the desktop and give buyers what they wanted—a Mac small enough to slip into a briefcase—it would springboard IDg to new prominence within the company and make Bob Brunner one of the most celebrated industrial designers in the world.

JAGUAR, ROUND TWO

PLATES 176-179

The first order of business was Jaguar. "After Bob settled in, we met with Jaguar's design manager, Tom Bentley," recalls Ray Riley. In January 1990, they were only halfway into the program and needed to double their efforts. Thus far, Bentley liked Ray Riley's, Mike Nuttall's and Bob Brunner's concepts. John Sculley had given Design Edge the thumbs down. That left only Giugiaro to consider. Following up the November sessions with Tom Bentley, Giugiaro and his designers had delivered a set of half-scale foam models that Bentley seemed to like. Yet Brunner was surprised by their odd appearance and funky retro styling.

"First Ray [Riley] and I opened the cartons, took out the models," Brunner recalls, "then we looked each other and said, 'My God... How are we going to use this stuff?' At that point, I realized that Giugiaro was not right for Apple. But Richard Jordan had already signed a big contract and wanted it to work. As I looked at those first models, however, all I could think about was how to end this situation as gracefully as possible."

Since Brunner and Riley had been involved with their own Jaguar designs, they were unaware of the conflict that existed between Giugiaro and Bentley during the November sessions. Tom Bentley never mentioned anything, because he had no idea that his presence in Turin had caused problems. And since Bentley held a lot of sway within Apple, Larry Barbera didn't mention anything either.

This left Brunner and Riley to wonder about Giugiaro's tiny models. "Some of them looked like 1950s televisions and some looked like 1960s automobiles, which was totally wrong for Apple," says Riley. "But we couldn't eliminate Giugiaro the way we had done with Design Edge, because Jean-Louis Gassée liked the idea of working with a European designer. Besides, Richard Jordan had invested a lot in Giugiaro and wanted to see something from it."

Brunner assumed that the tiny sketches represented Giugiaro's best efforts. But Sue Booker, who saw the November concepts in Turin while working with Giugiaro on Figaro, felt otherwise. "It was crazy for Richard Jordan to allow a non-designer like Tom Bentley to micro-manage someone like Giugiaro. Even a beginning designer doesn't like it when a non-designer gets involved during the concept phase. Expecting Giugiaro to work with someone like Bent who has no design sense at all, was a real mistake. The two of the should never have been allowed in the same room together."

For Brunner, the issue was simple: find out what the problem v fix it, and get an acceptable series of concepts as soon as poss so that the executives could review them alongside Nuttall's, Rile and his own designs. With the PowerBook looming and a dep ment to run, Brunner couldn't attend to Giugiaro himself. So gave the job to Ray Riley, who volunteered to do another round concepts with Giugiaro in Turin.

"The first models told us that the Italians had no idea what needed," says Riley, "So I had to go to Italy and establish a proc with Giugiaro to ensure that the final designs would at least acceptable."

For Riley, the situation in Turin was unlike anything he had e encountered. "At Giugiaro's studio, there were 12 Italians, 11 whom didn't speak English, on one side of the room ... and me, w doesn't speak Italian, on the other side. When Giugiaro arrived, conferred with Molineri and his two lead designers Nicola Guelfo a Sergio Casalegno, asking them: 'Where is Jordan? ... Who is this I'm working with?' " After his encounter with Tom Bentley, Giugi was not anxious to work with another unfamiliar face from Apple

"There was a lot of shouting, then they all left the room," says Ril "When Molineri explained to Giugiaro that I was a designer, not engineer, they all came back into the room and went to work."

The room had already been set up with the five tiny models or which Brunner had puzzled the week before. Riley then pulled a list and went through it item by item, discussing each model detail while a translator repeated every word in Italian.

"At first, they listened. Giugiaro was totally silent. Then the oth would start screaming, and file out of the room, forcing Giugiarc follow them and close the door, leaving me totally alone," sa Riley. "I would hear them shouting in the hall. Then they would I back in and resume as though nothing had happened. I continu with my list, showing them where we thought the designs could stronger." At that point, Giugiaro took out an enormous pencil a started drawing directly on the models, responding to Riley's co ments, while Casalegno and Guelfo looked aghast. "Then the thu of them would then go at it ... arguing back and forth ..., at whi point, the entire room would go through a violent upheaval tha didn't understand." For Riley it was an amazing experience. "Lat Molineri told me that's the way Giugiaro's people work every da

Like Tom Bentley, Riley was surprised to see that Giugiar designers worked mainly with pencils and paper, clay and woo "They didn't understand the logic of designing a computer on *computer* the way everyone in the Valley was doing," he says. " a result, their models had none of the precision that a compudesign requires." Months earlier, Richard Jordan had shipped seve al high-end Macintosh computers with software and other equi Ű.

ent to Turin, assuming that Giugiaro would use them to fulfill the ntract. "But the Italians didn't put the computers on the designers' sks. They put them in a separate room, isolated from the rest of studio, which meant that they were rarely used. In all the time worked together, the Italians didn't generate a single CAD drawfor Jaguar. Every time I turned on their computers, the last file ed was always the game file."

Riley also wondered whether Giugiaro was really doing the design. e would show up at our meetings, listen to me, draw on the mod-, and fix mistakes. But he seemed to be playing the role of design ector for my benefit. As soon as I left, he would always go back to Design to work on cars."

The difference in style between the Italians' and Apple's own signers was so profound that Riley couldn't figure it out. How ald "Il Maestro" manage to turn out superb automobiles one nute and struggle with something as simple as a computer the st? After a Jaguar session was over, he decided to find out by companying Giugiaro one afternoon his way back to Ital Design. The magic inside Giugiaro's operation doesn't happen in the sign studio. It happens in the interaction between the designers d the *carrozzerie*, the craftsmen who convert the designers' drawis into full-scale models.

As Riley watched, a designer would make a drawing, blow it up 1:1 scale, then take it to the model shop. "There the *carrozzerie* re constantly drinking coffee, bouncing off the walls, screaming, guing and working at incredible speed," he says. "They would e the drawing, and ... boom! ...something beautiful would come t that may, or may not, follow the original drawing. It was a beauil thing to watch ... but very different from the way we worked in ifornia. At Apple, the model makers always *follow* the designer's d. It Italy, it was the other way around."

tiley would have to adjust his approach accordingly. "I was in sural mode," he says, "taking it one day at a time."

EX IN CUPERTINO, WITH DESIGN EDGE OUT OF THE PICTURE AND GIUGIARO w a question mark, Tom Bentley and Bill Burnett consulted one designer for Jaguar, the Swiss visionary Luigi Colani, who hapned to be teaching at Art Center College of Design in Pasadena. own for a style of design characterized by slippery biomorphic apes, which applied to everything from furniture and high-speed ns to experimental cars that were tested at the Bonneville Salt ts, Colani frequently served as a visiting lecturer at design nools, where his eccentric ideas were considered charming.

We met with Colani at Art Center in a seminar setting," Bentley alls. First he gave a short lecture, then took questions, respondto each query with a few cryptic remarks and a signed drawing owing his idea. "When I asked him about the future for computkeyboards, Colani launched into a long diatribe comparing keyard design to the shape of a woman's derrière," says Bentley. "Since men like the woman's rear end, he said, the keys should split up the middle so that the keyboard could accommodate hands of differing sizes." Colani then made a drawing of a woman's derrière with computer keys on it and gave it to Bentley, who was almost too embarrassed to take it.

As word of the Colani incident filtered back to Cupertino, one of Bentley's colleagues purchased a plastic woman's derrière at a novelty store, glued computer keys to it in a split configuration and put it on Bentley's desk in place of his regular keyboard. "When I arrived the next morning," Bentley recalls, "every woman in the building was in an uproar. One had taped a note to my door that said, 'Men like you shouldn't be allowed in the building.' So I got rid of the prank. But the idea of a split keyboard remained ... I decided we had to have one for Jaguar."

By JUNE OF 1990, THE SECOND SET OF GIUGIARO CONCEPTS DESIGNED DURING Ray Riley's sessions in Turin, arrived in Cupertino. Very different from the concepts generated under Tom Bentley, the new work was smoother and less schizophrenic (Plates 176–179). Following the Jaguar consumer model, the concepts were white and unadorned, except for an occasional bulge or depression and automotive-style venting that was thin at the extremities and wide in the center. Building on the automotive motif, the concepts were not only streamlined, they looked like they had been designed in a wind tunnel. The best ideas centered on the display, particularly the use of broad sweeping curves where the bucket meets the back of the bezel, a beautiful horizontal curve on the small display and an bold vertical sweep on the back of the larger display.

As Brunner examined the models, "one idea that stood out was a rotating monitor base that moved the display up and down. I liked the form, the detailing and the pivot motion. But the structure would have been prohibitively expensive." he says. Another interesting detail was an elliptical depression on the tower CPU that appeared to suggest a handle. But it served no real purpose, it was just a depression. "Overall, Giugiaro's Jaguar ideas were too soft, and larger than they had to be," says Brunner. "Not knowing about computers, he did what any car designer would do. He focused on the chassis." But Apple executives felt differently.

During an executive review of the Jaguar models, says Tom Bentley, "everyone felt that Nuttall and Brunner's designs had a 'me-too' Silicon Valley look. But Giugiaro's work had a rounded, Pillsbury Doughboy look with car-like details that the executives really liked. When Giugiaro's white models were unveiled, every executive in the room loved them, and every industrial designer hated them. I considered Giugiaro's stuff interesting, because it was different and sparked a strong reaction from the senior VPs and division heads, which is a powerful thing for *any* industrial design to do."

As the executives' reaction sank in on Brunner, "it had a disquieting effect," says Bentley, "particularly since Brunner and Riley had made the effort to give Giugiaro a second chance. Even though the second set of models were better than the first, none of the ID guys liked Giugiaro's work. But Giugiaro had a giant reputation, and had already won over some of Apple's executive staff with his Figaro design, Gassée in particular. Brunner was correct that Giugiaro's models did not have the right sense of scale. They were too automotive-looking to be useful on a computer. But the executives couldn't see that."

Gradually, Bentley recalls, "a behind-the-scenes effort began within IDg to change minds inside Apple one executive at a time."

According to Larry Barbera, "Bob felt threatened by the whole Giugiaro arrangement. He feared that history might repeat itself. Management might end up falling in love with Giugiaro, the way Jobs fell in love with Hartmut Esslinger, and give all of Apple's design work to him. There was also the general feeling among Apple execs that Silicon Valley designers weren't as good as the Europeans, which Bob resented." Yet it wasn't possible for Brunner to change the mind of every executive in the company. So rather than compete with Giugiaro, Brunner played his trump card—by designing a entirely new set of Jaguar concepts that combined details from Giugiaro's second series along with elements from Mike Nuttall's, Riley's his own work, achieving a synthesis that was stronger and more coherent than anything the three designers had done on their own.

THE FINAL JAGUAR CONCEPTS

While the final Jaguar series, Bob Brunner was faced with the task of reconciling five different sets of Jaguar concepts. Design Edge's work was by far the most extreme, and could not be incorporated into the final designs. So Brunner set their work aside. He then looked at Ray Riley's concepts, which were stylish and sophisticated like Steve Jobs' NeXT computer—which made them quite different from the Nuttall and Giugiaro designs. So Brunner set Riley's work aside as well. He then analyzed the Giugiaro models, Nuttall's concepts and his own work and noticed that each set of designs had at least one element that expressed the Jaguar ethos. Yet none of the concepts, not even

"Mike Nuttall had developed a lot of good ideas," Brunner recalls, "including a white monitor with a nicely rounded back and a rubber bellows at the base. The black display that Ken Wood and I had produced was smoother and more user-centered than Mike's." The Brunner/Wood display had twin speakers and controls forming a 'chin' below the screen and an aggressive-looking back.

his own, was strong enough to stand on their own.

"As I compared the forms, I realized that Nuttall's best ideas were on the *back* of the display, and our best ideas were on the *front*, particularly the audio statement below the screen. Giugiaro had some interesting details around the base of his display. So I asked Mike Nuttall to develop a new monitor by attaching the chin from our black concept to the basic form of their display, replacing their bellows treatment with a standard tilt/swivel base" Inspired by the sculptural quality of Giugiaro's smaller display a the vents on all of Giugiaro's concepts, Brunner also suggested to Nuttall accentuate the vents on the back of the display by give them a louvered treatment with a strong graphical arc.

"By combining the best parts of Giugiaro's, Nuttall's and our c cept in one design, we came up with a multimedia display that l a sculptural presence and interesting functional details," s Brunner, who christened the new design **Telecaster**.

From a distance, the new display offered a unique profile: grace ly calm on the front, with chin-mounted controls, twin speakers is angled upward toward the user, and a vigorous back with strong graical venting. Up close, there were compelling details, small bulges of the speakers with radiating speaker holes that conveyed the idea sound moving out into space, and a microphone set into the foreh above the screen.

To accompany Telecaster, Brunner developed a toaster-sized de top CPU, code-named **Leadbelly**, based on two Lunar concepts v an upright design, an articulated curve on the front and express venting on top that echoed the venting on Telecaster. Because R technology allowed for a small densely packed circuitboa Leadbelly had trim proportions, a vertically mounted board and a gle expansion slot inside and vertically arrayed I/O ports on the ba The CPU worked well in terms of scale. To give it a sense of streer and mobility, an articulated curve was applied to the front and a bulges to the sides, suggesting legs and feet. "Hugh Martin called bumps 'mammalian protuberances," says Brunner with a laugh.

Three additional elements were: an ergonomically designed k board, called **Norsi** (designed by Mike Nuttall at Matrix), which s up the middle, allowing the user to adjust the angle of the key small router box, called **Spaghetti and Meatballs** (by Ken Wood Lunar), which connected Telecaster to Leadbelly; and a motori: mouse, called **Mojo** (by Paul Bradley at Matrix), which functioned a video-editing tool as well as a standard desktop mouse.

AFTER SURVEYING THE FINAL JAGUAR DESIGNS IN NOVEMBER 1990, T Bentley was pleased, "One of Bob's greatest strengths is his ability merge other people's ideas with his own to create something a exceeds the sum of the parts. Though many designers wouldn't the of doing that for ego reasons, combining the Matrix, Lunar a Giugiaro concepts took Jaguar to a whole new level and gave the Group the basis for changing Apple's entire design direction."

A dramatic improvement over the earlier concepts, Brunner's fi Jaguar series was so good, it forced Tom Bentley to ask the questi "Does Apple really need Giugiaro anymore?" Brunner thought ne "Even though he had done great work in other fields and w other companies, we didn't believe that Giugiaro fit well w Apple's way of working," Brunner says. "Even though their desig were full of complex geometry, Giugiaro's people were unable communicate those shapes to us in a form that we could use. The

PLATES 180-182

nly provided 2D drawings, a few cross sections and a model. iugiaro assumed that our product designers could just take their nodel and replicate it. But engineers in the computer industry need etailed information to ensure that a design will be done correctly omething that Giugiaro just wasn't prepared to give." So Brunner nded the relationship, let Giugiaro keep the equipment Apple had ent to him and decided to pursue the new design language proram within the Group.

Though Brunner was concerned about ending the deal with iugiaro, he shouldn't have been, says Larry Barbera. "By the fall of 590, Richard Jordan had washed his hands of Giugiaro. After hearing from Ray Riley that Giugiaro was not doing the actual design, ichard felt that the Italians had broken their word about not deleating the work. So Richard no longer felt any loyalty to Giugiaro. ob was his boy now, and he would do everything he could to suport him. If Bob looked good, that made Richard look good."

The Birth of a New Design Language. In time, Brunner's final guar designs would not only spark a major change in Apple's esign direction, it would outlive the Jaguar program itself. In recember 1990, after Brunner's models that had been shown witha the company and received approvals, technical problems ground the entire Jaguar program to a halt. As promised, Hugh Martin's chip researchers had completed the design of the RISC chip that lay at aguar's heart. But Apple's longtime chip provider Motorola was aving trouble manufacturing it, forcing delivery to be postponed null at least 1991. Meanwhile, a long-simmering rift between Hugh lartin and Roger Heinen, who was in charge of the RISC operating vstem, had reached critical mass.

"Even though the RISC chip would be late, Roger couldn't assure is that the operating system would be ready on time," says Tom entley. "Over an eight-year period, with hundreds of software esigners working under him, Roger had allowed our historic lead wer Microsoft Windows to slip away. Hugh Martin worried that as ong as Roger was in charge of RISC software, the same thing would appen to Jaguar. So Hugh asked that John Sculley to let him mange RISC software within Jaguar as a separate group. But that was a fficult thing for Sculley to do politically. So, in true Sculley fashon, he put off making a decision, hoping the situation would turn round by itself. Of course, it didn't."

Stymied by the Heinen-Sculley situation, Hugh Martin quit the proct in the spring of 1991, causing the whole Jaguar effort to collapse and forcing Apple to recoup its losses by striking a deal with IBM and Motorola in September 1991 to develop a new RISC architecture sing a different design. This ultimately led to the PowerPC chip that by runs on all Macintosh and PowerBook computers.

Yet Jaguar's demise did not affect Bob Brunner's industrial design. ather than shelve his concepts, he says, "I looked at the final display, eyboard, and CPU and saw a vernacular emerging that could serve the basis for a new design language that Apple needed to replace SnowWhite," It combined the same well-defined edge as SnowWhite with surface definition that was more complex and reflected light in a more interesting way. Occasional breaking or tearing of the surface heightened the sense of user-interaction, and vents conveyed the idea of air breathing through the product. And unlike those on SnowWhite, every detail on the Jaguar concepts had some underlying purpose.

"Wherever something was happening or the user touched the product," says Brunner, "we accentuated that point in a subtle way." The point where the user inserts the cable into the keyboard, for example, has a small accentuation. Touchpoints on the display invite user interaction. Cable insertion points on the back of the CPU have icons that were visible from the side of the product—no longer forcing the user to peer around the back to find the right I/O port. Bulging surfaces below the screen on the AV display illustrate the idea of sound radiating out. Strength and mobility were suggested with small bulges on the sides of the CPU, resembling muscular legs and feet.

Rather than follow the trend toward a lean vacuum-form look, the Jaguar designs had curved surfaces, a lively profile, seductive detailing and an iconic quality that was unlike anything else at the time.

"The complex surface definition and heightened sense of user interaction were very different from SnowWhite," says Brunner, "yet everyone agreed that the final Jaguar designs still looked and felt like Apple. Even though we didn't have all the details worked out in 1990, we felt they could serve as the basis for a whole new desktop design language."

APART FROM AESTHETIC AND FUNCTIONAL CONCERNS, THERE WERE OTHER REASONS for Brunner to update the design of Apple's products. In May 1990, amid great pomp and fanfare, Microsoft had rolled out Windows 3.0, which brought the world of PC computers that combined Intel's microprocessor with Microsoft's operating system a step closer to the look and feel of the Macintosh. Not only had Microsoft emulated the Mac OS's visual structure and feature set, it had concentrated on details as well-going so far as to hire Susan Kare (who designed the Mac's original on-screen icons) to create icons for Windows 3.0. Since the spring of 1985, when licensing was first discussed, around the time that frogdesign proposed the Jonathan concept, John Sculley had inched toward the decision to license several times, only to pull back, allowing the balance of power in the computer industry to more and more toward Microsoft and Intel, which supplied the critical software and chips for the vast majority of non-Apple PCs. To stem the tide and compete more effectively with Microsoft, many felt that Apple had to license the Macintosh operating system.

In August 1990, yet another executive summit meeting on the licensing issue was held But this time, there was a new face at the table: Michael Spindler, who had risen through Apple's European division and arrived in Cupertino as Chief Operating Officer. Spindler thought he could break through the logjam that had developed over licensing. But like so many debates at Apple, it led nowhere. "Apple

has a culture where the vote can be 13,000 to 1 and still be a tie," Spindler says.

In Bob Brunner's mind, the issue of Apple's market share could only be addressed by the company returning to its roots, rekindling the spirit of innovation from its early years and revamping Apple's product line with the best design the world had ever seen.

On the technology front, the new PowerPC chip was Apple's answer to ever-faster Intel chips. The Portable Products division was already developing a smaller, smarter laptop computer, called PowerBook. The Newton team was moving forward with its first product, which would share the new aesthetic. Yet the desktop line remained a problem.

"Since performance differences between the Mac and the PC world were approaching parity, the clearest ways in which Apple could differentiate itself were on price and design, "says Brunner. "Over the long term, price alone becomes a death spiral. That meant Apple's best opportunity was to work on design." With SnowWhite in its seventh year, and looking older in Brunner's eyes every day, it was imperative that he develop a new desktop design language for the next generation of Apple products.

"When Jaguar was finished, the trend in design was to move away from sterile corporate aesthetics toward unique and expressive solutions," says Brunner. "At the same time, Apple was transforming itself from a low-volume, high-margin producer to a low-margin, mass-market manufacturer. That meant we needed an entirely new approach to design. As designers, we were extremely lucky, because we were working in the best company in most exciting industry on Earth at exactly the right time."

Years later, Brunner would look back and see his first 24 months at Apple as the most exciting period in his life... "a time that will probably never be repeated."

BETWEEN 1990 AND 1992, THE FINAL JAGUAR CONCEPTS WOULD EVOLVE INTO three seminal products: a split keyboard, which would undergo further development to become the Apple Adjustable Keyboard, codenamed Norsi; the multimedia monitor, which would emerge as the AudioVision 14 Display, code-named Telecaster; and the toaster-sized CPU, which would grow to nearly four times its original size and change its code name twice to become Fridge, first shipped as the Quadra 800. Yet before these new products emerged, there was a second encounter with Giugiaro, the design of the PowerBook and Duo portable computers, a new studio for the Industrial Design Group, and new faces who would help Brunner create the new design language that Apple needed.

FIGARO BECOMES NEWTON

PLAIDS 183-192

Following his September 1989 victory in the Figaro competition, Giorgetto Giugiaro designed four new concepts for Figaro in January and February of 1990. introducing new colors, soft curves and expressive detailing that pushed the product in a new direction. As before concepts were put through focus group testing to identify the stree design—the 'winner' being a two-toned blue-green and grey co with angled speaker vents, a stylus tethered on a thin cable that me ed on the back, and a bright red 1.5-inch round infrared (IR) transwith an Apple logo in the middle. "User response for the se Giugiaro design was the strongest we'd ever had," says Sue Booke some members of the Figaro group raised doubts, calling Giug work "too cute," "too extreme" or simply "not Apple enough."

The dissension within the Figaro project mirrored tension a executive level. For months, a rift had been developing between Sculley and Jean-Louis Gassée. Having steered the Mac div through its glory years, when the Mac II and its progeny could be at 50 percent gross margins, Gassée opposed any talk of licensir Mac OS. To take advantage of the Mac's proprietary status and up the bottom line, Gassée had overseen the development of Ap highest-margin products ever, the Macintosh Portable and Macintosh IIfx, a pattern that Figaro seemed destined to follow to many inside Apple, this seemed like yesterday's strategy.

The end for Gassée came in early 1990. "Beneath the surface, always been a thorn in Sculley's side," he recalls. "So in Feb 1990, we finally had a serious one-on-one. He asked me to tel what I *really* thought of him ... so I told him. That was the begin of the end." In April, Gassée resigned, followed soon by Sakoman, head of the Special Products Group, which was dev ing Figaro. To fill the void, John Sculley named himself Apple's technology officer, put Michael Spindler in charge of manufact and marketing and brought in Michael Tchao to turn Figaro i marketable product. Having served as marketing manager fc Macintosh Portable, Tchao was well aware that introducing an engineered no-compromise product was a strategy for failure knew what to do—or thought he did.

"When Michael Tchao stepped in, everything about Figaro cham Sue Booker recalls. "The product we had spent four years deving was divided into three products"—a high-end 9- by 12-inch book-sized device (essentially the same as Figaro) called Ne Plus; a 6- by 9-inch version called Newton: and a pocket-sized 4. 7-inch model called Pocket Newt. "All three versions would be d oped simultaneously, ensuring that at least one of them would vive," says Booker. "But once the product specs were defined the team supported Pocket Newt, the other half supported the I Newton Plus, and no one cared about the mid-sized Newton a Predictably, the old guard, including Booker, favored the Ne Plus; while the younger developers, including Michael Tchac Steve Capps (a key technologist and original Macintosh team r ber) favored the much smaller Pocket Newt.

Believing that Apple should define all aspects of its product house—an attitude perilously close to the "NIH Syndrome"—T disliked the fact that Figaro/Newton Plus had been designed b disider. "Tchao was worried that Giugiaro's work was too playful and didn't look like Apple," says Booker. "Bob Brunner didn't like it ther. He thought the way Giugiaro had mounted the stylus on the ack was elegant but not very intuitive. The whole design was too off for Brunner's taste. And the red IR window wasn't positioned en well for beaming or receiving data (Plates 185, 186). It remindd Brunner of "a big blood-shot eye."

Hearing that, Booker reminded Michael Tchao that Giugiaro's work of scored well in focus group testing, which had always proven relible in the past. "When I told that to Michael, he stormed off," says coker. The very next day, Booker received a phone call from John culley ordering her to hold a new design competition for Newton tus between Giugiaro's February 1990 concept and a new set of esigns that Bob Brunner agreed to develop and would have ready September."

Since Newton was, by far, the hottest product under development, is understandable that Bob would not want to be left out," says ooker. "He agreed to do the work on his own time and fund it all inself. It wouldn't cost the Newton Group anything ... so I really ouldn't say no. For a long time, I wondered what all the effort was bout. Then I realized that behind all the smoke and all the beautial concepts ... the simple fact was that the guys at IDg felt threatened by Giugiaro's presence and wouldn't stop until they found some way a out-design him."

Though it's hard to imagine today, most people inside Apple in 1990 ssumed that Newton would transform the computer industry so comletely that desktop computers would become obsolete. In essence, ne Newton would do to the Macintosh what the Macintosh had done to the Apple II: render it extinct. Given that belief, plus the uneasiess that everyone at IDg felt about Giugiaro's Figaro design, Bob srunner had little choice but to offer his own designs—the same way nat Hartmut Esslinger tried (and failed) to redesign the first Macintosh ack in 1983.

There was also the issue of stature. "Since Bob had already outdone singiaro on Jaguar, he figured that he had proven himself equal to he Italians," says Larry Barbera. "But the Newton people didn't agree. Ordinarily, that wouldn't have mattered. But with Newton shaping up to be the most important product in the entire company, Bob could-'t afford to sit back and let Giugiaro design it. For one thing, any esign Giugiaro came up with would have clashed with the stuff Bob 'as doing for the PowerBook and the desktop products. For anothc, Bob liked the idea of going head-to-head with another designer, articularly someone like Giugiaro. He owed it to himself, and every esigner in the Valley, to put the Italians in the shade once and for 1 ... or at least go down trying."

By September 1990, Brunner submitted four foam concepts and one ard model for Figaro, introducing new shapes and colors, more inctional placement of the IR window and stylus, inventive speaker ole patterns and other features, such as one model with a pleasing ribbed pattern on the back (Plates 186-190).

"Unlike Giugiaro, Bob thought about the *entire* product and gave every surface an interesting treatment," says Booker. "The ribbed model was particularly nice. Bob showed us that the product could also give the user a tactile experience. Best of all, he didn't take a single approach the way Giugiaro had."

Two of the five Figaro concepts were designed by Lunar Design's Ken Wood, who used the exercise to push forms and detailing farther than Brunner had expected. "One concept had radiating speaker holes that looked pretty extreme," Wood admits. "The holes were big in the center and became smaller as they radiated out, which I thought looked neat. When Bob saw it, he said, 'Ooohhh noooo...' But it was too late. I'd already built the model."

To maintain a sense of fairness, the Giugiaro and Brunner/Wood designs were first judged by the Newton Group then tested in traditional focus-group settings. "To my surprise, Giugiaro's concept tested better than all of Brunner's suggestions," says Sue Booker. "As we understood it, there was one overriding reason: Giugiaro's design did *not* look like a Silicon Valley computer. The original idea behind Figaro was to design a computer that looked like a personal product. Giugiaro approached it from that perspective. But Bob handled it like a Silicon Valley designer. The difference was obvious."

In December, Sue Booker gave Brunner the test results. "I remember being discouraged, because in-house people liked our stuff, but user-testing gave a different result," says Brunner. "Michael [Tchao] told me that so much had been invested in Giugiaro, that the Newton Group would be going with the 'red eye' concept regardless of what anyone else thought."

But Tchao was wrong. In February 1991, Giugiaro produced a "final" Newton Plus design, code-named **MontBlanc** (Plates 191–192), with a black exterior and an elliptical IR window, which was tooled, engineered and readied for production. Then the Newton Group made a discovery that put the entire project in jeopardy.

"After all the work and angst that had been invested on the infrared window, further testing revealed that IR might not be such an important feature after all," says Bob Brunner. "Users weren't going to spend much time beaming data back and forth. But that big honkin' eye had already been designed and engineered. After fighting so hard to keep it, now they were stuck with it."

By the spring of 1991, Figaro's projected price (\$4,000-5,000) was still too expensive and too large, even for an executive-class product. And Newton Plus wasn't much cheaper (or smaller). Since Michael Tchao knew the pitfalls of selling an expensive no-compromise product from his experience on the Mac Portable, he persuaded John Sculley to put the NewtonPlus on hold and throw his support behind the Pocket Newt instead.

"Suddenly the goal changed from a full-featured notebook-sized product to something Sculley could fit in his pocket," says Sue Booker, who quit the project rather than see the user interface she had designed for Newton Plus trimmed down for Pocket Newt.

When the NewtonPlus was finally cancelled in May 1992, the last Giugiaro design for Apple Computer was laid to rest. Meanwhile its smaller sibling, code-named **Junior**, was in the middle of the most an intense development Apple had mounted since the original Macintosh, and would soon encounter problems that made Figaro and NewtonPlus seem like a tea party.

"Rather than follow a preconceived idea, we wanted the PowerBook to have its own identity and be exactly what it needed to be."

-Bob Brunner

POWERBOOK

PLATES 194-219

PowerBook 170 (TIM) and PowerBook 140 (TIM LC)

Industrial Design: Apple Computer: Robert Brunner, Gavin Ivester, Susanne Pierce; Mike Antonczak; Tom Bentley, John Sedmak, John Medica, Ken Provost, Pat Jackson, product design

Dates of Design: March 1990-February 1991

Introduced: October 1991

Awards: Gold Industrial Design Excellence Award, 1992; Industrie Forum Design Award (Germany), 1992; "Design Distinction," I.D. Design Review, 1992; SMAU (Italy), 1992

PowerBook 100 (Sapporo)

Industrial Design: Apple Computer: Robert Brunner; Lunar Design (Palo Alto, CA): Ken Wood and Matt Barthelemy

Dates of Design: September-December 1990

Introduced: October 1991

Awards: Gold Industrial Design Excellence Award, 1992; Industrie Forum Design Award (Germany), 1992; "Design Distinction," I.D. Design Review, 1992; SMAU (Italy), 1992

As the first important product developed after Bob Brunner's arrival at Apple in January, 1990, the PowerBook holds a special place in Apple's design history. The cast of characters was vast including no less than 15 engineers and product designers from Apple's Portable Products Group, three industrial designers from IDg, two more from Lunar Design, plus engineers at Sony in Japan—all working against a single unyielding opponent: time. Unlike the Macintosh Portable, which took more than three years to develop, the designers and engineers had less than two years to complete the PowerBook which meant that Time To Market would govern every aspect of the program. During an early planning meeting, the letters "TTM" were written all over the blackboard. When a latecomer arrived, he misread the board and asked, "What's this TIM?" Soon, everyone was calling the project TIM.

"Despite all the attention and market share and awards we received later, the first PowerBook was under such phenomenal deadline pressure, it threatened to become a *really* messed up program," says Brunner. "Everything happened so fast, we were under constant strain until the moment the products shipped. In the process, we learned more on the PowerBook than with any other project we've ever dor But we learned it all so quickly that, at times, it got kind of ugly."

With the Mac Portable already disaster in the marketplace, App needed a new portable in the market by the fall of 1991. "But 1990, Gavin Ivester was our only "on the boards" designer we portables experience," Brunner says. "I didn't want to rush out an hire a lot of new people. So I decided to work with the people had and try to hold things together until the storm passed," wor ing on Jaguar and PowerBook at the same time.

Brunner spent so much time on Jaguar—following Tom Bentley insistence that RISC represented Apple's future—he didn't notice the PowerBook was in trouble until very late. "We began the project March 1990. We should have started it much earlier."

The investigation that led up to the PowerBook began in May 198 eight months before Brunner joined IDg, when Richard Jordan sur moned Gavin Ivester to his office. "After baby sitting the Mac Portab I had become the de facto portables guy," says Ivester. "So Richard to me to get out of the studio and not come back until I had six new ide for a portable computer. Apple had to ship a new laptop by 1991, b didn't know what direction to take. It was my job to find out."

Ivester first interviewed Apple's key technology experts. "I war ed to find out what would be available two and three years out. S I talked to the keyboard guy, the display guy, the hard disk guy ar the CPU guy, gathered a lot of information, and hired a consulta to help me generate some concepts." In June and July of 198 Ivester worked with Tony Guido and Sigmar Wilnauer, sketched rough ideas, made 15 styrofoam models and came away with s hard models that pushed the idea of mobile computing to the lim They called their effort Twister (Plates 193–195).

"With Twister, I wanted to identify the core elements of a portable yet-expandable computer," says Ivester, "something you could tak with you anywhere but also use on a desktop. The key element wa a "tablet" that consisted of a flat panel display with a battery pac and circuitboard behind the screen, which would attach to a key board for portable use or plug into a "brain box" with a floppy/har disk for desktop use.

While working on Twister, Ivester recognized the basic problem wit laptop computers: "Users want the largest possible screen, a full-siz keyboard, as much memory and processing speed as possible an long battery life in the smallest package possible—which forces the designer to be ruthless when deciding what to include in the produce and what to leave out." In addition to the "tablet" and "brain box Ivester, Guido and Wilnauer developed a series of clamshell idea including Stand, which had a handle on the back that angled the bace of the keyboard to the proper typing angle; and Giraffe, which offere a height-adjustable screen that folded flat for easy carrying.

When Richard Jordan reviewed the portable concepts, he was so pleased that he rewarded Ivester with a month's vacation (which h spent in Italy studying design at the Domus Academy). Suddenl veryone at IDg was designing portable concepts, including contract vorker, Susanne Pierce, who had been helping Ray Riley with Jaguar.

Susanne Pierce. A 1988 graduate of the University of the Arts in hiladelphia, Pierce came to Silicon Valley that same year and made discovery. "I found virtually no women working in industrial lesign anywhere in the Valley," says Pierce. "I thought companies would be keen to hire a woman. But I had no real experience, so actually worked against me." To cut her teeth, Pierce built foamore models at Lunar Design in 1988-89 and followed Bob Brunner to Apple, where she assisted Ray Riley with his Jaguar concepts.

With so many portable explorations going on in early 1990, even a aptop version of the moribund Apple II, Pierce designed her own oncepts. One of them, called **2P**, arranged the screen and keyboard on a flat panel, a hinged screen cover and a shoulder strap (Plates 99, 201)—which compared well against another concept on the ame theme done by Mark Pruitt, who had been an Apple employee or more than six years. Pruitt's fluorescent yellow **IIP** (Plates 196, 97) had a stepped exterior that gave it a massive appearance, and a ixed handle that made the portable seem even heavier than it was. Following 2P, Pierce designed an even smaller portable concept alled **Arc** (Plates 198, 200), a curved two-piece construction with niniaturized components located behind a screen, which tilts up on n easel, and a keyboard that nests with the main unit for easy transport. Based on these concepts and his own pressing needs, Brunner tired Pierce in November—making her the first (and thus far only)

woman to work as an industrial designer at Apple. **The PowerBook Design Evolves.** Meanwhile, far from IDg, an apple electrical engineer named Jon Krakower was quietly develping his own portable concept. An expert in circuit board layouts by day, Krakower had spent months analyzing the problems with the Macintosh Portable and worked nights in his cubicle developing

Iternatives-his key feature being a centrally-mounted trackball

In September 1989, the week after the Macintosh Portable was aunched, Krakower constructed a paper model of a clamshell bortable with a front-and-center trackball using paper from a disarded Mac Portable sales brochure (an interesting choice of materids). The centered trackball allowed both left- and right-hand users o move the cursor with the thumbs while keeping the other fingers positioned over the keyboard. The space on either side of the trackpall would serve as a palm rest to support the user's hands. Next, Grakower made a 3-D model from styrofoam and wood with a keypoard and trackball mounted up front with palm rests on either side. When Apple's management saw it in January 1990, they cringed. The product designers didn't think it would work. Even so, Grakower's idea would soon influence the PowerBook's final design.

While Krakower was showing his concept in January, Bob Brunner and Gavin Ivester at IDg began work on TIM's interior layout, movng component blocks around and producing eight different clamshell models, most of them having a front-and-center trackball. Some had internal floppy drives; others had external drives. All used some form of the SnowWhite design language. Yet Brunner felt it wasn't working.

"Since SnowWhite had evolved as a desktop language, it was not extensible enough to use on a portable," he says. An even bigger problem was how to integrate a trackball into the design without expanding the box or attaching an add-on component, which PC laptop makers had done.

The answer came when Jon Krakower met with Brunner in February. "Jon said that we could push the keyboard toward the display, put the battery under the left palm rest, tuck the hard drive under the right palm rest and drop the trackball in between. Since the battery and hard drive are heavy components, placing them in the front shifted the product's center of gravity, making it easier to use on one's lap without having it slide toward the knees."

The next question was crucial: should the PowerBook have an internal or external floppy drive? Tests showed that only a small percentage of users accessed the floppy drive while on the road, which suggested that an external drive was better. An internal drive was heavy and occupied precious space inside the machine. As usual. opinions split down the middle: Gavin Ivester, TIM's marketing liaison Bruce Gee, and director of CPU engineering John Medica voted for an external drive; Bob Brunner and Jon Krakower preferred an internal drive. Because portable computing was still an immature market, Brunner reasoned that a machine would not be accepted without an internal drive. So, at Krakower's suggestion, he freed up space for an internal drive by dividing the main circuitboard into two stacked miniboards, leaving just enough space for the floppy drive under the keyboard. "This added a few millimeters to the product's thickness," Brunner observed, "but it also reduced the length and width, which gave us a smaller-looking machine."

According to Brunner, many people working on TIM had a conventional image of what the machine should look like. Indeed, several team members would have been happy to recreate the top-selling portable computer of that time, the Compaq LTE. "The engineers considered a centered trackball and palmrest risky," says Brunner. "But rather than follow a preconceived idea, such as Compaq's design, I wanted the PowerBook to have its own identity ... so that it could be exactly what it needed to be, a very different approach than the one Apple had taken on the Mac Portable."

In February 1990, Brunner designed a foam concept with an internal floppy drive and a front-and-center trackball and presented it to Sculley, who approved it on March 6th (Plate 202). "After that, there was no time to explore other configurations." The race was on.

Because the PowerBook contained so much original invention, user testing was essential. But rather than follow a linear process of design first/test later, design and testing were continuous from the initial prototype in April 1990 to the final result in August. Among the many details that testing uncovered was the barrier around the display. "An earlier version had a flat bezel," says Brunner. "But when people saw it, they worried that paper clips or cookie crumbs would get into the keys when the machine was in their bag. So we added the barrier to seal the product and designed a central locking latch on the front of the display so that it can be opened with one hand."

User testing also guided the positioning of buttons above and below the trackball. "We found that users enjoyed moving the trackball with one thumb and clicking the top or bottom button with the other," says Brunner, "leaving the other fingers positioned over the keyboard. To avoid the confusion inherent in having two mouse buttons, each button covers approximately the same square area and has the same visual weight." But details were important: the lower edge of the bottom button, for example, curves downward to avoid interacting with the user's palms when typing. The top button's upper edge is also curved to communicate that the upper and lower buttons have the same function. To prevent users from accidentally clicking the mouse button instead of the space bar, Brunner added a small ridge just below the keyboard to serve as a barrier. To reduce the sensation of "typing downhill," Gavin Ivester designed wheel-shaped lifters to elevate the back of product.

Millimeter Madness. As the design evolved, product design manager John Sedmak worked hard to reduce TIM's size, with every millimeter lost becoming a reason to celebrate—an attitude the industrial designers called "millimeter madness." But shrinking the product also reduced the surface area that IDg needed to give TIM the expression it needed. So Brunner wrote a memo in May 1990 asking that the "madness" not go too far. "In the end, buyers care less about a few millimeters than the question, 'Does it fit in my briefcase?" "he wrote. "More important than the actual size is the *perceived* size. With industrial design, we can *reduce* the perception of size even if we *increase* the actual length and width of the product."

Portability and Object Value. Months of design and testing the PowerBook caused a shift in the way IDg looked at products. New themes emerged. "As we got into PowerBook," Brunner says, "we thought about usability scenarios, and what people really want in a portable, which led us to think about issues such as emotional content and object value."

Notebook computer users don't just sit down, turn on the machine and start working. They carry their notebook around with them, open and close the case, and handle it in many different ways. "We realized that the PowerBook is not just a piece of equipment, it is a personal object that forms a close relationship with the user." But improving the product's object appeal was difficult, since Apple was still using the SnowWhite design language.

The most obvious SnowWhite elements are the raised 2-millimeter-wide lines set 10 millimeters apart on the exterior, which emulate the 2-millimeter-wide slots that frogdesign created for Apple's desktop products. But surface lines made the product seem static. To liven it up, Ivester designed a powerful-looking hinge that connects the display to the bottom of the product.

"Because SnowWhite evolved as a desktop language and was new well suited for use on a portable computer, Gavin had to juice us the hinge to give it some visual excitement. As a result, the hing became an important means of expression," says Brunner. The reltionship of the hinge to the display and base of the product woube carried forward on every PowerBook that came after it.

Given a choice, Ivester would have eliminated the 2-millimetel lines. "Even though we talk about SnowWhite lines on TIM as a wa of adding 'tactile feedback,' the fact is that we had no choic Everyone expected us to use the lines, even though they make r sense. The lines on TIM mimic the lines on Apple's desktop provuct, which function as vents. But portables don't need much vening, because they generate very little heat."

Taking Heat. When choosing the PowerBook's color, however Brunner took a lot of heat. "Color is such an emotional issue at App that debates over maintaining a platinum look or using a darker color turned into a major battle," he says. With factions leaning in bot directions, Apple marketing liaison Bruce Gee painted wooden most els with a series of shades, from platinum to near-black, and tester them on airport travelers, choosing only those who carried a laptic on their shoulder. "Our goal was to define a shade that was darke than platinum," says Gee, "but we didn't know how dark to go. Ligi colors provoked impersonal low-value associations, such kitche appliances and dentist's offices. Dark colors, on the other hand, prevoked high-value personal associations, such as a woman's hair, wallet or your favorite pair of pants. The darkest and lightest shade tended to show finger marks, which people didn't like. So we settle on a gray that was slightly darker than medium."

To Brunner, the solution seemed obvious. "With Product Desig pushing me to pick a color, I decided to go dark, specified a shac that is compatible with platinum," but not so dark that it would via late German product standards regarding color, reflectivity and rule that govern the contrast between the screen and surrounding bezand the color of keyboard graphics versus the keycaps.

Brunner then sent an E-mail message to other PowerBook proje members advising them of his action. "Immediately, I received storm of criticism. Everyone wanted to know 'Why did you do tha Why wasn't I included?' This taught me that having the right answe is not enough. Since Apple is a consensus-building company, you'v got to consult the team before executing a decision. You neve make a decision based on politics: you make the right decision, the work it through the political context so that everyone is on boar when the decision goes into effect."

Designing Sapporo. With TIM well under way, Bob Brunne designed the first phase of the PowerBook 100 as a simplified scaled-down product that would be engineered and manufacture for Apple by Sony. But as work on Jaguar continued and the secon

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1 The Byte Shop, Palo Alto, CA, 1976. 2 Steve Jobs' Garage, Chris Drive, Mountain View, CA, 1976. 3 The first Apple I prototype, designed by Stephen Wozniak, housed in a handmade wooden case. 4 An Apple I computer in a handmade wooden box made by its original owner, 1976. 5 The first Apple II finished plastic cases, March 1977.
6 Steve Jobs introducing the Apple II at the West Coast Computer Faire, San Francisco, CA, April 1977.



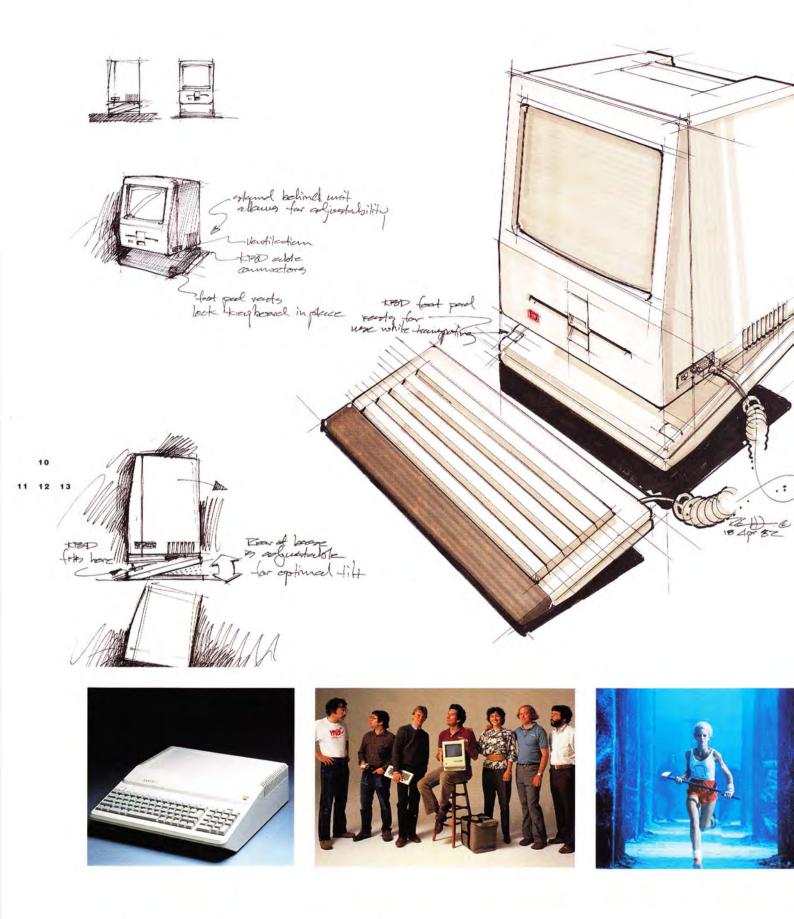
7 Apple II. Industrial Design: Jerry Manock. Dates of Design: January-March 1977. Introduced: May 1977.



8 Apple III (Sara). Industrial Design: Apple Computer: Jerry Manock, Bill Dresselhaus; Hovey-Kelley Design (Palo Alto, CA): Dean Hovey. Dates of Design: October 1978–June 197 Introduced: September 1981.



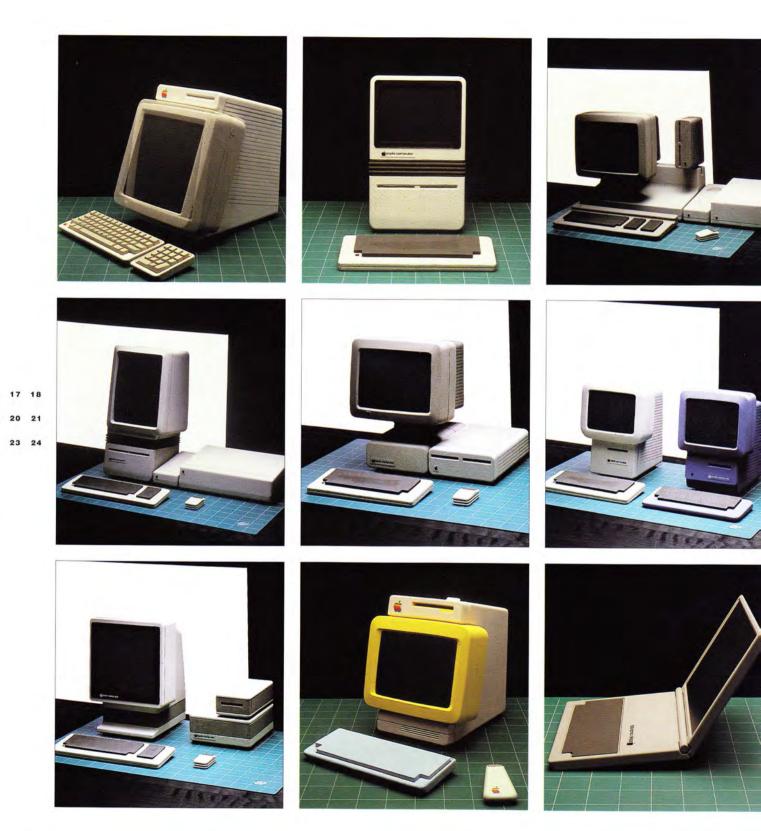
9 Lisa. Industrial Design: Apple Computer: Bill Dresselhaus, Ken Campbell, Clive Twyman; Steve Balog, Laszlo Zeidek, product design; Hovey-Kelley Design (Palo Alto, CA): Douglas Dayton. Dates of Design: July 1979–March 1980. Introduced: January 1983.



10 Alternate concept for the Macintosh with non-chamfered corners, mounted on a height-adjustable stand, designed by Rob Gemmell in April 1982, inspired by Terry Oyama's "Cuisinart Mac".
11 Apple IIe, an update of Jerry Manock's 1977 design for the Apple II. *Industrial Design:* Apple Computer: Rob Gemmell, Randy Bleske; Hovey-Kelley Design (Palo Alto, CA). *Dates of Design:* July–December 1982. *Introduced:* January 1984.
12 Members of the Macintosh design team (left to right): Bill Atkinson, Andy Hertzfeld, Bruce Hor George Crow, Joanna Hoffman, Burrell Smith and a bearded Jerry Manock.
13 Excerpt from the television commerical "1984," directed by Ridley Scott, produced by Apple's advertising agency Chiat-Day, shown during the Super Bowl. January 1984.



14 Macintosh. Industrial Design: Apple Computer: Jerry Manock, Terry Oyama, Steve Jobs; Ben Pang, Dave Roots, Steve Balog, Laszlo Zeidek, Bill Bull, product design. Dates of Design: February 1981–May 1983. Introduced: January 1984. 15 The Macintosh factory. Fremont, CA.

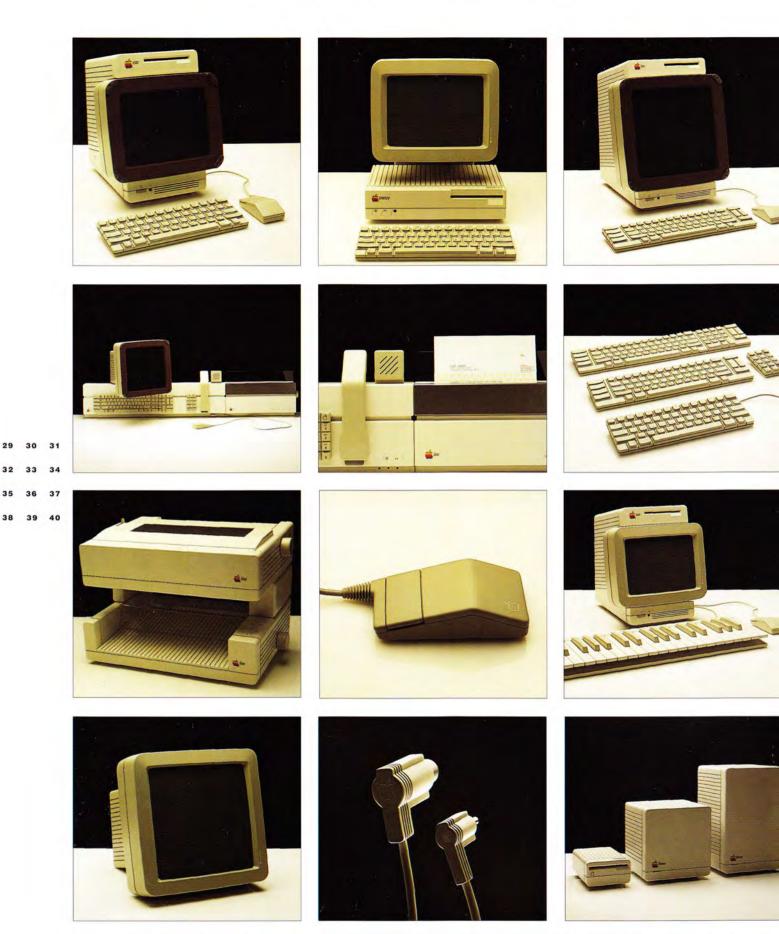


Hartmut Esslinger/Esslinger Design Early SnowWhite Concepts. **16** Revised "Digital Design" concept for Doc, the next-generation Lisa computer, showing the tilting display (Novembril 1982). **17** and **19** Revised concept for Doc, Happy and Sneezy, (code-named Dallas) also known as "The Wega Look" (September 1982). **18** Early concept for WorkBench, a next-gen ation office computer concept, (code-named Sheila), also known as "The American Look" (July–August 1982). **20** and **21** Early "Digital Design" concepts for Doc, Happy and Sneezy (October 1982). **22** Early concept for Doc, Happy and Sneezy, (code-named Module), also known as "The Hamburger Look" (June–July 1982). **23** Revised "Digital Design" concept for Happy, the next-generation Macintosh computer (November 1982). **24** "Digital Design" concept for a notebook-sized computer code-named PaperBack, (November–December 1982).

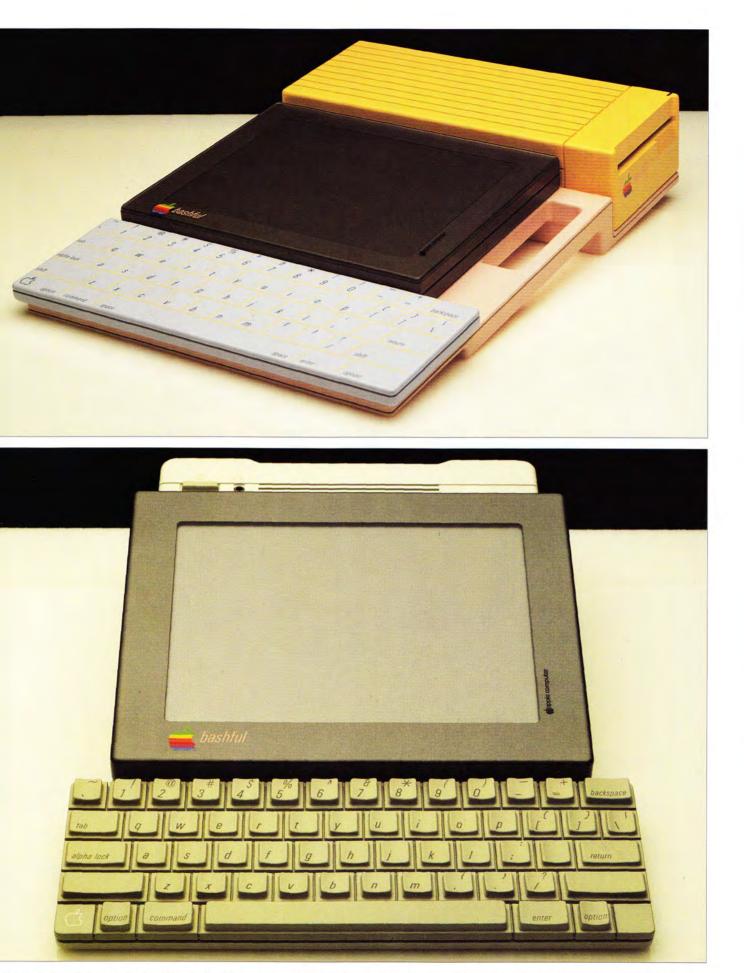
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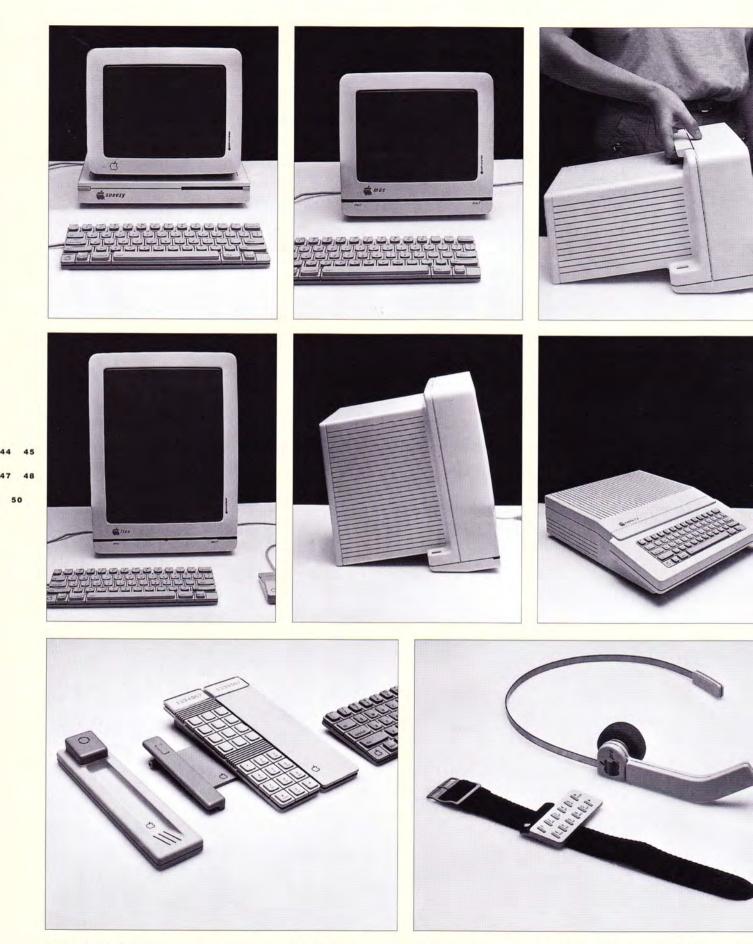
25 - 28 Letterforms, keycap graphics and logo treatments from Hartmut Esslinger/Esslinger Design's "New Brand Image" corporate identity program, shown at the March 13, 1983 SnowWhite presentation.



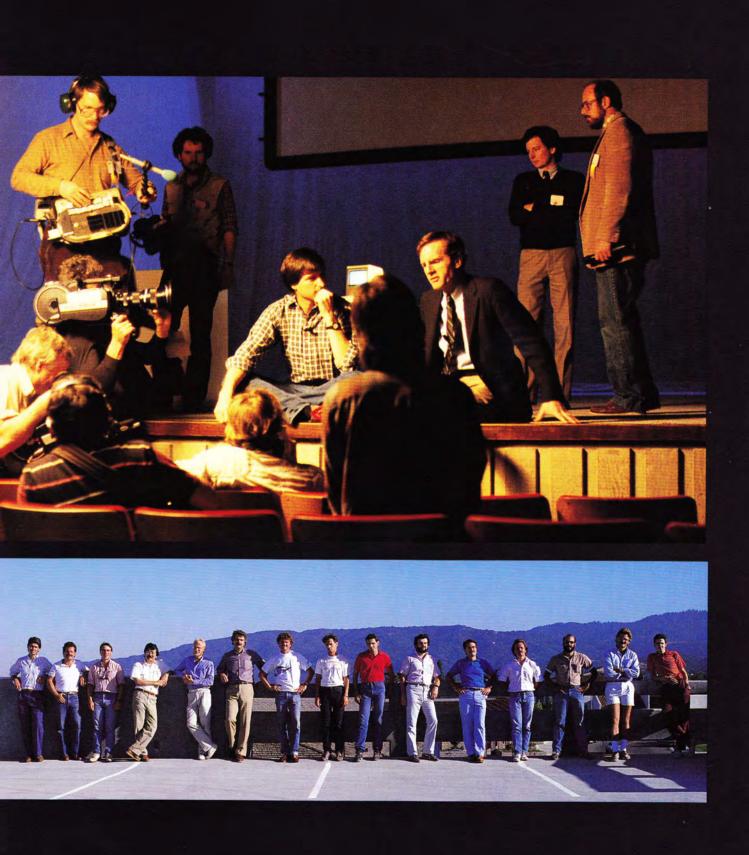
Hartmut Esslinger/Esslinger Design SnowWhite Concepts, presented to Apple management on March 13, 1983. 29 Happy, the entry-level Macintosh with Frameless Keyboard an Minimal Mouse. 30 Sleepy, the next-generation Apple II concept, with the Frameless Keyboard. 31 Doc, the next-generation Lisa concept, with the Frameless Keyboard (Cassie) and Minimal Mouse. 32 Workbench, a next-generation office computer with the Frameless Keyboard, Avant-garde Mouse and Vertical Dot Matrix Printer. 33 Detail of Workbench, showing Telephone Handset/keypad, Loudspeaker and Vertical Dot Matrix Printer 34 Standard and Extended Keyboard concepts.
 35 Horizontal Dot Matrix Printer. 36 Minimal Mouse concept. 37 Musical Keyboard with Happy. 38 External Display concept 39 Input/Output Connector concepts 40 Disk Drive and CPU/Server concepts.



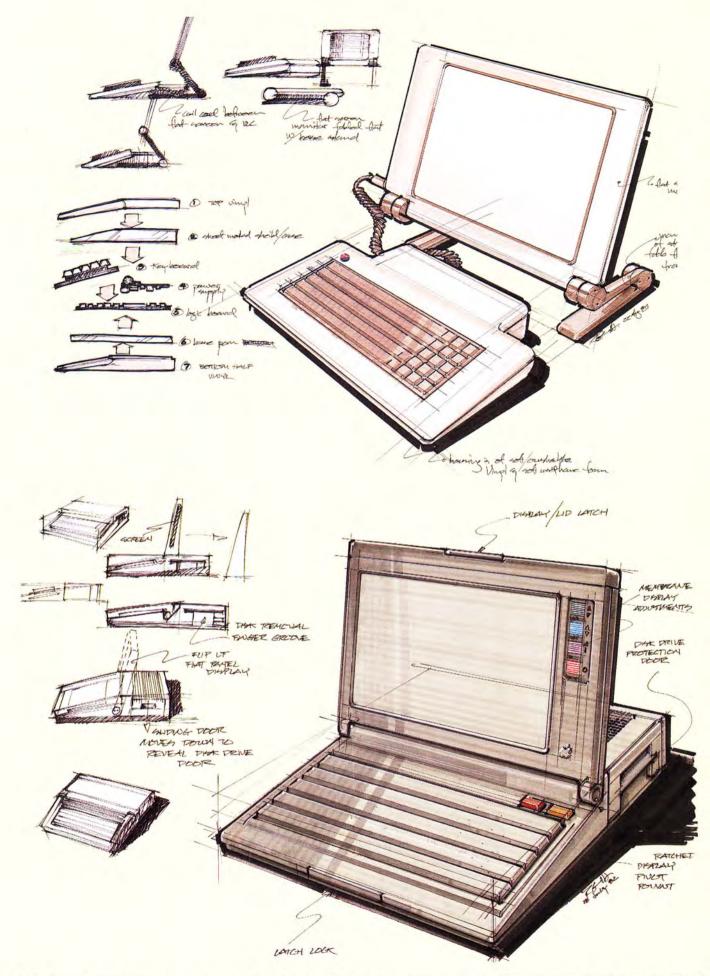
Hartmut Esslinger/Esslinger Design SnowWhite Notebook Computer Concepts presented on March 13, 1983 **41** Bashful, a child-friendly concept, of modular construction with an integrated handle and detachable screen, keyboard and floppy disk drive. **42** A second version of Bashful, with a detachable slate-like module on a wedge-shaped base with a detachable frameless keyboard (code-named Cassie).



frogdesign's "SnowWhite Pure" concepts presented to Steve Jobs in July 1983. **43** Revised concept for Sneezy, the next-generation Apple II computer with a pizza-box CPU, monitor a Cassie keyboard. **44.45** Revised concept for Happy, the entry-level Macintosh, now called 'Mac-2,' with Cassie keyboard and Minimal Mouse. **46.47** Revised concept for Doc, the next-generation Lisa computer, with a 15-inch portrait display, Cassie Keyboard and Minimal Mouse. **46** Apple II concept with an integrated keyboard, code-named Apple IIs. **49.50** Executive and Portable Telephone concepts.



51 Steve Jobs and John Sculley, Summer 1983. 52 frogdesign's California design team with Apple in-house designers: (left ot right) Tom Suiter, Bill MacKenzie, Rob Gemmell, Terry Oyama, Peter Müller. Roy Askeland, Hartmut Esslinger, Sigmar Wilnauer, Tony Guido, Barry Wingate, Jim Stewart, Jack Hokanson, David Hodge, Brad Bissell and Stephen Peart, August 1983.

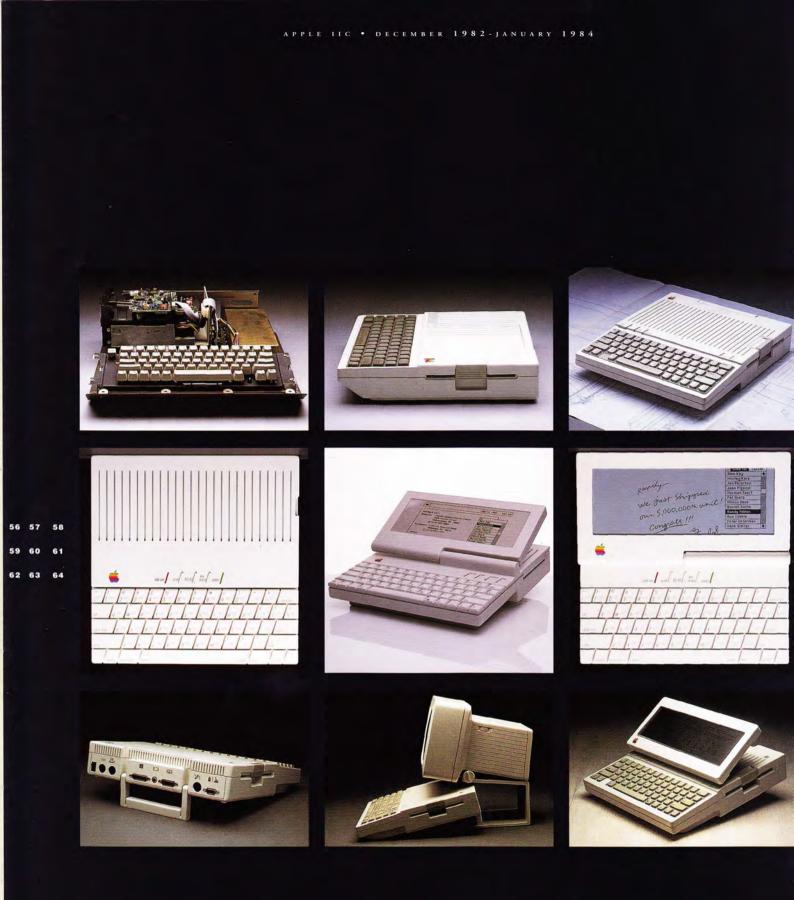


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53-54 Rob Gemmell's concept drawings for a desktop computer: one featuring an "intelligent" keyboard (with circuitboard and floppy drive mounted inside) wrapped in polyuretha foam with a soft vinyl exterior and a height-adjustable flat panel display, August 1981; another with a one-piece design, wedge shaped keyboard and folding display, July 1982.



55 Various Rob Gemmell concepts for an all-in-one portable that predates the Apple IIc. Summer 1981 - Fall 1982...



56 The components Steve Jobs used to visualize the Apple IIC, December 1982. 57 Rob Genmell's first hard Model, called the "Book Computer," December 1982. 58 Apple IIC (Moby) Industrial Design: Apple Computer: Rob Genmell, Bill MacKenzie, Mark Pruitt; Don Porter, product design; frogdesign (Campbell, CA): Hartmut Esslinger, Stephen Peart, Anthony Guido, HansPeter Leins, Sigmar Wilnauer. Dates of Design: December 1982–January 1984. Introduced: April 1984. 59-61 Hartmut Esslinger/Esslinger Design models for the Apple IIC with and without an integrated LCD display, made in Germany during the latter stage of the SnowWhite project, February 1983. 62-63 Final Design showing the external display and cantilevered display stand. 64 Final Design showing the folding LCD display. 65 (Opposite). Apple IIC (Moby). Industrial Design: Apple Computer: Rob Gemmell, Bill MacKenzie Mark Pruitt; Don Porter, product design; frogdesign (Campbell, CA): Hartmut Esslinger, Stephen Peart, Anthony Guido, HansPeter Leins, Sigmar Wilnauer. Dates of Design: December 1982–January 1984. Introduced: April 1984.





66-68 ImageWriter II, with and without the automatic sheet feeder attachment; with a detail showing the rear leg. *Industrial Design:* Apple Computer: Bill MacKenzie, Mark Pruitt; frogdesign (Campbell, CA): Stephen Peart. Dates of Design: January-May 1984. *Introduced:* September 1985. 69 BabyMac, concept for an entry-level Macintosh, for introduction in 15 *Industrial Design:* frogdesign (Campbell, CA): Hartmut Esslinger, Stephen Peart, Herbert Pfeifer, Brad Bissell, David Hodge. *Dates of Design:* January-August 1984 (project cancelled



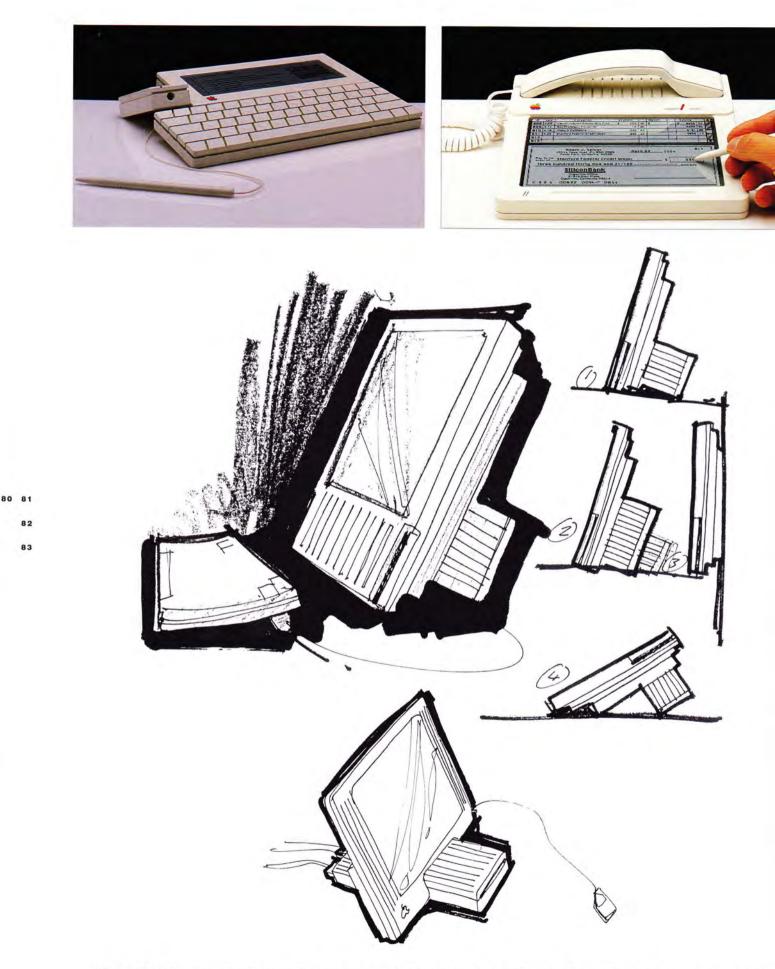
BigMac, a concept for an all-in-one Macintosh with a 15-inch portrait display, proposed for introduction in 1986. *Industrial Design:* frogdesign (Campbell, CA): Hartmut Esslinger, Stephen Peart, Herbert Pfeifer, Brad Bissell, David Hodge. *Dates of Design:* January–August 1984 (project cancelled).



71 Initial concept for the LaserWriter. Industrial Design: frogdesign (Campbell, CA): Hartmut Esslinger and Stephen Peart. April 1984. 72 LaserWriter. Industrial Design: frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, Peter Muller, Apple Computer: Bill MacKenzie, Mark Pruitt; Terry Christensen, Don Porter, prodesign. Dates of Design: April–June 1984. Introduced: January 1985. 73 Hard models of the AppleTalk Connector Family, showing two versions of the basic design (note the pos of icon and thumbgrip on various models). Industrial Design: Apple Computer, Inc./frogdesign (Campbell, CA): Brad Bissell, December 1983–August 1984. 74 Early SnowWhi concept for the Macintosh Plus (cancelled). Industrial Design: frogdesign (Campbell, CA). January–April 1984. 75 Macintosh Plus final design. Introduced: January 1986.



6 Initial concept for the Apple IIGS, inspired by the 1983 Apple IIs concept. Industrial Design: frogdesign (Campbell, CA). 77 Concept for the Apple IIGS, front view, showing the egrated keyboard inserted into the CPU. 78 The Apple IIGS keyboard (Universe), based on the SnowWhite frameless keyboard, code-named Cassie. 79 Apple IIGS final design with e Universe Keyboard and 12-inch Color Display. Industrial Design: Apple Computer: Richard Jordan, Adam Grosser, Don Porter, Chris Novak, product design; frogdesign (Campbell, CA): Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, Stephen Peart, Jose Delhaes, Herbert Pfeifer. Dates of Design: January–March 1985. Introduced: September 1986.



 80 Twenty-FourHourMac concept. Industrial Design: frogdesign. (Campbell, CA). Dates of Design: May-September 1984. 81 TelephoneMac concept. frogdesign (Campbell, CA). May-September 1984
 82-83 Concept drawings for FlatMac and SkinnyMac. frogdesign (Campbell, CA): Stephen Peart. August 1984.



87

Concept for a Flat Panel Desktop Display. **86** Portable CD-ROM Mac concept inspired by the Apple IIc form factor. **85, 87** Larger and smaller versions of BookMac, a portable Macintosh concept with an integrated handle inspired by the earlier Bashful concept. *Industrial Design:* frogdesign (Campbell, CA). *Dates of Design:* January–May 1985.

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88-99 Jonathan Computer Concept. Industrial Design: frogdesign (Campbell, CA): Hartmut Esslinger, Tony Guido, Sigmar Wilnauer, Stephen Peart, Herbert Pfeifer; Apple Computer: John Fitch, product manager; Tom Toedtman, Ron Hocksprung, Joseph Friedman, Pat Jackson, Richard Henkey, product design. Dates of Design: November 1984-June 1985 (project cancelled).



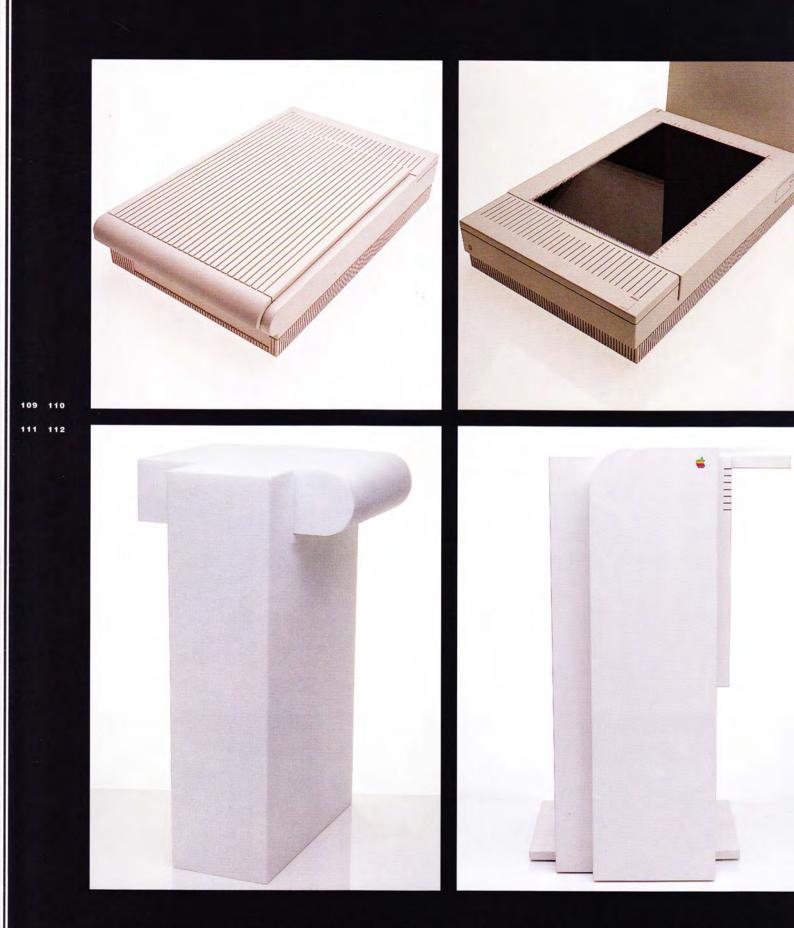
100 Macintosh II (Cabernet) with a 13-inch High-Resolution Display, the Apple Standard Keyboard (Eastwood) and ADB Mouse. Industrial Design: frogdesign (Campbell, CA): Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, HansPeter Leins, Herbert Pfeifer; Apple Computer: Richard Jordan, John Medica, product design. Dates of Design: January-December 1985. Introduced: January 1987.



101 Macintosh SE (Chablis) with the Universe Keyboard and ADB Mouse. Industrial Design: frogdesign (Campbell, CA): Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, Herber Pfeifer; Apple Computer: Terry Christensen, Bill Bull, product design. Dates of Design: January–August 1985. Introduced: January 1987. 102 frogdesign concept for the ADB Mouse Industrial Design: frogdesign (Campbell, CA): Herbert Pfeifer (initial idea), Stephen Peart (final design). Introduced: January 1987. 103 Apple Extended Keyboard (Saratoga) Industri Design: Apple Computer: Don Porter, Adam Grosser, product design; frogdesign (Campbell, CA): Hartmut Esslinger, Anthony Guido, Sigmar Wilnauer, Brad Bissell. Dates of Design May–November 1985. Introduced: January, 1987. 104 Apple 13-inch High Resolution Color Display. Industrial Design: frogdesign (Campbell, CA): Stephen Peart. Dates of Design June–September 1985 Introduced: January 1987.



107 LaserWriter II. Industrial Design: frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger, Herbert Pfeifer; Apple Computer: Mark Pruitt; Jim Huth, product design; Dates of Design: May–November 1985. Introduced: April 1987. 106 ImageWriter LQ. 108 BusinessWriter LQ. Industrial Design: frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger, Herbert Pfeifer; Apple Computer: Mark Pruitt; Bob Elliman, product design. Dates of Design: September–December 1985. Introduced: April 1987.



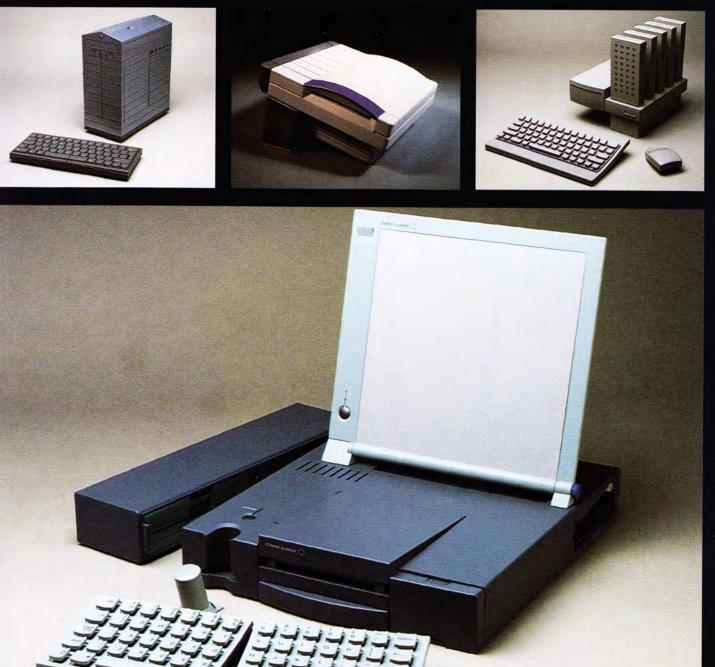
109-110 Apple Scanner. Industrial Design: frogdesign (Campbell, CA): Stephen Peart, Hartmut Esslinger, Herbert Pfeifer; Apple Computer: Mark Pruitt; Robert Elliman, Dexter Franci product design. Dates of Design: September–December 1985. Introduced: June 1987. 111-112 Vertical Laser Printer Concept. Industrial Design: frogdesign (Campbell, CA): Stephen Pee Brad Bissell. Dates of Design: August–December 1985 (project cancelled).



Mindset Computer. Industrial Design: GVO (Menlo Park, CA): Robert Brunner, 1981. **114** Aquarius Computer Concept for the Apple Advanced Technology Group. Industrial Design: Il Dresselhaus and Lunar Design (Palo Alto, CA): Robert Brunner and Ken Wood. Dates of Design: November 1986–February 1987 (project cancelled). **115** Synovex Bovine Hormone Injector. Industrial Design: GVO (Menlo Park, CA): Robert Brunner, 1980. **116** Morrow Portable Computer. Industrial Design: Lunar Design (Palo Alto, CA): Robert Brunner, 1985.



117 Macintosh IIcx (StingRay), with a 13-inch High Resolution Color Display and Apple Extended Keyboard (Saratoga). Industrial Design: Apple Computer: Gavin Ivester; Pat Jackson, To: Toedtman, Grant Ross, Jr., Jimmy Melton, Bob Wales, product design. Dates of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Introduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Interduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Interduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Interduced: January 1989. Inset: Macintosh IIcx, positioned as a mini-tower of Design: August 1986–April 1987. Interduced: January 1980. Interduced: January 1980. Interduced: January 1980. January 1



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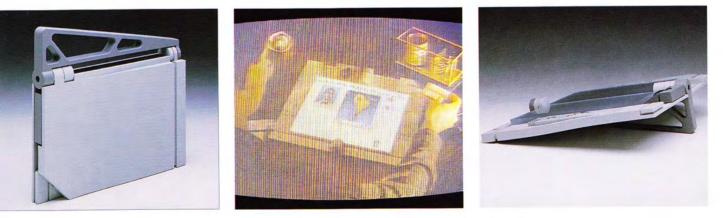


Idlocks and the Three Bears. Concepts for a new industrial design language. 118 Desktop Computer Concept with a Split Folding Keyboard. BIB (London), Nick Butler. 119 Desktop puter Concept. Patton Design (Irvine, CA): Doug Patton. 120 Desktop Computer Concept. Apple Computer: Gavin Ivester and Adam Grosser. 121 Portable Computer Concept. ID Two San Francisco, CA): Daniele De Iuliis, Robin Chu. 122 Desktop Computer Concept. Vent Design (Campbell, CA): Stephen Peart, Brad Bissell. 123 Desktop Computer Concept. Patton Design (Irvine, CA): Doug Patton. 124 Desktop Computer Concept. Vent Design (Campbell, CA): Stephen Peart, Brad Bissell. 123 Desktop Computer Concept. Patton Design (Irvine, CA): Doug Patton. 124 Desktop Computer Concept. Apple Computer Concept. Apple Computer: Mark Pruitt.



125-127 Columbo Tower and Desktop Computer Concepts, the desktop units having a tight-fitting CPU/display assembly. Industrial Design: Apple Computer: Larry Barbera; Matrix Design (Palo Alto, CA): Mike Nuttall. Dates of Design: January-June 1988 (project cancelled). 128 Cable Management detail on the back of Columbo. 129 Detail of Columbo's curr door with hard disk, floppy, CD-ROM drives behind and locking mechanism at the side.





130-133 Knowledge Navigator Concept. Industrial Design: Apple Computer: Gavin Ivester, Adam Grosser. Dates of Design: May-June 1987.



134-136, 138 H2O Transportable Computer Concept. Industrial Design: Lunar Design (Palo Alto, CA): Robert Brunner, Ken Wood. Dates of Design: March 1988.

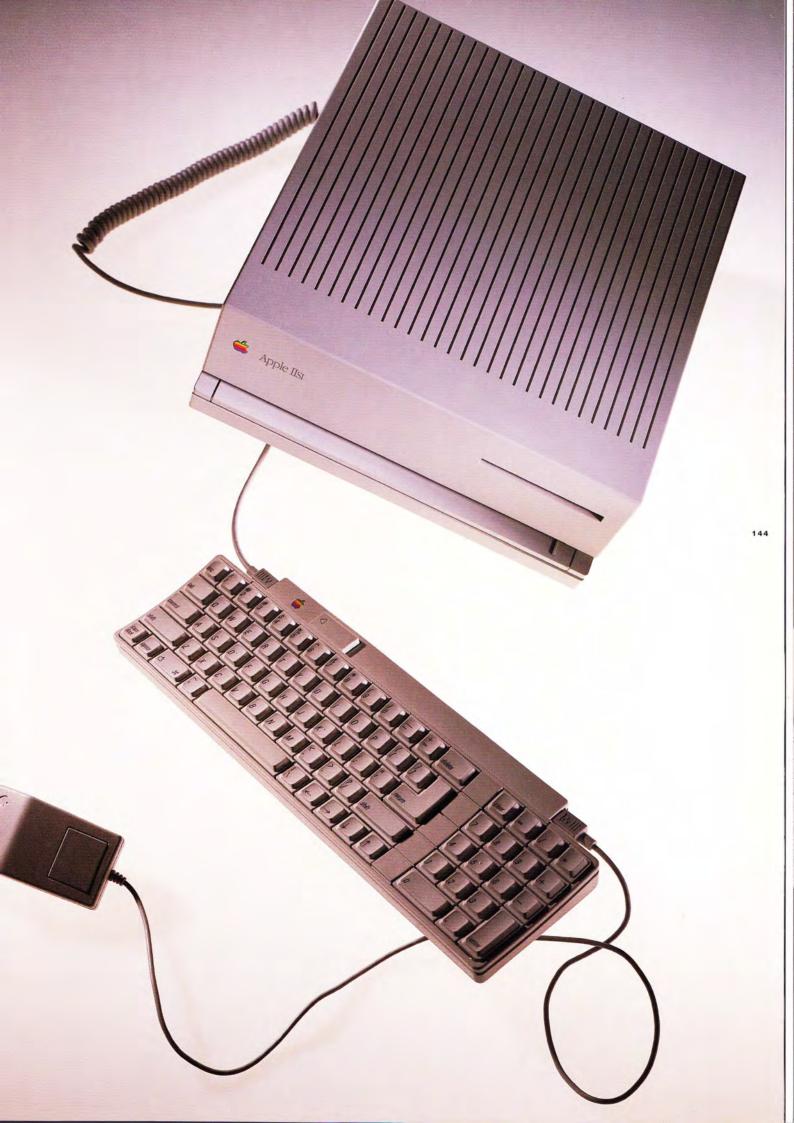


Q-Ball 3-D Mouse Concept. Industrial Design: Lunar Design (Palo Alto, CA): Robert Brunner, Ken Wood. Dates of Design: April-June 1988. 137, 140 Details showing Input Devices.

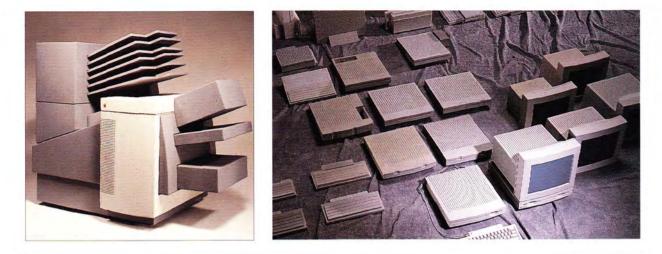




 141 Initial concept for the Macintosh Portable (code-named Malibu), with a downsized keyboard, LCD display, a simple screen hinge mechanism and Isopoint cursor controller. Industrial Design: frogdesign (Campbell, CA). Dates of Design: January–February 1986.
 142 Apple's first response to frogdesign's Malibu concept (Macintosh E). Dates of Design: March–September 1986.
 143 Macintosh Portable (Laguna) final design. Industrial Design: Apple Computer: Jim Stewart, Gavin Ivester; Terry Christensen, Eric Grunberg, Don Porter, T
 Hulick, Mel Philips, Jim Halico, Rich Frances, product design: frogdesign (Campbell, CA): Hartmut Esslinger, Tony Guido, Sigmar Wilnauer, Stephen Peart, Herbert Pfeifer. Dates of Dee January 1986–November 1988. Introduced: September 1989.
 144 (Opposite). Centossa Desktop Computer Concept (Apple IIGS replacement) with the Universe keyboard. Industria Design: Lunar Design (Palo Alto, CA): Robert Brunner and Ken Wood). Dates of Design: April–May 1988. (project cancelled).

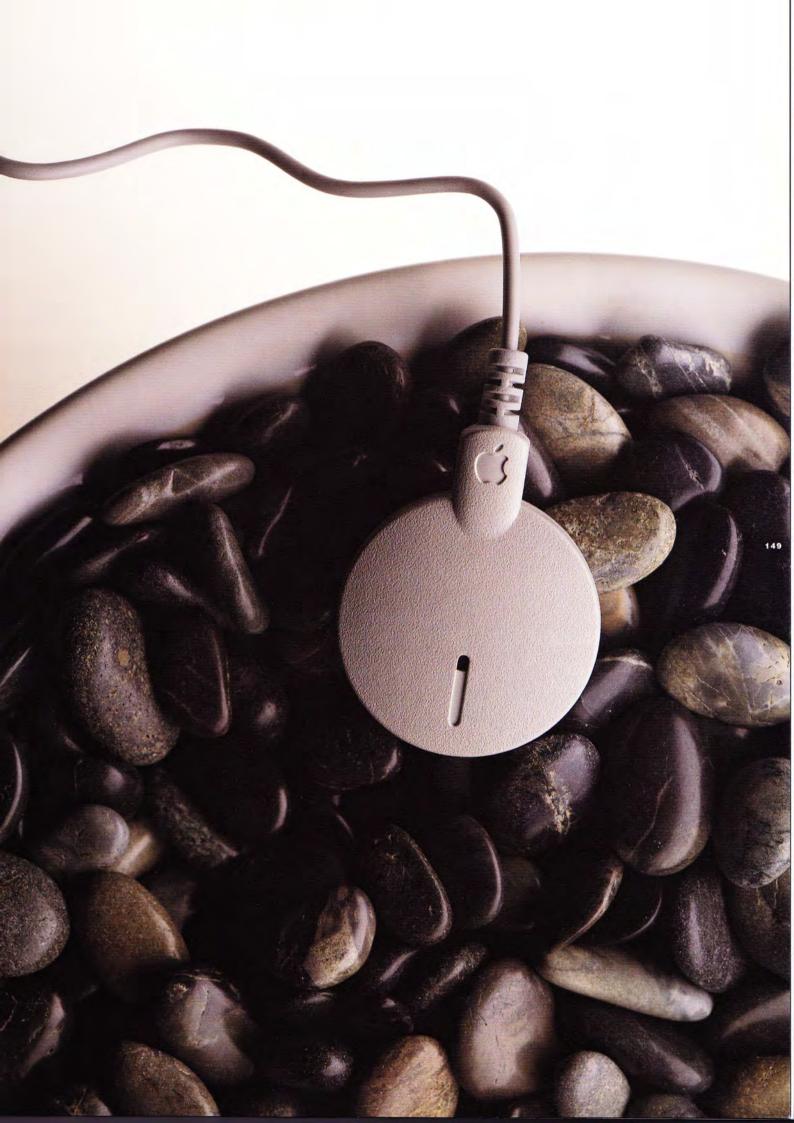


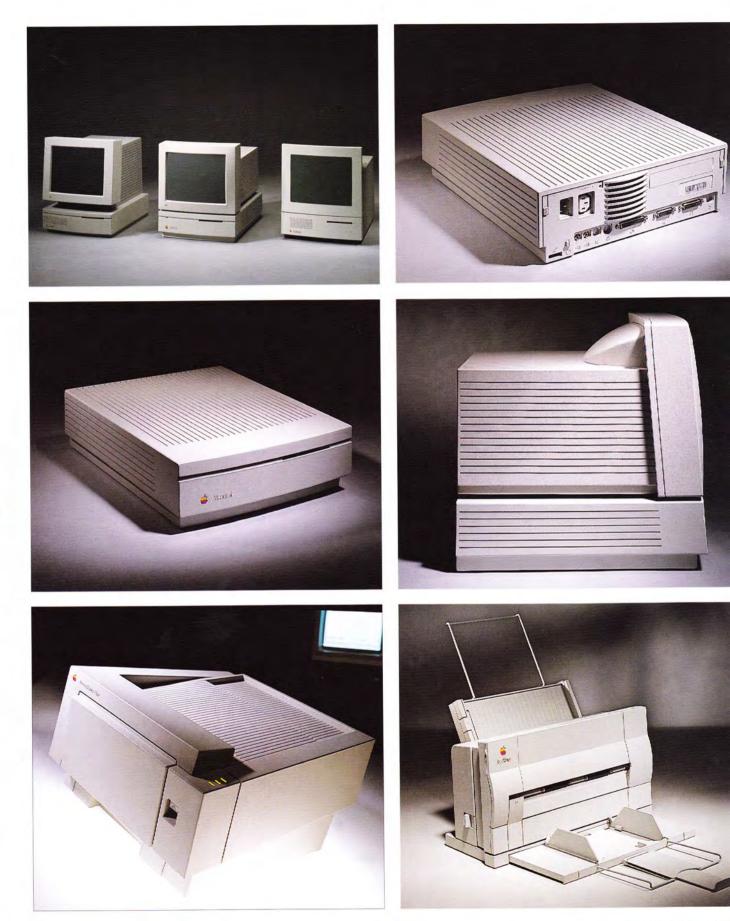
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145 Sequoia Office Printer Concept. Industrial Design: Vent Design (Campbell, CA): Stephen Peart. Dates of Design: July-August, 1988. (Project Cancelled). 146 Macintosh LC, first phi investigation. January–May 1989. 147 Macintosh LC (Elsie) *Industrial Design:* Apple Computer: Ray Riley, Eric Xanthopoulos, John Howard, Bob Riccomini, Pat Jackson, Betsy Dia product design: Lunar Design (Palo Alto, CA): Robert Brunner, Ken Wood. *Dates of Design:* January–July 1989. *Introduced:* November 1990. 148 White Jade, a series of color Macint concepts with a flush-mounted screen. *Industrial Design:* Lunar Design (Palo Alto, CA): Robert Brunner, Ray Riley; Ken Weber, product design; Lunar Design (Palo Alto, CA): Ken Wood. *Dates of Design:* Apple Computer: Ray Riley; Ken Weber, product design; Lunar Design (Palo Alto, CA): Ken Wood. *Dates of Design:* June–July 1989. *Introduced:* November 1990

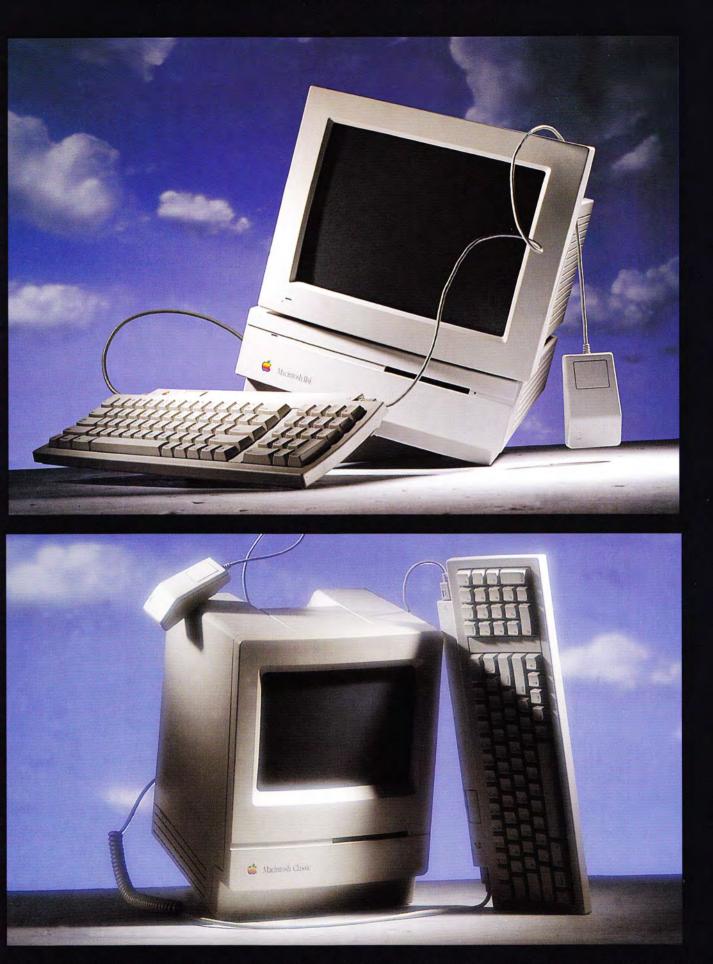




152 153

150 (Right to Left) All-in-One Macintosh IIsi concept; Tight-Fitting CPU/Display concept; final Macintosh IIsi (Spin). January–June 1989. 151-152 Macintosh IIsi (Spin). Industrial Dee Computer: Larry Barbera; Eric Xanthopoulos, Mike Milo, Ken Weber, Les Anderson, Chris Novak, product design; Matrix Product Design (Palo Alto, CA): Mike Nuttall, Mark Bia Dates of Design: January–June 1989. Introduced: November 1990. 154 Personal LaserWriter (Capriccio). Industrial Design: Apple Computer: Gavin Ivester; Danny Pratt, product design: Dates of Design: October 1988–May 1989. Introduced: September 1990. 155 StyleWriter (Franklin). Industrial Design: Apple Computer: Mark Pruitt; Azad Khodai, John O'Brien, product design; Patton Design (Irvine, CA): Doug Patton, Rick Jung, Dennis Grudt. Dates of Design: August–December 1989. Introduced: November 1990.

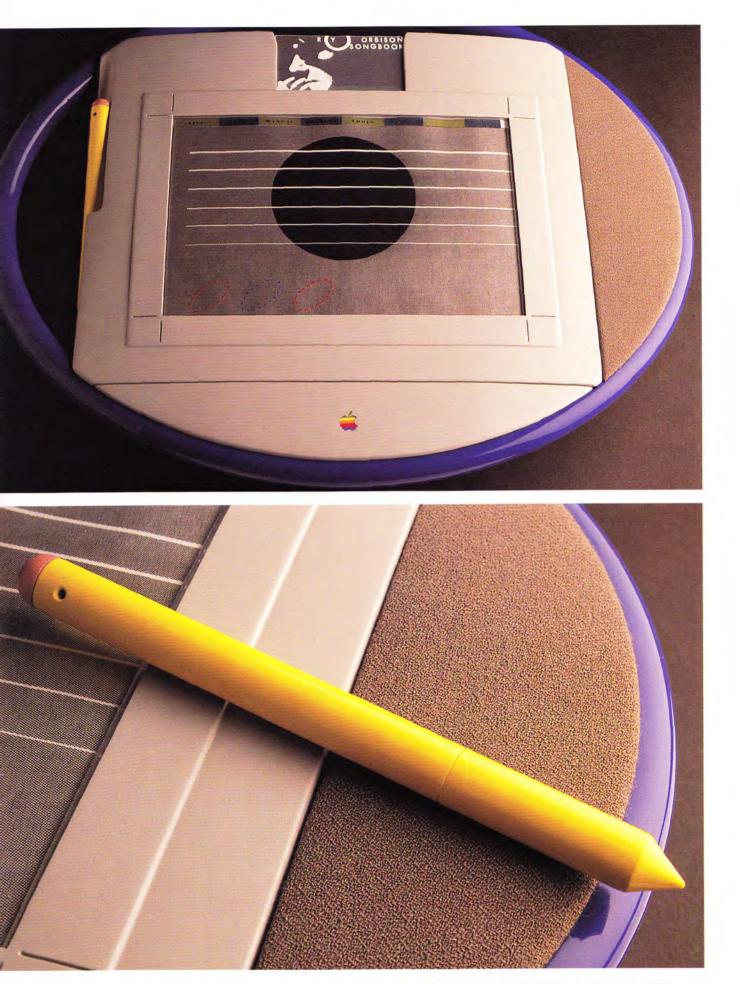
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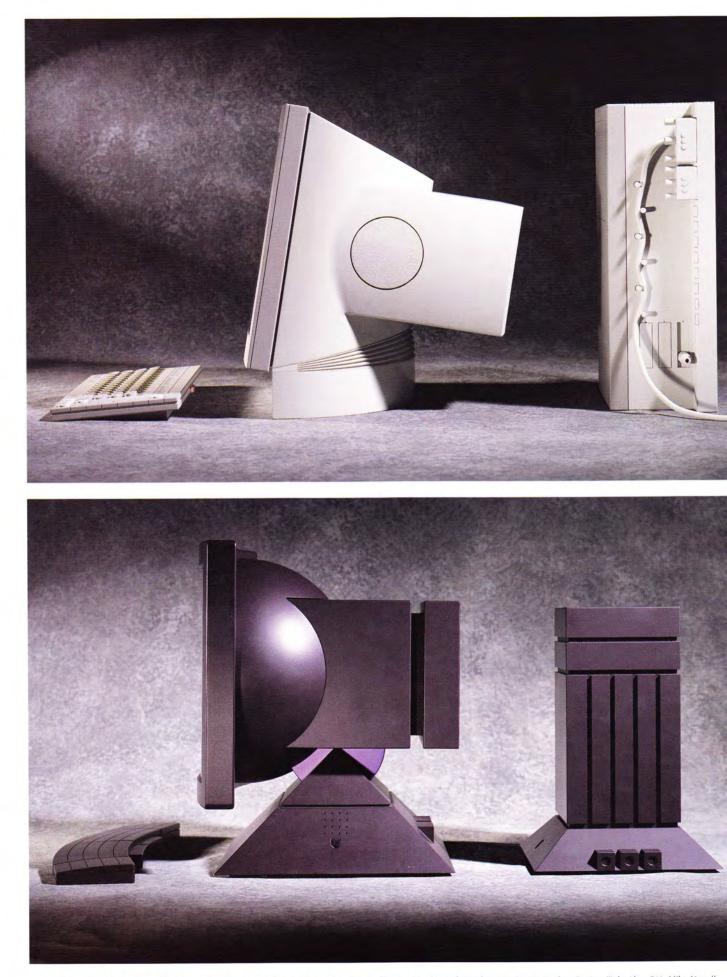
Macintosh IIsi (Spin). *Industrial Design:* Apple Computer: Larry Barbera; Eric Xanthopoulos, Mike Milo, Ken Weber, Les Anderson, Chris Novak, product design; Matrix Product Design lo Alto, CA): Mike Nuttall, Mark Biasotti. *Dates of Design:* January–June 1989. *Introduced:* November 1990. **157** Macintosh Classic (X.O.). *Industrial Design:* Apple Computer: Mark Pruitt; Bill Bull, Scott Campbell and Terry Smith, product design; Patton Design (Irvine, CA): Doug Patton, Rick Jung and Dennis Grudt. *Dates of Design:* August–December 1989. *Introduced:* November 1990.



The First Figaro Competition, speculative concepts for Apple's first notebook-sized "personal digital assistant" **158** Three Slate Concepts. Giugiaro Design (Turin, Italy): Giorgetto Giugiaro, Nicola Guelfo and Sergio Casalegno. **159**, **161** Aluminum Concept. Smart Design (New York, NY): Tucker Viemeister and Davin Sowell. **160** Figaro Concept. Patton Design (Irvine, CA): Doug Patton, Rick Jung and Dennis Grudt. *Dates of Design*: August–September 1989.

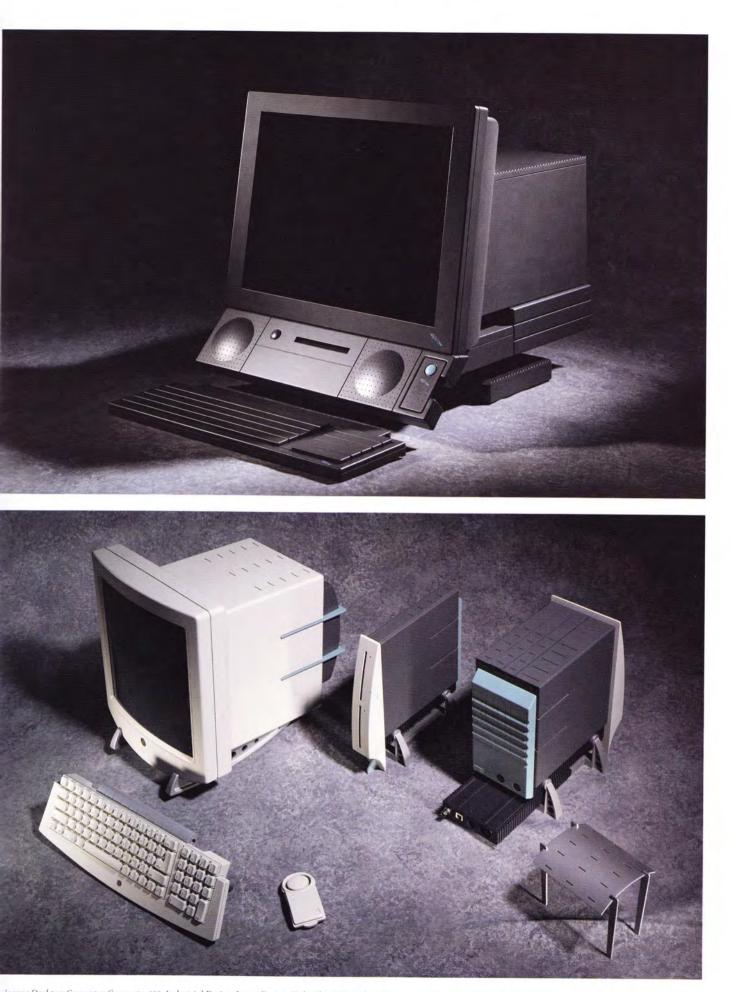


162, 163 First Figaro Competition. Hoop Concept. Smart Design (New York, NY): Tom Dair, Davin Stowell and Dan Formosa. Dates of Design: July-September 1989.

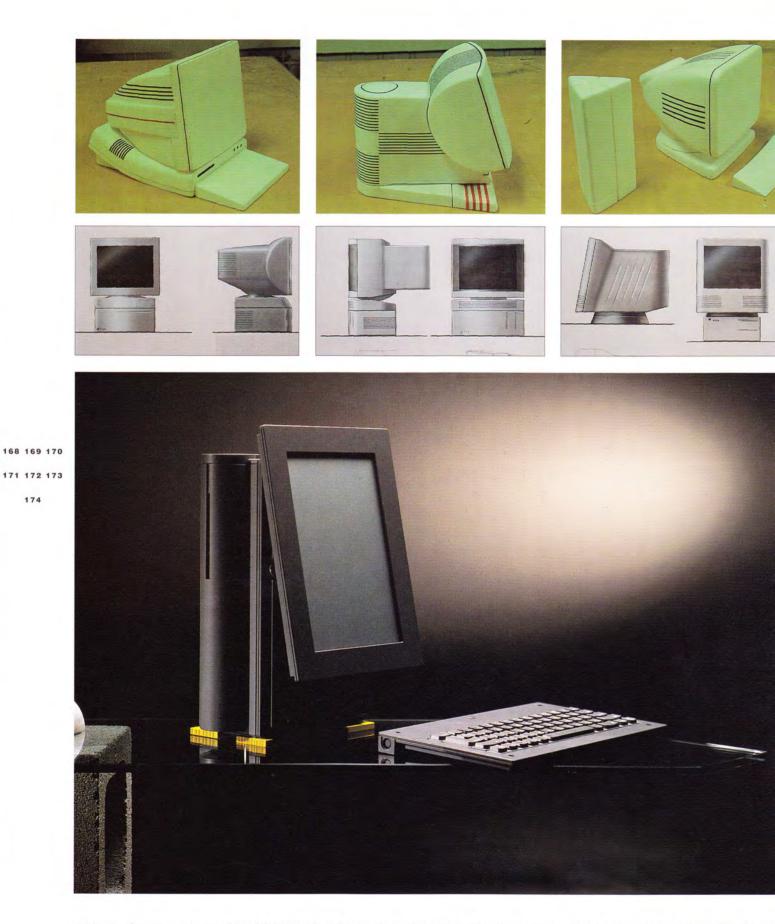


Jaguar, concepts for a series of RISC-based desktop computers predating the advent of PowerPC. **164** *Industrial Design:* Matrix Product Design (Palo Alto, CA): Mike Nuttall. **165** *Industrial Design:* Apple Computer: Ray Riley. *Dates of Design:* August–November 1989.



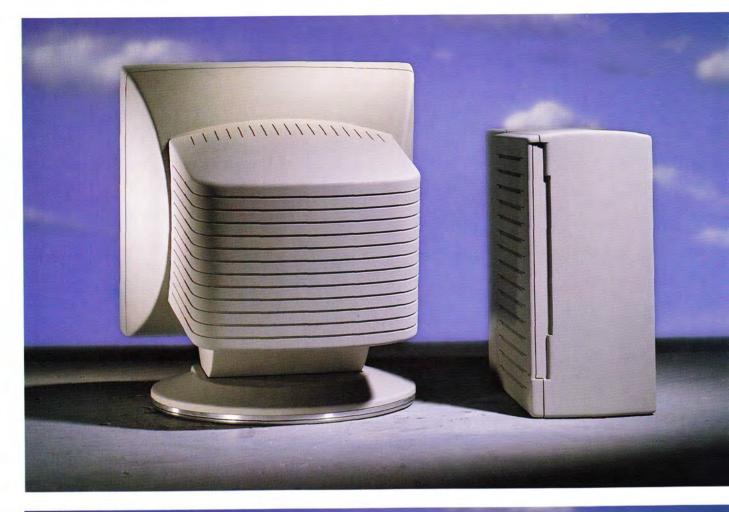


Jaguar Desktop Computer Concepts. 166 Industrial Design: Lunar Design (Palo Alto, CA): Robert Brunner and Ken Wood. 167 Industrial Design: Design Edge (Austin, TX): Mark Kimbrough, Chip Walters, Liz Walters, Lindsay Gupton. Dates of Design: September–November 1989.



 168-173 First-Phase Jaguar Concept models and drawings. Industrial Design: Giugiaro Design (Turin, Italy): Giorgetto Giugiaro, Nicola Guelfo and Sergio Casalegno. Dates of Design November 1989.
 174 BoomBox, a transportable computer concept using components from the Macintosh LC, tailored for youth and education markets. Industrial Design: Apple Computer: Ray Riley; Lunar Design (Palo Alto, CA): Robert Brunner and Ken Wood. Dates of Design: November 1989.
 175 (Opposite). BoomBox (folded position).







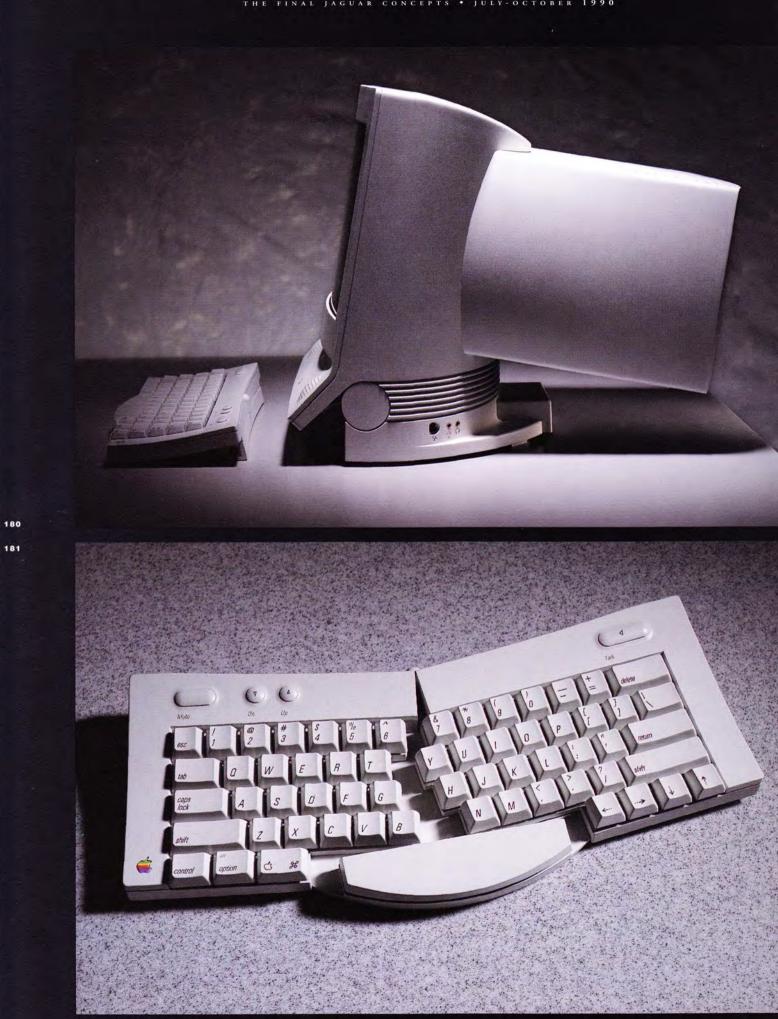
176, 177 Second-Phase Jaguar Concepts, resulting from Ray Riley's sessions with Giugiaro Design in Turin. Industrial Design: Giugiaro Design (Turin, Italy): Giorgetto Giugiaro, Nicola Guelfo and Sergio Casalegno. Dates of Design: February–March 1990.





178-179 Second-Phase Jaguar Concepts, resulting from Ray Riley's sessions with Giugiaro Design in Turin. *Industrial Design:* Giugiaro Design (Turin, Italy): Giorgetto Giugiaro, Nicola Guelfo and Sergio Casalegno. *Dates of Design:* February–March 1990.





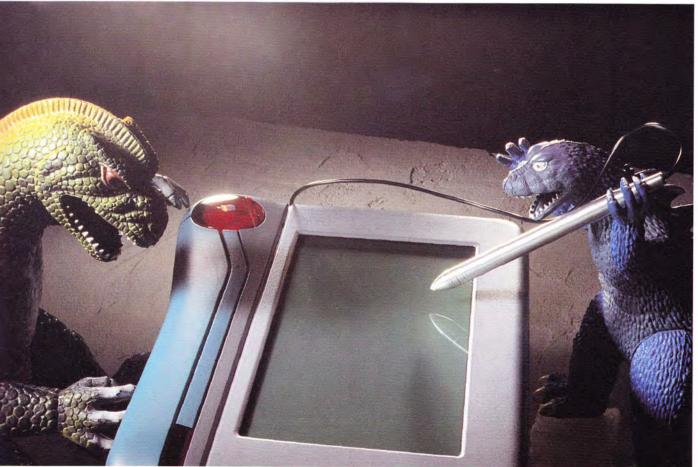


180-182 The Final Jaguar Concepts. Comprising the Audio-Visual Display (Telecaster), toaster-sized CPU (Leadbelly), Adjustable Keyboard (Norsi) with an external alpha-numeric keypad and Motorized Mouse (Mojo), derived from earlier concepts by Robert Brunner, Mike Nuttall and Giorgetto Giugiaro. *Industrial Design:* Apple Computer: Robert Brunner, (Display and Keyboard) Matrix Product Design (Palo Alto, CA): Mike Nuttall; (Mouse) Matrix Product Design (Palo Alto, CA): Mike Nuttall; (Mouse) Matrix Product Design (Palo Alto, CA): Paul Bradley. *Dates of Design:* July-October 1990.



183-184 Follow-up to the First Figaro Competition, revised concepts for a notebook-size personal digital assistant. *Industrial Design:* Giugiaro Design (Turin, Italy): Giorgetto Giugiaro, Nicola Guelfo and Sergio Casalegno. *Dates of Design:* December 1989–February 1990.





185-186 Follow-up to the First Figaro Competition. Concept for a notebook-size personal digital assistant selected after a second round of focus group testing. *Industrial Design:* Giugiaro Design (Turin, Italy): Giorgetto Giugiaro, Nicola Guelfo and Sergio Casalegno. *Dates of Design:* December, 1989–February 1990.

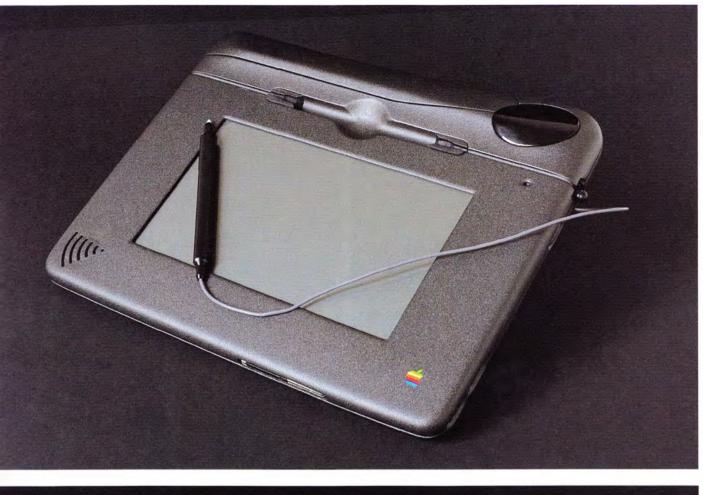


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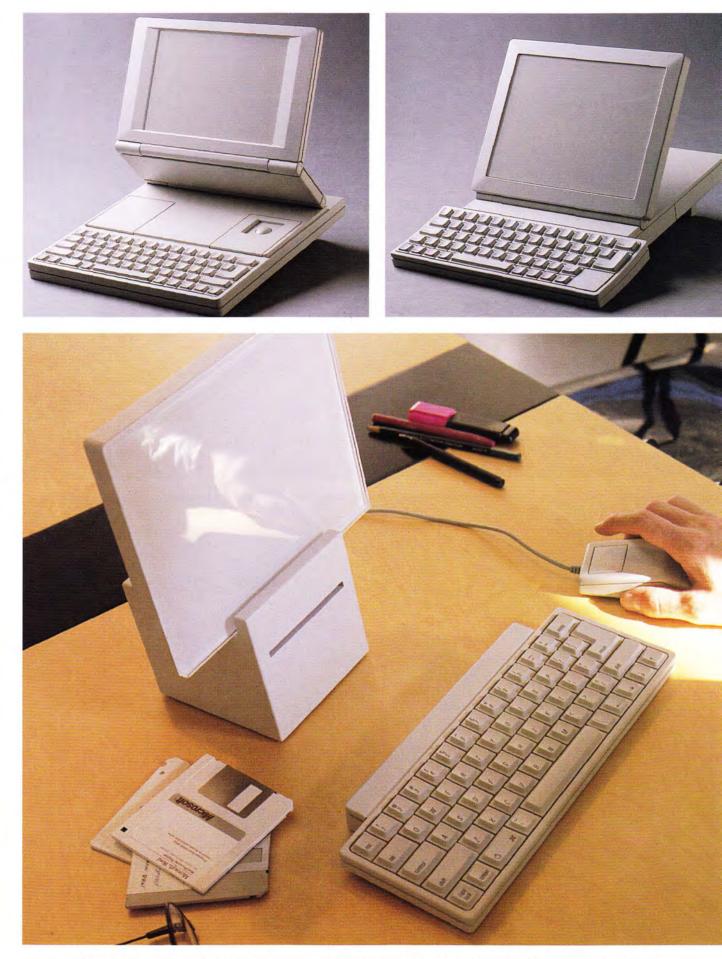
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The Second Figaro Competition. 187-188 Concept for a smaller notebook-sized personal digital assistant (front and rear view). *Industrial Design:* Apple Computer: Robert Brunner; Lunar Design (Palo Alto, CA): Ken Wood. *Dates of Design:* September-November 1990. 189 Concept for a mid-sized PDA (Newton). Industrial Design: Apple Computer: Robert Brunner. September-November 1990. 190 Concept for a larger PDA (Newton Plus). *Industrial Design:* Apple Computer: Robert Brunner; Lunar Design (Palo Alto, CA): Ken Wood. *Dates of Design:* September-November 1990.

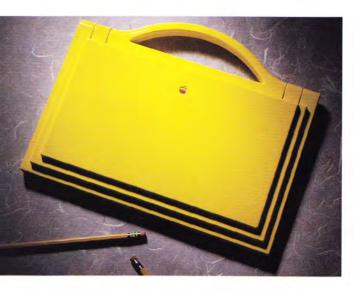




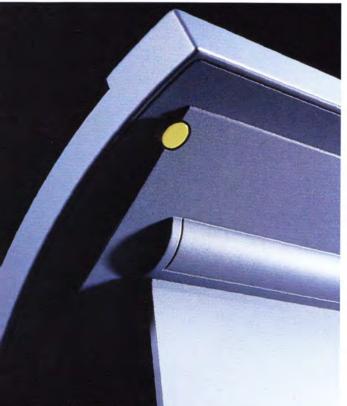
191-192 MontBlanc, the final design for Figaro (front and rear view) showing the revised shape and color, redesigned pen holder and black infrared window. *Industrial Design:* Giugiaro Design (Turin, Italy): Giorgetto Giugiaro, Nicola Guelfo and Sergio Casalegno. *Dates of Design:* December 1990–February 1991. (project cancelled)

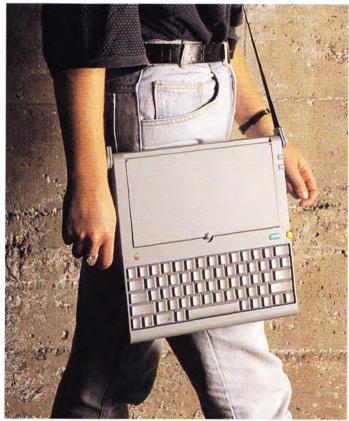


Twister Portable Computer Concepts. 193 Giraffe. 194 Tablet with a tilt-up display. 195 Showing the desktop 'Brain Box,' flat panel display and keyboard. Industrial Design: Apple Computer: Gavin Ivester; That (San Francisco, CA): Tony Guido and Sigmar Wilnauer. Dates of Design: April–June 1989.



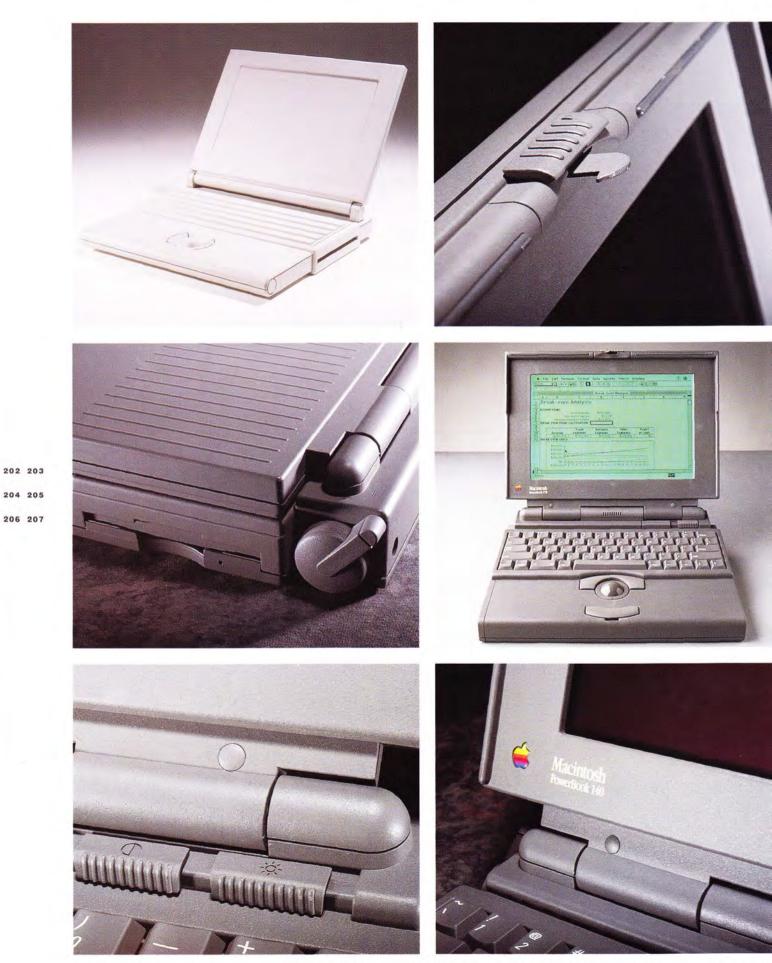








6-197 Apple IIp Portable Computer Concept. Industrial Design: Apple Computer: Mark Pruitt. Dates of Design: September–November 1989. 198, 200 'Arc' Portable Computer Concept. Industrial Design: Susanne Pierce. Dates of Design: November 1989–January 1990. 199, 201 'P 2' Portable Computer Concept. Industrial Design: Susanne Pierce. Dates of Design: September–November 1989.



202 Robert Brunner's foam concept for the PowerBook, showing the keyboard pushed toward the screen, a centered tradkball and palm rests containing a battery and hard disk driv which John Sculley approved on March 6, 1990. 203-207 PowerBook 140/170 (Tim LC / Tim) with details showing the central display latch, rotating rear feet, floppy disk slot, display hinge, brightness/contrast controls and raised SnowWhite lines on the top.

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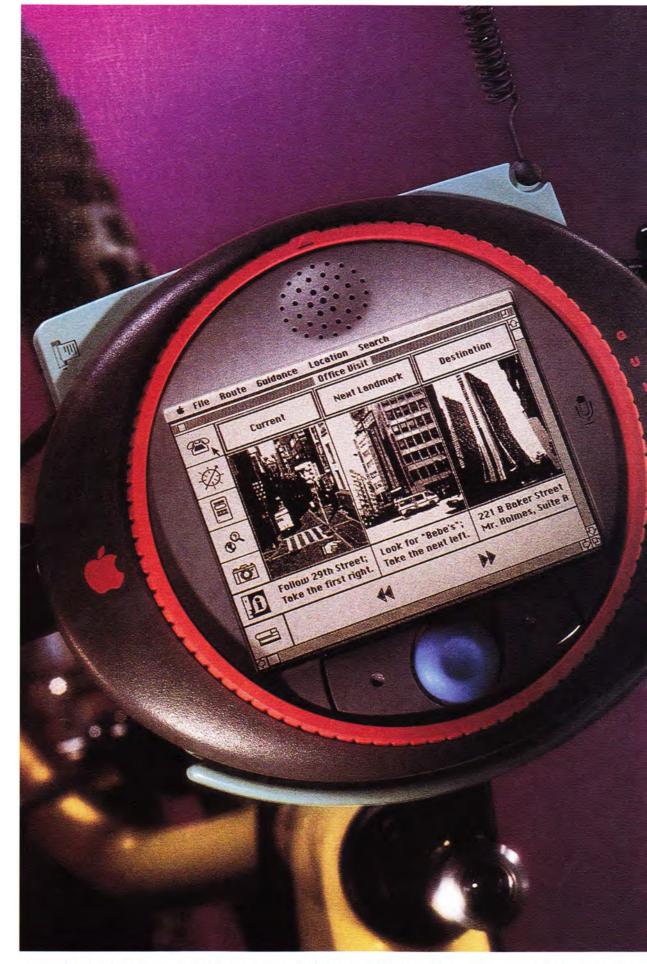


208 Left: PowerBook 100 (Sapporo). Industrial Design: Apple Computer: Robert Brunner; Lunar Design (Palo Alto, CA): Ken Wood and Matt Barthelemy. Dates of Design: September–December 1990. Introduced: October 1991. Right: PowerBook 140/170 (Tim LC / Tim). Industrial Design: Apple Computer: Robert Brunner, Gavin Ivester, Susanne Pierce; Mike Antonczak; Tom Bentley, John Sedmak, Ken Provost, product design. Dates of Design: March, 1990–February 1991. Introduced: October 1991.



209-215 PowerBook 100 (Sapporo) with Details showing the rotating rear foot, display latch. and external floppy drive (Buddy Boy). Industrial Design: Apple Computer: Robert Brunner; Lunar Design (Palo Alto, CA): Ken Wood and Matt Barthelemy. Dates of Design: September-December 1990. Introduced: October 1991. 216 PowerBook 100 (Sapporo). Industrial Design: Apple Computer: Robert Brunner; Lunar Design (Palo Alto, CA): Ken Wood and Matt Barthelemy. Dates of Design: September-December 1990. Introduced: October 1991.

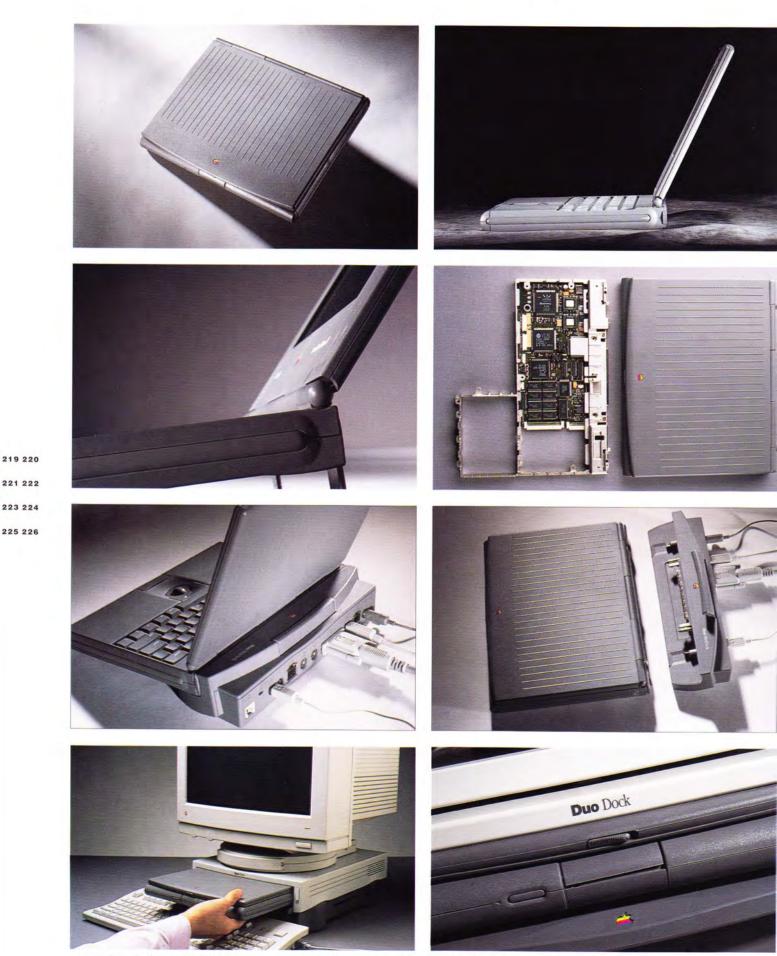




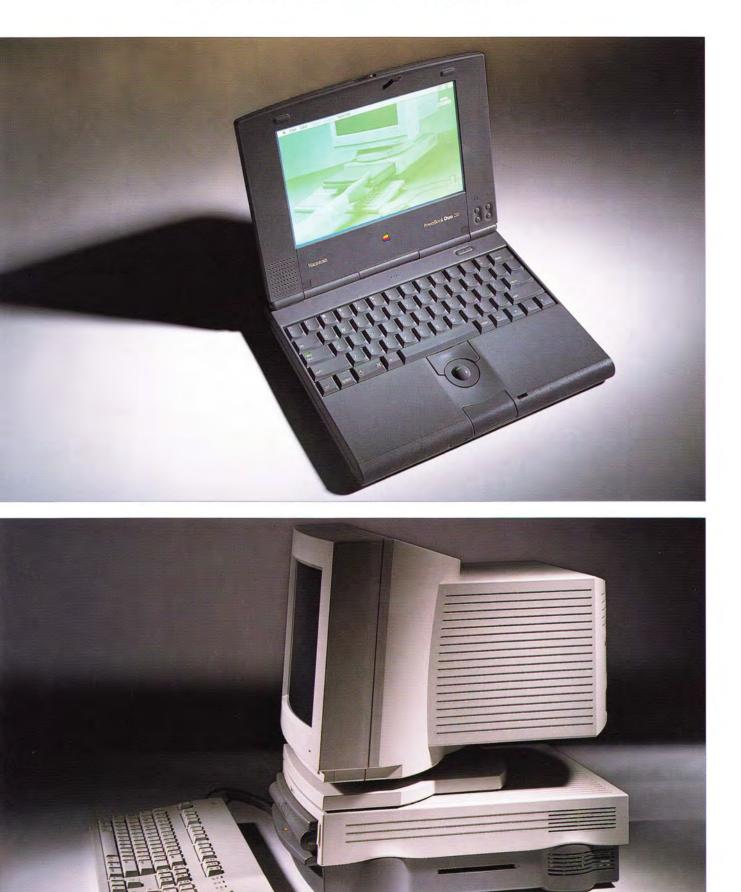
AppleSeeds. 217 Guide, a mobile directional finder concept, designed for the back cover of *ID Magazine*. *Industrial Design:* Apple Computer: Gavin Ivester, Larr Barbera and Tom Jacobson. *Dates of Design:* December, 1990.



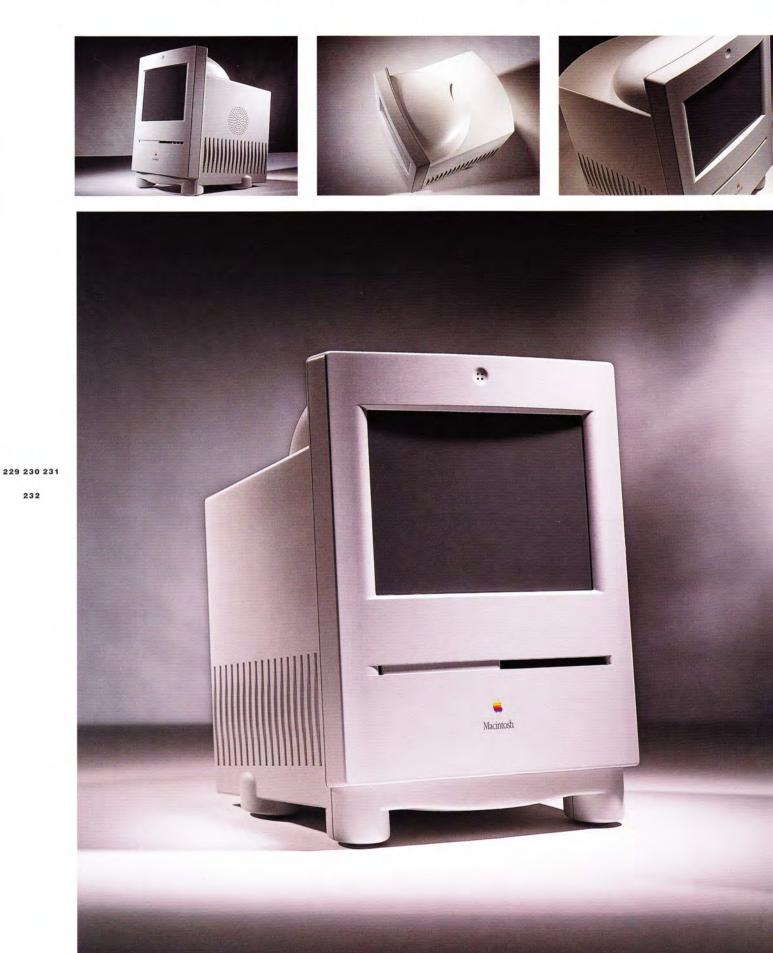
218 Exchanger, a handheld currency conversion concept. Industrial Design: Apple Computer: Susanne Pierce and Mark Pruitt. Dates of Design: December 1990.



219-220 PowerBook Duo. 221 Detail showing rear feet. 222 Detail showing internal chassis and logic board. 223-224 Minidock. Industrial Design: Apple Computer: Gavin Ivester, Bob Brunner; Matt Herron; IDEO Product Development (Palo Alto, CA) Denny Boyle, product design. Dates of Design: August–December 1991. 225-226 DuoDock. Industrial Design: Apple Computer: Jay Meschter; IDEO Product Development (Palo Alto, CA): Matt Herron, Denny Boyle, product design; Lunar Design (Palo Alto, CA): Dave Laituri. Dates of Design: October 1991–February 1992.



227 PowerBook Duo. Industrial Design: Apple Computer: Gavin Ivester, Robert Brunner, Susanne Pierce, Lawrence Lam; Robert Riccomini, Jeff Wood, Matt Herron, Dave Northway, product design; Lunar Design (Palo Alto, CA): Matt Barthelemy, Ken Wood. Dates of Design: March–October 1991. Introduced: October 1992. 228 PowerBook Duo, DuoDock, AppleColor 14-Inch Color Display, Extended Keyboard and ADB Mouse.



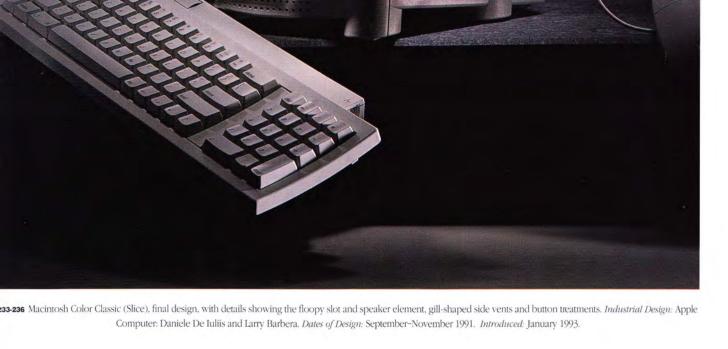
229-232 Mid-program redesign of the Columbia concept, adding short legs to the front, smaller feet to the back, a curved skirt below the front bezel and a more emphatic presence Industrial Design: Apple Computer: Robert Brunner and Larry Barbera. Dates of Design: June–August 1991.



Macintosh

Color Classic

233 234 235





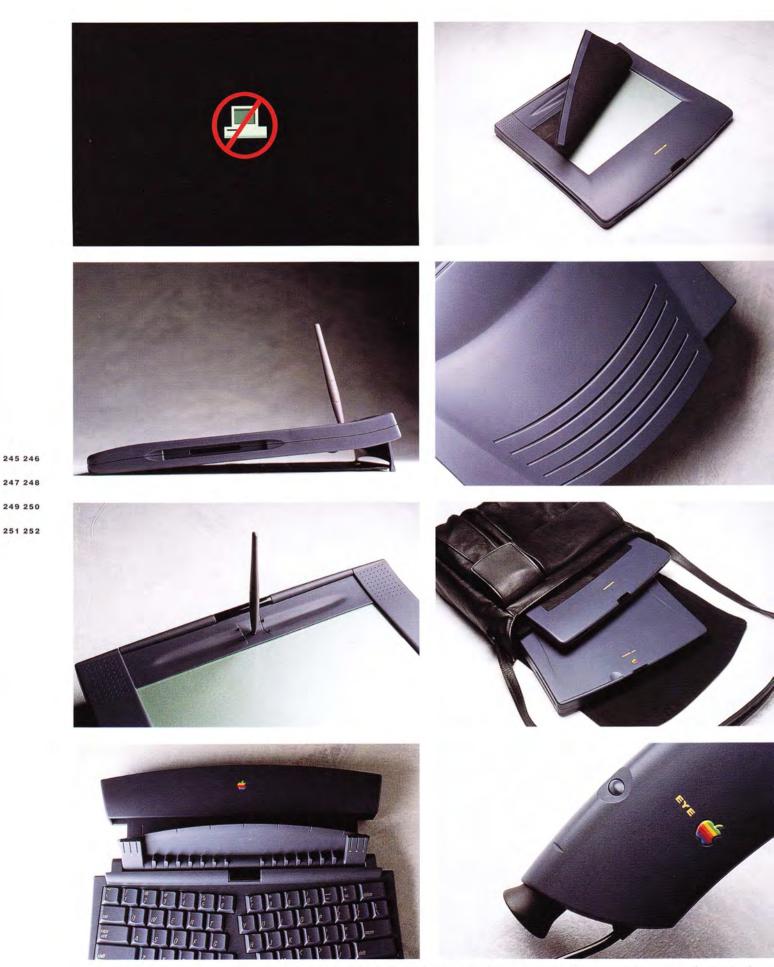
237 StyleWriter II (SpeedRacer) Foam Model.
 238-240 Details of the StyleWriter II final design showing the product's top, on/off button contained inside a divit, and finger scoop or the side indicating where the user opens the front lid.
 241 (Opposite). StyleWriter II (SpeedRacer). *Industrial Design:* Apple Computer: Tim Parsey; Pam Ryan, product design. *Date of Design:* November 1991–March 1992. *Introduced:* October 1992.





242 Apple ADB Mouse II (Topolino). Industrial Design: Apple Computer: Susanne Pierce; Brent Duchon, product design. Dates of Design: May-December 1991. Introduced: January 1993. 243 Mouse concepts by Susanne Pierce (top row). Daniele De Iuliis (bottom row, center) and Tim Parsey (bottom row, left and right). Dates of Design: September-October 1991. 244 (Opposite). Personal LaserWriter 300 (Comet). Industrial Design: Apple Computer: Daniele De Iuliis; Azad Khodai, Ken Ewing, product design. Dates of Design: October 1991-April 1992. Introduced: July 1993.





Juggernaut Design Investigation. 245 Program symbol. 246-247 WorkCase, by Daniele Defuliis. 248 DeskStation, by Daniele Defuliis. 249 WorkCase. 250 Leather Carrying Case. 251 Keyboard Station, by Daniele Defuliis. 252 Eye, a handheld video camera, also known as "Taco Cam," by Robert Brunner. Dates of Design: November 1991–September 1993.

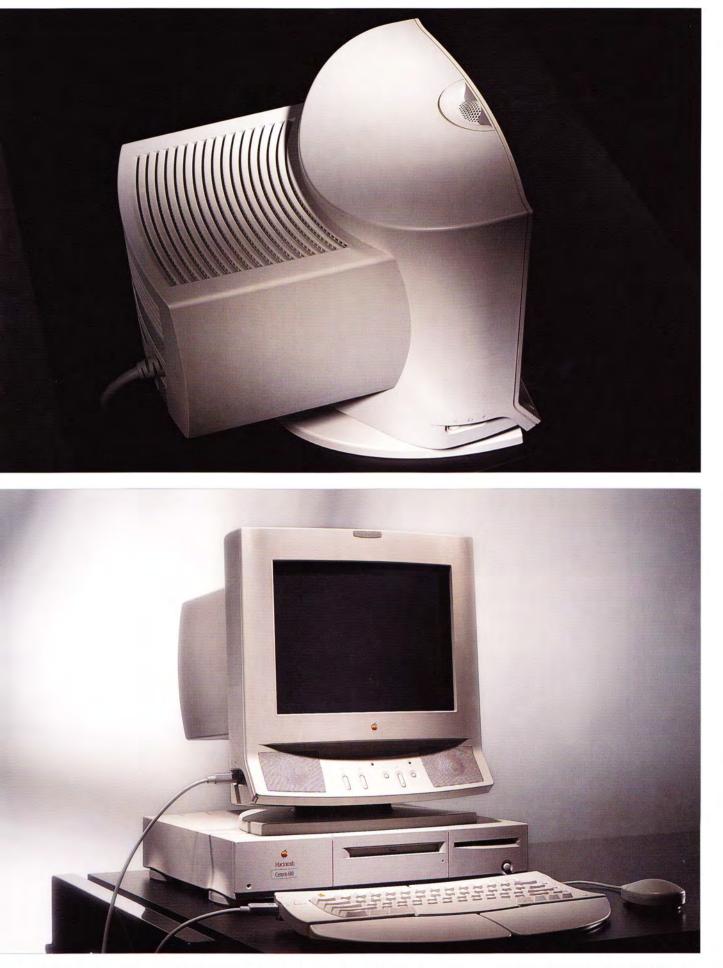


253 Juggernaut. Passport with Eye, WorkCase with DeskStation, Travel Kit and Keyboard Station (foreground). Industrial Design: Apple Computer: Robert Brunner, project manager; Daniele De Iuliis, Tim Parsey, Lawrence Lam. 254 WorkStation and PassPort. Industrial Design: Apple Computer: Daniele De Iuliis (WorkStation) and Tim Parsey (PassPort). Dates of Design: November 1991-September 1993.



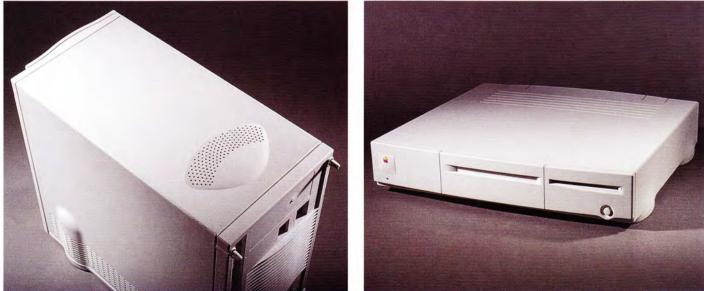


255-256 Apple Adjustable Keyboard (Norsi). Industrial Design: Apple Computer: Ray Riley; Harold Welch, project creator and research; Dave Shen, product design; Vent Design (Campbell, CA): Stephen Peart, Eric Chin. Dates of Design: January 1990–June 1991. Introduced: May 1992.



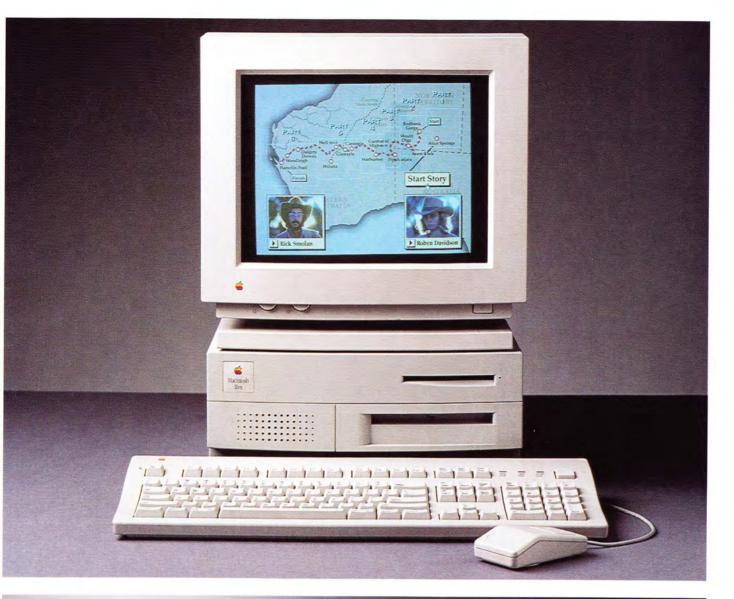
257-258 AudioVision 14 Display (Telecaster). Industrial Design: Apple Computer: Robert Brunner, Ray Riley; Dave Lundgren, product design; IDEO Product Development (Palo Alto, CA): Mike Nuttall, Mark Biasotti, Ricardo Salinas, Chris Hosking. Dates of Design: January 1991–June 1992. Introduced: January 1993.





259-260 Macintosh Quadra 800 (Fridge). Industrial Design: Apple Computer: Robert Brunner, Ray Riley; Wayne Miller, Brad Helm, Wayman Lee, Jim Melton, product design; Lunar Design (Palo Alto, CA): Ken Wood, Matt Barthelemy, Brett Lovelady. Dates of Design: January, 1991–August, 1992. Introduced: January 1993. 261 Macintosh Centris 610 (QFC). Industrial Design: Apple Computer: Ray Riley; Lorenzo Dunn, Bob Yuan, John Johnson, product design Dates of Design: March-April 1992. Introduced: January 1993.

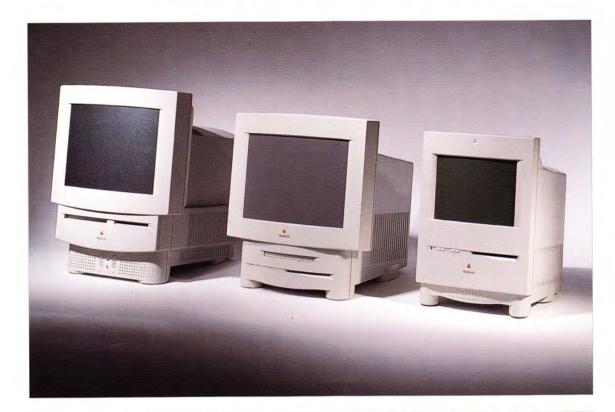
LEGO: MACINTOSH IIVX • DRAGON: APPLE 14-INCH DISPLAY NOVEMBER 1991-MARCH 1992



262



262 Macintosh IIvx / Performa 600 / Quadra 650 (Lego). Industrial Design: Apple Computer: Tim Parsey; Barry Marshall, Bill DeMeulenaere, Ben Pang, product design. Dates of Design: February–March 1992. Introduced: September 1992. 263 AppleColor 14-Inch Color Display (Dragon). Industrial Design: Apple Computer: Jim Stewart; Ron Moller, product design; IDEO Product Development (Palo Alto, CA): Mark Biasotti. Dates of Design: November 1991–March 1992. Introduced: September 1992.





264 Left to right: Macintosh LC520 (Hook) final design; Interim design (Mondo); Macintosh Color Classic (Slice). 265 Macintosh LC520 (Hook). Industrial Design: Apple Computer: Larry Barbera; Eric Xanthopoulos, Mike Milo, Betsy Diaz, Steve Chase, Chris Novak, product design; Lunar Design (Palo Alto, CA): Ken Wood, Brett Lovelady, Matt Barthelemy. Data of Design: Mondo phase: January–June 1992; Hook phase: October–November 1992. Introduced: June 1993. 266 Macintosh TV (Hook form factor). Industrial Design: Apple Computer Larry Barbera; Eric Xanthopoulos, Mike Milo, Betsy Diaz, Steve Chase, Chris Novak, product design; Lunar Design (Palo Alto, CA): Ken Wood, Brett Lovelady, Matt Barthelemy.



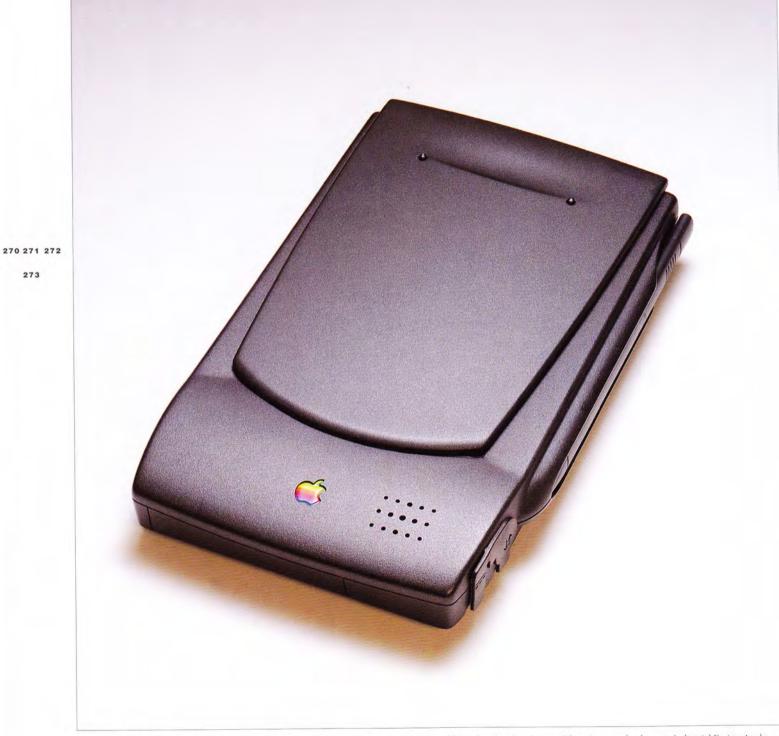


267-268 LaserWriter Select 300 (Ninja). Industrial Design: Apple Computer: Jim Stewart, Tim Parsey; Azad Khodai, product design; IDEO Product Development (Palo Alto, CA): Mike Nuttall. Dates of Design: February–September 1992. Introduced: May 1993.

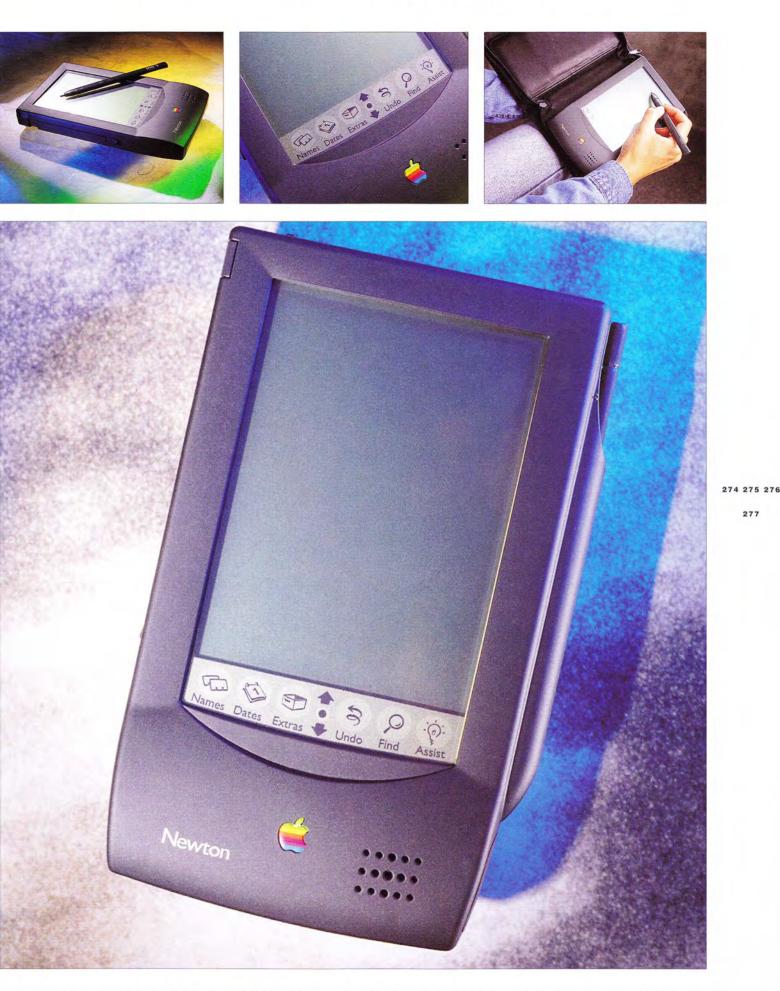


269 LaserWriter Pro 600/630 (Tollhouse). Industrial Design: Apple Computer: Robert Brunner, Jim Stewart, Grant Ross, Jr.; Ron van Thiel, product design; Lunar Design (Palo Alto, CA): Ken Wood. Dates of Design: February, 1990–February 1992. Introduced: January 1993.





270-272 Initial design for the Newton MessagePad 100 (code-named Batman), with a curved lid and sculpted enclosure with an integrated palm rest. Industrial Design: Apple Computer: Gavin Ivester, Tim Parsey, Daniele Defuliis, Susanne Pierce, Robert Brunner. Dates of Design: November 1991-February 1992. 273 Mid-program re-design for the Newton MessagePad 100 with a redesigned lid (note tiny protuberances on the upper portion). Industrial Design: Apple Computer: Tim Parsey. Dates of Design: April 1992.

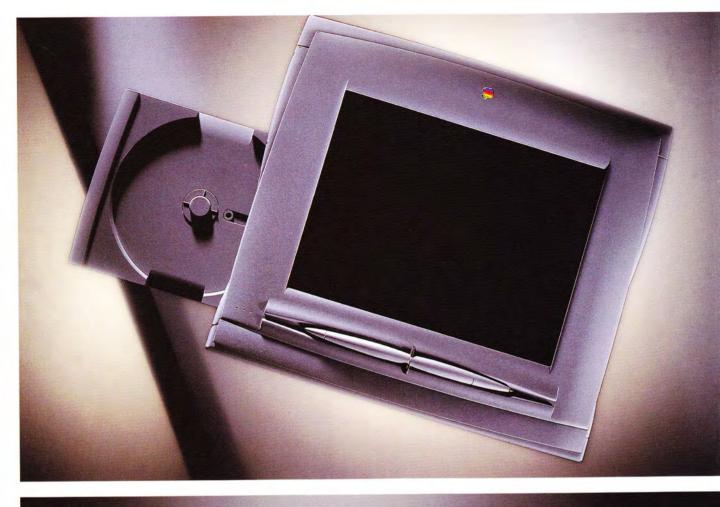


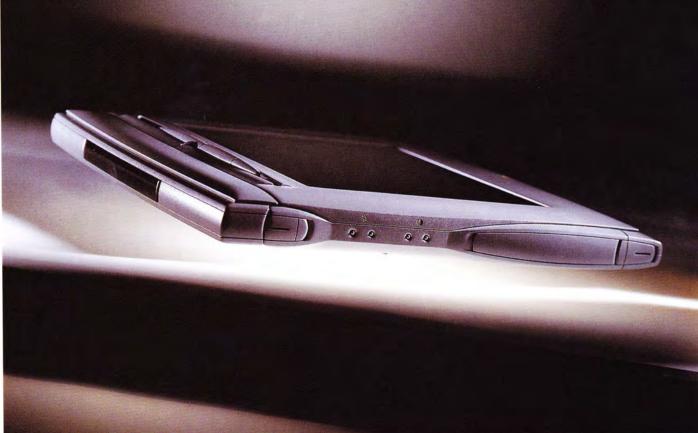
274-277 Newton MessagePad 100 (Junior), final design. (Details showing the stylus, touch-sensitive "button bar" icons below the screen and carrying case). *Industrial Design:* Apple Computer: Tim Parsey, Gavin Ivester, Robert Brunner, Susanne Pierce, Daniele De Iuliis *Dates of Design:* May–December 1992. *Introduced:* August 1993.



278 Apple PowerCD (Tulip). Industrial Design: Apple Computer: Susanne Pierce. Dates of Design: June-August 1992. Introduced: July 1993. 279 CD-ROM Multimedia Player Concept (Heavy Metal). Industrial Design: Apple Computer: Susanne Pierce. Dates of Design: November–December 1992. (Project cancelled) 280 AppleDesign Powered Speakers (Badger). Industrial Design: Apple Computer: Tim Parsey. Dates of Design: August 1992. Introduced: May 1993. 281-283 Computer–Fax–Telephone–Answering Machine Concept (Palladin).
 Industrial Design: Apple Computer: Bart Andre, Tim Parsey; John Howard, Julie McDonald, Eric Larkin, Rick Jackson, product design. Dates of Design: December 1992. (project cancelled). 284-285, 286 (Opposite). Hand-Held CD-ROM Concept (Popeye). Industrial Design: Apple Computer: Bart Andre, Tim Parsey, Bob Brunner. Dates of Design: September–December 1992. (project cancelled)

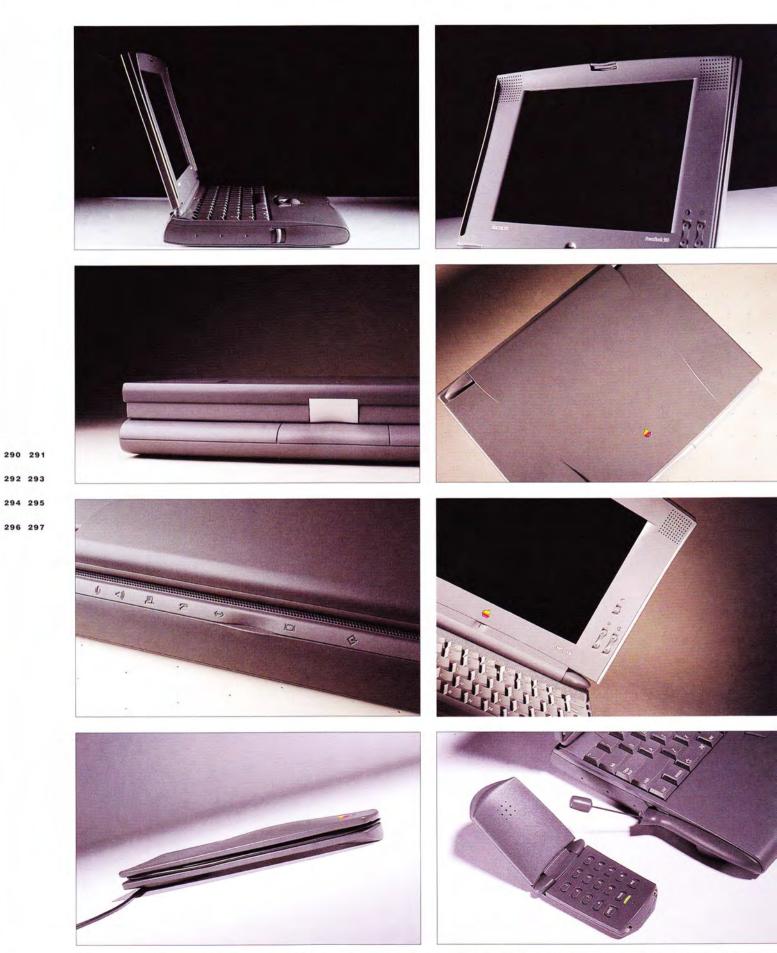






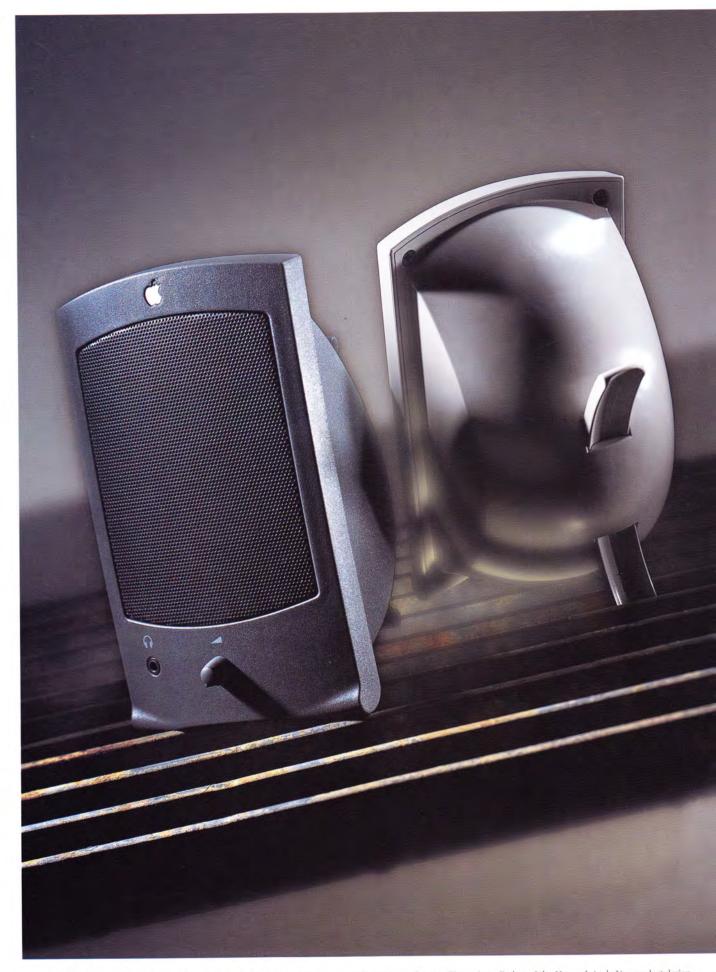
287-288, 289 (Opposite). PenMac Hand-Held Computer Concept (Folio) with an integrated stylus, Mac-style user interface, CD-ROM drive and an infrared data terminal. Industrial Design: Apple Computer: Masamichi Udagawa. Dates of Design: August–October 1992 (project cancelled).





290-297, 298 (Opposite). PowerBook 500 Series (Blackbird). Including details from the December, 1992 hard model showing the side view, display bezel with concave speaker areas and microphone below the screen, display latch, top cover, display hinges, product icons above the I/O ports on the back, brightness/contrast controls, elements from the Marconi communications strategy. *Industrial Design:* Apple Computer: Daniele De Iuliis, Lawrence Lam; Bill Burnett, Don DeGrass, John Larkin, Ken Weber, Dave Northway, product design. Dates of Design: December 1991–August 1993. *Introduced:* May 1994.





299 AppleDesign Powered Speakers II (Baby Badger). Industrial Design: Apple Computer: Susanne Pierce, Larry Barbera; John Howard, Andy Liu, product design. Dates of Design: October-December 1993. Introduced: May 1994.





300-301 QuickTake 100 Digital Camera (Venus). Industrial Design: Apple Computer: Marc Van De Loo, Tim Parsey; Dave Shen, product design. Dates of Design: October-December 1992. Introduced: January 1994.

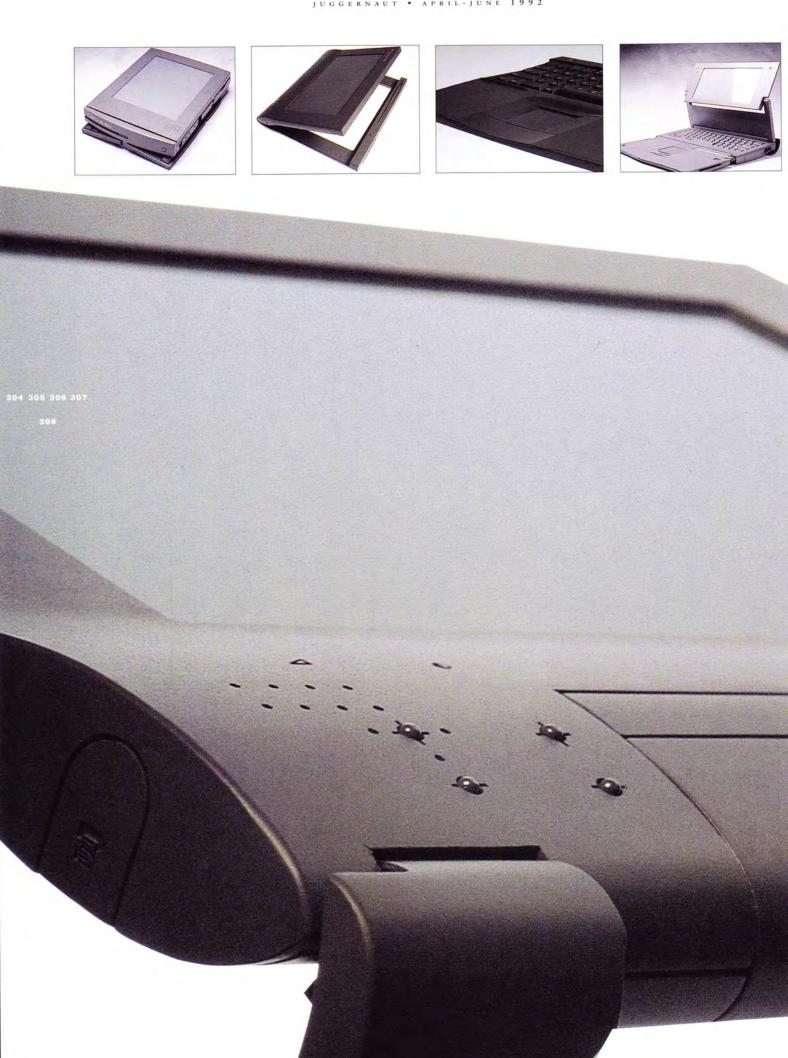


302 Zebra Writing Pen. Industrial Design: Roberts Weaver (London): Jonathan Ive. Designed in 1986.



JONATHAN IVE • 1990

303 Barber's Comb. Industrial Design: Tangerine (London): Jonathan Ive. Designed in 1990.

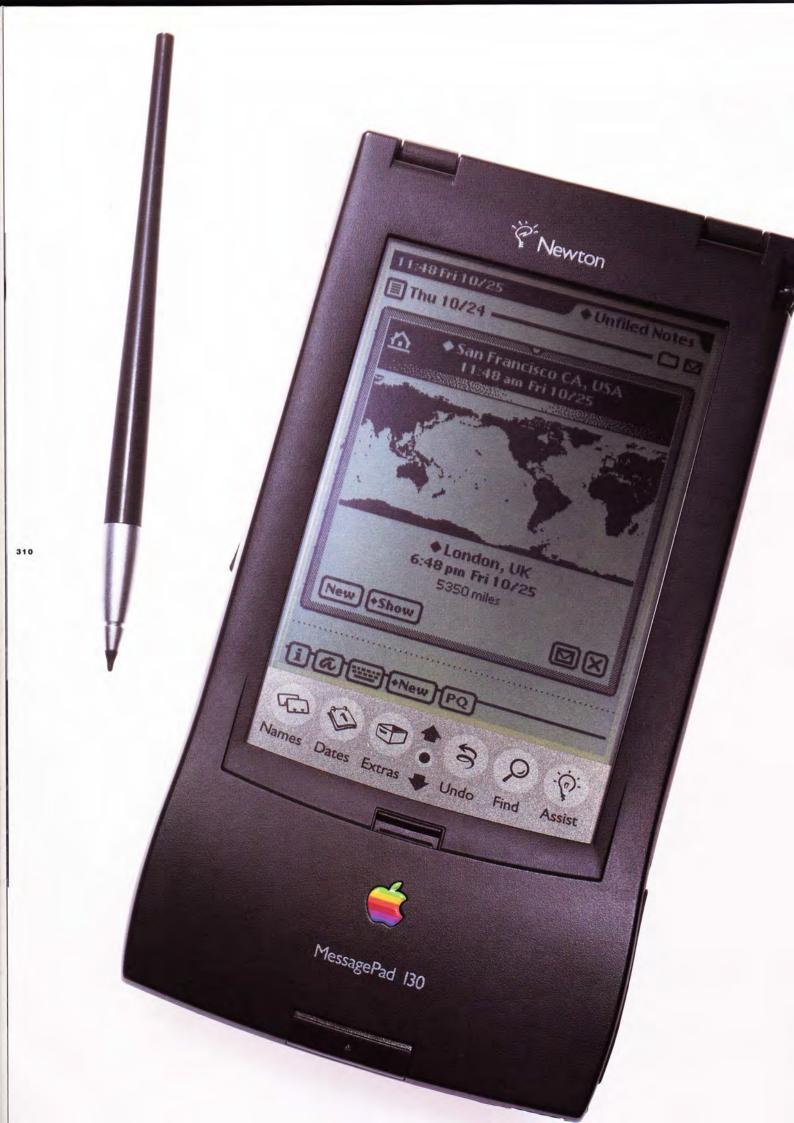


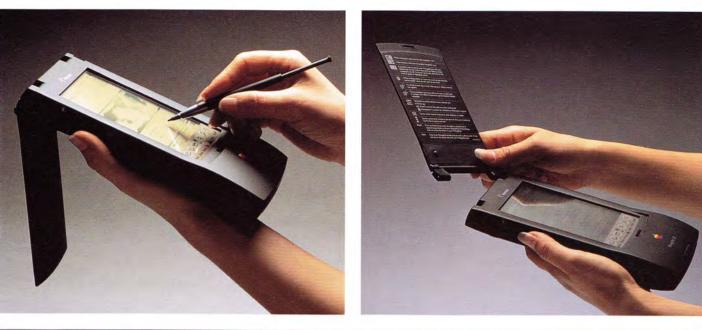


308a



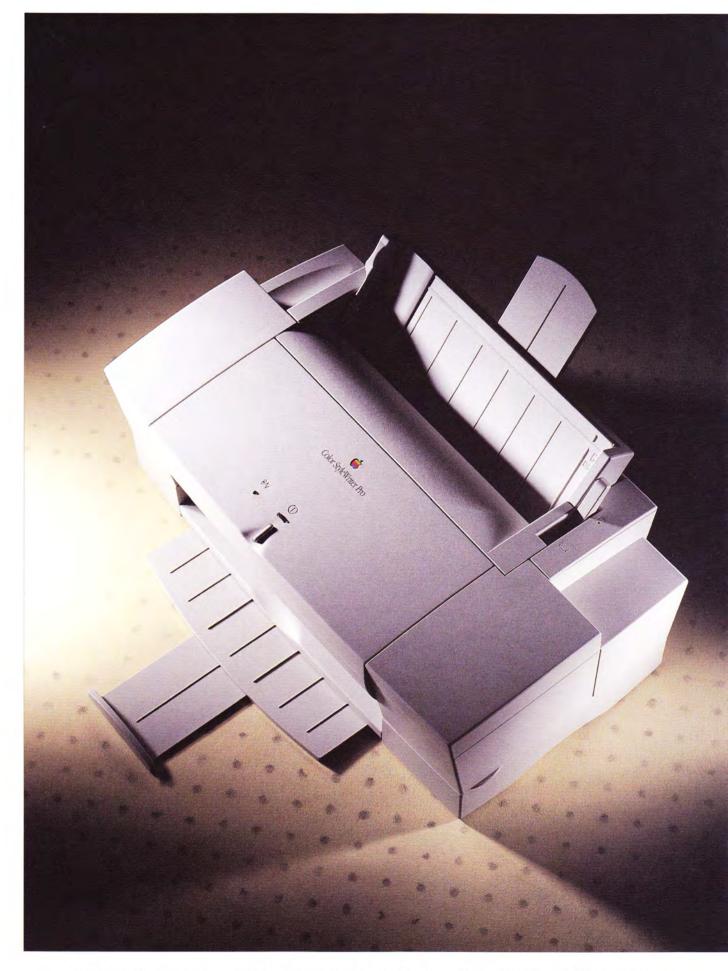
Juggernaut Design Investigation. 304, 309 Macintosh WorkSpace, a transportable desktop computer with a flat panel display and split folding keyboard. *Industrial Design:* Tangerine (London): Jonathan Ive, Clive Grinyer and Martin Derbyshire. 305, 308, 308a Macintosh Folio, a portable Newton-like slate computer with an integrated stand. 306 Folio Keyboard, which connects to Macintosh Folio to form a desktop computer system. *Industrial Design:* Tangerine (London): Jonathan Ive. 307 SketchPad, a portable computer with height/tilt adjustable display that folds into a purse-shaped bundle. *Dates of Design:* April-June 1992.





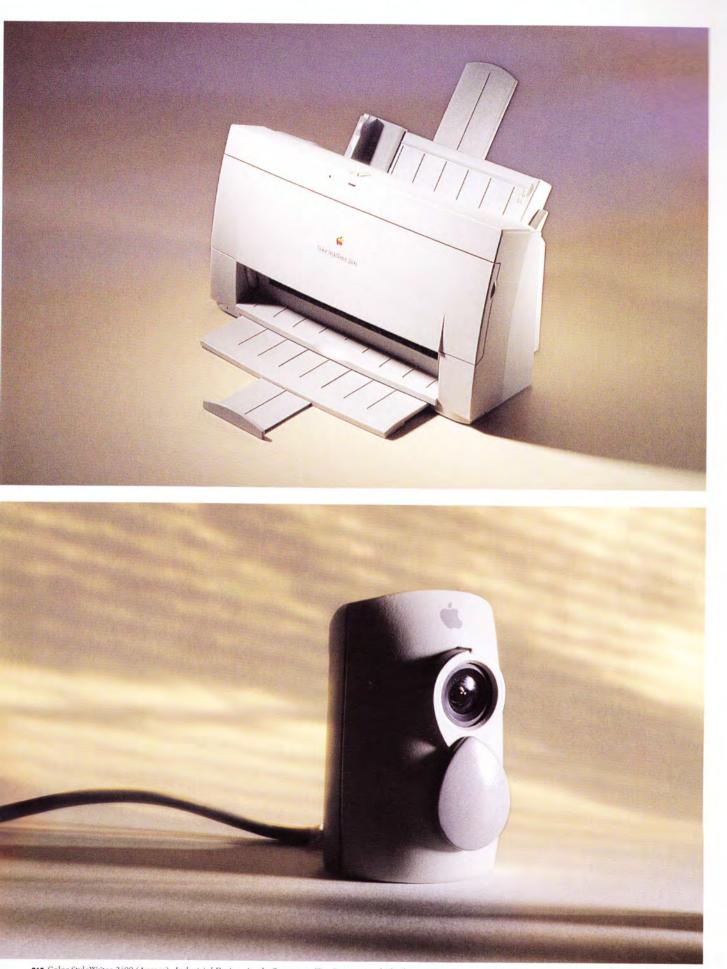


310 (Opposite), 311-313 Newton MessagePad 110/120/130 (Lindy) with Charging Station (Crib). Industrial Design: Apple Computer: Jonathan Ive. Charging Station: Daniele De Iuliis: Ron Moller, product design. Dates of Design: November 1992–January 1993. Introduced: February 1994. 311 312

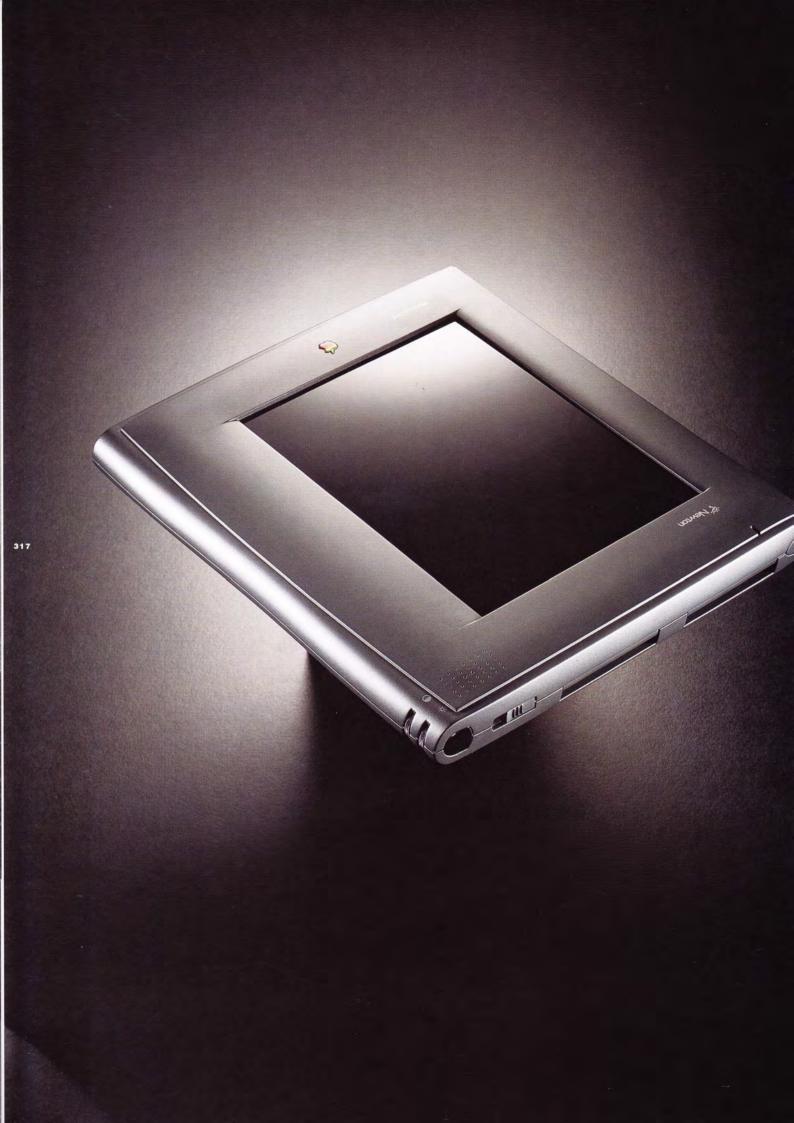


314 Color StyleWriter Pro (Fantasia). Industrial Design: Apple Computer: Tim Parsey; Pam Ryan, product design; IDEO Product Development: Christopher Loew. Dates of Design: February–May 1992. Introduced: May 1993.





315 Color StyleWriter 2400 (Aurora). Industrial Design: Apple Computer: Tim Parsey; Azad Khodai, product design; IDEO Product Development: Christopher Loew.
 Dates of Design: May–June 1994. Introduced: October 1994.
 316 AppleDesign Desktop Video Camera Concept (Palentir). Industrial Design: Apple Computer: Susanne Pierce.
 Dates of Design: March–July 1992 (project cancelled).

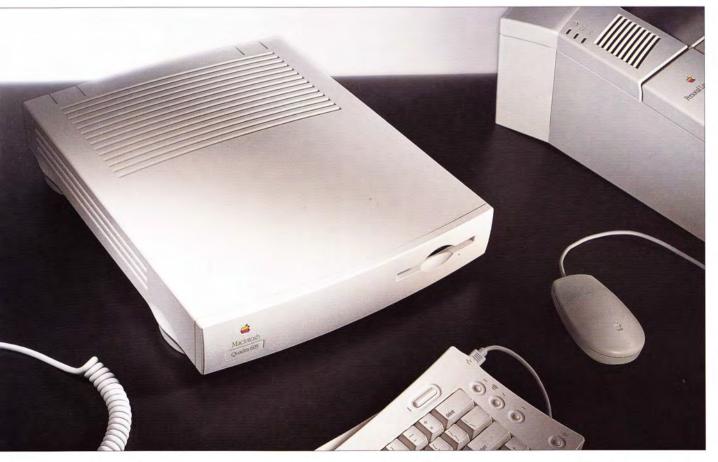


BIC: LARGE FORMAT NEWTON CONCEPT • MARCH-AUGUST 1993 SHOW AND TELL: QUADRA 630 • APRIL-OCTOBER 1993 ELB: QUADRA 605 • FEBRUARY-OCTOBER 1993



318

319



317 Large-Format Newton Concept (Bic). Industrial Design: Apple Computer: Marc van de Loo; John Tang and David Lima, product design. Dates of Design: March–August 1993 (project cancelled).
 318 Quadra 630 (Show and Tell). Industrial Design: Apple Computer: Jay Meschter, Cal Seid, Tim Parsey; Eric Xanthopoulos, Rick Mariano, product design. Dates of Design: April–October 1993. Introduced: May 1994.
 319 Quadra 605 (ELB). Industrial Design: Apple Computer: Calvin Seid; Bill de Meulenaere and Braxton Lathrop, product design. Dates of Design: February–June 1993. Introduced: July 1993.





320 AppleVision 1710 Display (Hammerhead, left) and 1710AV Display (Sousa, right). Industrial Design: Apple Computer: Jonathan Ive, Bart Andre; John O'Brien, Dave Lundgren product design. Dates of Design: June–December 1993. Introduced: September 1995.
 321 AppleVision 1710 Display, side view showing front/rear bezel, mid-bucket and rear bucket.
 322 (Opposite) AppleVision 1710 Display, top view.



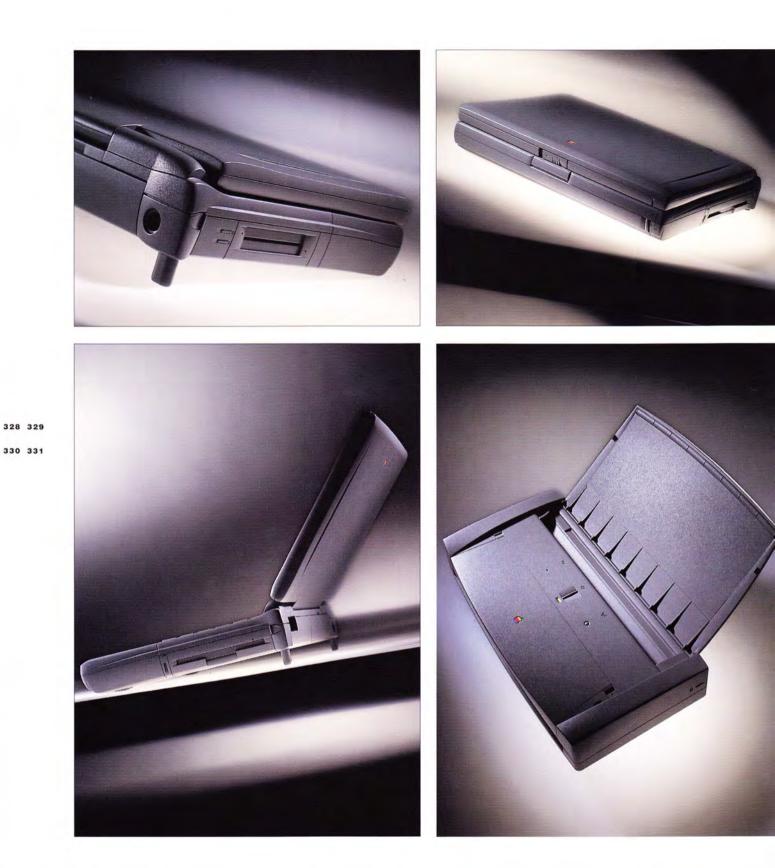


 323 First-Phase Foam Concepts for a low-cost all-in-one Macintosh (Rebound). *Industrial Design:* Apple Computer: Larry Barbera; BBiD (Los Gatos, CA): Brad Bissell. January-May 1993. 324 Second-Phase Foam Concept (Transformer). *Industrial Design:* BBiD (Los Gatos, CA): Brad Bissell, June-December 1993.
 325-326 Second-Phase Concept (Transformer). *Industrial Design:* Apple Computer: Jay Meschter, June-December 1993.



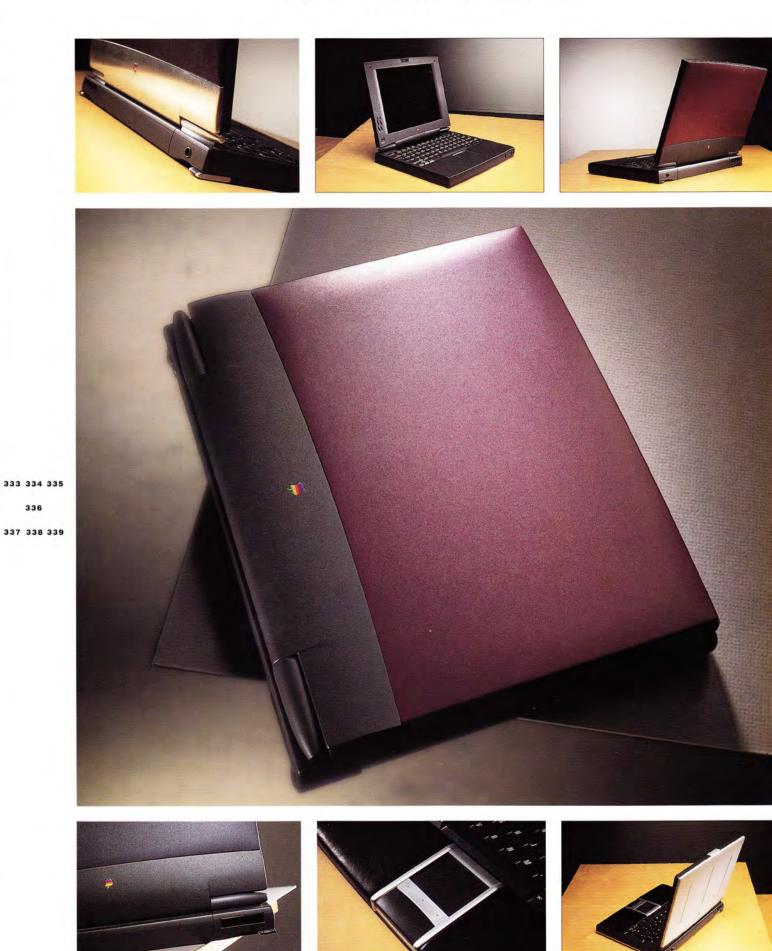


327 Power Macintosh 5200 (Bongo). Industrial Design: Apple Computer: Jay Meschter, Larry Barbera, Cal Seid, Robert Brunner; Jim Levins, Betsy Diaz, product design. Dates of Design: August-September 1994. Introduced: May 1995.



328-330, 332 (Opposite). PowerBook 5300 (M2). With details showing the stiletto feet, shaped rear corners and PCMCIA slot; top cover; and side view. *Industrial Design:* Apple Computer: Masamichi Udagawa; John Howard, Bob Yuan, product design. *Dates of Design:* November 1993–October 1994. *Introduced:* September 1995. **332** Portable StyleWriter 2200 (Calamari). *Industrial Design:* Apple Computer: Masamichi Udagawa; Azad Khodai, product design. *Dates of Design:* September-December 1994. *Introduced:* May 1995.

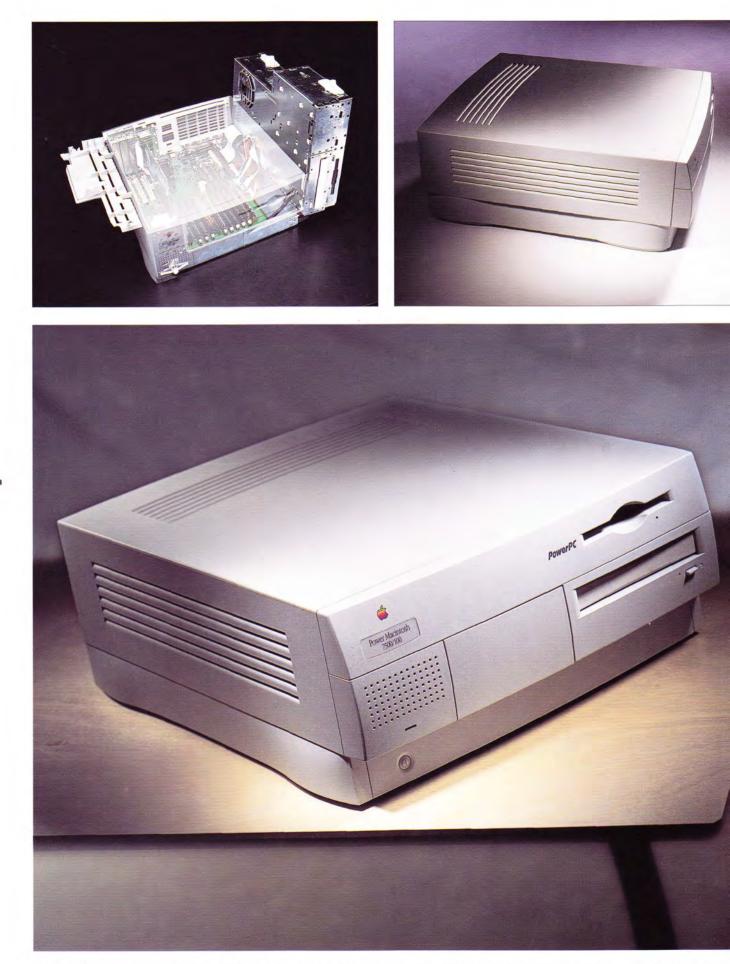




333-339 Nautilus, a series of subnotebook computer concepts trimmed in leather, polished/brushed/anodized metal, brightly color plastic and other non-traditional materials. Industrial Design: Apple Computer: Bart Andre, Lawrence Lam; Ken Weber, product design. Dates of Design: September 1994–August 1995 (project cancelled).

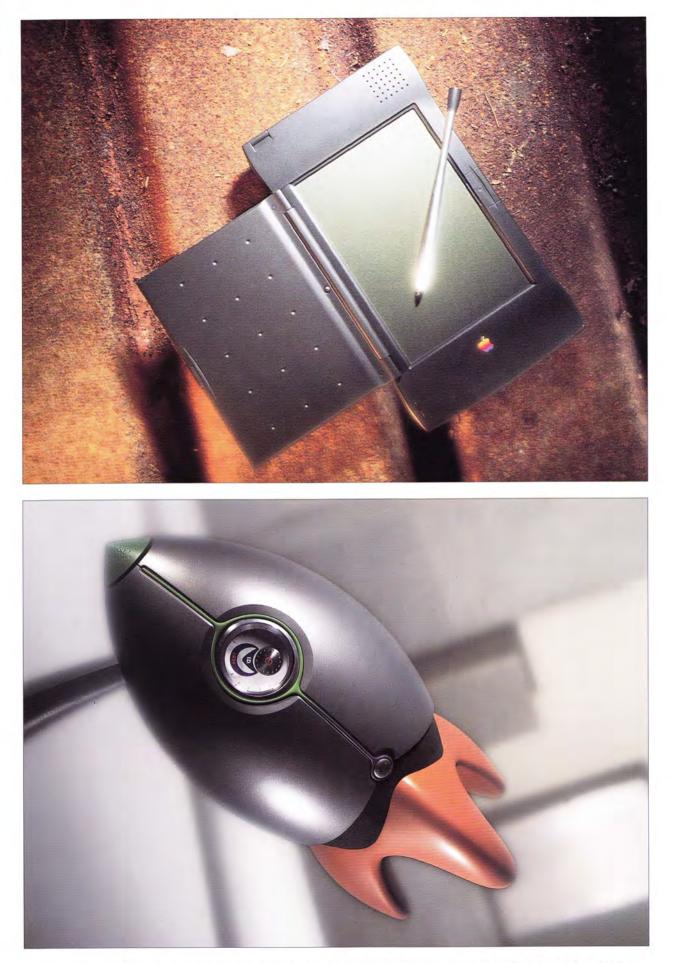


340-341 Nautilus, a series of subnotebook computer concepts trimmed in leather, polished/brushed/painted metal and other non-traditional materials. Industrial Design: Apple Computer: Bart Andre, Lawrence Lam; Ken Weber, product design. Dates of Design: September 1994–August 1995 (project cancelled).

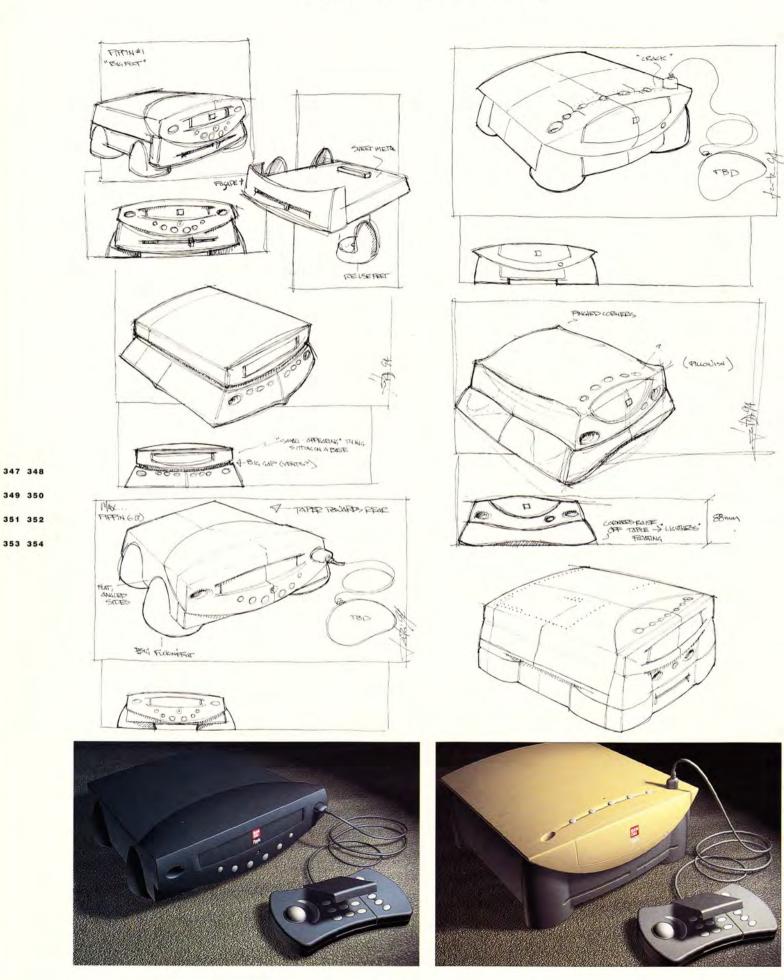


342 PowerMacintosh 7000 Series (Outrigger). Industrial Design: Apple Computer: Cal Seid, Tim Parsey; Bill de Meulenaere, Wayman Lee, Ben Pang, product design; IDEO Producelopment: Ian McColl, John Lai. Dates of Design: August 1994–January 1995. Introduced: September 1995. 343 Interior Configuration. 344 Side View.

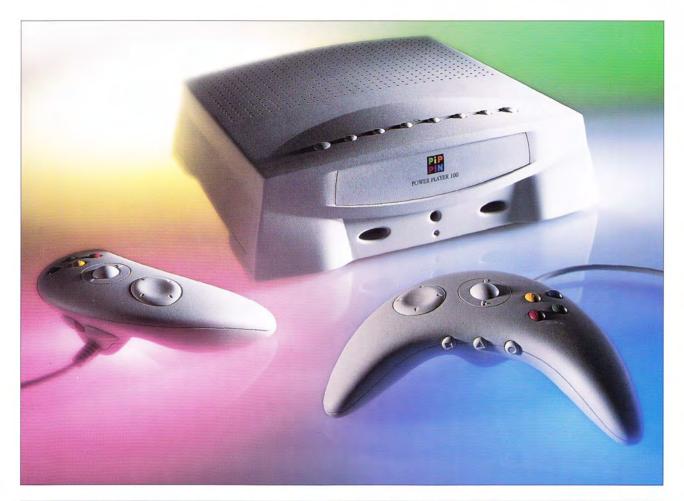
342 343 344



345 Newton MessagePad 2000 (Q). Industrial Design: Apple Computer: Daniele De Iuliis; Don Porter, Kusuki Mori (Sharp Electronics, Japan), product design. Dates of Design: October 1993–May 1994. Introduced: January 1997. 346 TimeCapsule. ID Magazine 40th Anniversary Concept. Industrial Design: Apple Computer: Danny Coster, Jonathan Ive. Dates of Design: August 1994.

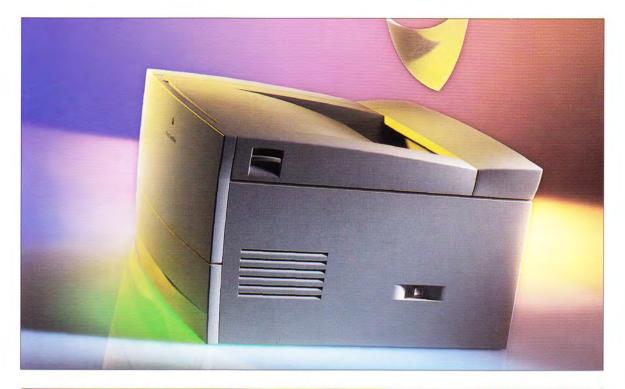


First-Phase Concept sketches for Pippin: **347** "Big Foot" **348** "Oriental Eye" **349** "Cow Catcher" **350** "Pillow" **351** "Max" **352** Final Concept.. **353-354** Second-phase Pippin hard model and color study exercise. *Dates of Design:* October–November 1994.





355 Bandai @Mark / @World (Pippin). Industrial Design: Apple Computer: Ray Riley; Rick Jackson, product design; Lunar Design (Palo Alto, CA): Dave Laituri, Gilbert Wong. Dates of Design: September 1994–February 1995. Introduced: March 1996 (Japan); November 1996 (U.S.). 356 Pippin Hand-Held Controller. Industrial Design: Apple Computer: Ray Riley; Lunar Design: Dave Laituri, Gilbert Wong.





357 LaserWriter 12/1600 (Mongoose). Industrial Design: Apple Computer: Jay Meschter; Ron van Thiel, Glen Gee, product design. Dates of Design: January–June 1995. Introduced: January 1996. 358 Macintosh Performa 6400 series (Instatower). Industrial Design: Apple Computer: Chris Stringer; Chris Novak, Rick Mariano, product design. Dates of Design: September–November 1995. Introduced: August 1996. Photo copyright © Beverley
 Harper. 359 Power Macintosh 8600/9600 (K2). Industrial Design: Apple Computer: Danny Coster; Wayman Lee, Troy Hulick, James Melton, Noriko Fukasawa, product design. Dates of Design: October 1995–May 1996. Introduced: January 1997. Photo copyright © Beverley Harper.



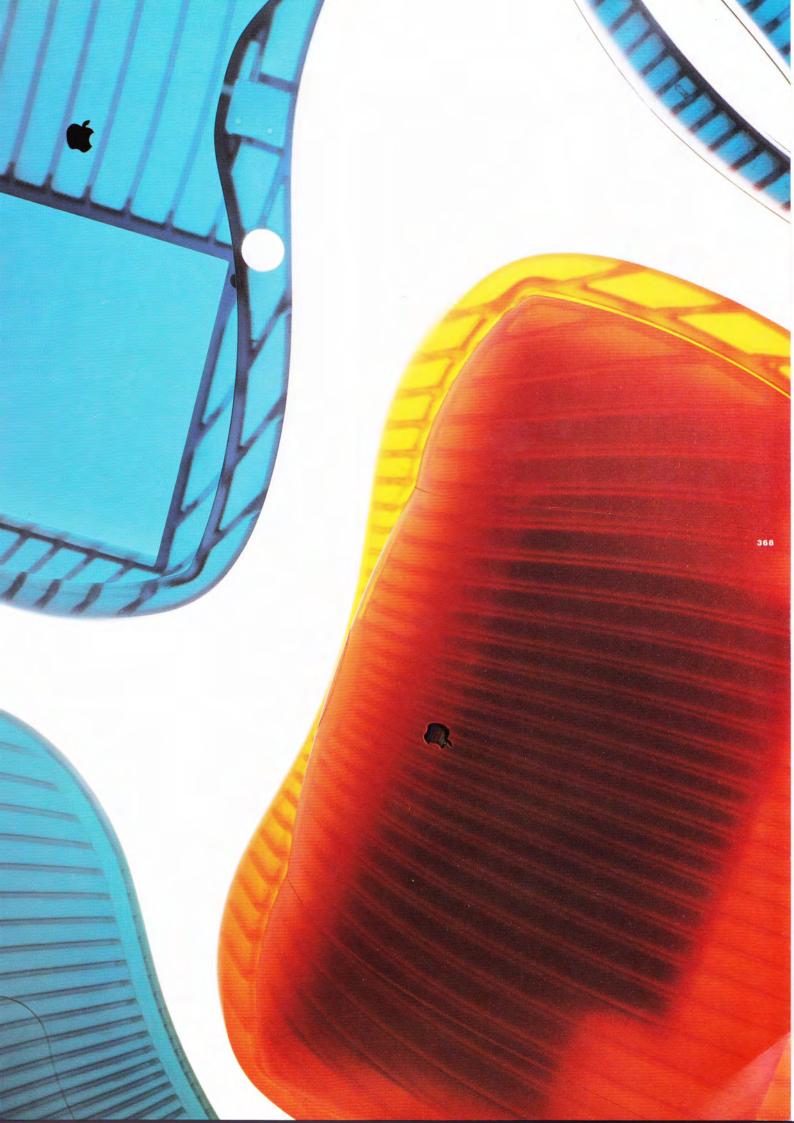


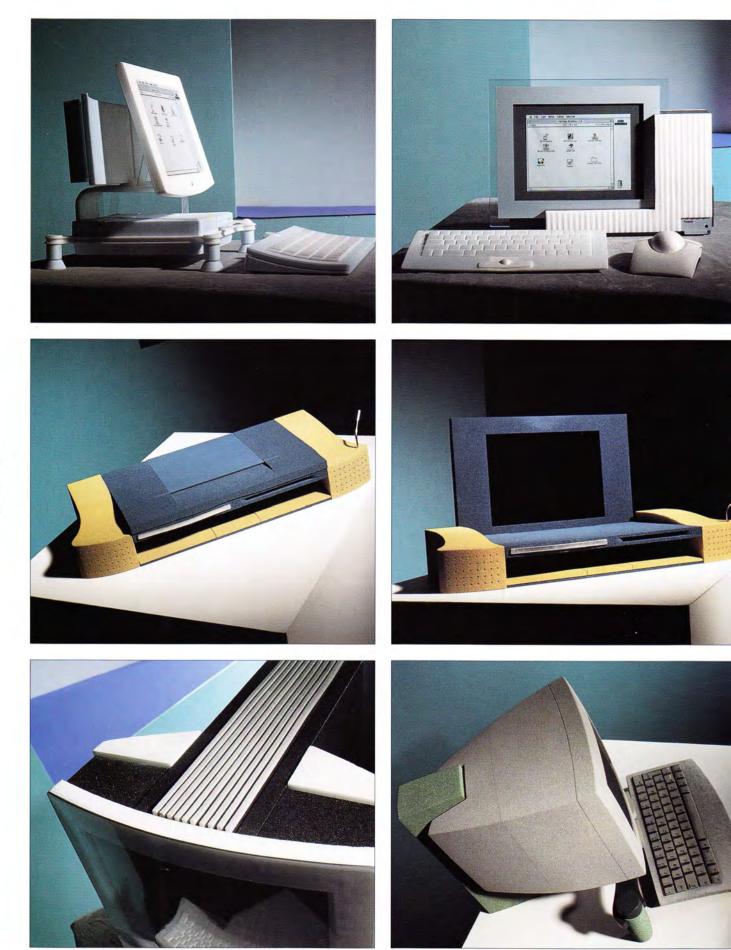
360, 364 (Opposite). PowerBook 1400 series (Epic). Industrial Design: Apple Computer: Lawrence Lam; Les Anderson, product design; Tonic Industrial Design (Palo Alto, CA): Gavi Ivester, Mark Johnson. Dates of Design: April–November 1995. Introduced: October 1996. 361 BookCover designs by: Weiji Ito (Tokyo), Carlos Segoura (Chicago), Michael Bartalo (San Francisco). David Karam (San Francisco), Brad Holland (New York) and Jim Mitchell (Sydney). Creative Director: Chris Stringer. 362-363, 365 (Opposite). PowerBook 3400 serie (Hooper). Industrial Design: Apple Computer: Lawrence Lam, Masamichi Udagawa; Bill Burnett, John Howard, product design; Stratos Product Development (Seattle, WA): Mike Nelson; Ginko Design (San Francisco, CA): Scott Yu. Dates of Design: June–August 1995. Introduced: February 1997.



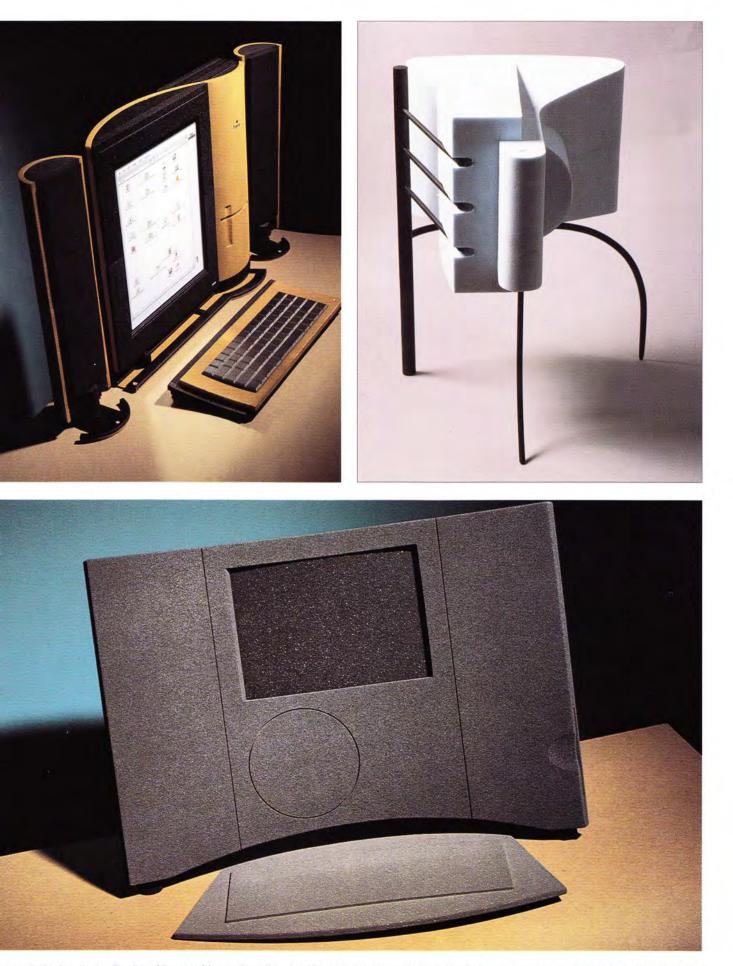


^{366-367, 368} (Opposite). Apple eMate 300 (K). *Industrial Design:* Apple Computer: Thomas Meyerhöffer; John Tang and David Baik, product design. *Dates of Design:* October 1995–February 1996. *Introduced:* October 1996.





Pomona Design Investigation: First-Round Foam Models. 369 Blue Spider Concept. 370 Flat Corrugated. Concept 371-372 Flat Tan Concept, with integrated keyboard storage, close and open. 373 Stripe Concept, detail of top. 374 Computer-on-Stand Concept, with a green granite supporting element on the back. *Dates of Design:* October–December 1992.



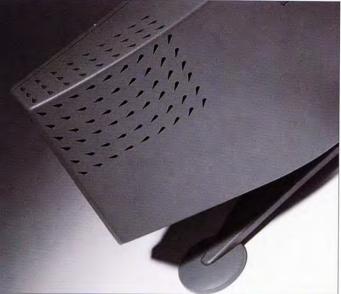
omona Design Investigation: First-Round Foam Models. **375** Curved Wood and Black Metal Concept with detachable speakers. *Industrial Design:* IDEC (Tokyo). **376** Spider Concept. (rear view). *Industrial Design:* Ecco Design (New York): Eric Chan, Jeff Miller, Eyal Eliav. **377** Curved Panel Concept (later called the B & O Macintosh). *Industrial Design:* Apple Computer: Robert Brunner. *Dates of Design:* October–December, 1992.



Pomona Design Investigation: First Round Foam Models. **378-379** The Domesticated Mac, a reinterpretation of the Macintosh Color Classic with simple splayed legs, and twin folc ing doors with a pin board and cubby holes inside and an analog clock mounted on a swivel mechanism. *Industrial Design:* Apple Computer: Daniele De Iuliis and Jonathan Ive *Dates of Design:* October–December 1992. **380-381** Domesticated Mac Hard Model showing the revised shape and leg treatment, with a loudspeaker and integrated handle on top and twin metal doors and analog clock mounted on a flexible plastic exoskeleton. *Industrial Design:* Apple Computer: Daniele De Iuliis and Jonathan Ive. *Dates of Design:* October–November 1996.





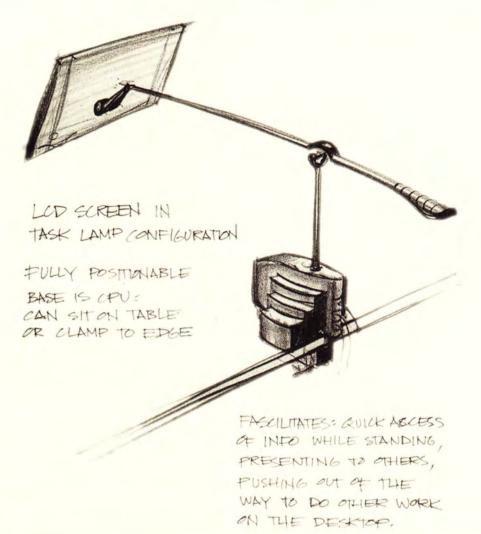


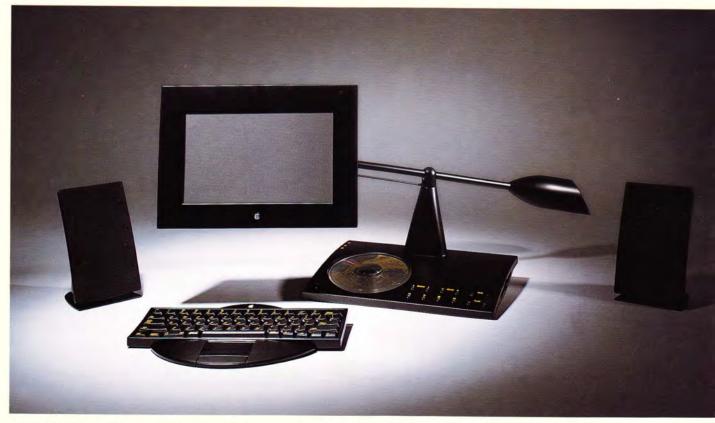






Pomona Design Investigation: Hard Models. 382-385 Pomona Concept, with details showing ear-shaped speaker elements on the display, four-footed base textured trackpad on the keyboard and comma-shaped vents on the CPU body. *Industrial Design:* Montgomery & Pfeifer (San Francisco, CA): Herbert Pfeifer and Paul Montgomery. *Dates of Design:* January–April 1993. 386-387 Slab Concept, with detachable speakers and keyboard storage detail on the front, sculpted profile on the back. *Industrial Design:* IDEO Product Development (San Francisco, CA): Naoko Fukasawa. *Dates of Design:* January–April 1993.





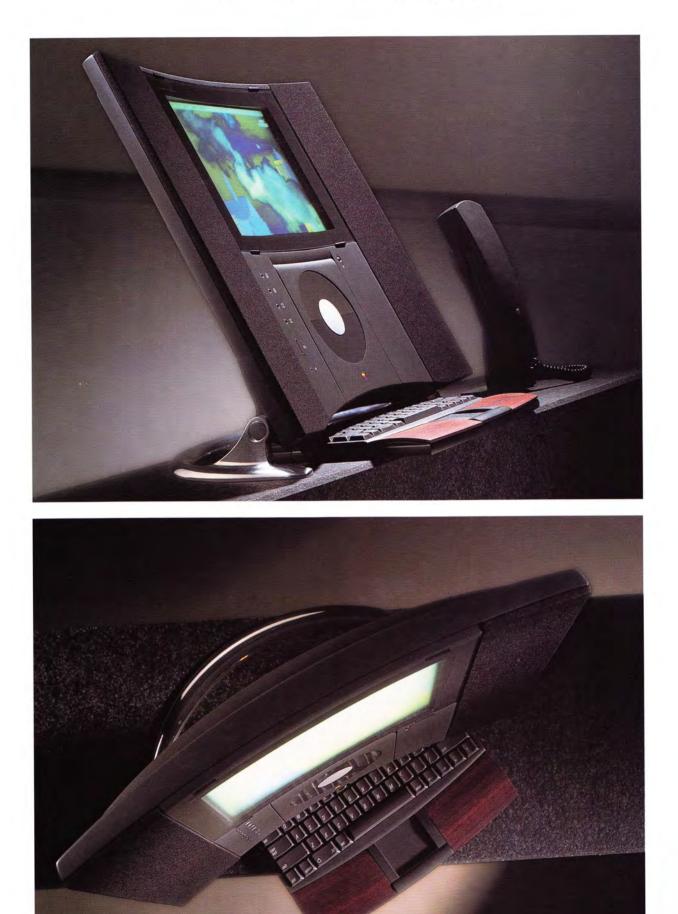
Pomona Design Investigation: Hard Models. 388 Phase One Sketch for a Desktop Computer, by Eric Chan (Ecco Design, New York, NY), inspired by Richard Sapper's Tizio Lamp. 389 Tizio Concept. Industrial Design: Apple Computer: Robert Brunner, based on a sketch by Eric Chan. Dates of Design: January-April 1993.



Pomona Design Investigation: Hard Models. **390-391** Sweep Concept. *Industrial Design:* Apple Computer, Inc.: Tim Parsey. *Dates of Design:* January–April 1993.



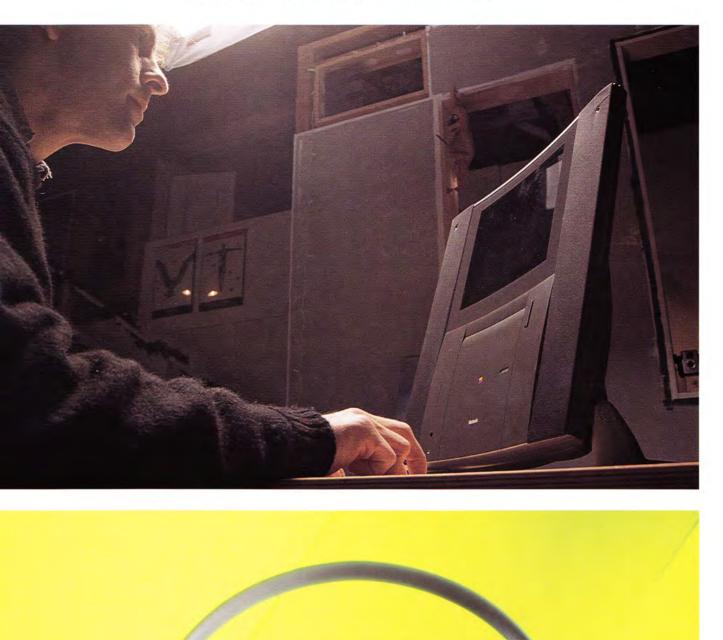
Pomona Design Investigation: Hard Models. **392-393** B & O Macintosh. *Industrial Design:* IDEO Product Development (Palo Alto, CA): Paul Bradley, based on a foam concept by Robert Brunner (Plate 386). *Dates of Design:* January–April, 1993.



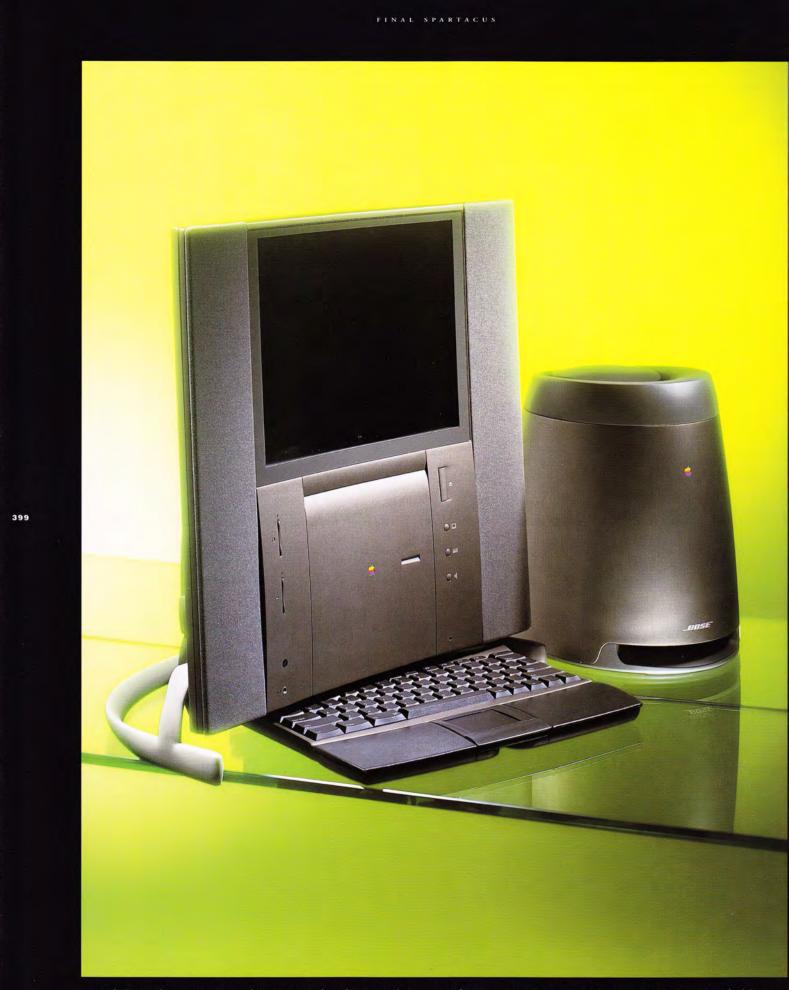
394-395 Spartacus: Prototype One. Part of the "Smoke and Mirrors" prototype shown to Apple management in the fall of 1993. The hoop-shaped foot allows the keyboard to be stored under the product and folds up to become a handle for easy carrying. *Industrial Design:* Apple Computer: Jonathan Ive, Daniele De Iuliis (keyboard); John E. Johnston, product design; Wil English, electrical engineering. *Dates of Design:* July–October 1993.



SPARKY • OCTOBER 1994-MAY 1995 SPARTACUS PROTOTYPE 2 • APRIL-JUNE 1994



(Opposite) Sparky. An entry-level proposal for a family of Spartacus products, designed around a 10.5-inch active matrix display, logic board and drives from a PowerBook 550c, ith an expressive child-friendly enclosure. Extended feet provide keyboard storage under the product. *Industrial Design*: Apple Computer: Tim Parsey. *Dates of Design*: October 1994.
 Spartacus: Prototype Two. Redesigned to incorporate a high-performance desktop Macintosh circuitboard (code-named Alchemy), a 12.3-inch flat panel display, PCI expansion, a designed CD-ROM drive cover and a simpler, less dramatic look. *Industrial Design*: Apple Computer: Jonathan Ive; John E. Johnston, product design. *Dates of Design*: April–June 1994.
 Spartacus: Final Design, top view showing the slim profile with concentric curves applied to the front and back of the case and hoop-shaped foot below. Credits, see following page.

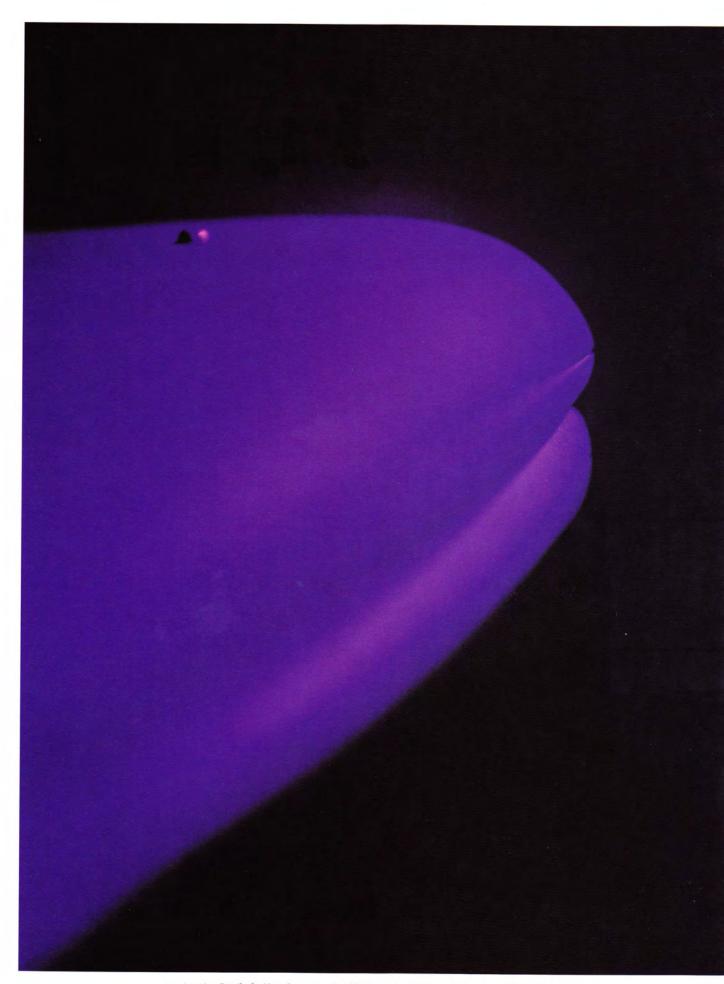


399 The Twentieth Anniversary Macintosh (Spartacus). Industrial Design: Apple Computer: Robert Brunner (initial concept), Jonathan Ive (second hard model and final design), Daniele De Iuliis (keyboard), Jay Meschter (power supply/subwoofer enclosure, ID program management); John Johnston, Wil Oxford, Troy Hulick, Mel Philips, Noriko Yanagisawa, Leslie Leland, Ken Jenks, Pam Ryan, Ron Moller, product design; Prabir Sarkar, Project Manager; IDEO Product Development (Palo Alto, CA): Paul Bradley (first hard model). Dates of Design: May 1993–August 1996. Introduced: January 7, 1997.



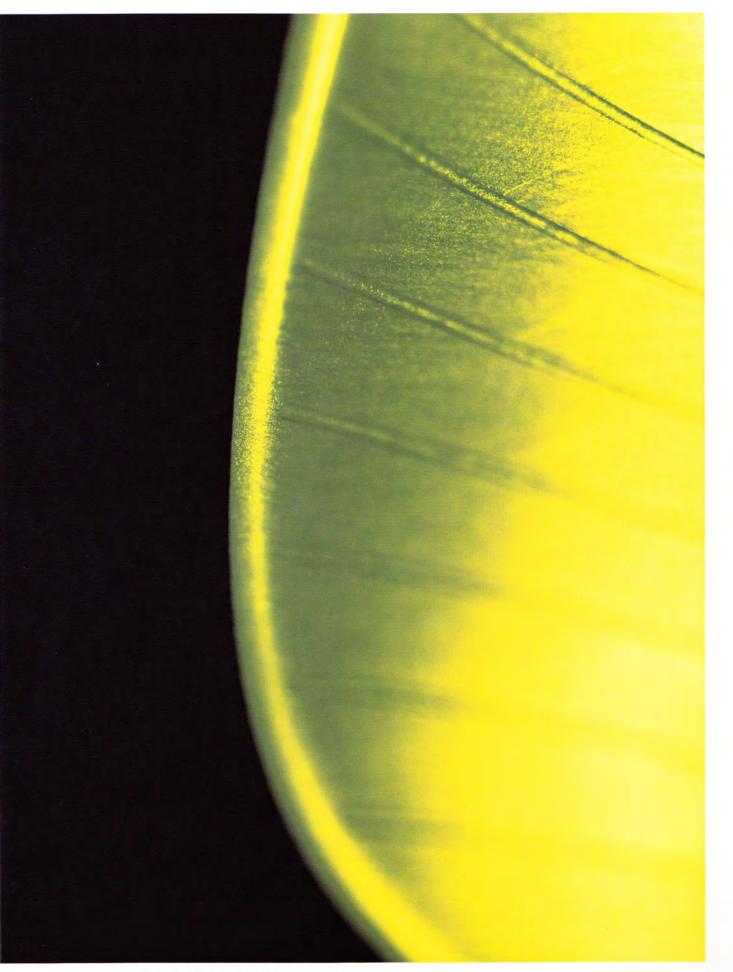
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400 The Twentieth Anniversary Macintosh (Spartacus). Industrial Design: Apple Computer: Robert Brunner (initial concept), Jonathan Ive (second hard model and final design), Daniele De Iuliis (keyboard), Jay Meschter (power supply/subwoofer enclosure, ID program management); John Johnston, Wil Oxford, Troy Hulick, Mel Philips, Noriko Yanagisawa, Leslie Leland, Ken Jenks, Pam Ryan, Ron Moller, product design; Prabir Sarkar, Project Manager; IDEO Product Development (Palo Alto, CA): Paul Bradley (first hard model). Dates of Design: May 1993–August 1996. Introduced: January 7, 1997.



401

401 Aquatic. Detail of a Next-Generation Portable Computer. Photograph Copyright © Daniel De Souza.





⁴⁰³ Terrestrial. Detail of a Future Desktop CPU Product. Photograph Copyright © Daniel De Souza.



404

⁴⁰⁴ Celestial. Detail of a Future Portable Product. Photograph Copyright © Daniel De Souza.

aro competition demanded his attention, he handed the 100 to har Design in September 1990 and told Lunar Design to have it dy by December. Within days, Sony defined the internal configuon and gave Lunar the specs.

Brunner contends that the entry-level Sapporo has a more attrace design than TIM, because it was designed later. "Sapporo bened from everything we learned on TIM. Since the first design olved basic invention and progressed so quickly, certain comomises were made on its details. Sapporo also looks better, cause it's smaller. Give two portables the same details, then shrink e of them by 20 percent, and the smaller one will always look ter. With a smaller product, there are more details-per-squareh, which make it look more sophisticated."

Corners on Sapporo are softer and more subtle with less of TIM's ock-like quality. The materials are also different. For TIM, Apple ecified an ABS/polycarbonate blend, which make the product rable, but also shiny. For Sapporo, Sony used pure ABS, which re it a beautiful matt finish, but also made it more fragile. For that son, it's difficult to find a PowerBook 100 today with all the corrs and edges intact.

apporo and TIM also differ around the edge of the display. On 4. the corner radius is wide and rather coarse. On Sapporo, the ge is angled by a few degrees so that the user's hand can fit under display and lift it more easily—an element that Gavin Ivester uld evolve further on his next portable, the PowerBook Duo.

he more Wood and Barthelemy worked on Sapporo, the more they nd ways to improve it—accentuating the raised area on the back of display that adjoins the hinge by reducing the flat surface around y a few millimeters, thus making the hinge area pop out. Another ail involved the rear feet, which raise the back of the product. her than use TIM's feet, which would have seemed too big for poro, Sony engineered a foot mechanism that opens and retracts he wheel is turned. Yet another detail was a total accident. "The owWhite lines on top were supposed to be the same as TIM's and e up with certain other lines on the product," says Ken Wood, stead, Sony took a fax of our original drawing, scaled it down on a ox machine to fit the area they thought it should fill, and cut tools in the Xerox. As a result, the lines are too narrow, not true owWhite. But no one noticed, except maybe Hartmut Esslinger."

or Bob Brunner, the most hair-raising part of the PowerBook berience came toward the end. With six months until ship date, first plastics came back with many mistakes that were supposed be fixed during tooling: creases on the surface, details that had to reworked and obvious mistakes. "Eventually, we made a list," is Brunner, "and came up with 150 defects that needed fixing. It is horrendous." The most obvious problem was the product icons t identified the I/O ports on the back: they were all upside-down. In November 1990, Tom Bentley transferred from Jaguar to become t's new product design manager, surveyed the situation and declared the PowerBook "the project from hell." With the ship date looming, Bentley decided that only the most important problems could be addressed; meaning that many details Brunner considered important would have to remain.

"I was horrified," says Brunner, "because all I could see were the flaws. When the PowerBook shipped, I assumed we would be crucified by the press. But instead, there was a huge positive reaction, and we won nearly every design award in the world, which stunned us. In my obsession with details, I had forgotten about the features that users see and respond to—the palm rest, the integrated trackball and a higher level of competence than other portables had at the time. That experience taught me an important lesson—not to focus so much on details that I fail to see the bigger picture."

A New Design Icon. Overnight, the PowerBook 100/140/170 took Apple from zero participation in the portables arena to a backlog of 140,000 units, won more design awards than any previous Apple product and received more media attention than any computer since the Macintosh. Its size, detailing and color gave the PowerBook "shelf consciousness"-that love-at-first-sight quality that SnowWhite products sorely lacked and that the Macintosh Portable didn't have at all. As a result, the PowerBook design attracted the sincerest and most irritating form of flattery-imitation. Within 18 months of the PowerBook's release, every major laptop manufacturer had redesigned its portable to conform to the PowerBook form factor. Suddenly, pushing the keyboard forward became as necessary in a laptop as a battery or an LCD display. Many competitors installed the front-and-center trackball as well; others used an add-on device that attached to the side of the case. The one exception was IBM, whose designers refused to copy Apple's front-and-center approach. Instead, they placed a small red button (about the size of a pencil eraser) in the center of the keyboard, which allowed the user to move the cursor up, down and diagonally in a fairly crude manner. Some users swore by IBM's approach; most swore at it. Meanwhile, the PowerBook became one of Apple's most powerful design icons.

Randy Battat, Apple's vice president in charge of Portables, considered Brunner and Ivester's design a key factor in the PowerBook's success. "People have an emotional attachment to the product that has nothing to do with its size, weight or performance," he says. "Unlike its competitors, the PowerBook was the machine you *wanted* to use. It may have been bigger than it needed to be because of its curves. But the curves are what generate emotion—the lust factor that only a great design can provide."

As THE POWERBOOK DESIGN NEARED COMPLETION IN DECEMBER 1990, BOB Brunner informed the Group that it would be moving to a new studio in 1991 and that a new team member, Jay Meschter, would be joining them

Jay Meschter. Raised in Philadelphia's northern suburbs, Jay Meschter graduated from Syracuse University in 1990 with a degree

in industrial design, and saw an advertisement in *LD*. Magazine for an entry-level position at Apple and decided to give it a shot, "I had some good 3-D models in my portfolio," says Meschter. "Even though I didn't have any professional experience, I took a wild leap and sent Bob Brunner some slides." To his surprise, Meschter not only got a call from Brunner, he received an invitation to visit him on his next trip to California. Within a week, Meschter was in Cupertino and shortly thereafter became the first designer to join IDg directly out of school.

APPLESEEDS

PLATES 217-218, PAGE 4

After the successful launch of the Macintosh LC, SI, the Mac Classic and the StyleWriter in the fall of 1990, Bob Brunner wanted to celebrate IDg's triumph and show the world that Apple designers could design more than SnowWhite boxes. In December, he learned that the back cover of *ID* magazine, the most visible 9- by 12-inch space in the entire design world, was available. For years, the back cover had been monopolized by frogdesign, which pioneered the concept of running advertisements to showcase their work. Sensing an opportunity, Brunner took over the back cover for three issues to show speculative prototypes created especially for *ID*. "Bob needed to attract good young designers to grow the department, so he asked us to design some visual snacks to leverage the Mac interface in a tongue-in-cheek way," recalls Gavin Ivester.

Walking the narrow line between possibility and absurdity, the designers came up with a number of ideas: an electronic food-taster with separate readouts for salt, spice, sugar and fat content; a mask-like product that would strap to your face for instant language translation; and a hand-held navigational guide that would download maps, pictures and traffic information from a satellite overhead. The third idea served as the basis for Guide, designed by Gavin Ivester, Larry Barbera and Tom Jacobson, which appeared in the March 1991 issue of *ID*. "The concept is feasible, assuming someone invests \$100 billion to build the infrastructure," Ivester quips. "The design was intended as a comment on our unbridled faith in technology."

The second concept, called Exchanger, designed by Susanne Pierce and Mark Pruitt, provided on-the-fly currency exchange (dollars go in one side, marks come out the other) without having to locate a bank or calculate conversion rates. A third concept, called TimeBand, designed by Brunner, was a wrist-mounted computer that used cellular transmissions to collect phone messages, update the user's personal schedule and store data like a miniature filofax.

THE BEST OF BOTH WORLDS

POWERBOOK DLO 210 / 230

PLATES 219-228

Industrial Design: Apple Computer: Gavin Ivester, Robert Brunner, Susanne Pierce, Lawrence Lam; Roger Mohme, Robert Riccomini, Jeff Wood, Matt Herron, Dave Northway, product design; Lunar Design (Palo Alto, CA): Matt Barthelemy, Ken Wood

Dates of Design: March-October 1991

Introduced: October 1992

Auards: Gold Industrial Design Excellence Award, 1992; "Top Te the Year," Industrie Forum Design Award (Germany), 1 Honorable Mention, I.D. Design Review, 1993

MINIDOCK

Industrial Design: Apple Computer: Gavin Ivester, Robert Brun Matt Herron, product design; IDEO Product Development (Palo CA) Denny Boyle, product design

Dates of Design: August-December 1991

Introduced: October 1992

Dto Dock

Industrial Design: Apple Computer: Jay Meschter; IDEO Pro Development (Palo Alto, CA): Matt Herron, Denny Boyle, pro design; Lunar Design (Palo Alto, CA): Dave Laituri *Dates of Design:* October 1991-February 1992

Introduced: October 1992

By the spring of 1991, with the PowerBooks out the door, Industrial Design Group scanned the horizon and didn't like v they saw: a market flooded with smaller and smaller IBM-compaportables. Soon, the PowerBook 140/170 would seem big by o parison. Meanwhile, a marketing brief wending its way thro Apple, called "BobW - The Best of Both Worlds" caught Brunner's attention. Written by Dave Rothschild, the brief descr a system that PowerBook customers said they wanted: an ultra subnotebook computer that served as the core of an expand desktop system—giving users "the best of both worlds." The lenge was reducing the computer to its absolute minimum designing the various parts so that everything would work, functionally and visually.

The question was: how small is a "subnotebook" computer Gavin Ivester recalls, "a market executive named Didier Diaz n up some wooden blocks of various sizes and weights, from pounds to around 6 pounds, which he kept on his desk. Any who visited his office would be handed one of these wooden bl to try. Over time, Didier tested the various sizes hundreds of t and decided that a portable measuring 8-by-11 inches with a we of 3.5 to 4 pounds would be the kind of machine that users w take anywhere and function as both a computer and a pers accessory."

The challenge those dimensions presented was immense. "Ha already climbed the learning curve with the PowerBook, we k the technologies inside would have to be tiny and densely pafor the most effective use of space," says Ivester, lead design or Duo project. Like the PowerBook 100/140/170, the Duo would the keyboard pushed forward with a centered trackball and an grated palmrest. As a result, the Duo's overall width would be d mined by the width of the keyboard, and its depth by the size o hard disk. Its battery would be stored under the wrist rest and a notherboard tucked under the keyboard. "That left us no room for n internal floppy."

Since PowerBook user studies showed that most people access oppies at home or in the office, but rarely on the road, the Duo did-'t require an internal floppy drive. "Experienced users know what any need in a portable computer, and a floppy drive isn't on that st," says Ivester. Eliminating the floppy made the Duo thinner and ghter, thus defining the whole subnotebook category.

Without a floppy, the Duo would need some means of downloadg and exchanging information with a desktop unit. Therefore a odem port and serial port (for printing and file transfer) would be reded alongside the power connector. But to keep the Duo's size a minimum, all other I/O ports would be moved off the motheroard and reduced to a single 132-pin "maxi-port." The "maxi-port" ould attach the Duo to a modular connector bar offering a full nge of I/O ports. With the connector bar attached to a monitor, inter, keyboard and floppy, the Duo would be a high-end desktop achine one minute and a lightweight travelling companion the next

The 88 Percent Solution. Next Ivester created a thin RenShape odel with slightly rounded corners. Realizing that existing compoents were all too large, he sought out the smallest batteries, hard sks and displays he could find, and used every millimeter these w devices could give. "The biggest problem was the keyboard: w small and thin could it be without sacrificing function?" Ivester ked. "I was determined to find out and drive the Duo to the edge that envelope."

lvester built keyboards of varying sizes and with varying key pitchthen asked Irene Wong, a specialist in Apple's User-Aided Design oup, to determine the smallest usable keyboard. The final result as a keyboard 88 percent of normal size. Anything smaller was not able for most people. And enlarging from the 88 percent size didenhance function enough to justify making it larger. "The small aboard was a risky decision," Ivester recalls, "but one worth takg if we wanted a truly small product."

Reducing the Duo's thickness was a bigger challenge. Unable to neeze much from existing batteries and hard disks, he focused on display. The LCD screen on the first PowerBook came assemd with a metal frame that added weight and thickness. But the o didn't need a metal frame and the Duo's plastic housing around to lvester removed the metal frame, saving 3 millimeters in thickss—"which is a lot for a laptop."

Compared to the PowerBook 140/170's slab-like design, the Duo rowed elements from the PowerBook 100's more rounded proach, yet did it one better. Key to its design are the front edge the wrist rest, which terminates in a beautifully rounded "bull ae," and the top of the display, which has a beveled edge that gles in and out in a subtle curve known as a B-spline. "If you se the Duo and examine the top curve, you will notice that the we does not have a continuous radius," says Ivester. "It has a beveled edge that tilts inward at the center and flattens out at the ends. As you follow the arc of the curve, the beveled edge swerves in and out. For Apple's product designers, defining that edge in three dimensions was like pushing molecules."

"Twisted Ribbon." Since the Duo's design was made entirely from 2-D drawings, Ivester sat with the engineers for hours describing that curve in words and by moving his hand through space. "I called the curve a twisted ribbon ... an arc that is flat in the middle and has an edge that waves in and out. I must have done this hand motion a thousand times," he says, moving his hand in an arc with his fingers moving slowly in and out. "In terms of geometry, that detail was as difficult as anything we'd done up to that point."

Though subtle, the convex curve on top, which laps over the "bull nose" at the front of the wrist rest, is crucial to the Duo's look and feel. "While designing it, I imagine how a pancake laps over the edge of a table," Ivester says with a chuckle. "At the time, that was considered witty design. But it was very difficult to do."

The beveled edge gives the user's finger something to push against as you slide the button release and lift the display. The Duo's top and bottom close tightly, because the top of the keyboard and trackball remain flush with the palmrest. The only part that sticks up is the space bar, which fills part of the void created by the screen when the unit is closed.

Rounded corners make the Duo comfortable to hold. The rubber bumpers on the sides protect the edges and make the product look as durable as possible. Small ribs on the top and bottom prevent scratches and maintain a familial relationship with the PowerBook 100/140/170 and earlier SnowWhite products. Yet the Duo's design transcends SnowWhite in the subtlety of its handling, the mixture of simple and complex forms that the PowerBook 140/170 do not possess and a sense of panache that even the PowerBook 100 lacks.

Docking the Duo. Before the design could ship, a docking strategy had to be designed. Connecting the Duo's "maxi-port" to peripherals required a modular device, called the MiniDock, providing the standard I/O ports found in a desktop computer, a floppy drive port, and pass-through connections for a modem and power adapter, in a small package with a curved handle on top that locks the Duo and MiniDock together. Accomplishing this feat required precision. As the handle snaps down, small metal fingers on the MiniDock fit into guide holes on the Duo position the MiniDock and pull it closed without damaging the Duo's ports.

For the Duo's power system, Gavin Ivester and Matt Barthelemy of Lunar Design designed a power adapter with a gull-wing wire wrap system and a toaster-style battery charger that snaps into the side of the AC adapter to form a desktop charging station.

Duo Dock. As the Duo's design neared completion, Bob Brunner examined all of the products in November 1991 and realized that the MiniDock would not give the Duo true desktop status. The Duo was the epitome of portability. But to work as a desktop system it need-

ed a monitor stand and a more secure and effortless way of connecting the Duo to a larger system.

"At that point, Dave Laituri at Lunar Design came up with a cool idea," Ivester recalls, "a skinny docking station that the Duo would slide into, allowing connections and cables to flow out the back and a monitor to fit on top. The dock stood on four elephant feet, which elevated the Duo off the desktop, leaving space for a keyboard, mouse and an external floppy drive to be stored underneath." To save 'development costs, the PowerBook 100's floppy drive, Buddy Boy, would be used with the Duo as well.

In November 1992, the design for the Duo Dock was given to Jay Meschter. "The elephant feet on Dave Laituri's concept resembled the legs on Bob Brunner's final Jaguar CPU, but were more emphatic," Meschter recalls. "The top of Laituri's dock resembled a SnowWhite box. So the problem was to combine round chubby feet with a zero-draft box. The point where the feet met the side of the box didn't work very well..... So I thought: if we had to stick feet on a SnowWhite box, perhaps I could allow the side of the box to lap over the leg, making it appear that the feet was actually stretching the box at that point." Meschter built a hard model in December.

"Focus groups responded well to the docking concept, but didn't understand the empty space between the feet," says Meschter. "They expected a desktop docking station to have its own hard disk inside the box, as well as NuBus expansion slots, like a real CPU. Apparently, the test subjects understood the "Best of Both Worlds" concept better the designers did. So Meschter filled the area with a floppy drive, hard disk bay and NuBus slots.

To develop a mechanism for inserting and ejecting the Duo from the desktop dock, Meschter first explored a slot-machine-style arm on the side of the box, then a solenoid mechanism like that found on a video cassette player. When Meschter mentioned that idea to Apple's product designers, they laughed. When the laughter died down, a consultant in the room named Denny Boyle said that it could be done and sketched a mechanism that would insert and eject the Duo with the press of a button.

Suddenly excited, Meschter built a foam model, installed an insert/eject mechanism from an audio CD player into the foam, built a foam Duo with a magnet in the bottom (to give the CD mechanism something to hold onto) and showed it to Dave Rothschild, the author of the original "BobW" product brief. "It's just like a VCR!," said Rothschild. "Now I have an analogy that I can use to sell the idea within the company."

Code-named Gemini, the Duo Dock became a key element in the Duo product family, providing video support for a 15-inch display, full I/O ports, an internal floppy drive, an internal hard disk bay, two NuBus expansion slots, and a mechanism that would receive and eject the Duo flawlessly. Like the MiniDock, the Duo Dock uses two metal fingers to drag the Duo inside (with 27 pounds of pressure), align it properly and lock it in place. This feat had to be performed hundreds of times without jamming before Apple's proc designers would accept it. The hardware and software verifies necessary connections—SCSI, video, modem—automatically, a prevents the user from losing data or damaging the computer accidentally docking or removing the Duo when it's powered Attempting to dock a powered-up Duo will cause the Duo Docl spit it out. Likewise, ejecting a Duo from the Duo Dock with powering down forces the system to pause and ask whether user wishes to save current documents first.

With the project racing toward completion, Jay Meschter rec ciled the Duo Dock's dual nature by designing the lower sect with gray plastic to match the Duo's gray enclosure, while leav the top half platinum in color, with SnowWhite slots, to main kinship with Apple's existing displays, printers and other produ

Implementing the Duo Dock's round feet and flared sides beca a problem for Apple's tooling engineers, who called Bob Brunne a panic. "When the first finished parts came off the line," Brun recalls, "the tooling guys told us, 'The sides of the box are warp and we don't know why.' When I said that's the way it's *supp*e to look, the guy on the phone said, 'Oh, OK.' and hung up. thought that was pretty funny."

A New Sensibility. Since its release, the Duo/Duo Dock far rewrote the rules that define portable and desktop computing : won more design awards than any previous Apple product (exc the PowerBook). A bridge between mobile and desktop comp ing, between SnowWhite and Apple's new Espresso design guage, between the past (flat surfaces, platinum color, slots) and future, the Duo Dock's design had something for everyone. A aesthetically, the Duo's design represents a bridge betw SnowWhite and a new style that was still forming in the mind IDg's designers but did not yet have a name.

"When the Duo came together, our new Espresso design langu was still evolving," says Brunner. "So we decided to make the I Dock's design an 'elegant transition.' But afterward, we realized customers don't care about transitions. They care whether a proc is visually cohesive, which the Duo Dock is not. As a result, learned not to get hung up on 'elegant transitions,' but to make product as good as it can be and give the customer the most sa fying experience possible"—which informed the next step tow Apple's new design language.

By THE TIME THE DUO SHIPPED IN THE SPRING OF 1992, THE INDUST Design Group had turned a significant corner. By incorporating more complex geometry and expressive aspects of Jaguar into t designs, it had closed the door on the SnowWhite design langua Bob Brunner had also moved the Group to a new studio, whe could grow and do the kind of work that would make App design the best in the world. To ensure that would happen recruited three new designers who would help manage the incr ing workflow and evolve a new language that would carry the Group far into the future.

The Move to Valley Green. During the spring of 1991, Bob Brunner was determined to separate the Industrial Design Group from Richard Jordan's Product Design Group. "It took time to convince everyone that a real Industrial Design Group needed a real studio," he says. That changed in the spring, when a managerial shuffle resulted in Brunner reporting to Randy Battat, head of Apple's Portables division, instead of to Richard Jordan. Forced to vacate the Product Design Group, Brunner found a new space for IDg in a building known as Valley Green Two, nestled on a leafy side street near corporate headquarters. Compared to the old space in Santa Clara, the new studio was vast, with room for a model shop, a conference room and an open-air plan that was redesigned from top to bottom, giving it a hip postmodern look.

With a new studio to fill, Brunner continued to build his design staff. "Handling Jaguar and the PowerBook at the same time taught me that I had to build a team and delegate more of the work," he says. "Otherwise, I was going to die."

Design as Policy vs Design as Strategy. Cutting ties with the past also freed Brunner to think more deeply about the strategy that would lead Apple's design forward. "By 1992, we'd finished the PowerBook, and the Duo was nearing completion. Yet both products seemed backward-looking to some degree," Brunner recalls. 'We had to take better advantage of our design potential. Though single products were doing well, we were still adrift as a company. Meanwhile the rest of the industry could see that industrial design was a valuable tool, and were poised to take that advantage away from us."

As he analyzed the situation, Brunner concluded that Apple was a company that used **Design as Policy**—as part of a linear product develop process that begins with Marketing, which conceives the product; followed by Engineering, which engineers the product; endng with Design, whose role is to package the product. Because there is no design input early in the development process, Design as Policy merely supports the status quo, and maintains the company's market position, but does not advance an agenda or pushing innovation.

"The Macintosh Portable was a perfect example of Design as Policy, because it was designed just like every other SnowWhite product, haring more similarities with Apple's desktop line than any portables hen on the market," says Brunner. "Even though it should have been rery different from Apple's desktop line, the Mac Portable used the ame SnowWhite language, the same 4-millimeter wall thickness, fullize keyboard and a lot of full-size components inside."

The desktop line also needed help. When the Macintosh II first nade its appearance in 1987, it seemed new and original. But every product that came after was essentially the same, which didn't fit with ne Apple ethos. By the summer of 1991, two more products reflectng Design as Policy were about to ship— the Quadra 700 and Quadra 900, both done prior to Brunner's arrival. Because of their strong performance, the new Quadras were well received. But their design, a calcified version of SnowWhite, left a lot to be desired. The Quadra 900, in particular, was the most boxy, line-obsessed product Apple had ever offered. The rigor that had once characterized SnowWhite had now turned to rigor mortis.

Rather than continue this mindset, Brunner proposed that use **Design as Strategy**, to create new products with innovative features and design that can expand existing markets or open up new ones. "If the Mac Portable and the Quadra 700 and 900 represented Design as Policy," says Brunner, "the PowerBook represented Design as Strategy by appealing to a different customer base with a design that was totally different, yet still recognizable as Apple."

As these thoughts came together, Brunner realized that true success meant more than just 'good design.' "We had to redirect our whole approach and develop a new language that would give us more opportunity to enhance the user experience, which we were doing with the final set of Jaguar models ... developing enhanced surfaces in those areas where the user has input, and allowing the design to express what the products can do for the user,"

While working on the PowerBook, Brunner decided that IDg would henceforth design every product for maximum business advantage— "which was not an obvious or popular thing to do. At the time, many designers felt that doing anything less than 'pure design' meant compromise. But a designer can be both *design*-driven and *market*-driven. It *is* possible to create museum-caliber art, meet business objectives and enhance the user's experience all at the same time."

To achieve that goal, IDg needed two additions—a senior designer with an ability to push the Group in a new direction and a someone who could help him manage the studio.

Building a Team. Assembling a new design team was like developing a new product. The most important ingredient was the quality of the designers's work. "I wanted to see design that was leaning forward design that would predict what was coming rather than reflect what we already know and see," says Brunner. "That predictive quality is important, because when we're in the studio, we're living in the future. We look at the designs not in terms of 1995 or 1996, but in terms of 1998 or 2000. That's a rare quality, but critical to the work we do." Prior manufacturing experience wasn't as important as the ability to get the work done. "It's easy to see whether a design can be produced. Instead, I ask: has the designer thought through all the problems that the design introduces and achieved the most workable and elegant solution before considering the work finished?"

More importantly, the Group needed a certain type of individual. "Rather than look for designers at other companies. I decided to hire people from the consulting world so that IDg could function like a consultancy, working with the speed and agility of an independent design firm. In my experience, consultants want to build their portfolio and will compete to do the most interesting work. So I concentrated my search on the best local consultants and talented people fresh out of school, such as Jay Meschter, who could become great by working here."

Ultimately, Brunner chose two English-trained designers, Daniele De Iuliis and Tim Parsey, who had both done award-winning work at ID Two, one of the best design consultancies in the Valley.

Daniele De Iuliis. Born in Bristol, England in 1961, Daniele De Iuliis (pronounced Day-You-Lease) trained at the Central School of Arts and Design in London, graduated in 1983 and joined the San Francisco office of ID Two that same year. "In order to become a top industrial designer, I needed international experience. Because of the way products are designed, manufactured and marketed, it's important to know what's happening in Europe. America, the Far East ... and in Silicon Valley, you're in touch with all three." In September 1983, De Iuliis joined ID Two's San Francisco office just as business in the Bay Area was exploding.

De Iuliis' first designs for Apple occurred in 1987 on the Goldilocks and the Three Bears project. "At that time, Apple wanted to move away from SnowWhite toward smaller, more flexible systems," he recalls. De Iuliis' main offering was a portable computer with a thin LCD screen, expandable butterfly keyboard and vents that closed after shutdown to prevent dust from infiltrating the machine. Another concept arranged components like books on a shelf ("Everyone tries that idea at least once," he quips) with slots that predicted the advent of PCMCIA (a widely-accepted standard for connecting peripheral components to portable computers) years before it was invented. A third design took a more radical approach, combining dramatic arched vent patterns and a balance of hard and soft forms with delicate roll-in details that gave mundane shapes a sense of richness and sophistication. Years later, all of these features would be used in Apple's new Espresso design language

"I could see that Apple's ID was coming to life," DeIuliis recalls. "We had just moved into the new studio, and Bob had a lot of plans. What he didn't have was enough good people to put those plans into action."

By joining Apple, DeIuliis decided that he was finally ready to produce designs on a much higher level than he ever had before. He would do that by attacking each project in a way that would infect the rest of the Group, thus raising the level of their work as well. This way, DeIuliis would that through sustained effort and a keen understanding of what form and detailing can do, it is possible to satisfy Apple's business requirements while elevating the practice of design to the highest possible level, the point where it becomes a true Art.

Tim Parsey. DeJuliis' cohort, Tim Parsey was born in Watford (northwest London) in 1960, where he studied art and engineering as a boy, entered London's Central School of Art and Design in 1979, performed an apprenticeship with Kenneth Grange at Pentagram in London, and went to New York after graduation in 1981, where he designed bobsleds for the U.S. Olympic Team. A year later, he joined Human Factors in New York, then moved on to ID Two in a Francisco, where he took part in three award-winning projects: ultrasonic analysis machine for Acuson (with Naoto Fukasawa blood pressure measurement device for Paramed, and a mechan heart pump known as the Baxter Ventricular Assist System (w Naoto Fukasawa, Robin Sarre and Jane Fulton), which won a bes category award in the 1991 *I.D. Design Review*. Like DeIuliis, Par was too ambitious in the extreme. But he balanced a love of des with skill at management. Thus Brunner appointed him as IDg's s dio manager and DeIuliis as a Senior Industrial Designer.

The day DeIuliis and Parsey stepped into IDg's studio, everyth started to change, says Larry Barbera. "Danny, in particular, gave that weird light that other designers tend to notice. I took one lo at him and figured that our work was gonna get a lot better *fast*

ATTRACTING TWO YOUNG EXPERIENCED DESIGNERS WITH FOOTS OUTSIDE Valley was a coup for Brunner. "I consider Danny a designer's designer, someone who can handle complexity or simplicity equally w Tim, on the other hand, is highly organized, motivated and resu oriented, which is the ideal combination for a studio manager needed help getting the work done and developing a strategy the future. When I showed Danny and Tim the Jaguar concept both of them wanted to explore how those forms could relate to t desktop and beyond."

When De Iuliis and Parsey arrived—both on the same day, Ju 17, 1991—the Industrial Design Group was poised for change. "Af experiencing the inertia that exists inside Apple, Bob realized th by hiring former consultants he could operate with the speed a efficiency of a freelance group," says Parsey, "As a former cons tant, Bob knew that we would think and act like consultants." Tr to their nature, both De Iuliis and Parsey hit the ground running.

"Change was in the air," De Iuliis recalls. " But no one quite known how that change would take place. Early on, we told ourselves the we wanted every product to be the best that it could be, which called for a less structured approach than SnowWhite would allow But unlike frogdesign in 1983-84, we had no time to generate concepts off-line and deliver a complete design language before important products. In 1991, we had a much larger task redesigning the entire product line using a new language that wou tie everything together."

The Significance of the PowerBook. There were precedents build upon. "Bob's work on the PowerBook broke SnowWhite rules so completely that all the king's horses and all the king's me couldn't put SnowWhite back together again," says Parsey. "Givin the PowerBook object value and designing it for function rath than design-as-policy, provided an important psychological break-

But the most important force at work in the summer of 1991 w the Group itself. "We had a lot talented people who wanted to ma their mark." says De Iuliis. "All we needed was an atmosphere th red for constant evolution and the courage to reinvent our own ns and make them obsolete before our competitors did it for us. est was simply a matter of applying our skills and agreeing on basic principals."

sign Language Meetings. As IDg's studio manager, Tim Parsey ed the new language through a series of group discussions, uning with a slide presentation on September 2, 1991. According tes from the meeting, Parsey felt that Apple's new design lane "should develop a provocative industrial design statement meaningful differentiation for product families."

the designers listened and took notes, Parsey intoned that: wWhite no longer differentiated Apple from the competition, and no longer cope with the new lines of business—including deskortable and hand-held products—that Apple is about to enter." ce Apple had been the design leader in the computer industry, olutionary step was required to make the design language vital As computers become commodity products, price and design ecome the key differentiators in the market. Therefore Apple d use design as a strategic tool.

h products becoming more complex, customers need meanvisual differentiation," Parsey continued. "Therefore, Apple's lesign language should cater to users' cognitive and cerebral nds ... address users' subliminal needs and satisfy sensory nds for beauty, tactile quality and surprise..."

arry Barbera recalls, "Tim's first design language meeting was intense." Already working on a follow-up to the Macintosh , Barbera wanted his product to use the new language. But 's concepts weren't helping, "Even though I'd been at Apple for five years, I'd never thought about 'subliminal needs' or 'cogattributes' before ... and didn't see how doing so would help th my design."

hat time, Barbera's design had already ground to a halt. To it, Bob Brunner asked Daniele De Iuliis to lend a hand with the facintosh and demonstrate how the new concepts could be n a real product.

s didactic approach got us started." says Brunner, "but what set us in the right direction was Daniele's work on the Color . That's when things really started to click."

MACINTOSH COLOR CLASSIC

vial Design: Daniele De Iuliis, Larry Barbera, Robert Brunner; Inthopoulos, Mike Milo, Chris Novak, Betsy Diaz, Rick n, Eric Takahashi, product design

- i dhe fuundani, product design
- *of Design:* Columbia: October 1990–June 1991; Interim June-July 1991; Slice: August–November 1991
- iced: January 1993

s: Gold Industrial Design Excellence Award, 1993; Industrie Design Award (Germany), 1993; I.D. Design Review, 1993 Larry Barbera learned in November 1990 that he would be designing a new all-in-one Macintosh, he says, "my mind filled with images of the 1984 Super Bowl commercial, the original Mac's classic all-in-one form and all the advertisements and photos I'd seen of the product. The original Mac is such an icon that doing it justice would make this project my biggest challenge ever. The problem was: How do you redesign a classic?"

During the winter of 1990–91, IDg was at a crossroads in terms of its design language. "Despite our success with the Mac LC and the Mac IISI, which were both SnowWhite-derived, the old language wasn't right for the products Apple would soon be developing," says Barbera. By the end of 1990, Bob Brunner had completed the final Jaguar concepts, which suggested a direction. But as Barbera points out, "we had yet to ship a non-SnowWhite product. That meant the pressure was on."

As an entry-level product, the new Mac, code-named Columbia, would have the same 9-inch black-and-white screen as earlier versions but none of the expensive tooling that SnowWhite enclosures required. Yet it had to look sophisticated.

Barbera began with a series of sketches that departed wildly from the traditional Mac form factor. Then he went conservative, "perhaps too conservative," he admits. "By redesigning the Macintosh, it felt like I was treading on sacred ground." Working with Mike Nuttall, he developed 3-D foam studies in February and March of 1991 that resulted in a design that was familiar yet timid.

"The first design still had SnowWhite elements," Brunner recalls, "but it had a split personality. Inadvertently, Larry had made a transitional statement, which was something we *didn't* want."

Barbera wasn't happy either. With the deadline looming, Barbera was told in early July that the flat top surface and bubble-shaped handle behind the display would have to go; combining both features made the case impossible to tool. "The product *needed* a handle, because the first Mac had one. But I wanted the flat top as well. We spent weeks trying to solve that problem.But the design was so integrated that every change in one area impacted someplace else." Problems grew worse in late July, when Marketing decided to replace Columbia's 9-inch black-and-white display with a 10-inch Trinitron, forcing Brunner to restart the project with a new name: the Macintosh Color Classic.

In the interim, Brunner designed a new configuration with elephant feet on the front and smaller feet on the back to give the design a more animated quality. The front feet tilted the bezel back 6 degrees, allowing the Color Classic to 'sit up'—a gesture first used on the Macintosh LC. He then gave the project a new code-name, Slice, and gave Barbera a new co-designer, Daniele De Iulijs.

"The Color Classic was our first chance to put the design language ideas we'd been discussing into practice," says De Iuliis. "So I told Bob that to make it work, we would have to take a bold step. He said, 'OK, go for it...'"

De Iuliis and Barbera redefined the Color Classic in two stages. First they gave it a clean slab-like face, with a straight floppy disk

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slot, vertical vents on the sides and a curved skirt beneath the chin with a small air space underneath to make the front appear less vertical. At that point, says De Iuliis, "I wanted to give the Color Classic some serious modernity as well as a sense of liveliness." To make the display appear larger and more interesting, he added 'roll-ins' on the left and right sides where the plastic dives in toward the screen, creating a small 'tear' at the corners. Pleased with the effect, he then made the 'roll-in' a common theme throughout the product, applying it around the power receptacle, the rear access door, the on/off switch and other points of interaction.

Next, De Iuliis redesigned the side vents, giving them a gill-like quality that roll in a certain points (suggesting air intake) and roll out in others (expressing the outward flow of air). Rather than cover the product with slots, which read as vents and make SnowWhite products appear 'hot,' the Color Classic's small graphically treated vents make it appear 'cool' by comparison.

The roll-ins and vents had a transforming effect. "Walking around the product, each surface and detail catches light in a different way, suggesting that the computer is a living breathing thing," says De Iuliis. In time, this quality would become a standard feature of Apple's new design language.

"The Color Classic taught me that small products, particularly an all-in-one design, should have details that are precise and balanced. Therefore, I placed the Apple badge and graphics in the center of the bezel, which was a pretty radical thing to do at the time," says De Iuliis. "Centering those elements made the product seem less aggressive. I wanted the front in particular to be quiet and slab-like so that the most important thing happening from the user's perspective would be occurring on the screen, not around it. Only when you disengage from the interface and move to the side does the product become animated."

This duality in the Color Classic's design—the ability to be active one moment and quiet the next—is another theme that later Apple products would share. "When the Color Classic is turned off, the design doesn't just sit there, it beckons you to come over and work or play," says DeIuliis. Like the Macintosh LC, the Color Classic assumes the presence of a "little being"—not just a head on a desktop, but a creature with feet, a compact body and a face with a chin, forehead, and mouth that droops to one side.

"The drooping mouth came about because of an engineering request," DeIuliis recalls. "When I joined the project, the forward elements on Slice were all straight and flat and didn't express anything other than themselves. But, later, the engineers told us that the floppy slot needed slightly more recess to function better. So while we redesigned it, I gave the slot a twist, allowing it to droop on one side, which tied in very nicely with the vents ... extending a fluid gesture from the front to the sides and allowing the floppy slot and vents to relate on a subliminal level."

As a final touch, Deluliis tucked the computer's loudspeak-

er under the chin, a natural place from which the sound we emanate, giving the surface a slight bulge to suggest sound rac ing out. From a certain angle, the bulge reads as a smile. V speaker holes that are large in the center and smaller at the edg the design appears to "speak" even when it is physically silent.

To complete the look, De Iuliis placed the Color Classic's mile phone above the screen and placed a door on the back to all easy expansion: by opening the rear door, the entire motherboslides in and out.

By late September 1991, De Iuliis and Barbera had transformed Color Classic from an ordinary product to one that was user-or tered, stylish and daring—perhaps too daring. But as Brun recalls, "we got surprisingly little grief from executives during development. Only when we had assembled units did we begin hear second thoughts." Yet this didn't phase De Iuliis.

"As designers, we spend a lot of time persuading executives h products should function visually, anticipating what the competit will be doing and designing our products to be as forward-look as possible. That kind of talk sometimes makes management r vous. But if a design doesn't make at least someone uncomfortal then we've probably failed. Any design that fits today's expectatiwill seem old and tired by the time it ships."

ONCE COMPLETED, THE COLOR CLASSIC POSSESSED ALL THE ELEMENTS T Apple's new design language would need:

- · an intriguing, expressive shape;
- a profile so simple and iconic it could be reduced to a few pixels and still be recognizable, like the first Macintosh;
- · a combination of simple and complex surfaces;
- details such as speaker holes that express their function;
- central placement of the logo and graphics;
- surprise elements such as roll-ins and tearing surfaces;
- details and surfaces that reflect light in interesting ways;
- · an animated (but not cartoon-like) quality;
- an orientation of details that allows the user to turn the design "on" and "off," so that it doesn't conflict with the Mac's screen-based interface; and
- · an emotional quality that is friendly and accommodating.

After its launch in January 1993, the response to the Color Clas was everything that De Iuliis and Barbera could have wanted. I first desktop product since the Apple IIc to be hailed in the coputer press specifically for its design, it quickly became an icom powerful in its way as the original Macintosh, the kind of prod that develops a cult following. Users loved its sassy appearance a personality, its feet, the bubble behind the bezel and the droop mouth. Put Slice in a room with other desktop PCs and it alc looked truly alive. Along with the Mac system software, the Cc Classic's charismatic design represented the very essence of Macintosh computing experience.

Yet for every user interested in cutting-edge design another yearns or machines with a large display, a CD-ROM drive and PowerPC rchitecture, none of which the Color Classic could support. Therefore, n the winter of 1993-94. Apple withdrew the Color Classic from the narket, filling the vacuum with the more cost-effective, feature-laden and prosaic-looking) Mac LCIII at the low end and a new all-in-one lesign, code-named Hook, at the top end. The decision to withdraw he Color Classic meant that Apple would never again sell anything that poked like the original Manock/Oyama Macintosh. This not only leprived Apple of its most treasured icon, it provoked a profound ense of loss among millions of users ... including those at IDg, who oon looked for ways to revive the old design. "The Color Classic's niggest problem was that it had no clear mission, distinct from other Acintosh models," admits Larry Barbera. "For that reason, we weren't ure how to revitalize the form, give it the same aura and personality s the original Mac, and make it seem brand new." The first attempt, ode-named Hook, which looked like the Color Classic on steroids, would become a bonanza product for Apple. The second, called Bongo, resembled a desktop display on a tilt/swivel stand. Both were nteresting attempts. But neither product managed to revive the spirit f the classic Mac and propel it into the future. For that, users would ave to wait for the third all-in-one Mac to come after the Color Classic, bold and beautiful statement that the designers called Spartacus.

Lawrence Lam. As the Color Classic reached completion, with ne PowerBook Duo hurtling forward and Tim Parsey working on his ext design language presentation, Bob Brunner found a new memer for the Group, Lawrence Lam. Born near San Francisco in 1960, am studied industrial design at San Jose State, graduated in 1985, nd worked at a series of Silicon Valley design shops before joining fike Nuttall at Matrix Product Design in 1986 as employee number aree. There he worked on a range of products, from bovine injecors to disposable survival suits to computer products. In October 991, Brunner hired Lam to manage the design of portable products. When I arrived, the Group had just moved into its new studio," Lam ecalls. "The new design language program was under way, and the Duo project was hyper-ventilating. To complete the program, Lam epped in to sweat the details with Product Design, such as the hape of the rear feet and the tiny rubber dots in the corners of the isplay. "Each detail was marginal, but fixing them all made the difrence between an unrefined product and the Duo you see today."

SPRESSO

s Lawrence Lam settled in, he attended his first design language neeting in October 1991. "As I recall, Tim had been watching globl design trends and felt that computers would become more expresve in the 1990s," says Lam. To move forward, Parsey encouraged Og to develop a new design language along the lines of the Color lassic that would use form and detailing to express a product's lentity and function, the product's comfort with its surroundings, and its relationship to the user. But first, they needed a name.

"The Group had just purchased an Italian espresso machine, the kind that worked by pushing the button and made steamed milk for cappuccino," Larry Barbera recalls. "Jim saw that as the invasion of yuppies into industrial design. During a design language meeting, Jim Stewart complained that we spent so much time talking about expression rather than problem-solving, we should call our new language Expresso ... or maybe Espresso. He said it to poke fun at Tim and Danny. The funny part was that they didn't see it as a joke." The following month, Tim Parsey's third design language presentation in November 1991, titled "Why Evolve Apple's Design Language?" contained an interesting subhead: "ESPRESSO: the new Apple design language."

Espresso Meetings. "Tim was very good at organizing meetings." says Daniele De Iuliis, "getting people together, and harassing ... no, I mean, encouraging us to verbalize what we were doing... In a situation like that, most designers would run in the opposite direction. But the more we talked, the more unifying elements emerged that we could then use to develop a new design language."

Rather than take a strict Bauhaus approach favored by a company such as Braun, IDg preferred to build the same brand equity with greater flexibility. "We needed to diversify the product line in terms of size," says Brunner, "from Newtons and PowerBooks to large CPUs and displays—as well as target audience—tailoring certain products for professionals and others for home use and education."

Over time, the designers visualized Apple's product line as a series of concentric rings. The innermost ring contained the core Macintosh products, which are modular and have to work together tightly, such as displays and CPU boxes, which must remain consistent. Keyboards and mice occupied a space just outside the center, allowing a greater level of expression. Printers were situated at the edge of this inner ring, because they usually exist away from the CPU and can have their own personality. Within this inner ring, all products had to belong together visually, with printers being less tightly integrated than the other elements.

Portable products such as the PowerBook and Duo defined another ring, outside the Macintosh circle, where relationships are looser and products can have more individual qualities.

Farther out would be Newton and other non-computer products such as desktop speakers and stand-alone CD players or digital cameras, which would all be developed in later years. Since the Newton exists in a mobile environment, it did not have to relate to desktop products or PowerBooks. The same is true with the other small peripherals, such as the LC microphone, which can exist on their own with a more expressive design while still maintaining a certain 'Apple' quality.

"As we looked at our product map and analyzed desktop Macs versus PowerBooks, Newton and non-computer products," says Brunner, " we realized that the farther a product was from the core, the more important it was to have that 'Apple' quality."

In all cases, the new language would enhance the product's intuitive quality by indicating its method of operation as well as functional issues, such as indicating how a notebook computer should be opened or carried in the hand or how paper flows through a printer. The way a product is designed can also have an iconic quality, like that of the original Mac, to make it more recognizable. It wasn't necessary or appropriate to make every product as distinctive as the Macintosh or the PowerBook. A battery charger, for example, should not read as an individual product; it should visually fit with the PowerBook that it supports. On the other hand, a stand-alone printer should have a more distinctive quality ... and a fairly high "Appleness quotient" so that it would look different from a CPU, yet still be recognizable as an Apple product.

The difficulty was in defining terms such as "Appleness," which had a different meaning to each member of the Group. "How do we define qualities that are 'Apple' without being SnowWhite?" asks Brunner. "First we identified an approach to form, a sense of symmetry, and a set of consistent details that allowed individual products to take slightly different approaches—something that SnowWhite did not allow." No longer would the language force designers to draw 2-millimeter slots spaced 10 millimeters apart or adopt specific corner treatments.

As the core ideas developed, the designers agreed on certain qualities of form, detail and expression. "We wanted to maintain the precision of having a well-defined edge, which SnowWhite gave us. But we wanted the surface to catch light in a special way, not just lay there," says Brunner. "It had to move and pick up highlights. Looking at the final Jaguar display concepts, as well as the Color Classic, we realized that bulging surfaces could also catch light, as well as illustrate the idea sound radiating out, defining points of interaction, places for the user to touch, or suggest ideas such as strength and mobility, in which bulges on the sides suggest muscular legs or feet." Meanwhile, the rest of the computer industry was headed in the opposite direction, toward a more vacuum-form look—an approach they would abandon as soon as the first Espresso products hit the market.

As THE GROUP DEFINED ESPRESSO, CERTAIN QUALITIES CAME UP AGAIN AND again—such as central symmetry, curvature, the use of complex surfaces that catch light in an interesting way, surprise elements such as bending surfaces, roll-in details around displays, consistent floppy slots and buttons treatments, occasional tearing of the surface and details that highlight points of interaction, such as bulges or divits around important buttons or controls.

Though design elements could be codified, the level of expression could not. "Each design has its own intensity," Brunner says.. "So we developed the idea of "dialing up" and "dialing down" expression. The Color Classic, for example, has been 'dialed up' close to the maximum, in part to show all the elements an Espresso proc could have in a single product. Daniele couldn't 'dial up' the Cc Classic any farther without making it look extreme. So we allow each product to have a character appropriate to its purpose with sacrificing consistency."

Variety was also needed to differentiate Apple's core produced located in the center of the product diagram from the periphe products on the edge. "No one would want a Newton that had same design cues as a CPU or display," says Ray Riley. "Even la and small displays needed to be handled differently because the scale is so different." Meanwhile, Bob Brunner proposed that pobles have their own language, because portables, not being tiec desktop products, don't have to share the same details.

Disagreement. "To some degree, Espresso was a mechanism some of us to exert our egos with certain built-in restraints to p vent us from going too far," Brunner admits. Yet the Group split the subject of expression. Daniele De Iuliis, Tim Parsey and Meschter wanted to see more personal expression. Jim Stewart p ferred less. Larry Barbera, Ray Riley and Susanne Pierce were in t middle. Lawrence Lam concluded, "we are all entitled to have a c ferent opinion about Espresso."

Jim Stewart held the minority opinion. Having seen industi design evolve from an engineering focus in the 1970s to a custom focus in the early 1980s to a marketing focus in the late 1980s buzzword status in the early 1990s, Stewart saw Espresso as response to an industry in which style and design had become t most visible means of differentiation. "Espresso was supposed to s we're 'better,' 'cooler,' and more 'globally aware,'" says Stewa "With no peaceful surface left undisturbed, the design had an your face' character—much like Tim. He was relentless abc Espresso, forever saying, 'Don't you just love it (me)?' "

Larry Barbera recalls one meeting when Stewart, questioning t Group's obsession with surface details, asked no one in particul "Are we solving problems here or are we just a bunch of h dressers?" From that moment on, Stewart was no longer consider an insider within the Group. "We went one way," says Barbera, "a Jim stayed where he was."

Ultimately, the Group decided to let each product be as good it could be, and manage consistency on an individual basis to provent the product line from diverging. "Rather than adopt a rubook," says Brunner, "we conducted design reviews every fe weeks to analyze our progress and determine what was worki and what wasn't. Whenever the conversations got heated, I wou make the decision. Otherwise, we would let certain issues slic such as the surface treatment on the Duo Dock."

Yet the second important Espresso product was not subject to a internal review. Created in a machine shop at Canon's printer fact ry in Japan by Apple designer Tim Parsey, armed with little mothan an X-Acto knife, some blue insulation foam, and his Espres ag of trips, the design of that product, the StyleWriter II, was done n the fly, proving just how flexible the new language had become.

PEEDRA	CER SIN	LEWRITER	п			PLATES .	237-241	
dustrial	Design:	Apple	Computer:	Tim	Parsey;	Pam	Ryan,	

oduct design

ates of Design: November 1991-March, 1992

troduced: October 1992

wards/Collections: Industrie Forum Design Award (Germany),

293; Permanent Collection, Museum of Modern Art, New York s Apple's second Espresso product, the StyleWriter II enjoyed more an a few similarities with the Color Classic. Both were redesigns of top-selling 1990 product, and both faced the prospect of changing e look of a product that had become a familiar friend to millions ⁶ Apple users. By the fall of 1991, with more than a million yleWriter printers in circulation, the thought of altering its trim mensions and proud upright stance was intimidating even for a esigner as fearless as Tim Parsey.

The first StyleWriter had achieved a such cult-like status within ople," Parsey recalls, "I understood the uneasiness Larry Barbera lt when he began work on the Color Classic."

Unlike the Color Classic, Parsey wasn't designing a single prodct. In all probability, the StyleWriter II, code-named SpeedRacer, ould set the tone and establish a baseline for at least two future ople ink-jet printers, perhaps more. Parsey knew his design would tain the vertical emphasis, slab-like profile and minimal footprint "the first StyleWriter.

I wanted the StyleWriter II to feel compact without making it eem weak or precious." he says. Surveys of StyleWriter users bund that some users considered the product delicate. "Like e Color Classic, StyleWriter II had to be sturdy and compent, yet enhance the user experience with a broad horizontal arve across the front, a strong pair of feet to enhance a sense grounding and inviting details at every touch-point, such as e soft recess on the side where the user opens the front cover and a sharper recess on the top, which cradles the power butn." Parsey calls the divit on the top a "surprise element."

Implementing such details was a challenge. "If you are trying to o something radical, even within an establish product type, you ave to live the product detail by detail. You must persuade execures that it's important to put the button on top where users can nd it and not save a few pennies by hiding it on the side near the inter's circuitboard," says Parsey. "If necessary, we even show the ngineers how to mount the mechanism and run wires from the cirtitboard to keep assembly costs down. At Apple, every detail is a ultidisciplinary event."

Parsey felt that Espresso would not succeed on the strength of its eas alone. The designers had to believe in what they were doing ad fight to protect the work if necessary. "To break through the inertia and resistance of a big company, we had to be passionate, make an effort to answer every question and turn each potential negative into a positive," he says. "That became essential when I took SpeedRacer to Canon for final development."

Like the first StyleWriter, SpeedRacer would be manufactured alongside a similar Canon product on the same assembly line, which forced Parsey to differentiate Apple's product as much as possible. Then came a shock. Arriving in Japan to present his design, Canon informed him that the budget for ID and tooling had been sharply reduced. "Canon intended to launch their printer with an inexpensive minimal box-like enclosure. I wanted to use Apple's industrial design for the product, yet Canon insisted on their minimal ID," says Parsey. "Soon we reached an impasse."

When the head of Canon's printer division took over the negotiation, tempers eased, and Parsey offered to design a solution that would satisfy both Canon and Apple. "We found some blue insulation foam and X-Acto knives in the machine shop, and Canon's printer people watched as I cut a block that showed how we could get a Canon product and an Apple solution using the same components. The Canon engineers all thought I was going to cut my fingers. But once I finished, they saw what I had done, the negotiation continued. Ultimately, we agreed that Canon's and Apple's printers would share all internal parts and certain external parts such as the backplate, baseplate and front door. SpeedRacer would have its own unique feet, top-panel and finger scoop that allows the user to open the door, and Apple agreed to pay the tooling budget for these unique parts. As a result, we got our own unique look at a fraction of the cost we would have incurred if we had done the printer ourselves. And Canon could use our industrial design (minus the unique parts) for their printer." This agreement set a precedent that allowed Apple to retain its unique industrial design on OEM products that everyone else was selling as cheap commodity items. As a result, the faster, better-designed StyleWriter II had a lower price than the first StyleWriter and sold a million units in its first 13 months. SpeedRacer gave IDg another reason for favoring Espresso: cost. "Unlike SnowWhite, which required costly zero-draft tools, Espresso can be manufactured with drafted tools that are cheap to build, yet look like a million bucks. In this way, Espresso fulfilled Apple's need for products with great design at a reasonable cost."

Between the FALL AND WINTER OF 1991-92, AS THE NOISE SURROUNDING the Color Classic and Espresso meetings increased, a quieter more methodical style of work was under way at Suzanne Pierce's desk, where she focused on redesigning one of the lynchpins of Apple's entire product line, the one item that ships with every Macintosh, the ADB Mouse II.

TOPOLINO APPLE ADB MOUSE II

PLATES 242, 243

Industrial Design: Apple Computer: Susanne Pierce; Brent Duchon, product design

Dates of Design: May-December 1991

Introduced: January 1993

Awards: Industrie Forum Design Award (Germany), 1993

Among Espresso's principal themes—curvature, central symmetry, surprise elements and complexity of surface—the Group added the need for comfort and positive feedback whenever a product is held or touched. Nowhere was this more important than in Susanne Pierce's design for the ADB Mouse II in 1991, a signature element of Apple's new product line. The goal was to inject Espresso into a ergonomic shape that feels and performs better than the six-year-old frogdesigned mouse, yet is less expensive to manufacture.

Code-named Topolino, the ADB Mouse II is the most deceptive of all Apple products. Rather than exhibit its function and performance through form and surface detail, Topolino does its work invisibly, communicating through nerves and muscles in the hand. up the arm to the user's brain, where the hand-eye coordination needed to manipulate the Mac operating system occurs. A silent servant, Topolino yields to a gentle touch without being submissive, yet asserts itself by being well shaped and perfectly balanced for a wide range of users.

Rather than study the old SnowWhite mouse, which reminded Pierce of a garage-door opener, she took an intuitive approach, designing a series of shapes that allowed the hand to direct and actuate the mouse in a relaxed position, performed user testing on the first series of concepts and studied videotapes of people using the mouse for various tasks to determine how they gripped the mouse and where they placed their palm index and middle fingers.

After more than 20 hard models, "we did a lot of testing on handsize to determine the correct length, width, thickness and the radius of the curve across the top and the back, where the bottom of the palm comes to rest," adjusting the weight, balance and shape of the button. In the final design, the button extends across the entire front of the mouse. She also considered designing left- and right-handed mice, but dropped the idea when Apple discovered that stores would not stock left-handed mice. "That decision drove the design to be universal rather than hand-specific."

Consistently Espresso in its approach, Topolino's visible surface has a gentle dome shape and wide shoulders to increase the button size, and only one flat surface, on the underside where a product label is applied.

Because of the huge number of Apple mice shipped every year, the final phase of Pierce's design involved cost reduction, paring away every ounce of material until an optimum price/performance ratio was achieved. "The volume of mice sales is so large that reducing the cost by as much as a penny yields significant savings," she says. One meeting with Manufacturing focused on a tiny change to the glide pad under the product that reduced the cost by a quarter of a penny. T far, that tiny design change has saved Apple more than \$50,000 could save \$100,000 over the lifespan of the product.

As ESPRESSO MEETINGS CONTINUED IN 1991-92, BOB BRUNNER PONDERED Design as Strategy approach and wondered whether IDg, in ev ing beyond SnowWhite, wasn't changing things too quickly. Afte some of the best corporate design groups in the world—firms Brunner admires, such as Sony, Porsche and Mercedes—manage with great control, preserving a sense of continuity or "family res blance" that make their products the most recognizable in the wo Was Brunner sacrificing recognizability for the sake of change?

Familiarity Rather than strive for a "family resemblance," Group wanted Espresso to give Apple products a sense of "faiarity." "Since 'family resemblance' is predetermined, it force designer to adopt rules that force certain products to be less t they could be," says Brunner. "The problem we sometimes hav defining "Appleness" is better than being absolutely certain of w we're doing—and being prevented from making each product strong and appropriate as possible. A certain amount of chaos "product disconnect" is inevitable as you transition from one guage to another. But chaos is neither good nor bad. It's inevitable

Flexibility without Chaos. According to Brunner, "chaos exeverywhere that creative work is happening. So, instead of fightin we should use it to our advantage. Ideally, our design approshould reflect the presence of chaos, because products and mark and idea development are constantly changing. Nothing is predicta in the computer business, and cycles rarely repeat themselves. If y try to develop strategies that predict the future, you're doomed."

Living in the Moment. "Inevitably, some products that you th are pivotal to a particular strategy will be cancelled or delayed." product you wanted to introduce after something else may come before. You can't expect anything to happen perfectly. Strive inste to plan as best you can, and remain flexible by acting and react and living in the moment."

Designing for Emotional Impact. "The Espresso approach ge beyond simple 'form follows function,'" says Brunner. "We believ that form should follow all the things the user might be about, wanted users to react emotionally to our designs and did this adjusting the product's stance at the table ... how it relates to user ... and making it Something the user will understand and en being around."

By building visual bridges between core products (CPUs, displa keyboards) and peripherals (mainly printers) and portable ite such as the PowerBook, Newton and digital cameras, the Espree language would reinforce the idea that Apple offers whole solution and not merely individual products.But after weeks of Espree meetings, consensus was difficult to reach. As Daniele De Iu recalls, "in the fall of 1991, we were all struggling to figure out will discussion, but not many examples to show what become, except for the Color Classic. Rather than become is to the rest of the Group through my be led De Iuliis to design his next signature product, the become 300.

ET DISONAL LASERWRITER 300

Design: Apple Computer: Daniele De Iuliis; Azad Khodai,

PLATE 244

Design: October 1991-April 1992

- July 1993

D Design Review, 1994; Good Design Award, Chicago Museum of Architecture and Design, 1995

The color Classic, Daniele De Iuliis began work on product, a low-cost desktop laser printer for home and products use. "The challenge was similar to the Color Classic," Details, "to inject vitality and expression into an entry-level that would operate in a stand-alone environment. Despite that would operate in a stand-alone environment. Despite the presence of something more powerful and capable than product low-cost printer."

The number of the second secon

be use of his training at ID Two, which did not have an in-house
shop. De Iuliis learned the importance of designing as much as
be up front, capturing the essential elements of a design quickly
orking out the details before proceeding to three dimensions.
be users I trained myself to work out a design in my head, then
at ID Two, we were sometimes allowed only one good model,
be rything had to be certain before taking that final step."

the underlying mechanical package was essentially a box, challenge was to give Comet a sophisticated feeling, with a se of activity and potential. "I wanted it to have a distinctive perality, yet be so simple that it could be dropped onto the printer sis in the factory and secured with a few screws," says De Iuliis. In iconic sense, the printer is shaped like an arrow, which indies the direction of the paper as it exits out the top. As the paper erges and climbs a tiny hill at the edge of the output tray, it nes to rest in a shallow receiving area that flares out to create athing space—a detail that energizes the entire design.

The first thing most users notice about Comet is the flared sides,

beautifully curved back and aggressive venting, which enhances airflow through the printer engine, and evokes the spirit of a high-performance racing car. A central element of Espresso design, the three-dimensional venting accentuates Comet's engine compartment, an area that most printers try to hide. The Y-shape at the back of the printer also serves an important function: it prevents the product from being placed against a flat surface that might cover the vents and obstruct the airflow. Cable management occurs a compartment in the back, where the wedge shape allows more finger space for attaching power and I/O cables.

Like the Color Classic, Comet's design expresses itself differently depending on the user's point of view. "When you look at the printer straight on, the overall shape seems conventional and the venting is visually quiet," says De Iuliis, "but as you move around, the venting becomes more aggressive as it communicates airflow going in various directions. Viewed from above, the Y-shape becomes the product's icon statement." The same 'Y-icon' appears in various forms on three later Apple printers: the LaserWriter Select 300 (code-named Ninja), LaserWriter Pro (Tollhouse) and the Color StyleWriter Pro (Fantasia).

Once the design was finished, the challenge for De Iuliis was convincing management to accept it. "Success was not guaranteed by any means. When the hard model first came in, a few designers asked, 'Are we *really* going to do this sort of thing?" But De Iuliis persuaded Marketing that a visually expressive design, even one that is more expensive to tool, would have greater longevity than a conservative look, allowing the same design to be used in future models [five years later, the design is still part of Apple's product line.]

"At Apple, if you have a good story and are willing to sell it inside the company, a designer can exercise a lot of influence." The process also had an effect on the Group, says Jay Meschter. "Watching Comet's design come together did more for Espresso than a month's worth of Espresso meetings."

JUGGERNAUT

IN-HOUSE DESIGN INVESTIGATION

PLATES 245-254

Industrial Design: Apple Computer: Robert Brunner, project manager: Daniele De Iuliis, Tim Parsey, Lawrence Lam; Tangerine (London): Jonathan Ive: Lunar Design (Palo Alto, CA): Matt Barthelemy *Dates of Design:* November 1991–September 1993

Looking back at the way the PowerBook had been developed simultaneously inventing, designing, engineering and testing the product under a tight deadline—Bob Brunner decided to avoid that experience in the future by conducting design investigations that allowed new products forms and details to evolve in a more thoughtful way.

"Whenever a designer tries out new ideas in a high-profile project with a tight deadline, the risks increase geometrically. As product schedules get tighter and the level of difficulty rises, the first casualty is innovation. To reduce that risk, we periodically conduct offline projects and parallel design investigations to develop new form factors, new levels of expression and strategies for handling new technology without the pressure of a deadline."

Working off-line allows the Industrial Design Group to try out novel techniques and occasionally make mistakes without courting disaster. "Because ideas generated off-line are often our best ideas, parallel design investigations can be extremely valuable," says Brunner. "This information not only enriches our language, it gives you something to point to and say: 'This is what we can move towards.' "

The first design investigation conducted by IDg, code-named Juggernaut, focused on the challenges of mobile computing, the relationship of portable and desktop hardware, new ways of linking penbased digital assistants, digital cameras and laptop computers using infrared, radio wave and cellular networks, and design protocols for connecting the various pieces into a flexible yet reliable system.

"With the Duo under way, the Newton Group charging forward, and John Sculley constantly talking about 'convergence' and 'pervasive computing,' we didn't want to be caught without a range of forms and details for these new product areas should they suddenly come on line," says Lawrence Lam. Designed around a new high-speed architecture for carrying video, sound, data, and power along a single line, Juggernaut components could be used individually or in combination to gather information, take notes or pictures and create documents. The four Juggernaut component were:

WorkCase, designed by Daniele De Iuliis, is a stand-alone computer with a full-sized color pen-addressable LCD screen, integrated stereo speakers positioned in the upper corners, a central microphone below the screen, a built-in modem with IR and spread-spectrum networking, and an external keyboard for text entry. WorkCase could accept a digital camera and external hard drive. A leather cover protects the screen, and helps secure the pen as well, giving the concept a high-end business image.

DeskStation, designed by Matt Barthelemy of Lunar Design, provides a home port for WorkCase. A floppy drive, hard drive, telephone handset called Link, and network connections, combined with a small processor, allowed information to flow to and from the DeskStation even with WorkCase detached. When connected, WorkCase and DeskStation would become a dual-processor system, a hub of shared activity. Since DeskStation would be used primarily for documents, a keyboard could also be used with the tablet.

Keyboard Station, another De Iuliis concept, is a docking stand for WorkCase that allows text entry at home or in remote locations using a split full-sized keyboard for greater comfort. On the road, the Keyboard Station could be used to make changes to documents without having to return to the DeskStation. While travelling, the Keyboard Station's docking connectors retract for enhanced mobility.

Passport, designed by Tim Parsey, is a palm-sized digital note taker combined with a small CCD (charged couple device) camera and hard drive which could gather text, voice, still image and video without the bulk and weight of a notebook comput-

er. A soft rubber cover protected the screen while in transit

Eye, designed by Bob Brunner, is a hand-held digital camera t attached to Passport or WorkCase. Because of its neat toroidal sha the design was known in-house as 'taco-cam.' **Travel Kit**. design by Lawrence Lam, is an extremely flat, compact ink-jet prin Juggernaut allowed the designers to push Espresso forms and det ing in a new direction, as well as elaborate on existing motifs, example, the combination of flared side walls and curved back fou on De Iuliis' Personal LaserWriter 300 became the ruling aesthetic WorkCase, DeskStation, Keyboard Station, Travel Kit and Passp with each handled in a slightly different way. Curved surfaces a deeply-cut, curved vents on Desk Station carried forward anot Espresso idea. Roll-in details around the WorkCase display w much softer than before. "Juggernaut allowed us to explore det and forms that would be useful in the future," says De Iuliis.

"When people saw our test units ... and realized they were not actual products, they asked, 'Why doesn't Apple offer something like this?' " —Stephen Pe

NORSI APPLE ADJUSTABLE KEYBOARD PLATES 255-Industrial Design: Apple Computer: Ray Riley; Harold Welch, p

Industrial Design: Apple Computer: Ray Riley; Harold Welch, p ject creator; Dave Shen, product design; Vent Design (Cample CA): Stephen Peart, Eric Chin

Dates of Design: January 1990-June 1991

Introduced: May 1992

Awards/Collections: Silver Industrial Design Excellence Award, 19 Industrie Forum Design Award (Germany), 1993; "Best of Catego I.D. Design Review, 1993; Permanent Collection, Museum of Mod Art, New York

The result of two parallel design investigations and thousands of he of engineering and testing, the Apple Adjustable Keyboard, conamed Norsi, was the first Jaguar concept to emerge as a finish product. Because so many people were involved in its genesis, it's ficult to know precisely where and when the first seed was planted

According to Harold Welch, Apple's in-house keyboard expert, "pa' checks show that the idea for a split keyboard dates back to at least 1 in the United States and probably even earlier in Europe. For a long ti we've known that to make a keyboard fit a wide range of people, it to be adjustable, because no single typing position is best for all use

That meant splitting the keyboard. "But that decision pose number of questions," says Welch. "Where do you split the k board? Between the 5 and 6 key? Or between the 6 and 7? And w do you do with the space bar? Is it attached to the left or right si Both sides? Or should it be mounted separately?" There was also issue of providing choice on a product where previously there w none. "In certain circumstances, people don't appreciate choice. decades, people have used keyboards that offer only one positi even though a single typing position is less-than-ideal for most p ole. Without proper introduction and education, too much choice confuses people," Welch says. "How could we expect users to set a comfortable angle for themselves? It was a quandary ... but one that wanted to solve."

Harold Welch had been thinking about these problems since the nid-1980s as keyboard expert at Apple's Garden Grove peripherals livision, where he worked on the first Apple Standard Keyboard, he Cassie frameless keyboard and others. Meanwhile, Tom Bentley, who directed industrial design on Jaguar, had explored the split keyboard concept at Xerox PARC; his encounter with Luigi Colani durng Jaguar rekindled his interest.

"After meeting with Colani, Tom Bentley asked Ray Riley and Aatrix Product Design to come up with a split keyboard for Jaguar, nd their model looked quite good," says Welch. "But like many people before them, they underestimated the mechanical and rgonomic issues and succeeded only in making a prop. I wanted to make a keyboard that was real." But finding support was diffiult until Welch met designer Stephen Peart in Bob Brunner's office.

According to Peart, "Harold wanted Bob to build some test rigs for new adjustable keyboard that he was developing. I could overhear im making his pitch. He said, "It's very simple. All I need are some rames to make the test rigs appear like real products..." But Brunner ouldn't do it, because Harold's keyboard wasn't an official project. fter Brunner turned him down, Welch hung around and listened as eart pitched ideas for a portable computer that Brunner didn't like ither. Then, as Peart prepared to leave, "Harold came back into ob's office and gave me the same pitch, word for word, that he'd ist given to Bob. I thought to myself, "This guy is either desperate r a total genius."

The theory behind Welch's design was to configure the keyboard o that it would keep the tendons in the hands as straight as possie to avoid bending the carpal tunnel in the wrists, which can lead stress and injury. Since all hands are unique, he keyboard had to e adjustable with wrist rests tailored to the height of the keyboard reduce upper-back tension.

The project began with a budget of \$10,000 and a single adjustable st rig that looked like it had been designed by Rube Goldberg, ince test subjects are easily intimidated by a piece of experimenl equipment, we assembled six prototypes with platinum gray astic housings, Apple logos and realistic graphics and cords to ake them look real. Each keyboard had an adjustable mechanism and a modified keyboard that split down the middle so that the keys buld be arrayed at various angles." While Peart built the frames, elch built flexible mylar circuitboards with keycaps and switches bounted to it—the first of their kind. "It was an amazing thing," eart recalled. "You could bend the circuitboard into any shape, and *e* keys still worked perfectly."

Three keyboards were used for testing and three were circulated nong Apple's Finance and Marketing executives. Within days, Peart says, the executives were fighting over them **When people** saw our test units and discovered that they were **not actual end**ucts, they asked, 'Why doesn't Apple offer something like the

Hearing this, Tom Bentley abandoned his research and gave is support to Welch. Meanwhile, Bob Brunner hired Lunar Design to design yet another version, code-named Norsi. But recalling his earlier meeting with Brunner, Welch said he would not continue the project unless Apple used Steve Peart's design. Brunner agreed.

"People take keyboards for granted, but it's probably the most difficult thing to design, because it's the thing you constantly touch, the thing you pound on. It's the connection between the user and the cyberworld," says Welch. The Adjustable Keyboard dispels preconceived notions of how a keyboard should be designed. The enlarged space bar and moveable wrist rests both improve function and give the design a sense of visual wholeness. Its unique appearance and inherent logic make Norsi one of Apple's most enduring high-visibility products.

 TELECASTER
 AUDIOVISION 14 DISPLAY
 PLATES 257-258

 Industrial Design:
 Apple Computer: Robert Brunner, Ray Riley; Dave

 Lundgren, product design;
 IDEO Product Development (Palo Alto,

 CA):
 Mike Nuttall, Mark Biasotti, Ricardo Salinas, Chris Hosking

 Dates of Design:
 January 1991-June, 1992

 Introduced:
 January 1993

Awards: "Best of Category," LD. Design Review, 1994; SMAU (Italy), 1994 A full thirty months after the final Jaguar hard models were completed, the second and most difficult of the Jaguar-based Espresso products, Telecaster, was released as the AudioVision 14 Display. Unlike any previous design by Apple, Telecaster was, like the Norsi keyboard and the PowerBook, a combination of design and original invention. Painstakingly engineered to compliment multimedia, integrated telecommunications and speech technologies of Apple's new Quadra and upcoming PowerPC computers, it combined high-end audio and video with a built-in microphone and a range of ergonomic and user-focused details in a striking Espresso design that almost rivaled the Color Classic for its intellectual depth and polished execution.

"In retrospect, it's bizarre how Telecaster came into being," says Ray Riley, who managed the effort. "It began by combining the back of Mike Nuttall's Jaguar display with the front of Bob Brunner's black Jaguar display, elements of Giugiaro's Jaguar work, plus input from three designers at IDEO. That's a lot of design for one product."

The problem was that no one had ever developed an audiovisual monitor of this quality on such a small scale. "Originally, we estimated an 18-month design and engineering cycle," says Riley. "In reality, it took nearly 30 months. Getting every detail right became my number one obsession." The final design shows it.

Every element on Telecaster reinforces the product's function and enriches the user experience. The overall shape reinforces the idea of sound and vision. Above the display, the integrated microphone includes the most sensuous case detail of any Espresso product thus far: a standard "perf" pattern that is flush with the bezel on the front, and a sculpted concave "perf" treatment on top. The detail expressed Telecaster's ability to gather both foreground and background sound and electronically cancel the ambient background sound emanating from behind the display to provide sharper, clearer performance during teleconferencing or when making voice notes in a multimedia document. Beneath the display, soft bulges over the speaker elements express the idea of sound emanating from those point. Even the lozenge-shaped controls between the speakers play a role. Controlling brightness, contrast, volume level, speaker muting, and the microphone, they could have been treated as mere buttons. Instead, the shape of each control mirrors the shape of the user's index finger, encouraging finger-to-button contact.

Behind the bezel, Telecaster's back view offers surfaces of almost baroque complexity with a deeply angled graphically charged vent treatment on the top that expresses power in its most undiluted form. "On a high-profile product like Telecaster, it makes sense to 'dial up' the expression," says Bob Brunner. "At the same time, we didn't want the product to be as exuberant as the Color Classic." For this reason, the bezel treatment around Telecaster's screen has none of the Color Classic's rolling or tearing surfaces.

Like Brunner's black Jaguar display, the chin on Telecaster engulfs the user both visually and aurally, positioning twin speakers, which are tuned for precise stereo imaging. Inside the display, an acoustic chamber contains a series of internal baffles (the work of product designer Dave Lundgren and electrical engineer Will Oxford), which allows small speakers to produce rich, full-bodied sound.

FRIDGEMACINTOSH QUADRA 800PLATES 259-260Industrial Design:AppleComputer: Robert Brunner, Ray Riley;Wayne Miller, Brad Helm, Wayman Lee, Jim Melton, product design;Lunar Design (Palo Alto, CA):Ken Wood, Matt Barthelemy, BrettLovelady

Dates of Design: January 1991-August, 1992

Introduced: January 1993

Awards: Industrie Forum Design Award (Germany), 1993

Originally conceived as a toaster-sized desktop CPU with a trim yet expressive profile, the design known as Leadbelly was the centerpiece of Bob Brunner's final Jaguar series. Yet once formal development began, it didn't last for long..

"In industrial art, there's often a huge disparity between the original vision and the final result," says Ray Riley, "and the Leadbellyto-Fridge story is no exception." As a Jaguar product, Leadbelly was a pure RISC design, which meant it could be very small ... no more than 8 inches tall. But after Jaguar collapsed, and before Apple agreed to develop PowerPC with IBM and Motorola, Apple decided that the first Leadbelly would be a CISC machine. This meant it would need a larger circuit board, which in turned gave Marketing, the engineers and product designers permission to a more memory, enhanced video, and more NuBus expansion, whi in turn required a larger power supply—all of it feeding the p nomenon designers call "creeping elegance." Thus Leadbelly be Cyclone, which later begat Fridge—which was nearly three til the size of Leadbelly.

Maintaining his original vision forced Riley to continually adjust surface details as the scale of the product grew. "To reduce the se of mass, we broke up the form into smaller interlocking bo: which makes the CPU look smaller," says Riley. The problem maintaining the right sense of scale. "What begins as a cute I product that fits on a desktop becomes gross when it's a power sta ment sitting on the floor. You can't increase the size without ruin the relationship between forms when the product was small."

The final Fridge design incorporates Espresso with its center Apple logo and graphics, iconic profile, complex curvature on front, soft bulges on the sides that read as legs and a loudspear on top contained within a soft bulge on an otherwise flat surfa Certain details from the Leadbelly concept survived, such as the v tically arrayed I/O ports on the back with icons placed on the s of the box, allowing connections to be made without turning CPU around. But most did not.

The most notable design feature on Fridge was the feet, wh evolved as the box grew. "It became like a tennis game," says F Wood. "Every time we hit it across the net, Apple would hit it ba and it would have different feet.."

Initially, the idea of feet was purely functional: a slight protrus on the side allows room for ventilation when products are push together—the same reason Jay Meschter put feet on the Duo Do But on a mini-tower, feet are another matter entirely. "An early v sion of Cyclone had tiny cylindrical feet that protruded half an in beyond the sidewalls. But as the product grew, the feet grew lan and larger. By the time Cyclone became Fridge, three years i development, the feet had become almost hip-like. "What begar a functional idea became a style statement," says Wood.

As an outside consultant, unaware of details going on inside company, Ken Wood didn't realize that his work on Fridge v advancing Espresso. "We knew that Apple wanted to create a new l guage, but we never attended any Espresso meetings, so we had idea what any of it meant," he says. "The evolution of Espresso ou Jaguar wasn't obvious at the time. None of us knew where the l guage was going. We were only certain of where he had been. So calibrated our work more in terms of moving away from SnowWI than moving toward something called Espresso. We only realized w we were doing after it had happened. Each element was develop independently and influenced the evolution of other elements."

The Fridge form factor became a mainstay of Apple's product li used for the Quadra 800 and 840AV, the WorkGroup Server 80 a 8150, and the Power Macintosh 8100/80, 8100/80AV, and 8500. A taller version, code-named SubZero, shipped as the Macintosh Quadra 950, Workgroup Server 95 and 9150 and the Power Macintosh 9500.

REDESIGNING THE SAME PRODUCT AGAIN AND AGAIN, AS RAY RILEY DID WITH Fridge, can discourage even the most experienced designer. "The challenge with design is maintaining your original vision and continually dogging the engineers to ensure that the final product has some relationship to your original idea," says Riley. "If you look around the IDg studio and see all the models on display that never became products, you'll see that only a small percentage of what we do actually ships. It's amazing to think that a product as complex and difficult as Telecaster was one of the few to make it all the way through. Part of that is due to the design, which inspired a product designer like Dave Lundgren to defend it and see it through to completion. The same was true with David Shen, who engineered the Norsi keyboard. Without him, it wouldn't exist... By focusing so much attention on CPUs, fewer people are left to worry about displays, keyboards or printers. For that reason, a display can make a stronger iconic statement and slip through development without anyone noticing. But with a CPU, the goal is constantly evolving. Once the process begins, you no longer think about your original vision; you concentrate on saving your most recent vision."

Sniffing the Creative Air. As Apple's sales soared after the release of the Macintosh LC, IISI and Classic, and its market share rose to historic levels, John Sculley spent a third of his time managng and investing Apple's ever-growing horde of cash (which would op \$2.5 billion in 1992), a third speeding up bread-and-butter product development (to fend off PC clonemakers) and a third pushing new technologies, such as Newton, to keep Apple at the forefront of innovation.

As Apple's chief technology officer as well as its chairman and CEO, Sculley wanted to shape the company's image as well as its products. He disliked the term "corporate culture," preferring to see Apple as a giant organism that is always evolving. "As individual rells multiply and grow," Sculley once wrote, "they carry with them kind of genetic coding, which imprints an identity and culture on the organization. Rather than instill a sense of 'corporate culture' at apple, which is inherently backward-looking, I wanted to encourge a forward-thinking model so that every action would be seen as n investment in the future, not an expression of the past." And one of the most forward-thinking areas of the company was the ndustrial Design Group.

"Sculley liked ID, because design was 'cool' and gave Apple good R," says Stephen Peart. "Since Sculley had dabbled in design while t college, it was natural for him to gravitate toward Bob Brunner, ecause Bob was every executive's image of the modern corporate layer." Unlike Sculley, who on some level was always considered

an outsider at Apple, Brunner was not. Since he had grown up in the Valley and was trained there, he was a product of its culture. Therefore, on a genetic level, he was more like Jobs and Wozniak than Sculley would ever be. But there was something else as well.

Unlike the executives Sculley dealt with at corporate HQ, who often took an overly-specialized rifle-shot approach to life, Brunner was part company man and part entrepreneur ... part team player and part warrior. He knew how corporations worked and could communicate with the Top People as well as anyone—knowing exactly how much information to give an executive and what to leave out. But he also had an independent streak that allowed him to manage IDg as a semi-autonomous unit and a high profile outside the company that many people inside Apple envied. And unlike most executives at his level, Brunner often ignored the rules or made them up as he went along, and always got away with it as long as he delivered the goods.

"Whenever Sculley visited Bob," Peart recalls, "he would sniff the air and fantasize about the designer he could have become if he'd stayed with ID instead of going off to business school."

"Don't show me boxes." During his visits to IDg, Sculley expected to see only the most exciting work. and had no patience for "ordinary" products. During one visit in the spring of 1991, when Bob Brunner showed Sculley a concept model for Fridge, the chairman pursed his lips and said, "Don't show me boxes." Even though CPUs were the core of Apple's product line, sold in oceanic volumes and paid most of the bills, they didn't represent Sculley's vision of the future. In that fanciful world, populated by executives and entrepreneurs toting portable computers and hand-held personal digital assistants, Sculley assumed that desk-bound CPUs with wires trailing out the back would soon become dinosaurs. So they didn't interest him. "Show me PowerBooks, PDAs, new concepts," he would say, "anything but boxes."

Because of this, Sculley didn't know what IDg was doing in the CPU arena when he addressed an audience in Tokyo in 1992 and pledged: "Within six months Apple will ship the first multimedia computer with an integrated CD-ROM." The audience cheered. Yet, back in Cupertino, the designers at IDg had no idea what the chairman was talking about.

"When we heard that speech," Tim Parsey remembers, "we all looked at each other in amazement, because there was nothing like that on any of our product road maps. Sculley just made it up. Or perhaps he wanted to do it and forgot to tell someone. In our view, shipping a new CPU within six months was impossible."

Following Apple's usual process—with Product Design. ID. Marketing and Finance shepherding a product to completion—a CPU would take between 12 and 18 months to complete. "But two days after Sculley's speech," Parsey says, "PD put together a chassis and motherboard with a built-in CD-ROM and asked us for a 'twoweek special'"—a sheet metal box with a molded plastic bezel. At first, Parsey refused; then he relented. "We had to put a gun to Tim's head to design that product," says Bob Brunner. "It was not our finest hour." When reminded of this, Parsey offers a crooked grin. "At that point, life went from hectic to flat-out madness."

LEGO MACINTOSH IIVX / PERFORMA 600 / QUADRA 650 PLATE 262 Industrial Design: Apple Computer: Tim Parsey; Barry Marshall, Bill de Meulenaere, Ben Pang, product design Dates of Design: February–March 1992

Introduced: September 1992

The first Macintosh to offer an internal CD-ROM drive. Lego was a low-priced, mid-sized CPU (a successor to the Mac IIcx/IIci) developed as a 'crash-and-burn' program under the tightest time and budget constraints of any Apple product. Because the computer would be offered as a low-priced Performa, Product Design used an existing chassis and motherboard to keep costs low. In keeping with its entry-level image. IDg gave it a simple bezel treatment with standard floppy and CD-ROM slots and a non-Espresso speaker treatment. Time was so short, in fact, that Parsey did not have time to center the product's logo and graphics, and applied a simple "perf" pattern to the metal box that became known as "Sculley vents." With an entire family of CPUs happening at the same time. IDg could not give much attention to Lego. Even so, the product was a huge success among first-time buyers. With its superior performance and low price point, the Lego form factor evolved into eight different products: the Macintosh IIvx, the Performa 600, Macintosh IIvi, Centris 650, Quadra 650, and Power Macintosh 6500, 7100/66 and 7100/66AV.

The Problem with Code Names. The use of code names at Apple dates back to its earliest days. Since the Apple II, security has dictated the use of internal code names to keep the competition guessing and allow developers to discuss a product without using its official name. Internally, code names became an interesting vehicle for expression: spawning names such as Pepsi Lisa (for the ill-fated Macintosh XL), Paris (an interim name for the Mac II in honor of Jean-Louis Gassée's hometown) and Spock (for the Macintosh IIx, a veiled reference to John Sculley). After Sculley's Tokyo speech in 1992, one executive said, "A computer with a CD-ROM? We'll sell billions and billions of them!"-echoing a remark made by the astronomer Dr. Carl Sagan, who often described the universe as having "billions and billions of stars ... " As a result, the computer was code-named Carl Sagan. But when word of it reached the press, Carl Sagan (the astronomer) filed suit, demanding that Carl Sagan (the computer) be given a new code-name. Eventually, an order came down from Apple's Legal Department stipulating that no living person or registered trademark be used as an internal code-name. Therefore, Carl Sagan (the computer) was renamed BHA (short for "butt-headed astronomer"), then changed to LAW ("Lawyers Are Wimps") and finally Lego-a well-known trademarked name.

QFC Macintosh Centris 610

Industrial Design: Apple Computer: Ray Riley: Lorenzo Dunn, I Yuan, John Johnston, product design

PLATE

PLATE

Dates of Design: March-April 1992

Introduced: January 1993

Awards: Industrie Forum Design Award (Germany), 1993

Intended as a replacement for the Mac IISI, Apple's next proceed evolved so quickly that it was given the code name QFC, short "Quick, Fast and Cheap."

"During the spring of 1992, product requests were coming in fast that we had to practice triage," recalls Ray Riley, we designed QFC in a two-week spurt of activity. "Because of frenetic pace, certain products fell between the cracks. Sac QFC was one of them." Mixing elements from Jaguar with a we pizza box shape to accommodate the motherboard and powe supply, the resulting Espresso design was "backwardly comp ble"—allowing it to work with Apple's older SnowWhite display yet not be transitional. "The Duo-Dock had taught us not design any more transitional statements," says Riley.

QFC's main point of expression centered on the feet, which I become an issue of some concern within the Group. "Some of questioned the feet on the Duo Dock and Fridge and wanted to whether a subtler expression was possible," Tim Parsey rememb "We didn't want the feet to look as though they were 'stuck on.

DRAGON APPLECOLOR 14-INCH DISPLAY

Industrial Design: Apple Computer: Jim Stewart; Ron Mol product design; IDEO Product Development (Palo Alto, CA); M Biasotti

Dates of Design: November 1991-March 1992

Introduced: September 1992

Awards: Industrie Forum Design Award (Germany), 1993

While most of IDg was developing Espresso designs, Jim Stew continued to design certain products based on the old SnowWl vocabulary. As Product Line Leader in charge of displays a printers until 1993. Stewart resisted the changes that accompan the arrival of Daniele De Iuliis and Tim Parsey. As a result, Stew designs such as the AppleColor 14-Inch Display, code-nam Dragon, maintained an uneasy relationship with Lego and QFC and a complete disconnection with Espresso products that wo soon hit the market. From an engineering standpoint, however Dragon was a triumph. Having purchased preassembled displa from Sony since the frogdesign days, Apple decided to engine Dragon internally, reduce the circuitry to a single board, and th deliver a better product at a lower price. Not surprisingly, became the first Apple display to sell more than one million un Dragon's tilt/swivel stand, designed by Ron Moller, has been us (with minor variations) on all later Apple displays.

HOOK MACINTOSH LC520

And Annual and

PLATES 264-266

Industrial Design: Apple Computer: Larry Barbera; Eric Xanthopoulos, Mike Milo, Betsy Diaz, Steve Chase, Chris Novak, product design; Lunar Design (Palo Alto, CA): Ken Wood, Brett Lovelady, Matt Barthelemy

Dates of Design: Mondo phase: January-June 1992;

Hook: October- November 1992

Introduced: June 1993

After the design for the Macintosh Color Classic was completed in the fall of 1991, Apple had no further plans to keep the all-in-one Macintosh form factor alive until Larry Barbera began a new investigation with Lunar Design in 1992 to create a 10th anniversary Macintosh for release in January 1994. "We wanted to give it a 14inch screen, but not make the product so massive that it would lose the height-to-width ratio of the original Macintosh," says Barbera. Code-named **Mondo**, the design echoed the basic elements found in the 1984 frogdesign concept called Big Mac. Yet now it would have built-in CD-ROM, a built-in microphone and stereo speakers between the front feet, like the Color Classic.

To reduce the bulk, Lunar allowed the plastic to hug the internal components as tightly as possible—a lower section containing the motherboard and speakers, a middle section containing floppy/hard drive/CD-ROM, and a top tier containing the monitor—which gave the design a 'wedding cake' look when viewed from the back. On the front, the sensation was reversed: with the largest mass (the screen) at the top and the smallest (the foot) at the bottom. The foot elevated the front of the computer and angled the display back six degrees, continuing the gesture used on the Color Classic and Mac LC, with speakers set behind a radiating perf pattern and rocker buttons controlling volume and display contrast.

The design was so strange that Larry Barbera could only scratch his head. Since no one at IDg liked the design, Barbera had no choice but to put it on the shelf. Months later, when John Sculley examined the just-completed Color Classic in the fall of 1992, he squinted at its 10-inch display, decided that it was too small, and asked Product Design to develop an all-in-one with a 14-inch screen, on-board CD-ROM and stereo sound—the same configuration as Mondo—and have it ready in six months.

Hearing this, Eric Xanthopoulos, product design manager in charge of entry-level CPUs, walked across the street, removed the Mondo concept from IDg's shelf and put it into development.

By forcing the Industrial Design Group to implement a design that they openly disliked, Xanthopoulos solved an immediate problem, but rekindled the age-old rivalry between Apple's product designers and industrial designers. "The conflict between designers and engineers exists because we work side-by-side, but think in very different ways," says Bob Brunner. "Engineers have to worry about making a product that's manufacturable at low cost. Designers worry about look and feel, which can make the engineers's lives difficult when the schedule is tight. For this reason, whenever the engineers can be control of a design, they do ... which makes us miserable

The new all-in-one Mac, code-named Hook, was a key element in John Sculley's 1992 strategy to feed the market with as many diffeent Macintosh configurations as possible at the lowest possible price, allowing Apple to replace millions of Apple IIs and entry-level Macs with larger multimedia computers in homes and schools. Because of its low price, solid performance and all-in-one simplicity, the Hook form factor spawned three additional products including one version, cloaked in black with a matching black keyboard and mouse, that was sold as the Macintosh TV, a hybrid product that functioned as a multimedia computer one minute and a cable-ready television the next. Produced in limited quantity, the Mac TV now commands a premium price as a collector's item.

As soon as Hook was released, its unusual look attracted more attention than IDg could have predicted, "We were amazed when it turned up in movies and on TV," Brunner recalls. Even so, Larry Barbera hated the design and soon began work on a replacement that would result in Apple's most recent all-in-one, code-named Bongo

Espresso Printers. "As Daniele De Iuliis showed in his design for Comet and Tim Parsey demonstrated with SpeedRacer, desktop printers offer the best opportunity for expression among all computer-related products," says Bob Brunner. "Unlike CPUs, displays and keyboards, printers are dynamic. They move and process paper, then deliver something tangible to the user. For this reason, we use design to highlight the paper path and enliven the mechanics of the product in ways that add value and make it easier to use.

"Because printers sit away from the CPU and are viewed on all four sides, we look at them as exercises in pure form," says Brunner. Small laser printers are given more expression, because they are targeted to individuals, who tend to be interested in a product's look and feel. Larger office printers, on the other hand, are treated as investments and thus receive a more conservative treatment.

All Apple printers benefit from one fact. "Because printers are not our main area of business," Brunner says, "fewer people in the company pay attention to them. Therefore, we can inject more expression into printers than any other product."

TOLLHOUSE LASERWRITER PRO 600/630

PLATE 3HD

Industrial Design: Apple Computer: Robert Brunner. Jim Stewart, Grant Ross, Jr.; Ron van Thiel, product design: Lunar Design (Palo Alto, CA): Ken Wood

Dates of Design: February 1990-February, 1992

Introduced: January 1993

Awards: Industrie Forum Design Award (Germany), 1993; "Desage Distinction," I.D. Design Review, 1993

Even though the project began in 1989, the LaserWriter 600, codenamed Tollhouse, experienced so many delays that it came in fruition years later, just as IDg was implementing Experience Therefore, what began as a replacement for the aging LaserWriter II became Apple's first business-oriented Espresso printer.

For Ken Wood, the project began at an unsettling time. "We negotiated the job while Bob was still at Lunar and expected him to take part in the design," he says. "After he went to Apple, I wasn't sure we could do the project." But after repeated delays, in which Apple changed its strategy for Tollhouse three times, Wood regained his confidence. Initially, Apple wanted to use a specific Canon engine. When another engine was chosen, Wood changed his design. Then Apple wanted to combine a laser printer and scanner in one product, forcing another design change ... only to return to the original Canon mechanism, the 600 dpi EX engine. "Fortunately, we still had our original drawings," says Wood.

Taller and more centered than the LaserWriter II. Tollhouse has a large curved paper exit tray on top that Ken Wood compares to a miniature amphitheater. "As the paper exits, it moves from a flat surface to a concave area, which was a tricky area to define using 2-D drawings. As the paper climbs into the exit tray, it curves in an appealing way."

After the design was finished, it remained in limbo for months until Product Design finalized details with Canon. "Then, just as Tollhouse was ready for tooling, we realized that Espresso was happening," Wood recalls. "So we applied curves to surfaces that the user routinely touches," such as the drawer that accesses the paper reservoir. Tim Parsey centered the logo and product graphics. Ken Wood then gave the top edge of the product a slight outward tilt, "as though someone had tied an invisible string around the case, half an inch from the top, and pulled it tight." This small detail allowed Tollhouse to echo the Y-shape that Daniele De Iuliis had given to Comet, the Y-shape Mike Nuttall would give to the side of Ninja, and a similar treatment that Tim Parsey would soon apply to another printer, code-named Fantasia.

NINJA LASERWRITER SELECT 300

PLATES 267-268

Industrial Design: Apple Computer: Jim Stewart, Tim Parsey; Azad Khodai, product design; IDEO Product Development (Palo Alto, CA): Mike Nuttall

Dates of Design: February-September 1992

Introduced: May 1993

"If you look at the lower end of Apple's laser printer family, the Personal LaserWriter [code-named Comet] and the LaserWriter Select [known as Ninja], both products contain a graphical shape that resembles the letter Y, which links them in a subliminal way," says Tim Parsey. "On Comet, the 'Y-icon' is visible when you look straight down on the product. With Ninja, the 'Y-icon' appears when you view it from the side. This is what makes printers so interesting. As a freestanding object with five sides that all need to be designed, there are many opportunities to build expression and create visual resemblances." Because it uses a Fuji/Xerox laser engine, which has an asymmetrical mechanical package and an unconv tional motherboard assembly, designer Mike Nuttall accentuated interior imbalance by giving the printer an aggressive stance wit strong sense of forward motion.

"After all the attention Newton received, few people who saw our first model ever noticed that the lid was missing on the final desi You tend not to miss things that aren't there." —Bob Brunn

-	JUNIOR NEWTON MESSAGEPAD 100 PLATES 2	70-							
1	Industrial Design: Apple Computer: Tim Parsey, Gavin F	ves							
1	Robert Brunner, Susanne Pierce, Daniele De Iuliis								
	Dates of Design: November 1991–December 1992								
ı	Introduced: August 1993								

Awards: Gold Industrial Design Excellence Award, 1994

During the fall of 1991, while the Industrial Design Group was copleting the Color Classic, the PowerBook Duo, the Jaguar produ-Norsi, Telecaster and Fridge and refining its in-house design 1 guage, a new project was taking shape inside the Newton Gro that would put the Industrial Design Group to an even bigger te

Ever since the cancellation of Figaro in the spring of 1991, Newton Group had been divided over what size and shape their f product should take. Those involved with Figaro, including Ste Sakoman and his successor Larry Tesler, felt that the first prod should be a full-featured notebook-sized computer. Others, led Steve Capps and Michael Tchao (Newton's marketing director an close friend of John Sculley) wanted to develop a smaller le expensive device called Pocket Newton.

Since Newton Plus had a powerful and proven technology (t product of four years of R&D) and had already been designed engineered, tooled and tested, Larry Tesler argued that it was fo to put that work aside in pursuit of a less-powerful (and unprove Pocket Newton. But Michael Tchao believed that Newton Plus w too large and too expensive to sell in significant numbers. Pr estimates for Newton Plus still hovered in the \$5,000 range, whi limited it to wealthy executives and "early adopters" who buy t first of any new technology. Tesler countered that Pocket Newt would have too little power, storage capacity or battery life to considered a serious product. Designing a product without a ha drive for storing data and a screen too small to use comfortal would make handwriting recognition the Pocket Newton's prin pal function. And if the recognizer the software writers were dev oping didn't work perfectly, the whole Newton concept would undermined.

As a new and unfamiliar technology, it was imperative that the fine Newton be a showcase product, Tesler said, offering as mu power and functionality as possible to build credibility and wh the public's appetite, allowing Apple to follow up with a lower priced version such as Pocket Newton. Rushing a pocket version market right away, Tesler warned, would cast doubt on the entire Newton concept unless the product was flawless.

Yet Michael Tchao had lost faith in Newton Plus. In a now-historic meeting with John Sculley aboard Mike Markkula's jet in February 1991, Tchao persuaded Sculley to cancel Newton Plus and devote all available resources to Pocket Newton. Both Tchao and Capps believed that the functionality of Newton Plus could be easily scaled down into a less expensive product. Eighteen months would pass before they realized how wrong they were.

After receiving Sculley's blessing in February, six months of nontop development resulted in a deal between Apple and Sharp Electronics of Japan in September 1991, calling for Apple to supply he basic technology and design for the Pocket Newton and Sharp o engineer and manufacture the product and market its own vertion under license from Apple.

Once the Sharp agreement was finalized, pressure to ship the product increased. In November 1991, Bob Brunner asked Daniele De Iuliis, Susanne Pierce, Gavin Ivester and Tim Parsey to submit deas for the first concept. "When we saw Steve Capps's prototype, we understood Newton's potential," says Parsey. "But we needed to levelop a new metaphor for this more personal kind of product. We snew about the earlier Figaro models, but ignored them since Pocket Newton would be considerably smaller."

Given its size and function, the most logical product metaphor for Newton was a notepad, resulting in it a vertical orientation narrow enough to hold comfortably in one hand while making notes with the other. Like a conventional notepad, it would have a protective id that folds up and snaps onto the back. "Because of our work on Espresso," says Parsey, "we wanted Newton to have rounded edges, complex surfaces, an emphasis on central symmetry and a strong conic presence." In November 1991, Ivester, Pierce and Parsey genrated six models, including one with a curved palmrest below the creen that contained batteries and a speaker.

This concept evolved into a hard model, code-named **Batman**, in early 1992. Its most visible feature was a solid lid, which Ivester culpted to resemble the hood of a 1960s Corvette and attached to he top of the product by means of a double hinge, allowing it to wing around and snap onto the back. The palm rest below the creen enabled the user to hold the product securely while making totes. A side-mounted pen holder kept the stylus in plain sight at Il times. Soft forms gave the product positive tactile feedback. vester's design also retained the kind of simplicity that focused the user's attention on the screen-based interface.

Because Sharp wanted to have a lid hinged on the right hand side n order to accommodate Japanese users, positioning the internal omponents was a challenge. Yet the designers met their eight-week leadline and delivered Batman in early February 1992. "We thought we were on course," says Parsey. "Then a series of events that we ever expected threw the whole design into chaos." The trouble began in February, when John Sculley announced that a pre-production version of Newton would be unveiled at the Consumer Electronics Show in May—giving the designers less than four months to complete their work.

Then came the second problem. As Bob Brunner recalls, "Sculley liked Batman. But when he tried to put it in his pocket, it didn't fit" at which point he ordered IDg to make it smaller.

"Given the tight deadline and manic atmosphere surrounding the whole Newton effort, the size issue became a crisis," says Brunner. "We thought we had already reduced the product's size to the absolute minimum. Then, suddenly, we needed to lose another four millimeters, which meant trimming around the edges and flattening the pen. But when we tried to shove the revised version into Sculley's pocket, it was still too large." This made the designers so frustrated, Brunner says, "we considered sneaking into Sculley's office and resewing his jacket pockets to make them a tiny bit larger. Instead, we flattened a few curves on the product and shaved the wall thickness until it passed John's test."

With everyone on the project (software writers, marketing, Sharp's engineers and IDg) hurtling toward the May deadline, each decision required everyone's support—including Sculley, who approved all design changes personally. Once the size issue was settled, attention focused on ergonomics. Could small hands hold the product comfortably? How could a flattened stylus be made to feel normal? Achieving the right balance without increasing the overall size forced the designers to make tiny adjustments, which soon led to a period of "millimeter madness" that reminded some of the PowerBook program. As Parsey recalls, "we would spend days looking for ways to trim half a millimeter from the product, yet still make it feel substantial." In March, IDg received approval to begin tooling, "Then we encountered another huge problem," says Parsey.

Back in November, the designers had been given specs that called for a PCMCIA (Personal Computer Memory Card Interface Adapter) slot at the top of the product in which small cards would be inserted and fit flush, not extend beyond the product envelope, allowing the lid to be folded over and around the back, "Four months later, in March, an engineer pointed out that future PCMCIA cards would physically stick out of the drive slot," says Parsey. With the PCMCIA card in place, folding the lid back could actually break the hinge that held the lid in place. "This was terrible news."

Because of prior commitments to Sharp, it was impossible to reposition the PCMCIA slot. It was also not possible to alter the tools that had already been created for Newton's case. To make matters worse, Batman's designer, Gavin Ivester, took a leave of absence in March 1992 and decided to leave Apple in May, forcing Tim Parsey to finish the design.

"The problem with Newton's lid threw the whole project into convulsions," says Brunner, "and it was Tim's job to sort it out." Parsey's first solution was a lid that snapped off the product and snapped onto the back when the PCMCIA slot was filled. "It worked OK," says Brunner, "but it was not intuitive. During user testing, no one could figure out how to make the lid work with a PCMCIA card in place. Most test subjects simply pulled it off and put it aside." Another problem was that two small rubber pads that Parsey had designed for attaching the lid to the back reminded some focus-group subjects of nipples. Rather than pursue the lid any further, Brunner asked Parsey to remove it. "This allowed Tim to focus on developing a case for the product instead."

The final design, code-named **Junior**, was unveiled at CES amid intense media scrutiny. Yet as Sculley put the product through its paces, "few people who saw our first Newton model ever noticed that the lid was missing on the final design," says Brunner. "You tend not to miss things that aren't there." With no lid to protect the screen. Parsey developed a range of case options instead—from a simple leather slip case to a zippered filofax-style case.

Choosing the right color and finish for Newton was critically important. "We knew the product would be a medium-to-dark shade," says Brunner. "But we wanted Newton to have more personality than black or dark grey implies." Working with color consultant Julia Christensen, Parsey chose a dark gray-green soft-feel paint that gives the product an almost suede-like finish.

When completed, the Newton concept and design represented a groundbreaking effort. Its size and shape pushed the computer from the desktop to the hand; and its tailored look and exceptional detailing eased the transition. "As well as it turned out," Parsey says, "the design could have been amazing. We had worked out most of the problems, but couldn't implement them because the design had been frozen too soon. In retrospect, Sculley's decision to preannounce Newton was a mistake, because it raised expectations higher than necessary and forced us to commit to a design several months before the product actually shipped."

Even before Junior left IDg in December 1992, a follow-up version, code-named Lindy, was underway with a new designer, Jonathan Ive, the soft-spoken dynamo from the London consultancy Tangerine. Ive had recently joined IDg and brought with him the determination to make Lindy the product that Junior should have been.

MAC-LIKE THINGS

PLATES 278-289, 299, 316

During the summer and fall of 1992, many inside Apple predicted that with the arrival of the first Newton PDA a whole new market for personal electronic devices would develop, allowing Apple to leverage its technology by marketing a wide range of non-computer products, such as personal audio equipment, digital cameras, slate computers with a Newton-like screen and a Macintosh interface, and handheld CD-ROM devices that put oceans of data at the user's fingertips.

With new ideas surfacing every day but no structure to assess and develop them, a group emerged within Apple called Mac-Like Things (MLT). Led by marketing executive Satjiv Chalil, an IBM veteran who joined Apple in 1988, MLT soon evolved into an unusu collection of projects. As Larry Barbera recalls, "MLT develope spent most their time searching for the Next Big Idea. As technolo migrated from the desktop, to the laptop, to hand-held devices, M figured that a concept as great as Newton was just around the co ner. It was their job to identify and develop that concept befor someone else did."

First, MLT developers would walk into the Advanced Technolo Group to get the latest thinking on some obscure new technolog enlist the Product Design Group to assemble components, then a the Industrial Design Group to package the concept so that it cou be presented to Marketing.

"Anything that had a touch-sensitive screen, a pen-based interface a CD-ROM drive or used computer technology in an unconvetional way was a potential candidate for MLT," says Barbera. "The also developed simple ideas such as self-powered speakers ar multimedia upgrade kits, which sold extremely well and gave MI credibility within the company." For all their energy and good idea however, few Mac-Like Things ever saw the light of day.

The best-remembered MLT projects were **Badger** (which shipper as the AppleDesign Powered Speakers, Plate 280), **Tulip** (App PowerCD, Plate 278), **Heavy Metal** (a CD-ROM multimedia play concept, Plate 79), **Folio** (a Newton-like slate concept that featured Mac-like interface, also known as PenMac, Plates 287–289), **Popey** (a hand-held CD-ROM concept, Plates 284–286), **Sweet Pea** (a sma er CD-ROM concept), **Paladin** (a word processor/telephone/a swering machine/fax/printer; Plates 281–283) **Baby Badger** (th AppleDesign Powered Speakers II, Plate 299) and **Palentir** (a tin desktop video camera, Plate 316). In September 1992, Mac-Lil Things was folded into Apple's New Business Initiatives group an then into the Apple New Media group, where MLT developers cotinued to identify new product ideas—the latest being technolog that led to Apple's first network computer, code-named Pippin.

BADGER AppleDesign Powered Speakers Industrial Design: Apple Computer: Tim Parsey Dates of Design: August 1992

Introduced: May 1993

Awards: 1.D. Design Review, 1994; Good Design Award, Chicago Atheneum Museum of Architecture and Design, 1995

PLATE 2

External loudspeakers are essential for tackling serious multimed projects, playing games, or simply enjoying a compact disc whi working on a desktop Mac. For many users, integrated stereo speal ers like those found on the Telecaster 14-inch AV Display provid the best solution. Yet other users prefer loudspeakers at the corne of the desk for more effect stereo imaging. This suggested a nee for small self-powered desktop speakers that could coexist with Macintosh yet have a personality all their own.

The AppleDesign Powered Speakers, code-named Badge

establish a strong direction for Apple's non-computer desktop product line by following the Espresso design language yet departing from it in some fresh and interesting ways. "Since there was no time to think about the design, my first impression was to accentuate their height and curved elements without making them stand out too much," says Parsey. Like the Color Classic, Badger's design reads in different ways depending on the user's point of view. From the front, their simple curved face, neutral grill treatment and minimal detailing around the controls allow the speakers to recede visually rather than stand out. From the top or side, however, the form suggests the idea of sound radiating toward the listener in a classic Espresso gesture. The tall slim design (about the height of a 13-inch display) gives them solid performance, particularly at high- and mid-range frequencies. Played through a Macintosh, they offer precise stereo sound at a level that will not disturb colleagues sitting nearby.

HEAVY METAL CD-ROM MULTIMEDIA PLAYER CONCEPT PLATE 279 Industrial Design: Apple Computer: Susanne Pierce Plate 279

Dates of Design: November–December 1992

After Topolino, Susanne Pierce designed Heavy Metal, a concept for a compact disc audio player with detachable speakers, which also functioned as a standard CD-ROM player when connected to a desktop Macintosh via its SCSI port. As a non-computer concept, Heavy Metal's shape and detailing did not have to conform to existing CPU designs. For example, the vent pattern on top and detailing on the front are more expressive than Apple's desktop computers. The speakers attach via slots on the sides of the main unit for a very tight fit, or can be separated by unfurling cables stored on a core-wrap at the back of each speaker.

Masamichi Udagawa. With IDg driven by American and European sensibilities, Bob Brunner's next recruit, Masamichi Udagawa, broadened the Group's international perspective in a new direction. Born in Tokyo, Udagawa graduated from Chiba University in 1987. He then cut his teeth designing furniture and musical instruments for two years at Yamaha, toured Silicon Valley during the summer of 1989, then spent a year at Cranbrook Academy, he says, "to focus on ways to humanize technology."

After Cranbrook, Udagawa worked for the architect/designer Emilio Ambasz in New York in 1991-92, where he co-designed the Handkerchief TV for BrionVega, which received an *I.D. Design Review* award in 1992. Though he enjoyed living in New York's Lower East Side, which reminded Udagawa of his old Tokyo neighborhood, working with Ambasz was problematic. "While touring the San Francisco Bay area in 1989. I had met Bill Moggridge at ID2. Mike Nuttall at Matrix and Bob Brunner at Lunar Design," he recalls. Udagawa stayed in contact with Brunner and joined IDg as a studio designer in July 1992. "I wanted to do high-level concepts and products, and Apple was clearly the place to do that."
 FOLIO
 PENMAC HAND-HELD COMPUTER CONCEPT
 PLATES >>>>>

 Industrial Design: Apple Computer: Masamichi Udagawa
 Dates of Design: August=October 1992 (project cancelled)

During the summer of 1992, all of Apple seemed to be caught up 'Newton mania.' Apart from developments occurring within the Newton Group itself, the Macintosh division was pursuing its own strategy for a hand-held Newton-like computer that would use the Mac interface, accept a Mac-style keyboard and mouse for desktop use, and (best of all) run Mac-compatible software, which Newton could not. "Once Newton development began to take off in 1992," says Larry Barbera, "many people assumed that hand-held devices would do to the Macintosh what the Mac did to the Apple II-render it extinct. To counter this thinking, the Macintosh division developed their own Newton-like Macs." The first concept, called PenLite, was the brainchild of Tom Gillies, who transferred from the Advanced Technology Group to the Portables Group in 1992, taking with him a concept that mated a PowerBook Duo form factor with a touchsensitive Duo-sized screen. The second concept, known as PenMac. was a tablet-size device based on a Sony CD-ROM electronic book product. To attract interest and venture capital for the idea, PenMac's chief evangelist Paul Mercer asked Masamichi Udagawa to design an appealing concept model, code-named Folio. "The Mac group needed a compelling design to differentiate their product from Newton," Udagawa recalls.

Ignoring the work that Giugiaro had done for the tablet-sized Figaro the year before, Udagawa gave Folio a simple, yet robust industrial-looking exterior. "Since Espresso was still undefined in terms of hand-held products, I followed my own sensibility as well as the underlying technology," he says. In the process, Udagawa broke new ground in his handling of shapes and surface details that would influence everyone in the Group.

"Masamichi is a master of form ... an artist really," says Tim Parsey. "He gave Folio several elements that later influenced our Espresso treatment of portable products"—one example being the flat surfaces on Folio, which have a very slight radius across the plane, and a decreasing radius at the bottom of the product, where it approaches the user. "The curves are, in part, a visual trick," says Parsey, "but it works beautifully, because it gives the design an inflated, full feel ... as though the surface of the product is under pressure."

Marc van de Loo. Bob Brunner's second recruit during the summer of 1992 had even more international experience than Udagawa. Born in Switzerland, Marc van de Loo spent his childhood in the Philippines, Sierra Leone, France and Switzerland, where he attended the Art Center College of Design in Montreux, then transferred to Art Center in Pasadena. "The breadth of experience and differing perspectives this affords was valuable to me," he says. After graduating from Art Center in the summer of 1992, Van de Loo joined IDg in July, within days of Masamichi Udagawa's arrival. In the comme weeks, he would begin his first serious project, the design of Apple's first hand-held digital camera.

Bart Andre. Bob Brunner's third addition to the Group in 1992 was Bart Andre, who first glimpsed the inner workings at Apple during a work-study project with the Advanced Technology Group while he was a student at the University of California at Long Beach during the summer of 1990. One idea that grabbed Andre's attention at ATG was a hand-held CD-ROM player with an LCD screen, code-named Sweet Pea. "In 1990, everyone at Apple was obsessed with miniaturization, CD-ROM technology and LCD screens, yet didn't know quite what to do with it," Andre recalls, "We all assumed that someone, somewhere would come up with a killer application for this kind of device ... and the moment that happened, the market would take off." Soon ATG asked Andre to design a concept for Sweet Pea that resembled a Sony Discman player with a high-resolution screen attached to the outside of the lid. During the project, Andre met Bob Brunner, who showed him around the Industrial Design Group and recommended he stay in touch. After graduating from UC Long Beach in 1991, Andre moved to Silicon Valley and joined the design firm GVO, where he redesigned the Synovex bovine hormone injector, the same product Bob Brunner had handled ten years earlier. Their paths merged again when Andre agreed to join Apple as a studio designer in September 1992.

 POPEYE
 HAND-HELD CD-ROM CONCEPT
 PLATES 284–286

 Industrial Design:
 Apple Computer: Bart Andre, Tim Parsey, Robert
 Brunner

Dates of Design: September–December 1992

Because of his experience on Sweet Pea, Bart Andre's first project was a larger version of the same concept, code-named Popeye, a Newton-like interactive CD-ROM player/recorder with an LCD screen that could hold vast amounts of data and imagery such as sales catalogs and repair manuals. A co-development between Apple's PIE division and Toshiba, Popeye was rich in possibility.

For months, Apple's Human Interface Group had investigated a range of hypothetical users for Popeye—such as United Airlines mechanics who wanted to store their repair manuals on portable machines for instant access to information and write up repair requests using templates displayed on its LCD screen. With this research, Bart Andre entered the picture, giving the concept a pen-based LCD screen mounted on the lid, a CD-ROM drive below, and a rounded compact case. Its tilting screen and simple controls make its functions easily accessible when used on a shoulder strap, on a laptop or on a tabletop. Further research showed that Popeye did not serve a large enough market to be profitable. Yet Andre used the experience for his next project, code-named Paladin.

PALADIN

Computer / Printer / Fax / Telephone / Answering Machine Concept Industrial Design: Apple Computer: Bart Andre, Tim Parsey; Julie McDonald, John Howard, Eric Larkin, product design Dates of Design: December 1992–June 1993 (project cancelled 1995)

Another 'skunkworks' effort that captured Bart Andre's interemerged from the Product Design Group. Having just completed update of the Macintosh LC called the LC III, product designer Ju McDonald used a brief period of down time to pitch a product id to Mac-Like Things. "For a long time, I wondered why most people knew outside the industry did not use a computer in the home," s says. "To find out, I went to the park with my child and talked to t other park moms." Though reasons varied, most felt that compute were still too complex. "The idea of a hierarchical file system scar them," says McDonald. "To the average mom, a device with simp functionality that could fit on a kitchen counter made more sense."

Combining the most often-requested functions—word process printer, image scanner, telephone, fax and voice answerin machine—into a quick L-shaped model, McDonald and her coleagues John Howard and Eric Larkin pitched the idea to MLT. F months, MLT had been toying with a similar idea proposed by Jol Sculley called Mac-n-Fax, which combined a computer, printer, tel phone and fax in a single product. On the surface, th McDonald/Howard/Larkin proposal didn't look much different. MLT turned it down. Undeterred, McDonald refined the concept, he a better high-resolution model built, and pitched it again—this tir winning approval under the code name Paladin.

McDonald and her team began the project by mounting PowerBook circuitboard, floppy disk and screen (but no hard driv around a module that combined a StyleWriter inkjet printer and sin ple scanner mechanism. Next, they fitted telephone, fax and answe ing machine circuitry around the edges and wrapped it in a gene ic-looking appliance-like case—then brought in IDg's Bart Andre give it some panache.

"Squeezing the components into a single form simplifies wh would otherwise be a complex product," says Andre, "But refinit the concept was difficult, because every time you accentuate or function, you undermine the others." Highlight the handset/keypa and Paladin becomes a telephone. Improve the paper handling an it becomes a printer. Accentuate the screen and keyboard, and becomes a computer. "Because we never knew which functio were most important, it was hard to achieve the right balance According to Andre, more models were generated on Palladin the all of his other Apple projects combined. "At one point, we we swimming in foam models," says Julie McDonald.

In the end, Andre took a conservative approach that stressed ef cient manufacture and maximum EMI shielding. "As a product ta geted for the home, we decided the form should be restrained." Focus groups not only understood the product and found the conols easy to use, "the women in the group actually pushed the men way to get a better look," says MLT's Satjiv Chalil. The response ras so good that the market research firm that conducted the test sked whether they could invest in the product."

Convincing Apple's sales force to support the product was anothr matter. The problem, says Chalil, was "bandwidth.... The sales pree would tell me, 'Sure, it's a great idea, but it's not part of our pre business, and we have no time to develop alternative sales hannels for this one product."

Multifaceted products have always been difficult to market, says ilie McDonald. "When the functionality isn't clear, it's hard to crete a product story that the sales force can understand. And with aladin, we weren't marketing to a typical computer user. We were iming it at the appliance market, where customers see things very ifferently. For example, a serious computer user will not buy a nachine that cannot be upgraded. But the appliance market cares ess about whether the chips inside the machine can be changed; ney care about what it does, how well it does it, and how much it osts." At a projected price of \$1,900, Paladin would have cost about the same as a Macintosh LC with display, says Bart Andre, "and we could throw in the telephone, fax, answering machine, scanner and minter for free. Yet the sales force still wouldn't bite."

Nonetheless, Satjiv Chalil hired the Taiwanese firm Mitec during ne spring of 1993 to engineer, tool and prepare Paladin for manuacture. But in June, just as Bart Andre was about to send the last aladin design files to Mitec, the project was halted amid a wave of ancellations that followed the announcement that Michael Spindler would become Apple's President and CEO, replacing John Sculley, who would resign as Chairman in the fall.

In the days following Sculley's departure, Michael Spindler estabshed the Apple New Product Process—which required two separate and rigorous) reviews before any project could receive funding for levelopment—then cancelled several projects that Sculley had avored, including Sweet Pea (the multimedia CD-ROM player), Bic (a late-sized Newton with a Mac-like screen), Scout (an entry-level dacintosh) and Paladin. Yet, somehow, Paladin refused to die. Three rears after its demise, the concept model remained on display in a corter of IDg's studio waiting for its day in the sun. "The key to selling new idea is a clear and coherent story," says Andre wistfully. "With story, we can develop a marketing plan. And with a marketing plan, we can excite the sales force. And once the sales force is behind a product ... it ships. That could still happen to Paladin... One day."

WITH JOHN SCULLEY GONE AND MICHAEL SPINDLER NOW IN CHARGE, APPLE eturned to its roots and revived the sense of mission necessary to rope with a world in which computers were fast becoming comnodity items. In the product arena, Spindler had three goals: to manage the transition to the PowerPC, which Apple developed in partnership with IBM and Motorola to keep pace with the ever-faster chips being developed by Intel; begin licensing the Mac OS to firms such as Radius and Power Computing; and continue development of a PowerBook to replace the 100/140/170 design as a prelude to the first PowerPC PowerBook, to be released in 1995.

"The balance between making a strong first impression and communicating with the user over a longer period ... is what distinguishes the best design...I wanted Blackbird to tell its story slowly, detail by detail." —Daniele De Iuliis

BLACKBIRD POWERBOOK 500 SERIES PLATES 290–298 *Industrial Design:* Apple Computer: Daniele De Iuliis, Lawrence Lam; Bill Burnett, Don DeGrass, John Larkin, Ken Weber, Dave Northway, product design

Dates of Design: December 1991-August 1993

Introduced: May 1994

Awards/Collections: "Design Distinction," I.D. Design Review, 1995: Silver Industrial Design Excellence Award, 1995; Design Innovation Award, (Germany), 1995; SMAU (Italy), 1995; Good Design Award, JIDPO (Japan), 1995; Good Design Award, Chicago Atheneum Museum of Architecture and Design, 1995; Permanent Collection, Cooper-Hewitt Museum of American Design, New York; Permanent Collection, Museum of Modern Art, San Francisco

When examining the PowerBook 500, it's easy to forget that it was originally intended as an "in-between" product with a lifespan of no more than a year, a replacement for the PowerBook 140/170 that would be pulled from store shelves as soon as the first PowerPC portable was ready to ship. Knowing this, some designers might not take the project as seriously as one they knew would stay in the market for a longer period. But Daniele De Iuliis realized that as a "one off" design, the PowerBook 500, code-named Blackbird, would offer *more* opportunity for expression, because future needs would not have to be built into the product. As a result, De Iuliis gave Blackbird more expression than any Apple product to date, thus creating the standard by which all future laptop computers would be judged.

When DeIuliis began the design in mid-1992, the PowerBook 140/170 was at the peak of its popularity. "That made it difficult to come up with a design that was totally new," he recalls. "When I received the design brief for Blackbird, Apple had just sold its *one-milliontb* PowerBook, which was a very humbling statistic. I asked myself, 'How could I follow up a success of that magnitude?' Then I realized, I didn't want to *follow* ... except for the basic elements, such as the integrated palmrest, the keyboard positioned near the display, the centrally-mounted trackball and the articulated hinge at the base of the display, Instead, I wanted to go beyond it."

Looking at the 140/170 from a technical perspective. Defuliis realized that by 1992 standards it had a mediocre display, inferior sound quality, poor battery performance, and no provision for expansion -all of which he could improve with Blackbird. Working with Bill Burnett in the Portable Products Group, De Iuliis wanted Blackbird to be the "ultimate" laptop, with the performance of a desktop Quadra, a 9.5-inch screen, 16-bit stereo sound, a solid-state trackpad instead of a trackball, an Ethernet port and provision for two batteries under the palmrest, or one battery and one PCMCIA expansion module. But fitting this much into a portable would be difficult.

"Small electronic devices are hard to design," says Defuliis, "because they offer very little chance for expression. Since components tend to be rectilinear, putting them together results in a rectilinear product. This forces the designer to build expression on what is basically an uninteresting shape," As a result, De Iuliis' design began with the first thing the user touches: the keyboard, trackpad and palmrest. "I had always considered the PowerBook 140/170 palmrest flat and uninviting," says the designer. "So 1 curved Blackbird's palmrest downward, increasing the downward angle around the edges, thus eliminating the sharp corners that surrounded the palmrest on the 140/170."

Decreasing mass around the edge of the palmrest enabled Defuliis to increase mass around the edge of the display, allowing the speakers in the corners to project outward and wrap around the display. As the corners "reach out," the display envelopes the user, making the design more personal and user-centered. "As I increased the volume at the top of the display, and decreased corresponding mass at the bottom, it created an inviting profile when the unit is open. Symmetry is also maintained when the unit is closed."

Because the curvature around the screen matches the downward slope at the bottom of the palmrest, Blackbird's top and bottom seal more tightly than those of the 140/170 when closed. This makes the PowerBook 500 appear smaller and more compressed than the 140/170 when closed, even though the 500 is physically larger. "Once I reached that point in the design, I could finally breathe," Defuliis says, "Everything evolved from this foundation."

In the coming months, De Iuliis took Blackbird's shape and detailing beyond industrial design to something approaching Art. "Because technology is precise, I wanted to give the design a sense of precision," he says, "When the product is closed, I wanted there to be a lot of activity on the surface to give the user a pleasant tactile experience. But once you open it, it had to be restrained. The challenge was to communicate those areas the user should touch and those areas that should be avoided. Subtle, complex and tactile surfaces invite the hand. Other surfaces are more precise and delicate, such as the area around the trackpad, which the user should treat with care and respect."

To enhance its subtlety, De Iuliis wanted users to digest the design gradually. "I wanted people to revel in the product, take it home and discover the details over time." he says. "It's difficult to achieve that fine line between a design that has a strong initial message and one that allows the user to discover it slowly. Since the product must compete in the marketplace, I wanted it to make a strong fi impression. But I didn't want that first impression to be *too* stron otherwise the user would grow tired of it. The balance betwee making a strong first impression and communicating with the us over a longer period, using a quieter voice, is what distinguishes t best design. For this reason, I wanted Blackbird to tell its story slo ly, detail by detail."

Because the PowerBook 500 was intended to fill a narrow m ket window—with no plans to modify the design or sell an evo ing series of Blackbird products—De Iuliis did not have to bu flexibility into his design. Thus he used the kind of complex surfac that designers often avoid, because they are hard to modify on they are finished.

As Lawrence Lam, who managed Blackbird's ID developme explains: "Blackbird began as part of a larger strategy. In 1992, App wanted to leverage its success with the PowerBook by offering hig , medium- and entry-level portable computers, with Blackbird repr senting the high end. Since it would cost the most, we wanted t design to stand out from everything else on the market. That mea using complex surfaces and B-spline curves that no other comput maker was using at the time. B-splines are very expressive, but c ficult from an engineering perspective. Therefore, we needed o own CAD [computer-aided design] operator, Ken Provost, to he define the subtle curves that make Blackbird what it is."

Initially, De Iuliis was skeptical about using CAD to generate 1 design. "It was a scary process. At first, I didn't realize that once the design enters Ken's computer, it's difficult to change one eleme without affecting everything else,"

The precision of CAD allowed De Iuliis to apply details such the two shallow ridges on Blackbird's top surface behind the d play. "There are four reasons for the locating those ridges on th top," says De Iuliis. "First, I wanted to break up what would othe wise be a large, flat surface. The first PowerBook used inverte SnowWhite slots to solve that problem. The ridges on Blackbi serve the same aesthetic function by breaking up the surface ar reducing the sense of visual mass. Since we had speakers on th inside, I also wanted to carry that expression to the outside. Th lines also provide a valley for your arm while carrying the produ-The back of the computer, along the hinge, is curved so that yo can hold it hinge-side down. To reinforce that message, I created small valley on the top of the case for your arm to rest in and mal the product more inviting to hold.

"Finally, I wanted to protect the Apple badge in both a physic and a symbolic way. Since the badge is the product's emblem, didn't want it to rest on a primary surface, where it could be scuffe So the curved ridges function as sacrificial surfaces, to protect II badge." To create the ridges, De Iuliis reduced the surface betwee the lines by one millimeter, providing a graceful, almost feminir counterpoint to Blackbird's otherwise masculine character. He als softened the exterior to give the appearance of surface tension, implying that the skin contained something powerful inside.

"As the design progressed, I continually debated these issues with myself. I wanted Blackbird to have a story behind it and convey layers of meaning that can be enjoyed over time," says De Iuliis. "At the same time, I wanted it to have a multi-dimensional personality. This is why certain details are soft and curvaceous, while the product as a whole is bold and almost militaristic in its strength. I wanted the user to believe what the product is saying, yet be moved by it on an emotional level. I wanted the surface to be tight, to convey the impression of contents under pressure. I also wanted the form to be sucked dry, so there is nothing frivolous about it. The result is a strong product statement, not a random series or nouns and verbs, but a complete sentence, with a period at the end. Full stop."

At this point, De Iuliis advanced his second iteration to a third hard model that was slightly larger (a quarter-inch wider and a halfinch deeper than the PowerBook 140/170), with many small adjustments. Certain details, such as the speakers, became less emphatic, and other areas, such as the conical hinge covers, became more pronounced. Subtracting expression from the speakers and adding to the hinge covers balanced the overall design." In the final design, the hinge covers are even sharper, almost pointed. "Since the first PowerBook established the hinge as a point of expression, it made sense for Daniele to focus on the hinge as well," says Tim Parsey.

As it progressed, Blackbird attracted considerable attention within the Group. "Daniele's design has always been the purest form of Espresso," says Jay Meschter. "And each design was stronger than the last. We all knew Blackbird had the potential to become great. The notion of designing a beautiful soft shape that appears to be under tension was a brilliant idea, and one that influenced nearly every Espresso design that came after it." Masamichi Udagawa described De Iuliis's design as having a two-level approach: "When you see it from a distance, it's beautiful and iconic; but when you get closer, you realize just how beautiful the forms and details really are."

Technical challenges that would force many designers to diminish the final product became an opportunity for De Iuliis to enhance Blackbird's expression. One problem was heat. "The Powerbook 140/170 emitted so little heat that venting was a non-issue," says Tim Parsey. "But Blackbird, with its faster processor did require venting. So Daniele added vents around the hinge at the base of the display, using a 'perf' pattern that is so delicate, you would *want* it to be there even if it wasn't needed. The venting integrates beautifully with details on the back, the speaker details, the buttons and the bulletshaped hinge. They're not 'stuck on.' Adding that kind of detail forces a designer to dig deep within, which is a marvelous thing to watch."

Blackbird's engineering manager, Bill Burnett, encouraged De Iuliis to push the design even farther by developing some of the product's more unusual features. "Bill loves to inject himself into the design process," says Tim Parsey, "and because he's an engineer, he can suggest technical ideas that none of us would have considered. The double battery bay was Bill's idea."

Final details included tiny sculpted rubber feet (rather than offthe-shelf parts) to make the underside appear unique. "When I saw that," Bob Brunner recalls, "I knew we were close to obsession."

In the end, De Iuliis' attention to detail won Blackbird more design awards than any previous Apple product. Explaining its success, Tim Parsey says the design appeals to a primitive human need for beauty and mystery. "Daniele's luscious detailing gave Blackbird a sense of timelessness that we all need in our lives but only the best massproduced objects can deliver. Since the basic invention had already been done with the PowerBook 140/170, Danny had the time and space to take the concept to the ultimate. And it becomes more interesting the more you use it, just as Daniele had intended."

Since its release, Blackbird became a design icon, which meant that it would turn up in the most unlikely places. In 1994, *Time* magazine ran a parody of Grant Wood's painting *American Gothic*, in which the farmer, standing next to his wife in front of a farmhouse, holds a pitchfork in one hand and Blackbird in the other. "When I saw that." says De Iuliis, "I realized how products take on a life of their own."

COMPUTER-AIDED DESIGN

"Designing with CAD doesn't change our ideas, It helps us realize them in a way that 2-D drawings cannot." —Daniele De Iuliis The magic behind Blackbird's complex form is due in part to Ken Provost, a self-taught engineer and CAD operator who joined Apple's Product Design Group in 1990 to assist on the PowerBook 140/170. "In 1990 most Apple product designers viewed industrial designers as 'artistes' who were impossible to deal with," Provost recalls. "So the PD guys picked me to work with ID on the first PowerBook, because I didn't have any prejudices." After the PowerBook was completed in early 1991, Provost resumed his liaison role between ID and PD in the summer of 1992 to assist in the design of Blackbird.

"When Daniele completed his 2-D drawings, Bob Brunner was concerned about how we would implement the design, because it had a lot of complex forms. The PD guys were also worried." says Provost. "Daniele made his original drawings on a Macintosh using Ashlar Vellum, a common 2-D drafting tool. But 2-D drawings can't adequately describe the complexity of Blackbird's surface. I told him that in order for Product Design to tool Blackbird's enclosure, the design would have to be translated into 3D."

But De Iuliis resisted. "Daniele's drawings were so precise, with so many cross sections, it was obvious that he understood what he was doing and could visualize his design in three dimensions," says Provost. "For that reason, he was suspicious of CAD. He understood what his parts would look like without have to see them on a screen." By December, however, resistance had faded as the level of trust between De Iuliis and Provost increased. The first step was to transfer Deluliis's finished 2-D drawings which included top, front and side views with cross sections and details—into Ken Provost's CAD system, a Silicon Graphics Indigo II workstation running Unigraphics and Alias software.

"Once Daniele's 2-D drawings enter my 3-D environment, they look like pieces of paper, which I can turn, tilt or flip around in space," says Provost. "Yet everything on the drawings remains in 2-D. So the first task is to create a 'tilt up' view ... in which I assemble Daniele's front, side and top views in space ... then line them up until they converge ... forming a void that is an exact replica of the product I am trying to draw.

"Next. I use 3-D drafting tools to go inside the void and trace the design's main features, constantly comparing my three-dimensional tracing to Daniele's two-dimensional views."

Once the 3-D 'tilt-up' view is complete, Provost converts the simple lines and arcs he has just traced into the more complex lines and B-spline curves that make the product visually compelling.

What's the difference between an arc and a B-spline? "An arc is a continuously curving two-dimensional line with a fixed radius," says Provost. "Draw an arc long enough, and it will eventually form a circle." Because such basic curves can be described by a formula, they are known in CAD-speak as analytical curves.

"B-splines, on the other hand, are freely formed and three-dimensional with no fixed radius or direction." Known as non-analytic curves, B-splines can change direction at any point, which makes them much more interesting for designers to use ... but require a lot of computer horsepower and a skilled CAD operator to prevent the curves from looking extreme or cartoonish.

"Because B-splines are flexible, I can make adjustments by grabbing part of a curve and moving it without affecting everything around it," he says. "This way, I can achieve smoother transitions with B-splines than I can with analytical curves. Anytime I see a curve that is composed of three arcs, I translate it into one B-spline, which will look and perform better when turned into plastic."

Once the 'tilt-up' view is converted into B-splines. Provost creates a solid model by covering his lines with a surface that is later given a measurable wall thickness. He first builds the simplest surfaces (flat planes, perpendicular corners, cylinders and simple toroids) using a Unigraphics solid modeller, then switches to Alias 3-D software for the more complex B-spline surfaces. "Without Alias, it would have taken *many* more models to reach a point that satisfied Daniele," he says. The finished geometry is then transferred back to Unigraphics, which can drive the machine that cuts finished tools.

Is the design *better* after Provost massages it with CAD? "Not better in the sense of being different from the designer's original concept." he replies. "I stay as close as possible to Daniele's 2-D drawings. Using CAD speeds up the process. I am really just a glorified drafter executing someone else's design."

Cutting a Solid Model. Even though Provost's screen can show

a design with startling clarity, no design is ever accepted from screen view alone. "When something looks good on the screen, then cut a model to see whether it's *really* good." To do the Provost sends the CAD file to another computer in IDg's moshop, just a few feet away, where the file is tweaked to remeredundant information, translated into a machining format, and into a Fadal CNC milling machine—a specialized apparatus whice about the size of a minivan and cuts a RenShape block down into detailed model under the direction of Apple IDg's modelmake Mike Pizzuti, Rob Barnette and Chris Harris. Once the desig approves the model, the finished CAD file showing interior a exterior walls and wall thicknesses is networked to Apple's Proc Design Group, where another model is built to ensure that inte components fit, I/O ports line up, vents provide the right air fle and other details check out.

Since completing Blackbird, Ken Provost has become a key me ber of IDg's staff, collaborating on more than 20 individual proje including Venus (the QuickTake 100 camera), Bongo (the Por Macintosh 5200) Hammerhead and Sousa (AppleVision 1710 a 1710AV), the follow-up to Blackbird (the PowerBook 5300 seri as well as Apple's newest high-end computer/entertainment/co munications center, Spartacus. "Ken has played a key role in evolution of Espresso," says Lawrence Lam. "Now the entire pr uct line can achieve the refinement that Ken gave to Blackbird."

VENUS QUICKTAKE 100 DIGITAL CAMERA PLATES 300-Industrial Design: Apple Computer: Marc Van De Loo, Tim Par Dave Shen, product design

Dates of Design: October-December 1992

Introduced: January 1994

Auards/Collections: Industrie Forum Design Award (Germa 1995; Permanent Collection, Museum of Modern Art, New York The most interesting non-computer product to emerge from IDg, QuickTake 100 digital camera uses a light-sensitive mechanism cat a charged-couple device (CCD) to convert light and shadow into ital information that is stored in computer memory and transferre a Macintosh for editing and transferral to both printed and on-documents. Transferring images frees up the camera's memory, ing the user an endless supply of "digital film." With Americans r spending \$12 billion per year on photographic film, equipment processing, it seemed only natural for Apple to develop its own ital camera, the QuickTake 100, code-named Venus.

"Because of its potential, we wanted to make Venus a signa product, and pushed the design until we felt it had reached icon tus," says Tim Parsey, Having demonstrated an interest in comp forms on his Neon concept, Marc van de Loo began work on Ve in October with sketches that quickly led to foam models." design was driven by the need to hold the product with one has both horizontally and vertically, and the desire to make that exp nce as pleasant and uncomplicated as possible," says van de Loo. Rather than use an existing mechanical package developed by hinon, Tim Parsey persuaded the Japanese manufacturer to modify heir front end, because the flash mechanism appeared too fragile. The mechanical package contained a front cover that would tilt up to reveal the viewfinder with a flash attachment," says van de Loo. But their mechanism was not very intuitive. We wanted a product hat you could wrap your hand around and operate without pulling hings out, or closing them up again after the picture was taken. With the Venus design, if you look through the viewfinder and see othing, you know the camera is closed and can open it by sliding panel near the lens on the front."

Working with Apple's Human Interface Group, Van de Loo anazed the way people held the camera and improved the tactile senation by giving the handgrip a toroidal form that the designer likens 5 a "squashed donut." Next, he applied the kind of surface comlexity that Daniele De Juliis gave to Blackbird.

"We wanted the product to be a joy to hold and have a strong raphic element that would register as an icon when viewed from a istance," says van de Loo. "On Venus, the product icon can be seen rom the top, which begins with a smooth, machine-like surface, a traight edge on the left side and concludes with a rounded threeimensional handgrip with a curved edge on the right." Effort was lso given to intriguing details, such as the door on the side that lides inward like a minivan door to access the I/O ports.

CAPPLEDESIGN POWERED SPEAKERS II PLATE 299 Padustrial Design: Apple Computer: Susanne Pierce, Larry Barbera; Sohn Howard, Andy Liu, product design

Dates of Design: October-December, 1993

ttroduced: May, 1994

wards: "Design Distinction," I.D. Design Review, 1995; "Best of fategory," Industrie Forum Design Award (Germany), 1995

ollowing the success of Tim Parsey's Badger self-powered desktop peakers, Apple's New Media Group asked Susanne Pierce to design smaller, low-cost version for mid-range and budget multimedia pplications. Code-named Baby Badger, the speakers show how ompetent use of form can achieve maximum expression in an inexensive product. To give Baby Badger its own identity, yet maintain link with its higher-priced predecessor, Pierce gave the face a simle, almost spartan look and a perforated grill. The only departure om the original design on the front are two conically-shaped npressions at the bottom that help position the speaker on the esktop. But turn it around and Baby Badger has a very different peronality, with a playful, pot-bellied, cartoon-like quality on the back hat lets it all hang out. "I wanted the back to express the nature of ound, which I think of as being organic and amorphic," says Pierce It shouldn't come from a stiff-looking box with flat sides. The encloure should be round. I also liked the idea of an arched support on

the back to provide a strong visual message and allow the speakers to tilt at various angles." Because the front feet are cylindrical, the user can pivot the speaker on the desktop. Depending on the speaker's position, the arched support curves downward toward the desktop or thrusts upward into space. Soft detents on the support allow the speaker to be positioned incrementally.

By SEPTEMBER 1992, BOB BRUNNER HAD ASSEMBLED A FORMIDABLE DESIGN team. Their collective experience and skills made them among the best in the world. Yet one piece of the puzzle was still missing—a designer with the emotional and intellectual depth to make the Group truly great. He had someone in mind. But the designer Brunner wanted had already formed his own partnership and would probably have the same misgivings about joining Apple that Brunner himself had, "I decided to make one last attempt," Brunner recalls, "We needed another voice in the studio, and I decided that voice should be Jonathan Ive."

As Jay Meschter recalls, "Bob knew the effect that a strong new designer would have on the Group. When Daniele De Iuliis and Tim Parsey first arrived, our whole approach to design changed. But when Jonathan came aboard..., the Group really took off."

Jonathan Ive. Born in London in 1967, Jonathan Ive was introduced to design by his father, who trained as a silversmith and woodworker and was himself a product of a craft tradition that has existed in England since the late Middle Ages. By showing the young Jonathan the wonder that results when simple materials are turned into something useful and meaningful, the father taught his son to think of design not merely as a profession but as a way of changing people's lives. As he grew, Ive accompanied his father on visits to design schools and studios in and around London, where he saw how real designers worked. After his first tour of a car design studio in the late 1970s, Ive was hooked. "At that moment, I realized that making sculpture on an industrial scale would be an interesting thing to do with my life," he recalls. From that day forward, Ive set a course that would one day make him one of the top industrial designers in the world.

While pursuing his ID curriculum at the University of Newcastle-Upon-Tyne, Ive undertook two semester-long apprenticeships at the London design firm Roberts Weaver, which was then receiving major contracts from clients in Japan. Ive's first project, a series of **writing pens for Zebra** (Plate 302) in 1986, not only went into production a rare event for an apprentice—they sold in large numbers all over Japan. Soon the partners at Roberts Weaver realized that Ive was more talented than the average student. Therefore, they agreed to pay him a regular salary while he finished his degree at Newcastle if he would agree to return to Roberts Weaver after graduation.

The first design student in England ever to receive two Royal Society of Arts Travel Burseries, Ive travelled to the U.S in 1989, spending most of his time in and around San Francisco. After making the obligatory tour of Silicon Valley design shops, (including frogdesign, IDEO and Vent), Ive visited Lunar Design, where he met their lead designer Bob Brunner, saw the just-completed design for the Macintosh LC, and showed Brunner a series of telephone concepts that he had done as a student project at Newcastle.

"At first, Jonathan's phones looked like fantasies," Brunner recalls. "But when I examined them more closely, I realized they not only had the correct part lines and wall thicknesses, they could be pulled apart and snapped together again. Even though he was a student, Jonathan had worked everything out in detail and proven that the parts could be mass produced," Ive's telephones were not only the best student work Brunner had ever seen, they rivaled some of the best professional design being done in the Valley at the time. "Anyone can make a trendy-looking object," Brunner says. "But it takes skill and determination to push a design into becoming a real product. Jonathan had that ability. So I decided to keep him in mind for the future."

Even though Ive had received several job offers during that first trip to the Valley, he returned to Roberts Weaver in September, 1989, watched as the firm was taken over, then left in December to form a partnership with Martin Derbyshire and Clive Grinyer, which they called Tangerine.

Though still only twenty three years of age, Ive had already evolved his own approach to design-the product of many hours with his father, an omnivorous reading habit (ranging from design theory to the sociological studies of B.F. Skinner to nineteenth-century literature), visits to London's Victoria & Albert Museum, plus a keen understanding of how people interact with everyday objects. He studied the work of Eileen Grey as well as modern masters such as Michele De Lucchi, a member of the Memphis group, who pioneered a "gentle" aesthetic that clothed appliances and high-tech objects in a way that made them humane, easy to understand and even a bit friendly. A reaction to the "anti-design" movement of the 1980s, which took a pessimistic view toward the manipulation of commercial culture and predicted the demise of mass production as a meaningful activity. De Lucchi believed that consumer goods could once again achieve the status of artifacts by rejecting the dictums of late Modernism and return to using form, color and detailing in a more symbolic, emotional and psychologically persuasive way.

Owing to these and other influences, Ive developed an approach that avoided any obvious sense of style, favoring instead the simple story-telling power of form, an unerring sense of balance and the kind of restraint and understatement that can tame even the most frightening feature-laden product. Unlike most of his generation, Ive did not see design an an occasion to exert his ego or carry out some pre-ordained style or theory. Rather, he approached each project in an almost chameleon-like way, adapting *bimself* to the product (rather than the other way around), conveying its function through the use of narrative, analogy and symbolism as well as form and detailing. For this reason, Ive's early works have no "signature style." In an era of rapid change, Ive understood that style has a corrosiv effect on design, making a product seem old before its time. By avoi ing style, he found that his designs could not only achieve great longevity, he could focus instead on the kind of authenticity in h work that all designers aspire to, but rarely achieve.

Pick up an Ive design for the first time, turn it over in your hance and you will see what we mean. Impressive in its simplicity, th forms and details are always well integrated and highly finished wit out becoming hard or finicky. Explore the product further, and ye will find something interesting. Beneath the quiet surface, you fir another layer of activity or meaning, and sometimes another-ead layer engaging the user in a quiet dialog as the product is used. Rath than play to our expectations by revealing his message all at once. It takes an almost literary approach, crafting a story into each produ by the way surfaces greet one another, the way elements pull apa or functions interrelate-giving us an object that is not only well su ed to its purpose, but meaningful in ways that most products are no Often the design suggests some kind of analogy-employing a almost instinctive understanding of the psychology of everyda objects-which, in turn, gives his products a symbolic weight th avoids seeming ponderous or obtrusive. Like Daniele DeIuliis design for Blackbird, the story Ive tells in his products reveals itself little more each time the item is picked up or used. Later, as the sto is fully absorbed, the product becomes more than a mere physic possession. It becomes an artifact that touches our heart in a qui way with imagery that remains in our mind forever.

While at Tangerine. Ive employed this technique in a wide range of products-from high-end ceramic bathroom sculpture for Ide Standard, power tools for Bosche and electronic equipment f Goldstar and Hitachi, to a simple Barber's Comb (Plate 303 designed in 1990, which contains a spirit level in the handle to mai tain the proper position while cutting hair. A small-budget job dor for a hairdresser in Scotland, the comb would have been a throw away project for most designers. But Ive gave it the same caref attention he would to any other product and came away with German Industrie Forum award for the comb in 1991. By this tim Ive's work was often included in rotating exhibits at The Desig Museum in London as well as travelling exhibitions in Europe ar Japan. With business at Tangerine booming and prosperity ju around the corner, most would assume that Ive had achieved th designer's dream-true independence. Then, in early 1992, Iv received a telephone call from Bob Brunner, asking Tangerine to su ply concepts for an in-house design project, code-named Juggernau The exercise included designs for portable computers, docking st tions, electronic cameras and a Newton-like personal digital assistar Within weeks, Ive and his partners developed 25 models, which the presented to Apple in the spring and refined into four princip designs. By the time it was over, Ive was a changed man.

The most interesting of these concepts was Macintosh Foli

ates 305, 308, 308a; comparable to Daniele De Iuliis's WorkCase). ich Ive designed as a portable notebook-sized tablet with a ch-sensitive screen, a soft rounded base containing a battery k, which also served as a palmrest, and an interesting "bull nose" file when viewed from the side. When tilted in an upright posin on its integrated stand, Folio could be used on a desktop when ched to Folio Keyboard (Plate 306). Similar to DeIuliis's board Station, Ive's concept functioned as an "intelligent kevrd" with a motherboard, networking ports, a recessed trackpad infrared connection. Folio Keyboard could also be attached to eight-adjustable LCD screen to form a portable laptop concept ed Sketchpad (Plates 307). Drawing its intelligence from the cessor in Folio Keyboard. SketchPad's articulated screen was h height- and tilt-adjustable and could be folded into a tidy se-shaped bundle for easy carrying. The fourth concept, called rkSpace (Plates 304, 309; similar to DeJuliis's WorkCase with sktop Station), designed by Ive, Martin Derbyshire and Clive nyer, had a tilting flat panel display attached to a slim CPU with atterfly keyboard at the front that folded under the base. With the en folded down and the keyboard fully retracted, the model was 1 and compact. Yet with the screen tilted up and keyboard pulled , it became a piece of desktop sculpture. Despite their bold pearance, each design offered visible clues that made them easy inderstand. Every detail suggested where the user should touch l interact with the product. Their graceful appearance undercut notion that added functionality always comes at the price of led complexity. By turning SketchPad into a purse and Folio into blet. Ive also used the intuitive knowledge that we all share to e those designs an added laver of meaning. As Bob Brunner alls, "Jonathan's Juggernaut designs stood out, because they didrely on anything we had done or seen before. They had an emonal maturity that's rare for someone Jonathan's age."

Then Brunner invited Ive to join IDg, no one expected him to ept, if only because Tangerine was one of the fastest-growing sign firms in London. But, for Ive, the Apple project had been a asforming experience. "Even though I had done a lot of interestwork up to that time, the issues I encountered on Juggernaut re unlike anything I had dealt with before," he says. "The princichallenge—to give personality and meaning to a technology that s still being treated as though it were anonymous—interested me of. Also important was the fact that Apple offers a supportive enviiment. It's the kind of place where a designer can focus less on z-to-day business and more on design as a craft."

With that, Ive said goodbye to his partners at Tangerine, moved his hily to San Francisco and joined IDg in September 1992, just as a Parsey was completing his design for the Newton MessagePad b. Ive's first assignment was daunting: to design the second-gention MessagePad, which Apple was desperate to finish and intendto ship as quickly as possible. "Since the first Newton hadn't yet been released, everyone was talking about it incessantly," Ive recalls. "But the first design didn't work as it should or convey the product's emotive quality. To be effective, the design needed to tell a story to the user." Designing that story would be Ive's first task.

LINDY NEWTON MESSAGEPAD 110/120/130 PLANS 310-313 Industrial Design: Apple Computer: Jonathan Ive; Ron Moller, product design

Dates of Design: November, 1992-January, 1993

Introduced: February, 1994

Auards/Collections: Best of Category, I.D. Design Review, 1994; Gold Industrial Design Excellence Award, 1995; Industrie Forum Design Award (Germany), 1994; Design Innovation Award (Germany), 1994; Permanent Collection, Museum of Modern Art, San Francisco

Even before his first day at IDg, Jonathan Ive had been briefed on the design of the first Newton. By that time, several decisions had already been made. Longer and thinner than Junior, the new design would also have a slightly better screen, more memory and improved handwriting recognition. Yet the problem with the lid remained. "On Junior, the lid that protected the screen would lift up, but if you pushed it back, it would collide with the PCMCIA card at the back," Ive recalls. "To use the product for any length of time, you had to snap the lid from its hinges and secure it to a set of tiny clips on the underside." The solution worked, but it was not very intuitive. So the task for Lindy was to design a double-hinge mechanism that allowed the lid to fold up and around the right way.

"Pushing the lid up and around the back was important," says Ive, "because the action is not culturally specific. Folding the lid to the side, like a book, created problems, because people in Europe and the U.S. would want to open it on the left, whereas people in Japan would want to open it on the right. To accommodate everyone, I decided the lid had to open straight up."

Next came the loudspeaker, which Ive moved from the palmrest (where the hand would cover it) to Lindy's front right-hand corner, where it could project sound toward the user yet remain unobstructed.

The third problem was the pen. On Junior, the pen was attached to the side of the case, which made the product seem too wide. It was Ive's job to not only reduce the width of the case but integrate the pen into the design so that users would treat it in a more intuitive way. As he recalls, "we wanted to give the product a restrained formal language allowing us to incorporate a range of materials such as soft-feel paint, nickel-plated brass and rubber. But as I studied the form, I discovered that by allowing the user to fiddle with the retractable pen and play with the pop-up lid, we could elicit the more abstract emotions of intrigue and surprise that would make Lindy seem personal and precious." Believing also that the shape and weight of the pen would make it seem more desirable, Ive designed a full-length brass stylus with collapsible mechanism inside that would allow it to be stored at the top of the case, adjacent to the lid's hinge." Once inserted, the pen can be extracted by gently tapping the exposed end, which allows users to 'fiddle' with it and develop a more personal relationship with the product.

"The problem with the first Newton was that it didn't relate to people's everyday lives. It didn't offer a metaphor that users could grasp. To correct that, I insisted that the lid fold up and over the top, like a stenographer's notepad, which everyone understands. Once users saw Lindy as a notepad, they naturally wanted to store the pen at the top"—the same way one stores a pen inside the curly wire of a standard notebook. "That became a key element of the product's story." While in Taiwan troubleshooting the project with Ive, Apple product designer Ron Moller fashioned the mechanism for the pen in a hotel room near the factory where the product would be assembled,

From the initial idea to the first RenShape model took Ive only two weeks to complete—one of the quickest developments anyone at IDg can recall. "I was impressed that Jonathan's first model was quite close to the form that eventually shipped." says Bob Brunner. "He understood the problems and developed the form quickly."

"We were moving so fast on the project, we didn't conduct focusgroup testing until the design was fully developed," says Ive. "Time to Market was short, because Apple wanted to replace the first Newton as quickly as possible." For Ive, the pressure to finish was brutal. "When you're aware of the lost revenue each day the schedule slips, it tends to focus your attention," he says.

Tim Parsey knew what Ive was enduring: "To do the best design, you *have* to live and breath the product. At the level that Jonathan was working, it becomes like a love affair. The process is exhilarating ... and exhausting. But unless you're willing to give everything to the work, the design will not be great." Fortunately, all of those hours came through in the finished product, says Parsey. "Lindy was Jonathan's shining moment."

Ive still remembers the night in December, 1992, a few days before Christmas, when the main product story came to him. "With my drawings spread out in front of me, I put together the folding lid, the pen at the top and the detailing around the lid. Formulating an identity based on the product's functionality—one minute it's a travel guide, the next minute it's a fax machine—seemed inappropriate. Instead, I wrestled with the more fundamental issues of object meaning and identity, which led me to explore qualities that would give the product greater object value. Most of all, I wanted to enhance the personal nature of Newton Intelligence ..., software that learns and adapts to each individual's habits and preferences."

As an object, the key to Lindy's power resides on, around and under the lid. "It's the first thing you see," says Ive, "and the first thing you interact with. Before you can turn the product on, you must first open the lid. I wanted that moment to be special." Remarkably subtle, the lid sits flush along the lower edge, rising slightly along the sides—as though the power of the screen is forcing the lid to bulge outward. The surrounding case tucks neatly underneath. The lower edge of the lid feels precise. Viewed from afar, the lid has a shiel like quality that protects the screen in a more symbolic way. Yet, close, it suggests that there is something special inside. Pressing bottom of the lid, the user feels a slight "pop," which allows a ligertip to slide under and push the lid up and over. That slight "pois achieved by a tiny copper spring that exerts the precise amount force when the hinge is released. To ensure that the lid would furtion perfectly, Ive convinced Lindy's engineers to move the PCMC slot from the top of the product to the right side. A "button bar" cotaining touch-sensitive icons are silk-screened below the displ affording instant access to Newton's most-often-used functions. T current version of Lindy features a backlit gray-scale display, (Newton 2.1 operating system, a fast 20MHz ARM 610 process (developed by Advanced RISC Machines, Ltd. Apple and Dig Equipment), plus keyboard support for rapid text entry.

This kind of attention extends to every part of the product—free the soft-feel paint and smooth brass pen, to the tiniest rubl details—all of which makes Lindy a sheer delight. When the desi was finished, Gaston Bastiaens, head of Apple's Personal Interact Entertainment division (which was then in charge of the Newt Group) told Ive to prepare himself. "You're going to win ever design award in the world." Bastiaens predicted. He was right.

 CRIB
 Newton MessagePad 110 Charging Station
 Plate :

 Industrial Design: Daniele De Iuliis, Jonathan Ive
 Dates of Design: November, 1992–January, 1993

Introduced: February, 1994

Awards/Collections: "Best of Category," I.D. Design Review, 199 Gold Industrial Design Excellence Award, 1995; Industrie For Design Award (Germany), 1994; Permanent Collection, Museum Modern Art, San Francisco

As the design took shape. Ive knew that Lindy would need a cha ing station to keep the batteries inside the unit fresh, recharge a se arate set of batteries and provide cable management for a ser interface, so that files could be downloaded or exchanged with Powerbook or desktop Mac. "I wanted Lindy to tell it's story as po erfully as Blackbird does," he says. "But I didn't believe it could t the whole story on its own. So I proposed a desktop charging s tion that fulfills a necessary functions and adds a new element Lindy's connectivity story." The beautifully sculpted cradle, coc named Crib, serves as a battery charger and serial connection a features a full-sized non-retractable pen that sits upright in "inkwell," giving it a unique presence on the desktop and exten ing Lindy's icon story beyond the mobile environment. "So mu attention was given to Newton as a hand-held product, many pe ple had lost sight of its desktop potential." says Crib's design Daniele DeIuliis. "The charging station makes Lindy a more con petent product by giving it a little protective throne. Though it's s a notepad, the charging station gives it a desktop identity as wel CONTROPING OF APPLE'S DESKTOP LASER PRINTERS IN 1991-92, THE COLOR ink-jet technology gave Tim Parsey the chance to incorcopresso ideas in the design of two new printers in 1992–93.

TASIA COLOR STYLEWRITER PRO

Design: Apple Computer: Tim Parsey; Pam Ryan, prod-IDEO Product Development (Palo Alto, CA):

- pher Loew

Design: February-May 1992

manuel: May 1993

Best of Category," I.D. Design Review, 1994; "Best of Low," Industrie Forum Design Award (Germany), 1995

opportunity to design Apple's first four-color ink-jet printer ed gave Tim Parsey the chance to use Espresso not only to a product expression, but to position it within an existing prodne-in this case, between Apple's entry-level StyleWriter II and more expensive laser printers. Featuring a high-resolution inksechanism with four separate ink cartridges [one each for cyan magenta (M), yellow (Y), and black (K)]-the Color StyleWriter orde-named Fantasia, can print vivid color with near-photothe quality. "Because the Pro was the first ink-jet printer to blur Estinction between inkjets and desktop lasers, we feared that s might be confused if we linked the Pro's design with the Writer II," says Parsey. "So we tilted the Pro toward our deskaser printer"-giving the side of Fantasia the same "Y-icon" that Nuttall applied to the side of Ninja without totally departing the earlier StyleWriter language used in SpeedRacer. "We felt ho should make a unique product statement, because high-end is will eventually take over the entry-level laser market." efore, the Pro has a more substantial monoform look. The "Yon the side positions it as the functional equivalent of a lowlaser printer. And the toroidal surface on the top evokes the ity that Parsey calls "simple power."

RORA COLOR STYLEWRITER 2400

strial Design: Apple Computer: Tim Parsey; Azad Khodai, proddesign. IDEO Product Development (Palo Alto. CA): stopher Loew

s of Design: May-June 1994

duced: October 1994

rds: Silver Industrial Design Excellence Award, 1995; "Best of gory," Industrie Forum Design Award (Germany), 1995

designing the Color StyleWriter Pro as a bridge between the Writer II and the mid-range LaserWriter Select, Tim Parsey used nilar technique in the design of the Color StyleWriter 2400 to cion it between the StyleWriter II and the Pro. After Canon develd the mechanism for the Pro, they engineered a color version of styleWriter II by adjusting the II's circuitboard and replacing the c-and-white printer head with a simple color head. Since the performance of Aurora's one-piece color head is inferior to the Pro's four-color mechanism, Parsey positioned the design above the StyleWriter II without competing visually with the Pro. While it shares the StyleWriter II's small footprint and upright stance, Aurora has a soft toroidal face, which gives it a fuller, more competent look, with soft details around finger touch-points to enhance the user experience, controlled suggestions that direct the user to the paper output area and a foot detail that gives the product a sense of grounding.

Cal Seid. The Industrial Design Group's next new member, Calvin Seid, was born in Portland, Oregon and studied industrial design at San Jose State, where he graduated in 1983. For five years, Seid worked at Ziba Design, then returned to Silicon Valley to work at Kasom Design. In January 1993 he joined IDg as Project Line Leader in charge of CPUs, arriving just as three new Espresso CPUs were completed: the low-profile QFC (designed by Ray Riley and Tim Parsey), the mid-sized Lego (designed by Parsey) and Fridge (designed by Ray Riley and Ken Wood). To that line-up, Seid added a new entry-level CPU.

ELB QUADRA 605

PLATES 319

Industrial Design: Apple Computer: Calvin Seid; Bill de Meulenaere and Braxton Lathrop, product design Dates of Design: February–June 1993 Introduced: July 1993

Awards: "Best of Category," I.D. Design Review, 1994; "Best of Category," Industrie Forum Design Award (Germany), 1994; Good Design Award, Chicago Atheneum Museum of Architecture and Design, 1995 A low-cost replacement for the highly successful Macintosh I.C, Cal Seid's first design for Apple was a classic "crash and burn" project. "We were still in the mindset that produced Lego and Hook and wanted to see how fast we could get products to market. Hook and Lego had sold well. We wanted to do the same with ELB." The codenamed says it all: the letters are short for "Extremely Low Budget."

"In 1993, Apple analyzed the channels of distribution for entry-level products-consumer channels versus business channels-and became convinced that we should differentiate our consumer products from our business machines by giving them a more 'customer friendly' design," he says. Seid focused on making the product softer, warmer and compatible with the home environment. Since ELB was a low-priced offering, Seid used as much tooling from old Mac LC model as possible, yet still give the design an Espresso lift. The bezel on ELB features a softly curved toroidal surface-one that curves both horizontally and vertically-which gives the box a sprightly expression and raised eyebrows within the Group. "The toroid on the front of ELB drove the whole product," says Larry Barbera. "The curved angled vents on the top echoed our earlier Espresso detailing, and the feet were perfectly handled. Going forward, the toroidal face would become an important element in our next Espresso products." Designed, tooled, engineered and manufac-

PLATE 314

PLATE 315

tured in less than six months—half the time of the average CPU—the ELB design was a classic user-centered exercise, with an elliptical floppy disk drive opening that accommodates disabled users (such as those who use mouth-stick disk-insertion devices) and a top cover that snaps off, allowing easy access to the interior. Packaged as a Quadra 605 (for home office/small office markets), the Macintosh LC 475 (for educational use), and Performa 475 and 476 (for consumers). ELB's low manufacturing cost made it a major commercial success.

HAMMERHEAD & SOUSA APPLEVISION 1710 / 1710AV DISPLAY

PLATES 320-322

Industrial Design: Apple Computer: Jonathan Ive (initial concept), Bart Andre (lead designer); John O'Brien, Dave Lundgren, product design

Dates of Design: June-December 1993

Introduced: September 1995

"Because of their size and complexity, the plastic enclosures for displays are more expensive to develop than virtually any other product Apple makes," says Jonathan Ive. Typically, a display is composed of two large exterior parts: the bezel (which cradles the front of the CRT) and the bucket (which encloses and protects the back of the tube), both of which require massive (and costly) tooling to manufacture in high volume. According to Ive, "tooling costs for a large monitor can easily reach \$1 million. To reduce this cost, I wanted to develop a method of construction that would allow monitors of various sizes to share certain key parts." The bigger challenge was not only to simplify tooling and reduce the cost of assembly, but also to deliver a more attractive product as well.

The design involved splitting the enclosure into four parts: a bezel, a mid-bucket, and a rear bucket composed of two parts.

"The key problem was designing a mid-bucket and bezel linkage that would appear to fit from the outside, yet have gaps inside that could accommodate bezels of different sizes," says Ive. "Normally any kind of gap is unacceptable. So we turned a negative into a positive by hiding the gap within a recess, allowing it to appear as a vent. This makes a perfect seal between the bezel and the midbucket no longer necessary."

The result was awesome. Unlike displays that are extremely wide at the point where the bezel meets the bucket, Hammerhead/Sousa contracts at that point, as though an invisible string has been drawn around the product and pulled tight. This gives the display a sense of grace that is rare in such a massive product. For added interest, all surfaces on the back are slightly convex.

"When viewing it from across the room, we wanted the profile to have an iconic quality and draw your eye in a powerful way," says Andre, Then, as you approach the product, you notice the surfaces dive toward one another in an interesting way."

Once the basic design was set, Bart Andre gave the AV version a modular speaker housing that attached below the chin and a forehead-mounted microphone for multimedia applications.

Tooling costs were further reduced by not hiding the extern screws that hold the display together. On Telecaster, a first-ph Espresso design, complex tooling was required to hide the sc heads. Yet on Hammerhead and Sousa, the screwheads are cover with plastic inserts that are visually interesting in themselves—o again turning a negative into a positive. As a result, this detail we turn up again and again in second-phase Espresso designs, the n notable being the all-in-one Macintosh 5200 series, code-nar Bongo.

Beyond its iconic presence and cost-saving details, Hammerhead-Sousa design introduced a new approach to vent "The venting now reads as a surface that has been pierced by ver rather than curved ribs stretched across a void, like you see Telecaster," says Bart Andre. "The earlier technique gave us a m graphical treatment. The new approach is more subtle. The difference in spacing is small, yet the visual effect is significant" soon became a key feature on second-phase Espresso produsuch as the next mid-sized CPU, called Show and Tell.

SHOW AND TELL QUADRA 630

PLATES

Industrial Design: Apple Computer: Jay Meschter, Cal Seid, ' Parsey; Eric Xanthopoulos, Rick Mariano, product design

Dates of Design: April-October 1993

Introduced: May 1994

Awards: Good Design Award, Chicago Atheneum Museum Architecture and Design, 1995

A low-cost multimedia CPU that featured ease-of-use, integrated C ROM and provision for an on-board TV tuner, the Show and ' design replaced the Macintosh IISI, filling a critical niche betwee the mid-range Lego form factor and the entry-level ELB design. "I to rapidly changing market conditions, Show and Tell needed a fl ible design," says Cal Seid, who co-designed the final product v Jay Meschter and Tim Parsey. "The idea was to offer a similar des with minor modifications as both an entry-level Performa proc and a lower-middle-range Quadra computer. To make them visu ly distinct, each product would have a unique face. For this reas the plastic case would have a separate top, front and sides so t last-minute changes could be made at the factory as demand for two products fluctuated.

Both products featured a small door on the back of the c through which the user could remove the main circuit board, co named Tell, for easy servicing or upgrade. "A removable moth board is the ultimate user-centered feature," says Meschter. "Y slide it out, add memory or whatever, and slide it back in with having to remove Show and Tell's case or disconnect anything." T design also lets the user to change the existing board with upgraded version without having to buy a whole new computer "With Show and Tell, we managed to segment one design into t Ś

ifferent products by taking advantage of a decision by Product besign to install the components inside a metal cage," says Cal Seid. Instead of designing a plastic box, spraying the inside of the plasic to provide EMI shielding and snapping components inside the ox, Product Design built a lightweight metal cage, which is less expensive to assemble and offers better shielding." Once the comonents are installed inside the cage, external plastic panels are trached to the sides of the cage and snapped together, giving the roduct a seamless look.

"The brilliance of this strategy was threefold," says Seid. "We could llow ourselves to update the industrial design without affecting the netal cage or its components. It also allowed Apple to define entryevel and high-performance versions using the same metal chassis, ncremental upgrades in memory or processor speed and a different lastic bezel."

Espresso Doppio. To implement this strategy, Jay Meschter gave ne entry-level Performa version, code-named Show, a concave downrard-sloping bezel, which projects a sense of quiet competence rather nan power. "That seemed right for a low-priced product," he says. Ieanwhile, the high-end Quadra version, code-named Show Biz, esigned by Cal Seid and Tim Parsey, had a rounder, fuller face with a nore confident toroidal curve on the bezel. "The ShowBiz bezel design xuded a sense of power more in tune with a high-priced product," ays Seid, who notes that Jonathan Ive and Bart Andre were using a milar shape on the "chin" of their high-end Sousa display. "The proidal face on Show-Biz gave us the makings of a new house style." fall it Espresso Doppio.

The designers also focused on the product's feet, making them moother to give the design a sense of poise—an effect that would e carried forward onto the next CPU, called Outrigger, which has n even softer, more fluid treatment around the feet.

"The idea of segmenting 'Show' and 'ShowBiz' with separate bezel esigns and targeting them to different customers had considerable otential and was worth testing," says Meschter. But Apple's marketng channels could not support the effort as it neared production. 'hus the "low-end" strategy was cancelled. Instead, the "Show" box nd "Tell" board were combined as "Show and Tell" using the proidally-shaped bezel for all versions of the product. These include ne Quadra 630, the Performa 631CD, Performa 640CD-DOS Compatible, Performa 6200CD and Power Macintosh 6200.

ONGO POWER MACINTOSH 5200

PLATES 323-327

ndustrial Design: Apple Computer: Jay Meschter, Larry Barbera, Cal eid, Robert Brunner; Jim Levins, Julie McDonald, Betsy Diaz, prodact design

Dates of Design: Rebound: January-May 1993; Transformer: une-December 1993; Bongo: August-September 1994

ntroduced: May 1995

wards: "Top Ten of the Year," Industrie Forum Design Award

(Germany), 1994; Good Design Award, Chicago Atheneum Museum of Architecture and Design, 1995; Silver Industrial Design Excellence Award, IDSA, 1996

The impetus behind Apple's newest all-in-one computer grew out of the Hook development in 1992, which persuaded IDg that Apple needed a new multimedia computer with an enclosure that combined the spirit and character of the Color Classic with the expressive elegance that characterized the Group's more recent Espresso designs. Begun even before the first Hook product shipped, the project started with a proposal written by Larry Barbera and Apple marketing executive Claire Dean for a new all-in-one code-named Rebound. In the spring of 1993, Barbera asked Brad Bissell of BBiD to design concepts that used the Color Classic as a point of departure. Bissell gave his designs a familiar upright stance with chubby feet, vertical side vents, and a soft bulge behind the top of the bezel.

Barbera and Dean then submitted Bissell's three Rebound concepts to management hoping to receive development funding. With his proposal, they outlined the product's projected feature set, product cost (to Apple), development schedule, R & D budget (which included industrial design, product design and tooling) and financial information (the expected revenue that such a product could expect). Impressed by the figures as much as the design, management gave Rebound a green light, at which point the project was renamed Transformer and positioned as an entry-level Mac with a 14-inch color display, integrated CD-ROM and a tilt/swivel base that would distinguish it from Hook. "Adding the tilt/swivel feature meant eliminating the feet from Brad Bissell's concept," says Larry Barbera, "which we considered a key part of the product statement. Without the feet, Transformer would no longer be a cute desktop friend. It would resemble a display with a computer tucked inside."

During the summer of 1993, Barbera asked Brad Bissell and Jay Meschter to design concepts around the new theme—with Bissell continuing the expression of his earlier designs and Jay Meschter taking a more conservative approach. As an entry-level product. Transformer would use a less expensive display technology with a noticeably curved screen, which made the design more difficult. "The challenge was enclosing the tube and minimizing that curve without making the product seem massive." Rather than fight the curve, Bissell decided to make it a principal element of his design, extending the curve down the front of his concept and joining it to another curve underneath that forms part of the tilt/swivel base.

In contrast, Jay Meschter developed a simple low-key concept that resembled a small consumer television "Jay's model had a cleaner, more mainstream appearance that was appropriate for an entry-level product," says Barbera. "From across the room, it looked like a house appliance rather than a computer." It also reflected a shift in attitude that was occurring within the Group. "Following Daniele De Iuliis's work on Blackbird during the fall and winter of 1992 of some of us felt that we had reached an endpoint in terms of view and complexity," Meschter explains. "Rather than continue down that path, we began to pull back in terms of expression." The first design to introduce that idea was Jonathan Ive and Bart Andre's Hammerhead and Sousa, followed by Cal Seid's ELB design and Meschter's Show and Tell.

"I decided to pursue the same direction," says Meschter, "giving Transformer a subdued appearance that was almost plain compared to the work Daniele and Tim had been doing the year before. For months, the Group had been asking itself: 'Could we design products that were totally unadorned, then spin each one in an individual way to give it the right level of expression? That's what I wanted for Transformer ... a shape that was strong and iconic with detailing that was simple without being bland." To alleviate the squareness on the front of his design, Meschter added small notches at the lower corners, and a panel beneath the display (with CD-ROM/floppy slots and volume/screen controls) that curved toward the user to form a chin. Simplification extended to the mechanical design as well: Transformer used the same circuitboard as the Quadra 630, which is removed through a door in the back for easy servicing.

During the second review, Apple management examined Bissell's and Meschter's concepts and decided in favor of Meschter, who then developed his design into a graceful all-in-one shape, giving the chin under Transformer a "reverse curve" similar to the bezel on the entry-level 'Show and Tell' design (the version that did not ship).

At that point, the project was halted for several weeks as surveys from Hook owners indicated that Transformer would not purchase an all-in-one with CD-ROM unless it also offered stereo sound. The project then underwent a third review, after which Meschter's design was given front-mounted speakers, as well as a larger and flatter 15inch Trinitron tube, a significant change which also resulted in a new code-name Bongo. "After a year and a half of effort, Bongo became the replacement for Hook that I had always wanted," says Larry Barbera. "It was also shaping up to be Apple's sole entry in the all-in-one segment for 1995–96, which suddenly made it a *very* important product."

To accommodate the flatter display and twin speakers, Jay Meschter redesigned the bezel for Bongo, placing the speakers in the lower corners where the notches had been, repositioning the slots and controls and changing the curve on the chin so that it ballooned outward in a toroidal shape rather than curving inward.

As Meschter recalls, "I admired the toroidal surface that Jonathan and Bart had designed for the chin on Sousa, and the horizontal crease they had drawn across the front, which separated the top of the chin from the bottom of the bezel. It looked as though a string had been drawn across the surface and pulled tight."

Unlike Telecaster, which has graphical venting that reads as curved ribs stretched across a void, Bongo's venting reads like a surface that has been pierced by vents, which makes it appear softer. Following Jonathan Ive again, Meschter left the screws that hold Bongo's case together exposed (which reduces the cost of tooling) and cove the screw heads with plastic inserts, which function as interes visual elements in themselves.

This combination of elements—the toroidal chin, the horizo crease across the front, less graphical venting, and a preference subdued elegance and inexpensive solutions rather than overt (sometimes costly) expression—place Bongo firmly within Espres second phase while giving the product a spirit similar to the o nal Macintosh. As *MacWorld* noted in its review of Bongo, " mark of a truly elegant solution is that from the moment it con into being, it seems so obvious and natural that you have troo fathoming why no one came up with it earlier."

M2 POWERBOOK 5300 SERIES PLATES 328-330. Industrial Design: Apple Computer: Masamichi Udagawa; Je Howard, Bob Yuan, Ken Weber, John Larkin, product design Dates of Design: November 1993–October 1994

Introduced: September 1995

Given the success of the "pure design" approach Daniele De In had used on Blackbird and the number of design awards and p tive reviews that product received, many expected Apple's r portable computer, code-named M2, to be an even more compel design statement. For Masamichi Udagawa, the prospect of surpaing Blackbird was within his grasp. On the technical side, M2 wo be Apple's first PowerPC PowerBook, with a 10.4-inch scree touch-sensitive trackpad, wireless infrared networking and ot features that surpassed even the very capable Blackbird.

Yet M2 would be a very different product. With competing lap computers shrinking in size as their power increased, market executive Dave Rothschild thought it wise to position M2 as smallest full-functioning portable on the market. Given this costraint, fitting a full-size 5.25-inch CD-ROM drive into the case v not possible. Instead, M2 would incorporate a 3.5-inch magne optical drive, which can record and playback 230-MB disks, mak it an effective system for backing up data as well as playing p recorded disks. [Accessing the MO drive is accomplished by reming M2's floppy drive and inserting the MO drive in its place.]

To achieve the most expressive design from the smallest possi form factor required IDg's Masamichi Udagawa to negotiate an ad tional 3 millimeters (slightly more than 0.1 inch) on each side of t product to develop surface details—a request that prompted M product designers Matt Herron and John Howard to rearrange t interior free up an additional four millimeters on the back and c millimeter on the front, thus giving Udagawa even more space which to work.

Once the product size was set, time became critical. Using less learned on Blackbird—such as the efficient use of CAD—allow Udagawa to complete most of M2's design between January and Ju 1993, half the time Daniele De Iuliis took to design Blackbird. "On Blackbird, we learned that certain shapes—such as complex 3D surfaces or four B-splines that meet at a single point—slow the CAD machine down to a crawl," Udagawa notes. "But other features that are visually similar but just slightly different run much faster. So rather than do the hard thing for the sake of doing it, I designed M2 to make the best use of Ken's Provost's time." For example, the surfaces to the left and right of the keyboard are analytical curves rather than B-spline—a detail that allows Apple to offer a stretched version of M2 with a full-size CD-ROM drive in a year or two without redesigning the case."

Rather than luxuriate in complex surfaces, Udagawa limited his Bsplines to the corners, the back and the top cover, where they exert maximum visual impact yet do not hinder future modification. For example, the top cover on M2 is totally flat except for two razor thin lines that run around the perimeter of the flat-panel display, which lays just beneath the surface. Though subtle, the lines function in a powerful way by making M2 appear thinner and lighter than it otherwise would be.

Instead of conventional rocker-style feet on the back, Udagawa designed tiny stiletto-style feet that disappear inside the product when not in use. The spring-loaded mechanisms are encased in beautiful bulges at the back, achieved through the delicate use of CAD-generated B-surface treatment and a slight shaving of the interior wall thickness (from 2 millimeters to 1.5 millimeters).

Determined to use every last millimeter given to him, Udagawa measured his nearly-completed design, found that he had one extra millimeter on each side, and applied a thin ridge all the way around the case—the only "pure design" element on the product.

"Masa's side detail looks simple, but it's a genius design element," says Tim Parsey. "It takes advantage of where the components are not and achieves the message of slimness that the product needed. It also makes a new statement that hasn't been used on a PowerBook before."

The dark color and spare look of M2 stands in marked contrast to the blunt slab-like shape of the first PowerBook and luxury and drama of Blackbird. It's a quieter statement with details that instill a sense of calm reflection. In all likelihood, Udagawa's design will have greater longevity than its predecessors precisely because it is so simple.

CALAMARI PORTABLE STYLEWRITER 2200

Industrial Design: Apple Computer: Masamichi Udagawa; Azad Khodai, product design

Dates of Design: September-December 1994

Introduced: May 1995

Awards: I.D. Design Review, 1996

A low-profile ink-jet printer based on a Canon mechanism, Calamari was designed in parallel with M2. "In 1993, we had the chance to co-engineer the product with Canon, which would have allowed us to give it the best possible design," says Masamichi Udagawa. "But Apple cancelled our involvement early on, leaving Canon to pursue it on their own. Later, Apple reversed itself. But, by then, Canon had already developed an asymmetrical mechanism and chassis design. So I had a dual problem: to make our version as different as possible from Canon's; as well as disguise the lopsided mechanism." The solution is classic, second-phase Espresso, a self-contained form with surfaces that dive toward one another, exuding a sense of grace under pressure. For mobile use, Udagawa designed a battery pack that attaches to Calamari's back and mimics the shape of M2's rear, making the laptop and printer ideal travelling companions.

 NAUTILUS
 SUBNOTEBOOK
 COMPUTER
 CONCEPT
 PLATES
 351-341

 Industrial Design:
 Apple Computer, Bart Andre, Lawrence Lam; Ken

 Weber, product design

Dates of Design: September 1994-August 1995 (project cancelled) For nearly two years IDg had attempted to launch a subnotebook computer to accompany, and eventually succeed the PowerBook Duo. Between May and August, 1994, IDg conducted a Juggernautstyle design effort, code-named Minicooper, to define the "ultimate" subnotebook computer. Tim Parsey and Jay Meschter designed traditional clamshell models that packed most of the components behind the display, making the keyboard extremely thin. Parsey's version divided components into modules that could be added to or removed from behind the display. Meschter's design allowed the keyboard to be detached and the screen used as a penbased computer. Out of this program, IDg redefined the subnotebook into a slim stand-alone computer with a full-sized keyboard. 10.4-inch screen and an external floppy drive that could be attached without an adapter. "The basic design followed the use pattern that many Duo customers preferred," says Bart Andre, who began the program, code-named Nautilus, in September 1994.

Part of a new class of machines called SlimNote, Nautilus was intended to be distinct from Duo, says Andre, "with a full-size keyboard, full-size screen, and a very thin case, which Apple could offer in a variety of finishes such as leather, metal and other non-traditional materials to distinguish high-, medium- and low-end versions.

The materials in Nautilus were the culmination of a three-year trend. "The first PowerBook had an all-plastic body," says Andre. "The Duo combined plastic with rubberized bumpers on the sides. Then came Blackbird with its soft-feel surface. For Nautilus, we wanted a high-end product wrapped in leather or polished metal. high-grade synthetics and combinations of these and other materials. plus conventional grey enclosures and low-end materials such as fabrics, tapestry and simulated leather."

According to Nautilus program manager Lawrence Lam, "Bart generated an entire sketchbook of ideas using metal, leather, removable denim panels, simulated wood, picture frames, and one he called 'City Slickers' with a cover made of branded cowhide. When Markers g saw Bart's sketchbook and some early samples, they loved the idea."

PLATE 331

As Nautilus evolved, Andre developed a wide range of finishes: brown leather, brushed aluminum, black leather with a metal buckle, purple- and red-tinted leather with metal trim, and a low-end version with a bright yellow synthetic cover. Explaining the use of leather, Andre says, "the idea of 'breaking in' your computer by touching it every day, the way you would a favorite leather bag, appealed to me." Ultimately, however, Marketing was not convinced that materials alone would differentiate Nautilus from Apple's existing PowerBooks.

For designers, cancelled products are a recurring fact of life. Since no one can predict the future, Apple must develop products for as many scenarios as it can foresee, fund development and testing, and occasionally tool a product before deciding whether to go forward. It is always easier to predict market demand four months ahead with a prototyped, tested and tooled product in hand—than a year ahead, when all that exists is a hard model. Industrial design is such a small percentage of total R&D, that projects such as Nautilus are treated as a form of insurance. Should the need arise, Nautilus (or a derivation) can be quickly put into production.

Danny Coster. Born in Christchurch, New Zealand, Danny Coster received his degree in industrial design from Wellington Polytechnic in 1990 and began his career designing consumer electronics, sporting goods, furniture and lighting products for the Australian consultancy KWA Design Group. In June 1994, while visiting the San Francisco Bay area, he took a three-month position as a contract worker at Apple, working on docking strategies and new colors and finishes for upcoming Newton products, and soon came to the attention of Daniele De Iuliis and Jonathan Ive, who asked Coster to join IDg full-time in December 1994."Having worked on a range of consumer and lifestyle products, and I want to inject some of that spirit into Apple's next-generation computers," says Coster. "At a time when computers are entering the home in record numbers, it's appropriate that computer design include attitudes and styling cues prevalent in the design of mass-market consumer and lifestyle products. With technology evolving more quickly and products being released at a faster pace than ever before, I draw upon a lot sources of inspiration for my work, such as sports equipment and furniture."

TIME CAPSULE I.D. MAGAZINE CONCEPT

PLATE 346

Industrial Design: Apple Computer: Danny Coster, Jonathan Ive Dates of Design: August 1994

Asked by *I.D.* Magazine to design a time capsule to commemorate the magazine's 40th anniversary, the Industrial Design Group came up with a novel concept. The initial idea came from Bob Brunner's sketch of a bomb half submerged in the earth. But image of a bomb was wasn't aesthetically (or politically) correct. So, after consulting with Jonathan Ive, Coster turned the bomb into a playful-looking rocket. "Rather than bury the capsule, I imagined placing it inside a rocket, launching it into space from the parking lot outside the studio, and have it orbit the Earth until the 2034, when the rocka internal clock would signal it to reënter the atmosphere and land IDg's parking lot," says Coster. Giving his model an almost toy-li quality, Coster fixed an orange plume to the bottom of the rocket resemble flames and applied impact marks to the nose cone to si ulate the effect of space debris. The body panels are held togeth by rubber seals not unlike the O-rings on a real missile. When t rocket lands, the pressure seals around the two clam-shell doors v separate on impact and split into three segments, revealing the tir capsule and its contents—which until then remains a secret. T most amusing and exuberant of all IDg concepts, TimeCapsule reresents a high-water mark in Apple's design history. With stor clouds already gathered at the horizon and Apple turning in a ne direction, years would pass before the Group would have the fle bility and fervor to turn out such memorable fantasies.

 OUTRIGGER
 POWER MACINTOSH 7000 SERIES
 PLATES 342-3

 Industrial Design:
 Apple Computer: Cal Seid, Tim Parsey; Bill of

 Meulenaere, Wayman Lee, Ben Pang, product design; IDEO Produ

 Development (Palo Alto, CA): Ian McColl, John Lai.

 Dates of Design:
 August 1994–January 1995

 Introduced:
 September 1995

Cal Seid's task as Product Line Leader for desktop CPUs has been identify problems and making incremental improvements that refu rather than redefine the Macintosh experience. "The identity Apple's CPUs has already been firmly established. I focus instead or redesigns that are evolutionary rather than revolutionary," says Sei

Since users view CPUs as a long-term investment, Seid conduct need-finding reviews with customers to solve problems that haver yet been addressed. "Our most problematic CPU was Lego, becaus users found it difficult to open to increase memory or insert a expansion card," says Seid. Because of this, Seid proposed that Leg be redesigned, made more visually cohesive and given a top th comes off easily.

Inside the new design, components would be mounted within metal cage, part of which folds out, like the inside of a fisherman tackle box, allowing the user access to all interior components. Whe folded out, part of the internal chassis comes to rest outside the mai enclosure, hence the code name: Outrigger. To gain access, two bu tons under the front fascia releases the plastic cover, which pivots u and detaches from the CPU. Inside, the components are surrounded by a metal cage. Some components are mounted on the bottom of the cage. Others are suspended from the top. Two latches release the top of the cage, which swing around on a hinge and come to reoutside the CPU enclosure, making internal components totally access sible. "The hinge is stamped from the same piece of metal as the cage itself," says Seid. "The only separate part is the pin that fits inside the hinge. This makes the cage easy to manufacture and reduces the number of parts." The internal metal cage also addresses the probler of electromagnetic interference (EMI). "The faster our PowerPC chip runs, the more EMI it emits," says Seid. "To meet the most stringent FCC standard for home use, we found that the metal cage provides better shielding than a metal coating sprayed inside the plastic."

Aesthetically, the Outrigger design shares qualities with both Show and Tell and ELB. "The top cover has a series of grooves that resemble the curved vents found on earlier Espresso CPUs," says Seid. "But on Outrigger, the grooves are structural. Underneath, the plastic is quite thick between the grooves to make the top strong enough to support a 21-inch display." The grooves are also help position Outrigger in the Apple desktop family." The feet on Outrigger are less emphatic than those on Show and Tell to give the design a more unified appearance. The result is a single form, not as a box with feet added at the last minute. This flexibility of expression distinguishes second-phase Espresso designs.

WITH TRAFFIC ON THE INTERNET GROWING AT AN ALMOST GEOMETRIC RATE, Apple was also developing a new product to take advantage of the fast-changing computer landscape.

 PIPPIN
 BANDAI
 @MARK / @WORLD
 PLATES 347-356

 Industrial Design: Apple Computer: Ray Riley; Rick Jackson, product design; Lunar Design (Palo Alto, CA): Dave Laituri, Gilbert Wong
 Dates of Design: September 1994-February 1995

Introduced: March 1996 (Japan); November 1996 (U.S.)

To expand the market for the Macintosh operating system, Apple Inter-active Media (a descendent of Satjiv Chalil's Mac-Like Things) began developing a low-cost system architecture in February 1994 code-named Pippin—which used a modified version of the Mac OS for use in video games, interactive CD-ROM devices and Internet appliances that allow users to browse the Web or surd the Net to their heart's content.

Rather than manufacture the hardware itself. Apple decided to license Pippin's architecture. The first to sign up in December 1994, was Bandai Digital Entertainment (a division of the Japanese toy giant, famous for the Mighty Morphin Power Rangers) to create a combination game/multimedia player and Internet browser. Called @Mark in Japan and @World in the U.S., it features a 66MHz PowerPC 603e chip, a ROM chip containing a subset of the Mac OS, a 4x CD-ROM drive, basic I/O ports (sound, video, serial, ADB, modem) on the back and a nifty hand-held game controller. To give the product the right spin, Bandai hired Apple's Industrial Design Group to design the case. IDg's Ray Riley, in turn, hired Lunar Design to consult.

From the outset, Bandai's product had to appeal to three very different audiences: young children ages 6 to 10 (as a game player); and students (as a multimedia CD-ROM player); and adults (as online search tool and Web browser). The goal was a product that would challenge adults yet be simple enough for a child to use. When Lunar Design's Dave Laituri began the design, he had just returned from a trip to Africa. "My mind was full of images of animals and African jewelry," he says. "I wanted to blend those images with an Asian flavor." Thus he designed a narrow Asian-looking eye set on wide powerful-looking legs, followed it with a broad sweeping form on short fat legs, pillow and automotive shapes, a curved slab and a flat Oriental-looking spaceship on legs—which Laituri distilled into a friendly and engaging shape.

The final design combines the look of a desktop creature (with a slight swell at the front of the box, suggesting a head, slots and ports arranged on the front to look like a face, and the suggestion of fat legs on the side) with a textured platinum skin that accentuates its computer identity. On top, controls are laid out in a row at the front with a widely spaced "perf" pattern toward the back instead of Espresso vents. "We sketched Espresso vents but decided they were too strong for a product of this size," says Laituri.

The Pippin controller, designed by Ray Riley, Laituri and Lunar Design's Gilbert Wong, is shaped like a boomerang with M&M-sized buttons, rocker switch and trackball. "Depending on the application, the controller can function as a competent tool for multimedia CD-ROMs, an Internet search tool, or the fast game controller." says Riley. "We wanted the trackball to move the cursor on the screen, access the menu bar and click on icons and windows in a controlled manner when doing educational work or Internet browsing, yet be responsive when playing games." To give the fingertips something to grip, Dave Laituri sculpted the underside with bumps like the bottom of a steering wheel.

While development proceeded during the summer of 1995, one part of Pippin's feature set—on-line communications—began to sweep the personal computer industry. With the rise of the Internet in 1993-94 and the lack of penetration of computers into the home, many in the industry foresaw the day when \$2,000 PCs running a complex operating systems and memory-hungry applications would be replaced by \$500 or \$700 "network computers" running a stripped-down microkernal operating system and platform-independent software (written in Sun Microsystem's Java language) that could be downloaded from the Internet.

In theory, a Network Computer can do almost anything a PC can do. Instead of a floppy and hard disk drive, for example, a network computer would use a CD-ROM drive for running specific applications and draw everything else off the Net, much the way a telephone receives and transmits information over the phone network. The Bandai Pippin product offers both a built-in CD-ROM and an optional floppy drive for running programs or downloading information from the Net, making it the most flexible "network computer" designed thus far. Because it uses a subset of the Mac OS, developers can port thousands of existing Mac applications to Pippin with relative ease (either rewriting them on CD-ROM or making them available on-line). Better still, applications ported to Pippin, are upwardly-compatible with the Power Macintosh.

"Every household that can afford a \$500 TV can afford a network computer," says Mark Orr, Apple's head of Pippin business development. "A classroom with 30 children and two Macintoshes could have eight NCs instead. Textbooks and other learning materials ported to networks of NCs would revolutionize public education and corporate training programs," says Orr. With Netscape Navigator software, Pippin can browse the Web, or with a Java-enabled browser, it functions as a true NC, drawing content and off the Net with no other software to install or maintain. With its PowerPC chip and 6MB of RAM, the Bandai box is as powerful as many desktop PCs. Keyboard, floppy drive and hard drive are optional.

But will NCs become commonplace? "Any time you launch a new hardware platform, you need content to attract an installed base, but you also need a large installed base to attract developers to create content," says Mark Orr. "That was the challenge with the first Macintosh ... and that's the challenge we have with Pippin."

MONGOOSE LASERWRITER 12/640PS PLATE 35	7
Industrial Design: Apple Computer: Jay Meschter; Ron van Thie	1,
Glen Gee, product design	
Dates of Design: January-June 1995	

Introduced: June 1996

Exhibiting qualities of both early and late Espresso printer design, Jay Meschter's design for Mongoose shares the sense of forward motion used on the 1992 Ninja design, yet firmly establishes itself as a second-phase Espresso product by moving beyond the exuberance of the past toward a cleaner, less decorative style with a controlled flow on the surface.

Built around a Fuji-Xerox laser engine, the printer delivers 16 pages per minute with a 500-sheet paper capacity and advanced duplexing options. Yet the Fuji-Xerox engine is asymmetrical compared to the Canon mechanisms found in earlier Apple printers. To hide this fact and give the printer an interesting yet balanced shape, Meschter gave the case a series of curved surfaces that dive in toward one another to form creases, which separate major surface areas, directs the user's hand and eye and eliminates any sense of boxiness the printer might otherwise have.

"By using creases and toroidal surfaces, I wanted to suggest a visual linkage with our displays and all-in-one products," says Meschter. Turn Mongoose on its side, for example, and it begins to resemble the toroidal chin found on Bongo or Sousa.

The strongest crease defines the paper output area. "The product's surface energy meets at this area," Meschter notes. "This strengthens a design that would otherwise be a simple arrangement of shapes." Yet amid all the curves and creases, Meschter's work holds a surprise; a slight angle at the corner where the top of the product meets the sides—a reference to the 'Y' icon used in first-phase Espresso designs such as Comet (when viewed from the top), Ninja (when viewed from the side) and Fantasia. "It's an inside reference," s Meschter, "an acknowledgement that what we are doing now re on the work we've done in the past."

EPIC POWERBOOK 1400 SERIES PLATES 360, 361, Industrial Design: Apple Computer: Lawrence Lam; Les Anderse product design; Tonic Industrial Design (Palo Alto, CA): Ga Ivester, Mark Johnson

Dates of Design: April-November 1995

Introduced: October 1996

Intended for first-time and university students, the new Eg PowerBook was the most quickly developed portable computer Apple's history, offers the same performance as its predecessor M2 a lower price as well as four features that M2 did not: stereo sour a 6x CD-ROM drive (which fits in the floppy drive slot on the froi and an innovative top cover design that encourages users to chan the look of their computer as needs and preferences change.

"Once M2 was ready to ship, surveys indicated that that a lau demand existed for PowerBooks with an integrated CD-ROM," sa Lawrence Lam, who managed both M2 and Epic. "So rather th develop our own unique design, which would have added months the project, we went box shopping." In Taiwan, the Epic team vis ed several vendors that manufacture of portable computer cases at chassis, among them Quanta, which manufactures cases for a varie of PC makers, selected a box with a small footprint and a from mounted CD-ROM, then adjusted the tooling to accommodate the PowerBook's larger SCSI port and unique I/O ports on the bac "Retooling the case also allowed us to do some interesting things wit the design," says Lam.

For years, Apple has been selling PowerBooks in various shades grey-ranging from a medium grey on the first PowerBook to the near-black color of M2. "As an entry-level product, we wanted Epic design to attract a more youthful audience," says Lam. "But most co sumer products targeted at young people are lively, colorful ar style-oriented. For that reason, we wanted to inject Epic with mo personality by allowing the user to change the look of the comput from day to day." Thus, borrowing an idea from the Nautilus project Lam designed a removable panel, called a BookCover™, which comes in several versions: plain black to match the rest of the cas scratch-resistant clear plastic (for inserting written notes, a photo, o one of Apple's pre-printed BookCover inserts) or third-party solution made of cherrywood, burl ash, leather, or other materials (such a photovoltaic cells that can recharge Epic's internal battery or exten its range when working under battery power). The black and clea plastic panels and printed inserts are included with the product. Harking back to the first Apple computer, which users personalize by making their own wooden or metal case, Apple expects Epic user to insert a favorite image (such as a drawing, photo, or organization al symbol) under the clear panel. To whet their appetites, Appl designer Chris Stringer commissioned six designers [[Weiji Ito (Tokyo); Carlos Segoura (Chicago); Michael Bartalos and David Karam (San Francisco); Brad Holland (New York); and Jim Mitchell (Sydney)] to provide BookCover designs that slip under the clear plastic panel and will be included with the product.

"The BookCover is not only a fashion statement," says Lawrence Lam, "it's an organizational statement. It allows users to carry their desk with them at all times, storing notes and papers under the plastic sleeve rather than typing them into the computer. Some people within the company saw this as anti-technology, but it only follows the way real people use their computers. Just think of how many people stick Post-It notes to the edge of their computer display." Carrying the Epic idea a step further, Lam imagines a future model enclosed in a binder that can also store printed information and CD-ROM disks. Bolder in its design than M2 and more playful than Blackbird, Epic has a sweeped roll-in treatment at the corners and front edges that flair out to make the product look less boxy. Inside, it features the same PowerPC architecture as M2 (in both 117-MHz and 133-MHz versions) a larger (11.3-inch) color display and a floppy drive at the front. As Apple's least expensive PowerBook, Epic was its most popular ever-at least until the release of its successor, called Hooper.

HOOPER POWERBOOK 3400 SERIES

PLATES 362, 363, 365

Industrial Design: Apple Computer: Lawrence Lam, Masamichi Udagawa; Bill Burnett, John Howard, product design; Stratos Product Development (Seattle, WA): Mike Nelson; Gingko Design (San Francisco, CA): Scott Yu

Dates of Design: June-August 1995

Introduced: February 1997

Though only an inch longer than M2, the PowerBook 3400 series, code-named Hooper, has so many improvements both inside and outside that it bears only a casual resemblance to a predecessor. "Since the goal for M2 was to make it as small as possible, we assumed that the follow-up version would be longer to accommodate a full-sized CD-ROM," says Lawrence Lam, who co-designed and managed Hooper. "But once the project was under way, the engineers used that extra inch to pack the new version with as much power and functionality as possible." Because Udagawa's original design employed non-analytical curves on the sides of the case, it was easy for IDg's Ken Provost to stretch the base on his CAD system and widen the media bay enough to fit a CD-ROM drive into the side. Because a CD-ROM drive is wider than a floppy, an ingenious little door was designed to fill the quarter-inch gap when the floppy drive is in place. The media bay will also accept a Zip drive, hard disk or a 230MB or 640MB magneto-optical drive.

Inside, the larger footprint allows Hooper to have a larger motherboard with a fire-breathing 240MHz PowerPC 603e chip, an internal PCI expansion slot, two PC card slots (for adding a modem or other peripheral) and a PCI data bus, which gives Hooper performance equal to Apple's high-end desktop computers.

Packaging this much power in a compelling way. Hooper's product design manager Bill Burnett wanted the industrial design to make a bold statement. While Lawrence Lam redesigned the top cover to accommodate a 12.3-inch display, Masamichi Udagawa designed two speaker enclosures, each containing bass and mid-range speakers. Tucked into the left and right sides of the display, the speakers port their sound outward through narrow gill-shaped wire-mesh grills. giving a "surround sound" effect that is unique for a portable computer. Tweeters located in the corners of the computer's base, near the display hinge, offer precise stereo imaging. Another change from M2 is the top cover, which now has a gentle convex curve to accommodate the speakers and a strategically-placed "butt crack" down the center that makes the cover seem thinner and accommodate the user's hand and arm while carrying the product.

"The new design evokes a greater sense of dynamism than M2." says Lam. "M2 showed us how small a full-functioning portable can be." Though Hooper is nearly the same size as Blackbird, it's the most powerful feature-laden portable ever developed. "It represents the ultimate power statement in the PowerBook realm."

ONE ASPECT OF APPLE'S CORPORATE CULTURE WAS ESTABLISHED IN THE MID-1980s by John Sculley, who declared that no one should ever expect to retire from Apple. "We want people to join the company, give it their best years, then use their experience on the next challenge and give others the same opportunity they've had," said Sculley. To formalize this process, Sculley instituted a policy in 1987 giving fulltime employees a six-week sabbatical after five years of employment, allowing workers an opportunity to recharge their batteries. sample life outside the company and reassess their long-term options, perhaps even restart their careers. Indeed many Apple employees actually refer to the sabbatical as a 'restart.'

Over the years, the number of employees who used their sabbatical as a prelude to changing jobs is so high that taking a paid leaveof-absence is one indication that a career change might be in the offing. Yet during the five years that Bob Brunner managed the Industrial Design Group, only one designer—Gavin Ivester—used his sabbatical as a springboard to a new career (starting his own design firm Tonic).

Jonathan Ive considered this lack of turnover a challenge. "Though we don't *want* people to leave the Group, the lack of movement makes it difficult to bring in fresh talent," he says. "We need new people at regular intervals to prevent ourselves from stagnating. But this can only happen if other people are willing to leave." The problem was that IDg had become a very pleasant place to work. With Brunner at the helm and Ive and De Iuliis managing the studio, only the most lucrative job offer would tempt one of IDg's designers to consider leaving. That changed, however, in May of 1995, when Bob Brunner announced that he would be taking his sabbatical, plus accumulated vacation time beginning in June, thus extending his leave of absence until early September—a decision that set in motion a chain of events that brought the Brunner era to an end.

In August, Ray Riley announced that after seven years at Apple (two lifetimes in the personal computer industry) he would be leaving to become a designer at Nike. Next came Masamichi Udagawa, who left in September to join IDEO Product Development in New York, followed by Larry Barbera, who ended his eight-year stint by joining Design Edge in Austin. Finally, in December 1995, Brunner announced that after six years as IDg director, he would leave to join Pentagram Design in San Francisco.

WITH BOB BRUNNER'S DEPARTURE, THE FOURTH CHAPTER OF APPLE'S DESIGN history came to an end. Compared to the three preceding eras-the years of explosive growth under Jerry Manock (1977-83); the frogdesign era (1983-86), when Apple's industrial design reached extraordinary heights; and the chaotic "middle years" (1987-89)-the Brunner era (1990-95) was by far the most productive and interesting period in Apple's design history. The day he joined the company in January 1990, Apple was changing its entire product line to survive at a time when desktop personal computers were becoming commodity items and focus was shifting from desktop to portable systems. Reacting to this change, IDg redefined what a portable computer could be by delivering the PowerBook and PowerBook Duo. They gave Apple's products a compelling new look by launching Espresso design language, a set of aesthetics that was so success in its defiance of the computer-as-commodity that Apple competitors soon became to copy it. Among the many products designed under Brunner's leadership, his favorites are the first PowerBook, "because you see something of it in just about every other portable PC out there," the Macintosh Color Classic, "because it had attitude and forced people inside and outside the company to talk about design in a new way ... " and, finally, the Jaguar concepts, "which was probably the most fun I would ever have as a designer. Jaguar was the kind of project that will never be repeated." Other masterworks of the Brunner era include Daniele Deluliis's designs for Blackbird and Comet, Jonathan Ive's masterwork, Lindy and the Jonathan Ive/Bart Andre design for the Hammerhead/Sousa display. Along the way, IDg became the most visible and prestigious corporate design group in the world, won more design awards than the rest of the computer industry combined and reached a level where further improvement meant using its own work as a yardstick rather than the competition's.

Just as he had arrived at the right moment, , Brunner also timed his departure with precision. Within days of his announcement, Apple warned that the Christmas 1995 buying season would not meet expectations due to an overabundance of low-priced systems and not enough high-end PowerPCs and PowerBooks. "Our warehouse was full of Yugos at a time when everyone was buying Mercedes," said marketing VP Satjiv Chalil. As the damage was tallied and rumors of a merger with Sun Microsystems were debated the newspapers, the formal board meeting on January 23, 1996 w followed by a secret session held at a hotel in the New Mexi desert, far from the rumor and speculation of Silicon Valley. Wh the directors returned, they fanned out across the company to ra the troops and inspect Apple's "core assets"-including one gro that visited the Industrial Design Group, led by the diminutive ch of National Semiconductor, Gilbert Amelio. Relaxed and unassumin Amelio walked through the studio, dissected each design conce with hawk-like eyes, asked short precise questions of Jonathan I and the other designers, and spent several long minutes examini the fruit of IDg's four-year quest to define the next generation home computing-a slim powerful-looking concept code-nam Spartacus. Two days later, Amelio took the helm at Apple as the fi person ever to hold the joint title of Chairman and CEO. His ch lenge was three-fold: to steer Apple back to profitability, streamli operations and light a fire under the engineers, software writer a designers whose innovations would define the company's next er

A New Era Begins. In January 1996, Bob Brunner was succee ed by Jonathan Ive in January 1996, who injected the Industr Design Group with his own personality and ideas and laid plans f a new era that would be very different from the preceding one.

Recruiting new talent for the Group has fallen mainly to Danie De Iuliis, who at first found it difficult to find people who meet IDg specific needs. "We are looking for personality, overpowering tale and the ability to work in a small group," says De Iuliis. "We al want to be impressed by a designer to the point of intimidation. We want people who will question our ideas in a constructive way that we can all learn and make better products. Engineering ski are nice. But since we have an army of engineers working across the street, it's not essential, And it may sound strange, but comput experience is not essential either. I would rather work with an enth siastic car designer than with someone with average talent and se eral computers to his or her credit. More than anything, I want to se ideas that force me to scratch my head and think."

Chris Stringer. Born in Australia in 1965 and raised in the nor of England, Chris Stringer studied product design at Nor Staffordshire Polytechnic in Stoke-on-Trent, graduated in 1986, the attended the two-year industrial design program at London's Roy College of Art in London, where he received his degree in 1988. 1990, he toured Silicon Valley and visited a number of design firr the same way Jonathan Ive had done the year before. In June 1995 just three months before Ive joined Apple, Stringer went to work IDEO Product Development in San Francisco, where his effor revealed both sides of his personality: serious (as in the desktop ar a portable systems design language he created for Dell Compute and whimsical (a fishtail light switch concept that won an *LD. Desig Review* award). By September 1995, Stringer had created enoug noise for Jonathan Ive and Daniele De Iuliis to take notice and per sende him to join IDg as a Senior Industrial Designer. Since then, he has helped forge a resurgence within the Group that parallels Apple's recent change in strategy. "As we move away from low-end commodity items toward high-performance products," he says, "industrial design will add more value than we ever have before." To get his feet wet, he designed Apple's more recent consumer CPU tower, code-named Instatower.

INSTATOWER MACINTOSH PERFORMA 6400 SERIES PLATE 358 *Industrial Design:* Apple Computer: Chris Stringer; Chris Novak, Rick Mariano, product design

Dates of Design: September-November 1995

Introduced: August 1996

Responding to customer requests for more power and performance with enclosures that consume less desktop space and function well in a domestic interior, Chris Stringer's first design for IDg was a consumer-oriented CPU tower, code-named Instatower. Combining ProverPC performance with a built-in TV tuner and serious audio and indeo output, the enclosure has a calm, furniture-like presence. Like the Show and Tell design, the case is made of separate top, side, front and back panels that are attached to a metal cage under the skin. "Since the external parts snap together, I decided to accentuate the paneled construction by giving Instatower a soft upholstered look." says Stringer. Subtle yet vigorous in its execution, each

punel curves ever-so-gently from the center to the edge, then rolls inward as it reaches the corner, where it meets the adjoining panel. "We applied negative draft to the edges, creates an aggressive undercut where the panels meet." Stringer also applied a mitre joint where the front panel meets the top. "Getting that joint right ensures that Instatower won't read like a box." As a result, surfaces that appear to be flat seem to undulate on closer inspection, like the arm of a wellworn sofa. "The design evokes values you associate with a domestic environment rather than an office or laboratory," says Coster.

To heighten the upholstered effect, Instatower has no venting on the top and sides. Air enters through the bottom of the unit and exhausts out the back. To ensure proper airflow, Instatower's saberlike feet are taller than normal to compensate for any settling that might occur when the computer is placed on a carpet.

"The feet give the product a friendly stance, " says Stringer. "Above all, I didn't want the product to have a serious or high-tech feeling." On a subliminal level Instatower carries forward the animated pet-like stance first used on the Macintosh LC and amplified on the Color Classic. But Stringer takes this idea one step farther by allowing the rear legs on his design to kick back slightly, which gives the product a sense of forward dynamism. Brand identity is maintained with a centered badge on the front and a centered recess on the sides. "The sides would seem rather plain if we didn't add something to focus your eye," he says. Three rows of narrow speaker holes give only a modest suggestion of Instatower's audio capability, which includes a subwoofer mounted beneath the cabinet. As the demand for more powerful home computers continues, Stringer predicts that the minitower will become the standard CPU shape.

 K2
 POWER MACINTOSH 8600 / 9600 SERIES
 PLATE 559

 Industrial Design: Apple Computer: Danny Coster; Wayman Lee,
 Troy Hulick, James Melton, Noriko Fukasawa, product design

 Dates of Design: October 1995–May 1996
 Design: October 1995–May 1996

Introduced: January 1997

Danny Coster's first product for IDg is a high-end CPU for research and business applications, code-named K2, which translates Cal Seid's Outrigger design into a tower configuration. "The main issue with K2 was to improve access to the interior so that users can access the drive bays, install PCI cards or add memory to the system," says Coster.

To achieve this, Coster worked with Wayman Lee (lead product designer on Outrigger) to design a side panel for K2, which folds down like the tailgate on the back of a pickup truck, revealing the components divided into blocks and mounted inside a metal cage. Like Outrigger, the nearest block on K2 (containing the power supply and drives) pivots out on hinges to access the motherboard.

"After we designed Lego years ago, customers complained that the box was difficult to open," Wayman Lee recalls. "So we designed Outrigger for easier access, only to be told that we had made it *too* easy to access for a business environment, where CPUs have multiple users and security is an issue. So we solved that problem on K2 by designing a dual security system with an internal security bar and a place for attaching an external padlock to prevent unauthorized access."

Once the padlock and internal security bar are removed, the user pushes a sculpted triangular-shaped button on top of the case to release K2's side panel. Made of translucent coke-bottle-green plastic, the release button is one of many small details that make using K2 a pleasure. "By giving the user access to the interior, we're asking them to put their hands among a lot of sheet metal and electronics." says Coster. "I wanted to make that experience as friendly as possible by giving the release mechanism and handles inside the same green color as the button on top. In that way, the green areas show the user which parts to grip and which areas to leave alone."

Once the side panel is folded down, the block containing K2's drive bays and power supply pivots out on hinges to access the PCI expansion slots, additional drives in the base and the main circuitboard (contained in a slim box on the side of the K2's case), where the memory chips are inserted. When fully loaded, the 8500 holds 512 megabytes of RAM and three PCI cards, while the 9500 can handle 768 megabytes of RAM and six PCI cards. Both towers will hold one 3.5-inch accessible drive in the top, four 5.25-inch accessible drives below and two 3.5inch drives in the base accessible through the removable side panel.

Unlike Instatower, which has a consumer orientation, K2 exudes a more solid business-like feeling. Its shape is aggressively architectural, with diving surfaces and venting pattern near the base similar to those found on the business-oriented Hammerhead display.

To separate Instatower from K2 in the user's mind, Coster wanted K2 to evoke a sense of monumentality. Up close, details such as the curves on the side and the green button on top seem personal and inviting, he says. "But from a distance, the tower presents itself in a more powerful way, like the Arc de Triomphe."

Thomas Meyerhöffer. A month after Chris Stringer's arrival, Jonathan Ive and Daniele De Iuliis recruited another young master, Thomas Meyerhöffer. A native of Stockholm, Sweden, Meyerhöffer graduated with a degree in industrial design from the Art Center College of Design in Montreux, Switzerland in 1991, worked with the British designer Julian Brown (where he collaborated on the Vercingetorige clock for Rixite, which won an award in the 1992 I.D. Design Review) and later for Porsche, where he collaborated on the interior of the new Porsche 996 (known as the Boxster) as well as the Porsche 998. In the fall of 1993, Meyerhöffer joined IDEO's Palo Alto office, where he developed a wide range of products, including the V3 ski goggle for Smith and the M line of computer monitors for NEC, designed for the home and home-office environment. Evolving NEC's computer design language in an interesting new direction, Meverhöffer's monitors combine the hard surface quality that NEC products are known for with a strong yet graceful outline and sculptural qualities that have influenced NEC's current design direction. Meyerhöffer has continued this approach at Apple to even greater effect.

"I think of product performance not only in terms of function, but also its metaphorical and emotional quality," says Meyerhöffer. "I want the product to tell a story through its form and visual appearance, the flow of different components, tactile qualities and levels of meaning. A good design should not only tell you what it does and how it functions; it should communicate a vision as well." In this way, Meyerhöffer's design combines the artistic quality of industrial sculpture with the heft and rigor of industrial design. "As we go forward, the iconic and metaphorical aspects of each design will become as important as its performance," he says. "After all, the emotional content of a product *is* part of its performance."

To test this idea, Meyerhöffer was given an important project: the first Newton product with a built-in keyboard and adjustable screen.

K	Apple eMate 300	D	LATES 36	6-26
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Industrial Design: Apple Computer: Thomas Meyerhöffer: John Tang, David Baik, product design

Dates of Design: Schoolbook: February-September 1995; K: October 1995-February 1996

Introduced: November 1996

Awards: "Best of Category," I.D. Design Review, 1997

Since the release of the original Newton MessagePad 100 in 1992 and Newton MessagePad 110 in 1994, IDg has developed many speculative Newton concepts showing the range of applications to which Newton technology could be applied. These include a hand-he medical record-keeper in a white case with a bright red cross on t cover, a Newton mounted on a flexible arm in an automobile for u as a navigational aid, telephone Newton concepts and a Newt series called "My First Apple" that combined bright colors and s inventive shapes that would appeal to children.

Meanwhile, developers inside the Newton Group were busy wiing a more powerful version of the operating system, called Newt-2.0, giving it a better handwriting recognizer, a code structure this virtually immune to crashing, improved memory manageme keyboard support, enhanced connectivity (including E-mail via c lular telephone) and "speed buttons" on the display for quick accessing to certain frequently-used functions.

In 1994, Robert Kondrk of Apple's educational marketing groreviewed a beta version of Newton 2.0 and considered it an ide environment for a children, particularly those who have never usa computer before. "Since the new OS is powerful yet extreme compact, doesn't require the student to save data and comes up soon as you turn on the machine, I urged the Newton Group develop a product with a touch-sensitive screen as well as a ke board for the K-12 education market to give students the mobil and accessibility that desktop computers do not provide."

Since students in a classroom often move from room to room "having a computer tied to a desk with wires trailing out the basis no longer the best solution." says Kondrk. Instead, every stude should have an inexpensive notebook computer on their desk wi a kid-sized keyboard for text entry, a pen-sensitive screen for draw ing or writing, and a PC card slot for inserting lesson plans and oth information on PC cards that could be tailored to an individual st dent. Thus, no matter how many students used a machine, eac encounter would be seem personal.

"The goal was give this Newton product the power and features a PowerBook, yet make it as unobtrusive as a piece of paper," sa Kondrk. "The problem was price. To succeed in the education ma ket, we had to deliver a product for less than \$800, which is le than the price of our existing MessagePad, which has a small scree and no keyboard. Yet if we could hit that price point for the Kmarket, we would also have a product for the masses ... and tu out future versions for higher education and specialty markets."

Rising to Kondrk's challenge, the Newton Group spent month developing the basic hardware, then invited IDg to collaborat Rather than craft a design in-house, IDg asked Mark Johnson Tonic Industrial Design to develop a concept in January 1995. Codnamed SchoolBook, the Tonic design was smaller than the *N* Powerbook with a keyboard on the front and a tilting 9.5-inch per sensitive screen in a bright purple case.

In October 1995, the Schoolbook concept was approved for development under the code-name K. Yet, by this time, Kondr Newton product designers John Tang and David Baik and IDg 'homas Meyerhöffer all had doubts about Tonic's design. Meyerhöffer, in particular, wanted K to have the same the spirit of nvention and iconic quality that the original Macintosh and the first 'owerBook possessed. "But the only way we would get there was o start over," he recalls. "Working in a steady focused way, we would discover what kind of product K should be. If I could transite into a model what I had in my head, we would all realize what n incredible opportunity this product represented."

Since K was intended for students in a classroom situation, Meyerhöfer did not want the design to look and feel like a conventional lapop computer, which many children find intimidating. "I wanted that rst experience to be inviting, with associations that are easy to nderstand. At the same time, the design should tell the user that K is a serious product. It's an \$800 computer that *really works*, not pomething you'd expect to find at Toys R Us."

Unlike early Newton products designed by IDg but engineered by n outside vendor, the Newton Group decided to engineer K's nechanical package in-house, working closely with Meyerhöffer, who would develop a new industrial design. "Thomas wanted to take a bold approach with the exterior," says John Tang. "So it made ense to engineer the mechanicals and design the case side-by-side." By the time Meyerhöffer saw the Tonic concept, he had only four weeks to come up with a new design. "I not only had to create a ense of momentum and explain my ideas to the team," he says, "I lso had to develop a vision for K that would result in an entirely ew product icon and give it a strong emotional story."

As Robert Kondrk recalls, "Thomas wanted something that was imilar to the PowerBook, but also unique. Like the PowerBook, it ad to be highly intuitive and rugged. But it also needed an emoonal pull so that it could appeal to young children, who might be ntimidated by technology. Thomas said he wanted the product to ell a story. So he took the concept and ran with it."

Because of its low price point, the design had to exert maximum mpact at minimal cost and have the kind of charisma that establishs brand awareness and reinforces Apples' identity. Like Daniele DeTuliis's Blackbird design, Meyerhöffer also wanted K to reveal self to the user through a process of discovery, with layers of meanng that allows each user to take a personal journey and come away /ith his or her own interpretation.

Using the same footprint and configuration as Tonic's concept, teyerhöffer began his design by lowering the keyboard and tilting it ightly toward the user to provide a better working angle—a decision nat forced K's product designers to move certain components that ad been under the keyboard toward the back of the unit. He then rew a soft outline around the perimeter and designed a graceful op surface that melds the display with the area around the keyoard. This surface not only enhances the surface flow, it gives K a ense of strength and solidity that is rare in a portable product.

To protect the keyboard and screen when the unit is closed,

Meyerhöffer gave the display bezel a lovely foliate shape. When folded down, the display covers the keyboard, with the top edge of the display lapping over the bottom of the product, making it easy to insert a finger, lift the screen and begin work. When closed, the convex curve on the top of the display and the reverse curve on the bottom of the keyboard are beautifully handled. The shape of K's bottom also bears a faint resemblance to Lindy—which not only strengthens K's identity as a Newton product, it reminds us how important Lindy was in the evolution of the Newton product line

Like all Newton products, K's touch-sensitive screen encourages writing or drawing—or scribbling with an index finger—as though it were a piece of paper. To make it accessible, Meyerhöffer and K's product designers allowed the screen to pivot backwards to a nearly flat position, so that one student can work in front of the keyboard and another can participate at the screen with pen in hand.

The slight swell around the display functions not only as a framing device, making the screen appear slightly larger, it provides support for the user's palm while drawing or writing. A similar curve around the keyboard serves as a palm rest while typing. The ability to input using the keyboard, pen, or a fingertip makes K unique.

Using Newton 2.0, K's backlit screen can be viewed in either landscape or portrait mode, allowing the user to view the screen horizontally while facing the keyboard or vertically when drawing on the screen from the side. To accommodate right- and left-handed users, Meyerhöffer placed inkwells on both sides of the screen, as well as a recessed penholder above the keyboard for storing the stylus when the unit is closed. The shape of the penholder recess is echoed in the shape of the speaker holes and the volume and screen controls.

To enhance K's emotional impact, Meyerhöffer substituted Tonic's purple enclosure with a translucent dark green polycarbonate case with structural ribs inside that create a lovely shell-like effect when held up to the light. Visually stunning, the shell pattern gives K an almost poetic quality. "I wanted every part of the design to enhance the product's story," says the designer, "as well as tell the user that Apple gives its customers more than anyone else." Because Apple has its own factories, it can control production and deliver products with real differences. Consider the structural ribbing inside K. "Using translucent plastic allowed me to communicate the shell-like quality of the 'clamshell' design," says Meyerhöffer. The shell pattern enhances the foliate shape around the display and purifies the sculptural elements." With its steel substructure, the case can withstand the kind of abuse only a fifth-grader can dish out.

During the review process, Meyerhöffer's design provoked strong reactions from Apple executives—both positive *and* negative. "Whenever you propose a radical departure from the norm, there will always be disagreement," says Robert Kondrk. "A lot of people considered Thomas's design too curvy. Others didn't understand why it had to be translucent. Every time I tried to explain the design, I would get beaten up, which was discouraging. But Thomas stuck to his guns." During one meeting, while VPs argued over the design, Kondrk felt depressed until he looked up at Meyerhöffer across the table, who mouthed the words, "Be Strong!" Kondrk defended the design one last time—and persuaded the executives to go along.

"The soft forms and flowing surfaces give K an emotional quality that students need in a classroom situation," says the designer. "Since it will be used by a wide range of students, from very young children who may have never used a computer to older, more experienced students, I tried to make the design friendly and accommodating for the little ones, yet sophisticated enough so that older students will think it's cool and use it for more demanding tasks, such as writing, Web browsing or Internet research."

Unlike most computers sold to schools, which are little different from machines designed for businesses or the home, K offers a new approach. With its soft outlines and foliate shape, says Meyerhöffer, "the design has a more expressive personality than we normally associate with a machine." In focus groups, the design reminded children of "gummy bear" candies.

Symbolism aside, K's soft forms also make the product more durable (fewer sharp corners to be dented if the unit is dropped) and easy to carry. The curves encourage the user to grasp it with two hands where the sides flow inward, then carry it by placing the hand in the recess at the bottom.. Smaller children with limited hand strength can use the handle with a rubberized surface inside. "I want the product to say, 'Hold me any way you like," says Meyerhöffer.

Because of its complex shape, Meyerhöffer designed K in 3-D with the help of CAD operator Ken Provost. Yet conveying the 3-D information to K's manufacturer, Inventec, forced Newton's product designers to translate the finished design back into 2-D-drawing horizontal and vertical cross sections at 4-millimeter increments as well as a control drawing that can be cut out and draped over the product to check the position of every detail. "Except for the screen and the underside, there isn't a single flat surface on the product," says John Tang. "The surface that begins at the top of the keyboard and curves up to meet the screen was particularly challenging." Another difficulty involved shielding the EMI interference given off by K's processor (a 25MHz ARM 710a chip, which is more than twice as fast as the chip in Lindy) without affecting the translucent case. Since it has no hard drive, the product boots up from its 8MB ROM chip almost instantaneously, offers an interface simple enough for a child to understand and includes NewtonWorks software, a built-in word processor, drawing program, graphing calculator, Web browser and Classroom Connection, which allows a teacher to update a roomful of K units from a single Mac or PowerBook via infrared.

"The fact that Apple can deliver this kind of product at a low price demonstrates our ability to combine technology and design in ways that our competitors cannot," says Jonathan Ive. It also proves, once again, that Apple views design as a "quality" feature. Rather than produce generic one-size-fits-all products, eMate signals Apple's intention to develop highly-targeted products that will also appeal to use beyond its target market. "The fact that K can be used in more the one way is symbolic of our new direction," says Ive. "Being able use and, at times 'mis-use' a product makes it more personal, whi makes the user feel happy about using it." By demonstrating ju what can be done with a market-focused design, Thomas Meyerhe fer has planted a seed that could grow into a whole new species powerful yet-inexpensive PC that combines the functionality of PowerBook with the portability and price of a Network Computer

NEWTON MESSAGEPAD 2000
 PLATE 3
 Industrial Design: Apple Computer: Daniele DeIuliis; Don Port

Kusuki Mori (Sharp Electronics), product design

Dates of Design: October 1993-May 1994

Introduced: January 1997

Along with eMate, the Newton Group also released the successor Lindy, the MessagePad 2000—which offers an impressive combin tion of hardware and software. Compared to Lindy, everythin about Q has been revised, beginning with a 162MHz StrongAB processor, which provides an eight-fold increase in performance, y requires only half as much power. Other enhancements include:

- a larger 3.3- by 5-inch (480- by -320-pixel) active matrix displa with sixteen shades of grey and a unique software feature tha rotates the display in all four directions, with software-generated "button bar" icons that can be placed anywhere on the screen
- two Type 2 PC card slots for adding memory, modem, etc.;
- an integrated microphone and speaker with "Audio Stationary" software for recording and reviewing voice notes (a single 4M PC card can store up to one hour of voice recording); and
- an infrared (IR) terminal, plus Newton InterConnect, a high-spee port that offers serial, LocalTalk, power and audio connections

To harness these functions in a compelling yet familiar-lookin product, design Daniele DeIuliis adopted a dual strategy: buildin on the precedent that Lindy provided, then moving beyond it in way that would distinguish Q as a high-end product. "I made a co scious effort to connect Q with Lindy on a visual level to establi: a sense of kinship with the earlier design," says DeIuliis. "Ther made changes that would take full advantage of the new software

The most obvious change occurs on the lid that protects Q's displa Because the screen on Junior and Lindy offered a portrait-only view their design employed a notepad metaphor in which the lid flipped u and over the top of the product. Yet because Q's display is in the ceter of the product, designing a lid that flipped over-the-top would hav made the lid too large to handle comfortably. Instead, De Iuliis too advantage of Q's rotating screen and moved the lid to the side, chan ing the product metaphor from a notepad to something that resembl a paperback book. He also reserved space where the lid meets the cato store a non-collapsing stylus that is similar in size and weight to the pen De Iuliis designed for Lindy's desktop charging station, Crib. "While the notepad metaphor was the best solution for a Newton with a fixed screen," says DeJuliis, "the side-mounted lid is a more emocratic solution for Q, because the rotating screen allows you to add the lid in any direction." Right-handed users can use the screen in portrait mode and open the lid from right to left. Users in Japan and left-handed users will rotate the screen 180 degrees and open the lid from left to right.

Having a solid pen was important, says Defuliis, "because Q is esigned for pen input, which makes the pen the first thing you ouch ... the first impression you have of the product. I wanted that experience to be special." Rather than cut corners on its construcon. Apple devoted *more* time and energy to developing Q's stylus han it had spent on Lindy. Details such as the pen are important, ecause they tell you that Q is a quality product. To reinforce the oint, De Iuliss fashioned a tiny "inkwell" in the corner of the case or storing the pen when using Q on a desktop.

Originally scheduled for shipment in mid-1995, software problems, s well as the determination not to release Q until it was "bulletroof" delayed the product for more than a year. This restraint not nly allowed the developers to improve the technology, it allowed em to reposition Q in subtle but significant ways. Looking back, 's predecessors Junior and Lindy could best be described as data eripherals-convenient devices for storing information while on e road and exchanging data with a desktop computer. However, ith the MessagePad 2000, the Newton platform has finally grown 5. Like the eMate, its power and feature set are closer to the owerBook while retaining its unique Newton qualities; such as stant startup, blazing performance, and handwriting recognition ith built-in word processing, Web browsing, and E-mail capability. Even though DeIuliis completed the Q design nearly three years go, it's remarkable how up-to-date it looks. Certain details, such as e almost feminine crease near the latch, recall the diving surfaces und on late Espresso products. Yet dimples on the lid are new. actile feedback being a perennial theme at IDg, De Iuliis wanted "a ibtle texture for those areas where you rest your hand."

One indication of Q's long-term potential is the series of the small rategically-placed hooks and threaded holes on the case for attachg a keyboard or cellular telephone. With the proper attachments, can function as a mobile workstation, allowing the user to input xt via an external keyboard, draw or write directly on the screen, owse the Net or send and receive E-mail using a PC card modem id digital cell phone. It can even exchange data with Windows PCs. Though many will continue to think of Q as a handheld device, pple will also offer it in a book-style carrying case with a keyboard cked inside—an indication that the next Newton may follow eMate merging the qualities of a PowerBook as well as a PDA.

TER BOB BRUNNER LEFT IDG, THREE DESIGNERS FROM THE BRUNNER ERA .de farewell: Lawrence Lam, left in May, 1996 to join Gavin Ivester at Tonic. Susanne Pierce departed in June to become a freelance designer in San Francisco. And Tim Parsey left in July to join the office products maker ACCO in Chicago. Meanwhile, another new designer joined the Group.

Richard Howarth. The latest addition to IDg, Richard Howarth, studied industrial design at Ravensbourne, a small college on the outskirts of London, where he graduated in July 1993. While at Ravensbourne, Howarth's minidisk Walkman concept called "Telepathik Fish" won him a travel bursary and the opportunity to work for a short time for Sony in Tokyo. There Howarth designed a low-cost cellular telephone for children that fits around the neck and was shaped like a pebble. After Sony, Howarth joined IDEO's Palo Alto office in January 1994, where amongst other products he designed a small travel iron for Matsushita called "Fat Billy." The design (made from ceramic-plastic (which remained cool when the iron was hot), had a distinctive rabbit-eared profile, simple controls, a squeeze mechanism in the handle to control the flow of steam and a padded insulation/storage bag made from Fire Blanket fabric. Asked to join IDg in May 1996. Howarth is now working on Apple's upcoming portable products. His first design will be a high-end PowerBook that will move beyond the current Epic and Hooper models, rekindling the kind of personality last seen in Blackbird. "Laptop compute are now superfast, have large screens, can be taken anywhere and are as much of a personal accessory as they are a work tool. For that reason, we will consider choice of materials and tactile qualities as much as usability and form in the design of our next PowerBook."

LOOKING BACK TO THE WINTER OF 1993-94, WHEN APPLE WITHEDREW THE Macintosh Color Classic, millions of Mac enthusiasts feared that the small all-in-one Mac—the most famous product icon in all of personal computing—was gone forever. Reporting on the Color Classic's demise in the spring of 1994, *MacWorld* magazine urged Apple to reinvent the all-in-one Mac and offered a blueprint for the product. It "should be small, with a keyboard not much wider than the system ... (it) should be fast ... a small upright computer should feel swift and nimble, not ponderous ... it should be expandable ... (it) should have a strong visual identity ... it could combine a desktop computer and communications center [and] should assert its individuality and stand upright instead of assuming the prone position of a PC. Apple should make it black and slick."

Neither of IDg's follow-ups to the Color Classic—the Hook all-inone (offered in platinum as well as black) or the more elegant Bongo design—hit the target that Daniele DeIuliss and Larry Barbera had set back in 1991. Nor did they break new ground the way Jerry Manock and Terry Oyama had done with the original Macintosh. No one was more aware of this fact than Bob Brunner. Yet Brunner didn't merely want a product that would eclipse the Color Classic. He wanted to solve the most vexing problem of all: to design a personal computer that would work so well in the home that it would become the center of family activity. "Most people still view their home computer in terms of work and school," says Brunner. "When they select a computer for the home, they ask two questions: 'How can the computer help me with my office work or freelance business?' and 'How can it help my children with their schoolwork?' "Currently, between 35 and 40 percent of all American homes have a personal computer used for office work, running a home-based business, school work, Internet browsing, entertainment or E-Mail. As the number of home-based computers increases, Brunner says, "the way people view their PC will change dramatically. Rather than accept the machines we have today, which look like they belong in an office, they will ask: Why does it have to be made of grey plastic? Why must it be so big and bulky? Why can't I have a computer in my living room that looks and functions like my television or stereo?" Indeed, why can't a computer be the most beautiful thing in the home ... not a machine, but a work of Art?

"It's been clear for a long time that computers, entertainment, communications and commerce are converging in the home," says Brunner. "Yet very little research had been done to determine the kind of home computer people *really* wanted."

Well before *MacWorld* decided to publish its blueprint for the Macintosh-of-the-future, Brunner set out to find the answer, launching an in-house design investigation code-named Pomona.

"As technologies converge, blurring the distinctions between work, entertainment, communications and other functions, we need to give these objects a meaning that is consistent with their new identify." —Jonathan Ive

POMONA DESIGN INVESTIGATIONPLATES 364-397Industrial Design: Apple Computer: Robert Brunner, program manager; Jonathan Ive, Daniele De Iuliis, Tim Parsey, Jay Meschter,
Masamichi Udagawa, Suzanne Pierce; IDEO Product Development
(Palo Alto & San Francisco): Paul Bradley, Naoto Fukasawa;
Montgomery & Pfeifer (San Francisco): Herbert Pfeifer, Paul
Montgomery; Ecco Design, Inc. (New York): Eric Chan, Jeff Miller,
Eyal Eliav; IDEC (Tokyo)

Dates of Design: October 1992-May 1993

SPARTACUS THE TWENTIETH ANNIVERSARY MACINTOSH PLATES 398-400 Industrial Design: Apple Computer: Robert Brunner (initial concept), Jonathan Ive (second hard model and final design), Daniele De Iuliis (keyboard), Jay Meschter (power supply/subwoofer enclosure); Prabir Sarkar, project manager; John Johnston, Wil Oxford, Troy Hulick, Mel Philips, Noriko Yanagisawa, Leslie Leland, Ken Jenks, Pam Ryan, Ron Moller, product design; IDEO Product Development (Palo Alto, CA): Paul Bradley (first hard model) Dates of Design: May 1993-August 1996

Introduced: February 1997

Awards: "Best of Category," I.D. Design Review, 1997

The most recent product to emerge from the Industrial Desi Group began life in the fall of 1992 with an investigation coc named Pomona. "For years, I'd wondered how the computer wou evolve from a box into something more physically compelling th would fit better in the home," says Bob Brunner. "In survey af survey, customers told us they want 'power systems' with expansislots and extra drive bays that allow them to add to their system a later date. That demand forced us to adopt a box-like design hold the cards and drives. But most home users never add to the system, which leaves them with unused slots, drive bays that remaempty and a box that they don't really need."

Eventually, says Brunner, "home users should realize they only ne a standard setup with a single expansion slot. When that happens, we can stop thinking of the computer as a plastic box and instead give a shape that expresses its function, using materials such as woo metal and leather that are more in tune with the home environmer

To anticipate this change, Brunner launched the Pomona Desi, Investigation in October, 1992, wrote a two-page design brief, at invited IDg's designers, as well as consultants from Silicon Valle Tokyo and New York, to submit concepts in an effort to redefine t home computer, invent shapes to better address user's needs an employ materials that would function as well in a domestic setting Apple's platinum grey plastic works in the office.

Just as Steve Jobs had done with the original Macintosh, Brunn encouraged his designers to integrate the CPU box, display, driv and keyboard in a more cohesive way—treating the computer as single thing" rather than "a collection of things."

"Whether it's sitting on your desk or used as a piece of furnitur a computer is a very personal object," says Brunner, "as personal your favorite armchair. But in 1992, no one was designing compuers with that idea in mind. For Pomona, I wanted to see concepthat would encourage people to select their computer the same w they would a piece of furniture or a home stereo."

The Pomona design brief was distributed to IDg's designers and fr outside consultants—Eric Chan of EC Design (New York), Tangerii (London), IDEC (Tokyo), Montgomery & Pfeifer (San Francisco) ar IDEO Product Development (San Francisco). Their task was to crea a desktop Macintosh with high object value using miniature comp nents, high aesthetic content, and alternative materials. According Brunner, "Pomona concepts should not necessarily follow Apple existing product language. Instead, they should project high-perfc mance values with compelling vision, provocative forms, rich mat rials, unique configurations and added functionality using miniatu components." The design for each concept "should explore mit mum footprint opportunities. Modular displays (user-configurab separate or attached display) should be explored, but an integrate (all-in-one) product was also acceptable."

"The emphasis should be on small size, striking appearance ar added utility, such as keyboard storage and cable managemen asportability was also an option, but not at the expense of the duct's visual impact. Most of all, Brunner wanted to see a range ew materials—such as polished or brushed metal, wood veneer, onventional finishes, coatings and textures—to add richness and arate the product from traditional desktop solutions." According grunner, "likely users for the new machine would be Macintosh cionados, upscale consumers who are interested in modern agn, as well as those who like to 'make a statement' in their home or. It could also function as an executive workstation."

irst Concepts. As Brunner expected, the Pomona brief sparked walanche of ideas, many of which did away with the traditional puter box or shrunk it to a barely noticeable size. Eric Chan and staff at Ecco Design generated dozens of sketches showing table-desk-mounted and freestanding concepts. One design wrapped display and components in a metallic exoskeleton. Another kaged the components inside a compact vase shape with a flat el display on top. Yet another resembled Richard Sapper's clas-Tizio lamp with the circuitboard and drives stored in the base a flat panel display mounted at the end of a long arm that could positioned anywhere over the desktop.

Iontgomery & Pfeifer took a similar approach, enclosing a Powerok circuitboard, floppy drive and CD-ROM drive inside a narrow dy,' a flat panel display serving as a 'head' (with ear-shaped sures at the sides containing speakers) and a four-footed pedestal e that gave the concept an animalistic look and stance.

comesticated Mac. The most appealing in-house Pomona cont was Jonathan Ive and Daniele De Iuliis's interpretation of the cintosh Color Classic morphed into a traditional cabinet-on-legs. ed it The Domesticated Mac. "Since many of the Pomona conts used costly technology, Daniele and I took the opposite roach," says Ive. "By returning to the Color Classic icon, we need to recapture those aspects of the original Macintosh that e so seductive," such as the head-like presence on the desktop, ompact all-in-one shape, face-like elements on the front, an intered handle on top and unique functionality. "It's easy to be draic when you're using LCDs and PowerBook components," says

"It's more difficult to make a bold statement using a convenal CRT display and a standard desktop circuitboard. Rather than duce a 'blue sky' concept, we wanted Domesticated Mac to be ple enough to deliver at a modest price point.

ppealing and homey, the foam concept differed from the origi-Mac in two key respects. First, the designers rested the Mac on ee legs (a pair of thin splayed legs on the front and a single thick at the back) to provide keyboard storage underneath. They then ched twin doors, which cover the display and media slots, givthe design a functional identity when the doors are open, and a a-computer look when the doors are closed.

n the home, a computer should have an active personality when in use and a quieter non-working identity when it's turned off," says Daniele DeIuliis. "That way, the computer can exist in a domestic environment without reminding us that there is still work to be done." Another problem is keyboard storage. "When the keyboard is left in plain sight, it almost begs you to come over and touch it." Narrow shelves and a pin board inside the twin doors can be used for storing disks or displaying snapshots or notes. DeIuliis and Ive then installed an analog clock, which pivots inside one of the doors, allowing the user to tell time whether the doors are open or closed.

Later, DeIuliis and Ive refined the Domesticated Mac into a hard model, giving it a stronger perpendicular legs, a more aggressive horseshoe shaped body that kicks out at the back and a crater-like loudspeaker detail on top with dome-shaped handle that allows the unit to be carried from room to room. To ensure that the design would function in almost any interior, the twin doors are crafted in a variety of materials (such as brushed aluminum, wood veneer and textured plastic) and mounted on flexible plastic exoskeletons, which allow the doors to be changed in minutes, serve as cushions when the doors are pushed against the screen, are convenient for mounting an analog clock inside one of the doors (as in the earlier concept) and allow the user to tuck a floppy disk or note inside the doors. With its combination of hard and soft forms, sinuous part lines and underlying humanity, the Domesticated Mac indicates one direction that future Apple designs might take.

Other in-house Pomona concepts included Jay Meschter's smallwedge-shaped Mac with curved sides, widely-spaced legs on the front and a green faux marble column that defines the back. Masamichi Udagawa imagined a computer like a small a tabletop lectern with a flat panel display that flipped up, speakers in the base, and an amusing little microphone at the side for making voice notes.

Tim Parsey's Sweep concept arranged the components into two horizontal curving planes with a flat panel display and tiny lights that illuminate the keyboard, allowing the user to work in the subdued light found in a home environment.

As Bob Brunner had hoped, most of the Pomona designs used PowerBook components and flat panel displays to make their concepts as svelte as possible. The Tokyo-based consultancy IDEC, for example, encased their concept in a thin curved wood panel with contrasting black metal trim, a flat panel display, and the components laid out in a single plane bracketed by two thin external speakers.

Thin Curved Panel. Taking a similar approach, Bob Brunner designed a foam sketch that not only did away with the traditional CPU box and display, it dematerialized the computer into a simple curved plane. With a flat panel display in the center and a CD-ROM drive below, the concept had stereo speakers that curved outward at the sides, embracing the user in a manner reminiscent of Bang & Olufsen audio equipment. For this reason, it was dubbed the "B & O Mac."

Like all design-driven concepts, Brunner wanted his thin curved design to push the idea of a computer to the edge of possibility, figuring that if his idea was compelling enough, it would inspire Apple's engineers to find ways of making it work. As a concession, he sketched his curving plane in two flavors—one using a conventional CRT display that extended out the back; and another with a flat panel display that would be more difficult and expensive to produce but would also guarantee the slimmest profile. He then leaned the curved panel against a hoop-shaped foot, allowing the angle of the panel to be adjusted. When he was done, Brunner's concept looked less like a computer than a personal home theater.

In January 1993, the designs were assessed.

First Cut. "As we assembled the concepts, there was a lot of provocative work," Brunner recalls, "but we preferred ideas that emphasized the computer as a product rather than a piece of furniture." Brunner then selected five concepts for development into hard models: Tim Parsey's Sweep; Montgomery & Pfeifer's concept; a grey slab-like design by Naoto Fukasawa of IDEO; Eric Chan's Tizio concept, which Brunner would model himself; and the thin curved panel, which IDEO designer Paul Bradley would develop.

"Philosophically, Bob's concept had the most potential," says Bradley. "The shape was simple enough for most people to understand. The wraparound gesture encouraged a sense of intimacy between the user and the machine. It combined computer and audiophile functions in an interesting way. And using a flat panel display, the concept could be very thin with almost no perceived mass."

In early 1993, Bradley refined the Brunner concept into a black, mahogany and silver hard model with a centered CD-ROM drive below the screen, widely-spaced buttons on the case to access the most frequently-used functions, curved fabric over the speakers, a sculpted backplate, a hoop-shaped cast aluminum foot that allowed the concept to tilt at a comfortable angle and a curvy black and mahogany PowerBook-style keyboard.

During the summer of 1993, Brunner's thin curved panel and four other Pomona concepts were shown to focus groups across the U.S.—with the Brunner concept being the clear favorite. At that point, Brunner turned the project over to Jonathan Ive, who had just completed the design and follow-through on Lindy.

Enter Jonathan Ive. "On a technical level, we understood the challenges associated with packaging a lot of components into a very slim space," Ive says. "But philosophically the project was more challenging. Like the first Macintosh, the design had no predecessors, which meant I had to come up with a new meaning for the product"—one that represents a departure for Apple, yet still looks familiar enough to be seen as a Macintosh. "I wanted the design to be simple almost to the point of being invisible," says Ive. For that reason, he considered many of the details on Paul Bradley's hard model too aggressive. Before he was finished, he would change every one of them.

Redesign. First, he altered the proportions. The wide panoramic sweep of the first model was dramatic, but too extreme. To improve it, Ive made the design taller and narrower, giving it a more upright

stance similar to the first Mac. Next, he focused on the curved a minum foot, which supported the panel. The shape—known a bale—was beautiful, but Bradley's version was too strong for the pr uct Ive had in mind. So he softened it and designed a mechanism t allowed the bale to fold up against the back of the product to serve a handle when carrying the computer from room to room, "The ir grated handle was an important feature on the original Mac," so Ive. With the bale folded up, the design fits perfectly under the an

Using feedback from focus groups, Ive then concentrated on CD-ROM drive. Several respondents considered it too bright and c tracting, particularly when a disk was spinning inside. Since essence of the Mac is its on-screen interface, it was important make the front of the product as quiet and restrained as possibl

Next, Ive redesigned the back panel, giving it a gorgeous thr dimensional curve with a more generous curve near the bottom make the product appear strong and provide enough space for t circuitboard, drives and other components that would fit inside.

Rather than think of the product as an objet d'art, says Ive, " concentrated on the same criteria as the original Mac: making best use of desktop space, giving the product a unique identity a allow for keyboard storage underneath ...reclaiming the most imp tant space for the user, the area directly in front of the product."

Ive also had to deal with the computer's multimedia personal "As technologies converge, blurring the distinction between we entertainment, communications and other functions, we need to g these objects a meaning that is consistent with their new identity.

Smoke & Mirrors. In March and April of 1994, Ive handed design over to product designer John Johnston and electronics en neer Wil Oxford, who built the first working prototype (Plates 39 395). Dubbed the "Smoke & Mirrors" prototype, it had a 10.4-in display, floppy drive, hard disk, a 2x CD-ROM drive and ster speakers inside the curved panel, and a circuitboard, power supp and subwoofer inside a Centris 660AV box on the floor (which t product designers painted black to hide its presence). "It was a kludgey," says Johnston, "but it gave us an idea of what the product could become."

As the first prototype took shape, Macintosh marketing manag Dan Rubin prepared a brief for the in-house review that would necessary to fund additional development. In the brief, Ruh described the concept, outlined the costs and benefits, and gave t concept its first official code-name: Spartacus, a word that had be kicking around IDg for months.

After the review, which the concept passed with ease, Ive set work on the final design—the challenge was to fit all (or most) the components inside the slim curved case

The main problem was the circuitboard. For months, the designed ers had considered using an enhanced version of the circuitboard used in the M2 PowerBook. Such a board would allow the deskter unit to be remarkably thin yet still contain all of the necessary contained and the statement of the statement.

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onents. The problem was performance. Even though the board as capable of accepting a 200MHz PowerPC processor, it did not fer the same performance video performance and expansion ptions as its desktop equivalent.

"PowerBook components offer a lot in terms of miniaturization," ivs H.L. Cheung, the general manager of the \$4 billion Macintosh erforma division, which would manufacture Spartacus. "But miniaire components are more expensive to produce and nearly half-aeneration behind desktop components in terms of performance. ortable computer buyers are willing to pay a bit more and give up ome performance in order to have the smallest possible product. But as a desktop computer, Spartacus needed top performance sing lower-cost common parts." By using a standard desktop ciruitboard, Apple could not only offset the cost of developing the new design and allow the developers to give Spartacus a few extra eatures, such as a custom-made graphics accelerator chip and mhanced sound. For that reason, management decreed that partacus have a standard desktop circuitboard-the same board code-named Alchemy) that had been developed for the mass-market Performa 6400, known as Instatower.

In order to fit the Alchemy board inside the slim Spartacus case, ve had to expand his original design by six millimeters in height and width to preserve his original proportions. Mounting the board in the center of the product, directly behind the flat-panel display, ne positioned the floppy drive, CD-ROM and hard drive around the motherboard at the three-, six-, and nine-o'clock positions, placed an FM tuner on a separate daughter board, and put a cable-ready TV tuner on yet another board, which the product designers tucked tucked into the bottom of the case, near the back. Stereo speakers were then set behind narrow fabric enclosures at the sides.

Since these components filled all the available space inside the case, Ive placed the power supply (and its cooling fan) inside a brick-shaped enclosure on the floor. Yet one problem remained: where to fit internal expansion cards.

Designing the BackPack. Even though the original Pomona concepts allowed for minimal expansion, surveys showed that desk-top computer users wanted at least one expansion slot to give their computer additional power or functionality. The Alchemy board filled this need by offering both PCI expansion and a communications slot for inserting an internal modem or Ethernet card. Ive's task was to find a way to fit the cards inside without sacrificing the thinness of his design. "Even though PCI expansion was essential, many users never expand their computers," says Ive. "For them, I wanted to preserve the thin look of the original design."

For those who needed expansion, Ive designed a second back panel—known as a "backpack," replacing the original back panel. The new panel kicks out at the top to provide room for two expansion cards Used only when a PCI or communications card is inserted, the "backpack," can he substituted for the original back in min-

utes and will be included with every Spartacus unit sold.

Beyond its functional purpose, the backpack also serves as a visual metaphor. "With the original back in place, the design is powerful yet physically lean," says Ive. "But with the backpack inserted, it becomes a real power system, expressing on the outside the enhanced function contained on the expansion card inside." Since many users will want to fill the communications slot with an Ethernet card, every Spartacus unit comes equipped with a 33.6Kbps Geoport external modem, which attaches via the modem port on the back.

With or without the backpack, the rear panel is the strongest part of Ive's design. Both simple and complex, the back is composed of three elements: a concave surface at the top with conically-shaped perforated vents at the top, a massive three-dimensional curved surface in the center that hugs the internal components very tightly, and a more generous curve below, which contains the I/O ports and provides an effective visual transition between the back and the hoop-shaped foot.

To design the back panel, Ive first developed the surface in 2-D using Ashlar Vellum software on a Macintosh, then drew cross-sections along the *x*- and *y*-axis every few centimeters. Ken Provost then entered this information into his CAD workstation to develop the massive three-dimensional shape. "The back of Spartacus is something I couldn't have done a couple of years ago," says Provost. "The shape is so subtle, it would have been impossible without first doing Blackbird."

Ports on the back include a video-out socket, external headphone and speaker jacks, ports for SCSI, FM and TV antennae and ADB, modem and printer ports located behind a locking door for better security.

Masterpiece. With so much attention given to its form, entertainment value and audio/video performance, Spartacus transcends the idea of a desktop computer. Like the original Macintosh, it's a fundamentally new product. The more one looks at it, the more subtle—and un-computer-like—it becomes. Surfaces that appear flat at first glance, such as the bezel surrounding the CD-ROM drive, are actually curved with subtle contrasts that catch light in an unusual way, heightening the sense of drama and intrigue. Though full of interesting details, no single element distracts the eye or calls undue attention to itself. As a result, the final product exudes a profound sense of calm, allowing Spartacus to rank among a small handful of mass-produced objects that achieve true masterpiece status. "The design challenges our perceptions in a fundamental way," says Ive A more radical or elegant solution hardly seems possible.

As the final design came together, the rest of the Industrial Design Group marvelled at the way Ive mixed subtlety with strength. 'It's *really* complicated geometrically," says Tim Parsey. "But it doesn't *look* complicated. From the front, the design is quite simple. Yet it embraces the user in a powerful way. It's incredibly thin, yet the back tells you that it's strong enough to support itself with ease. And every curve and detail has a purpose." The perforated venting at the top is so finely handled that it balances function with visual appeal.

Using an automotive analogy, Parsey sees Spartacus as part sports car and part luxury sedan. "The back gives you a power statement, like a Dodge Viper or a Porsche 911. But the front is clean and restrained, like a Mercedes or a Lexus." In this way, Ive shows that a rich product statement should appear *less* complicated, not more.

Sparky. When showing Spartacus to management in 1994, IDg also presented smaller and larger versions of the concept to illustrate how a Spartacus product family might look. The smaller version, called Sparky (Plate396), was designed by Tim Parsey using a 10.4-inch flat panel display and internal components borrowed from a PowerBook 550c (the Japanese version of Blackbird). Conservative in its rear geometry compared to Spartacus, the Sparky design is more complex and eye-catching on the front, with an interesting mix of color and texture, inward-curving surfaces, framing elements around the display and hard buttons, such as a moon-shaped control that puts the unit into sleep mode and a sun-shaped button that wakes it up. Speaker holes below the screen convey the idea of sound travelling outward, which strengthens it's visual appeal.

Sound by Bose. From the outset, everyone on the project wanted Spartacus to include high-fidelity sound. Yet generating that kind of sound forced the designers to physically isolate the vibrating speakers from the circuitboard, drives and active matrix display. "Every time we turned up the volume, the CD-ROM drive would skip," recalls product designer Johnston.

After months of trial and error, the solution was found during the summer of 1995, when Bob Lapino, a representative of the Bose Corporation, renowned for its high-fidelity speaker technology, suggested that Apple replace the speakers in the head unit with Bose Cricket drivers (which produce high- and medium-range frequencies) and tuck Spartacus's brick-shaped power supply and cooling fan inside a Bose Acoustimass subwoofer on the floor. With the Bose system in place. Spartacus could deliver spacious sound using only 40 watts of power. Tucking the power supply (and cooling fan) inside the subwoofer also eliminated another problem: noise. "Because the fan is constantly turning, you don't realize how much noise a computer makes until you turn it off," says Lapino. "Isolating the power supply fan allows Spartacus to run virtually silent." When the speakers are not pumping out sound, the only noise the computer makes is the occasional whir from the CD-ROM and a barelyperceptible sound made by a tiny fan positioned directly over the PowerPC chip inside the case.

Compared to the ultra-modern design of the desktop unit, the canister-shaped subwoofer has a vaguely retro look. From a distance, it looks like a smokestack on a 1930s ocean liner. To protect it from occasional kicks and bumps, IDg's Jay Meschter crafted a thick rubber ring around the top.

Whether listening to the FM tuner, cable TV, or an audio CD, the Bose system makes using Spartacus a true pleasure. Even the chime that occurs when the machine boots up has new depth and re nance. "When we heard that sound," says H. L. Cheung, "we understood what Spartacus could mean and executed to that leve

Outside Opinions. With the Alchemy board, an 11.3-inch disp and Bose system in place, John Johnston's product design team copleted Prototype One (consisting of five hand-built units) in Ne ember and December of 1995. This not only proved that the desi could be made in volume, it allowed working units to circulate a reactions to be assessed. As more people saw the design, Ive reca "gender issues came up again and again. Some people considered the product feminine because of its soft curves. Others considered masculine because of its strong iconic quality. Philosophically both, which tied into our thinking about Espresso at the time."

In retrospect, Ive says, "it would have been easy to go too far w the design and 'make a statement.' Instead, we made a conscieffort to be as restrained as possible, to give the product a sense longevity. As a successor to the original Macintosh, it was importa that we design Spartacus for the long term, so that it will look strong 12 years from now as the original Mac does today. For th reason, there's nothing added and nothing missing ... except p haps a larger screen." The screen problem was solved w Prototype Two in June, 1996 (five more units with a 12.1-inch d play, a 4x CD-ROM, and a 200 MHz Power PC chip on an enhance version of the Alchemy board, code-named Gazelle

Final Changes. After living with Prototype One for months, eve one at IDg agreed that the aluminum foot needed to be more robu and the integrated microphones should be moved from the top of t speakers toward the center to minimize audio feedback. But no o could agree on the color. From the first Paul Bradley hard model bu in the spring of 1993 to Prototype Two in the spring of 1996, all vasions of Spartacus had been clothed in dark gray with brushed or p ished metal trim and mahogany veneer around the keyboard. But t longer the designers lived with this decision, the less certain th became. "Some of us felt the color was too strong," Ive conced "But, we had all looked at the concept so much, we couldn't deciwhat color it should be."

To get a fresh opinion, Jay Meschter hired the San Francisco col and textile consultant Thome Guido-Clark, who advised IDg not think about the *product* when selecting a color, but think inste about the *environment* in which it would be placed. "Spartacus h such a beautiful shape," says Laura Guido-Clark, "we didn't want treat it like a television or even have it read as an object. We did want the design to say, 'Hey, look at me.' "

To determine the right color, the consultants built palettes, usin a variety of fabrics, woods, painted surfaces, metals, carpet an leather that are found in a typical domestic environment. Spartac mockups were then painted various shades and placed against eapalette under different lighting conditions. More than a doze options were reduced to three, and finally to one—a green/gc mixture with a slight metallic content. The color, which resembles bronze, is used for the case, the edges of the keyboard and the subwoofer. The metallic content in the paint gives the product a chameleon" effect—allowing it to reflect its surroundings in a subtle bet interesting way. Because of this effect, the final product works well in virtually any interior. The mahogany palm rest on the keyboard was changed to black leather, which will look and feel better over time than wood.

Full Feature Set. The final specifications for Spartacus are stateof-the-art in all respects but one. It includes a 250MHz PowerPC 603e processor, a 3-D graphics accelerator; 32 MB of RAM, a 12.3-inch active matrix color display; a 2-gigabyte hard drive; integrated stereo mcrophones; FM stereo and TV tuners; the Bose sound system, PCI and Ethernet expansion, a 33.6 Kbps external modem; and more. Only the 4x CD-ROM drive falls short. The reason: no 6x or 8x drive can read a disk accurately when mounted in a vertical position. "The 4x CD-ROM was a classic trade-off," says Ive. "The benefit of mounting the drive upright, which preserves the slender product profile, outweighed the performance loss of a 4x drive."

With the final details in place, John Johnston's product design team finished Prototype Three (95 units built on an actual assembly line) in August 1996. By September, the tooling for the case was complete. The final prototype was finished in December 1996.

As the design came together, we discussed the convergence of computers, communications, disk-based media, learning and entertainment, and developed a form that gives new meaning to this convergence," says Ive. A product such as Spartacus is better suited to home-based multimedia applications than a conventional desktop computer, because it offers a more personal experience. "It envelopes the user and makes a better statement about what a computer can be." Using Spartacus is also a more casual experience. Because of its rich sound, vivid screen and high product value, it's not only a pleasure to use, it's actually *exciting*—something that users accustomed to computers in boxes have almost forgotten.

Depending on the application, Spartacus can be anything the user wishes. At one end of the spectrum, it delivers multimedia with a combination of sight and sound that will keep the user constantly interested. At the other end, it can offer a totally passive entertainment experience by delivering broadcast/cable television, CD-ROM movies or high-end stereo sound through the CD player or tuner. Add Web browsing, and conventional computer functionality, and Spartacus becomes an all-purpose home entertainment, productivity and communications center.

"With Spartacus, we are moving away from the computer as a generic machine," says Ive. "Like the first PowerBook, Newton and now eMate, Spartacus shows how the physical expression of computing has changed. As more people see it, its impact will become apparent, which will change user's expectations"—the way the first

Macintosh did in 1984. "It's our job to observe these changes and evolve new ways of connecting technology to people in even stronger ways."

Unveiled on January 7, 1997 by Gilbert Amelio at the Appleworld expo in San Francisco, the first two Spartacus units were given to Apple's co-founders Stephen Wozniak and Steve Jobs. As employee number one, Wozniak received unit number 00001; Jobs received unit 00000. To celebrate the product, Apple has mounted a lavish Web site with QuickTime video tours showing how Spartacus was developed, how the case is molded and sprayed, how the circuitboard is laid out, how the aluminum bale is cast and how the finished units are assembled—plus a feature than allows Web browsers to order the product. As a commemorative product, Apple will assemble only 20,000 of these dream machines, then break the mold—thus making Spartacus a true collector's item.

Rather than ship finished units in a conventional manner, Apple will deliver each Twentieth Anniversary Mac via a specially-trained 'concierge' who will set up the machine, install any expansion cards and advise the user on how to achieve the best possible performance.

The design not only commemorates Apple's 20th anniversary, it spearheads the company's "Third Decade" campaign—an entire family of CPUs, printers, displays and other peripherals designed by the Industrial Design Group, which will be unveiled in 1997–98.

AN INTERESTING POSTSCRIPT TO THE SPARTACUS SAGA IS THE FACT THAT Jonathan Ive now considers the design tame compared to products IDg has done for Apple's Third Decade. "Everyone who sees Spartacus speaks of it in terms of the present and the future, except us," says Ive. "We refer to it in the past tense." As they do Espresso.

After five years of development, during which Espresso became the most recognizable and enduring corporate design language in American business, Jonathan Ive and his team at IDg decided during the summer of 1996 to start over. As Apple reassessed its product strategy in the face of the most withering competition in its twentyyear history, IDg returned to its roots. For Jonathan Ive, that meant not only developing a new look and feel for the products, but going beyond the formulaic approach that design language implies—injecting the sense of excitement and possibility into Apple's next round of product that users remember and want to see again.

Since its founding on January 3, 1977, two doctrines have shaped Apple's corporate mission—an unwavering belief in the rightness of its own ideas and, if necessary, to go it alone in an effort to serve its users. Assuming that it alone had the best ideas for hardware, software and industrial design led Apple to develop the most innovative products in the personal computer industry—such as the Apple II, the Macintosh, the PowerBook, the first multimedia computers, peripherals such as the LaserWriter and the Telecaster display. Newton, QuickTime video, and now Spartacus. Yet, in 1995, a split developed within the company that has grown wider in 1996 and

early 1997. Simply put, Apple's innovation in software has slowed, allowing Microsoft's Windows operating system to catch up, and in some ways surpass the MacOS. For the past five years, Apple executives have promised a next-generation operating system under various code-names. The most recent attempt-called Copland-cost Apple untold millions in development costs, only to be cancelled in the fall of 1996. In a not-so-secret search for a new operating system that Apple could merge with its own effort, interest quickly centered on a tiny startup company called Be. Inc., Founded in 1990 by former head of Macintosh R & D Jean-Louis Gassée, Be harnessed the expertise of some 50 software writers (including many former Apple employees) and came up with an innovative piece of software called BeOS. Written for the PowerPC chip, the BeOS was demonstrated on a PowerComputing machine at the fall MacWorld expo in Boston. It not only ran existing Mac applications faster than the current Mac OS, Be's multi-threaded code structure makes it ideal for audio- and video-intensive applications (a traditional Apple strength) running on machines with more than one processor. Soon negotiations to purchase Be and its software spilled into the newspapers, sparking rumors of a \$500 million price, a rich number for an unproven software. Then, in the land where memories never fade, Gassée's old adversary at Apple, Steve Jobs entered the picture. For years, Jobs had been marketing his own Unix-based Next software-an objectoriented operating system that can run on PowerPC and Intel Pentium chips-winning acclaim from developers for its power and simplicity but not gaining enough market share to be a significant player. Hearing of Apple's interest in buying a new operating system, Next convinced them to take a look, at which point Jobs weighed in to give a presentation to Gil Amelio and a handful of Apple executives that convinced them to put aside Plan Be and develop a NextMac instead. In a stunning move that caught the entire computer industry off-guard, Apple announced in December 1996 that it would purchase Next Software, Inc. for \$433 million and invite Jobs to assist in the development of the new Mac operating system, reporting directly to Gil Amelio. Software developers familiar with Next's object-oriented code structure hailed the decision. Software writers at rival Sun Microsystems declared that the Next OS is at least five years ahead of anything else on the market. Formalizing the Apple/Next alliance. Gil Amelio invited Jobs to the stage at the January 1997 MacWorld expo in San Francisco and announced that Jobs and Apple co-founder Stephen Wozniak would both return to Apple to sit on an executive committee charged with steering Apple away from the abyss. Jobs then presented the Next OS to the assembled audience. When he finished, the standing ovation was so loud and sustained, it reminded old-timers of the applause Jobs received in January 1984 when he unveiled Macintosh.

In early February, Apple let it be known that Jobs would not only advise Gil Amelio on the new operating system but rejoin Apple on a part-time basis, installing Next executives in key hardware and software positions and taking a more broad-bas interest in Apple's revival.

Once pessimistic about Apple's future, Jobs is now optimis insisting that an improved operating system and new faster hardw will enable Apple to challenge Microsoft, much as the Macinto challenged IBM technology ten years ago. "If anything, "he sa "IBM was more powerful than Microsoft is today."

Apple couldn't hope for a better pitchman than Jobs, whose gen for exciting others—especially programmers who write the all-imp tant software that makes computers so valuable—is legendary. So his abiding interesting in the industrial design that is now Appl principal strength.

From his earliest days, Jobs has been a modernist—an advoct for the "simple elegance" that the first Macintosh embodied and to SnowWhite design language carried to an even higher level. To notion of "taste"—born of wide experience, a very specific sensibty and an almost genetic understanding of popular culture—looms large in Jobs's business strategy and world view that it's impossil to believe that he will not apply this standard to Apple's upcomi products. Great products, says Jobs, are a triumph of taste, of "tryi to expose yourself to the best things humans have done and then t ing to bring those things into what you are doing." Jobs's return Apple not only signals an opportunity to reintroduce these standard into an industry that has grown dull and predictable, it could be major opportunity for the Industrial Design Group.

No longer a proponent of the design language strategy that II pursued under Bob Brunner, Ive has stepped away from t Espresso aesthetic in a major way. The first evidence of this shift w Thomas Meyerhöffer's design for the eMate 300—with even me radical changes just around the corner.

According to Ive, Apple's earlier ID strategy allowed the company to inject a coherent aesthetic into a growing line of product Yet getting the work done meant employing outside consultants help execute the most labor-intensive projects. In so doing, App provided R&D for the rest of the industry by allowing too mu about its design language to pass to competitors's products. Desig for Hewlett-Packard's 1996 desktop computer line, supplied by Lur Design, was only the most obvious example of what Apple fol describe as "leakage."

To reverse this trend, Ive has stopped using outside designers at compelled the Group to generate everything in-house. This mak the atmosphere at IDg as busy as ever. Management reaction h been positive "Gilbert Amelio gives more support to industrial desig than any CEO in Apple's history," says Ive. "Since our integrity is a the line with every product we ship, we're determined to mainta our leadership in design and enhance the user experience in ever possible way." IDg now works smarter than ever before: limitin complex surfaces to areas that have the most impact, evolvin designs more quickly than in the past as they come up with a tota Ś

ly new look and feel for their "Third Decade" product line.

"For a designer," says Ive, "there couldn't be a more exciting place to work at this moment than Apple."

LOOKING FORWARD

Plates 415-418

"We are what we repeatedly do. Excellence, then, is not an act, but a babit." —Aristotle

AS APPLE ENTERS ITS THIRD DECADE, ONE EVENT HAS ALTERED EVERYONE'S view of the future: the return of Steve Jobs. For months, Jobs has said that must first reinvent itself before it can recapture the spirit of innovation that once drove the company. Since his departure in September, 1985, Apple made huge profits off the Macintosh technology that he helped to develop. But as the profits piled up, Something Happened that would take a book much larger than this one to explain. For every innovative product released since Jobs's departure-such as the Macintosh II, the Mac LC, the PowerBook, peripherals such as Telecaster, the eMate and Spartacus-there were almost as many failures-such as the Macintosh Portable, the first Newton and the M2 PowerBook-as well as technologies such as Jonathan, Figaro and Palladin that never saw the light of day. While the rest of the industry hurtled forward at an almost frightening rate, Apple maintained a steady pace, allowing 'Wintel' PCs to catch up in terms of performance and take a commanding lead in market share.

Jobs's official role at Apple will be to advise Gilbert Amelio on the creation of Apple's operating system, code-named Rhapsody, which is scheduled for release in 1998. To that end, Apple installed the former head of software at Next, Avie Tevanian, to lead Software R & D and Jon Rubenstein, former head of Next's hardware division, to take charge of Apple's hardware R & D. Since Jonathan Ive reports to Rubenstein, who in turn reports to Gil Amelio, this puts the Industrial Design Group closer to the chairman's ear than ever before.

The question remains: what role will Steve Jobs—one of the most design-savvy executives of all times—play in the shaping of Apple's industrial design?.Will IDg join software and hardware on the list of things that need to be reinvented?

Assessing the Jobs Factor. The day Steve Jobs stepped away from Apple in 1985, Apple's products represented the epitome of modernism. A combination of German restraint and California populism, the SnowWhite look of the mid-1980s not only reflected the tastes of its principal creator. Hartmut Esslinger, it mirrored Jobs's own belief that products should have "simple elegance." The very notion of "taste"—a word that Jobs uses often—plays a role in every decision he makes. Last year, when the time came to buy a washer/dryer for his home in Palo Alto, Jobs didn't pick up the telephone and place an order the way most Silicon Valley executives would do. Instead, he discussed the problem with his family at the dinner table, examined the issue from all sides, made a list of the qualities the family wanted most (a machine that uses minimal water, detergent and energy; one that generates little noise, has a tasteful exterior.), researched every model on the market., then chose a German model, even though it cost twice as much as a competing American product. The parallel between this exercise and the 1982 SnowWhite program is stunning—and proof that Jobs's dedication to design hasn't waned. If anything, it's stronger than ever.

Since the day Apple was founded, Jobs has considered great products a triumph of taste, which he defines as "trying to expose yourself to the best things humans have done and then trying to bring those things into what you are doing."

As this book goes to press, Jobs has yet to visit the Industrial Design Group. Naturally the current Group is as different from the old frogdesign as one can imagine—which only feeds speculation as to how Jobs will react. He will certainly be impressed by the people he will meet—whose skill, commitment and understanding of design issues are second to none. But what will Jobs think of their *designs*

One thing Jobs will not see is anything that remotely resembles SnowWhite. As Apple has broadened its product line over the past twelve years-with desktop Macintoshes for the professional market. consumer Macs for the home, PowerBooks, Newtons and assorted peripherals-it needed a more flexible design approach than SnowWhite could provide. The design of each product had to be appropriate for its function. Everything had to have a consistent "Apple" quality without being dependent on a specific look or set of details. This led IDg to develop the Espresso design language, which did away with the rigidity of SnowWhite, made luxurious use of form and detailing, emphasized the relationship between products and allowed each product to "be the best it could be." By stressing relationships rather than rules, Espresso survived far longer than SnowWhite and produced many more successful products. Yet the sense of forward motion that Espresso promised did not prevent competitors from borrowing elements for use in their own productswhich undermined the unique look that IDg had set out to achieve. Nor could Espresso evolve as quickly in 1996 as it did in 1993.

"The pace of change today is so much faster than the days when Espresso was developed that any new language we create now would seem as inappropriate in 1999 as Espresso does today," says Jonathan Ive. "Therefore, as we head toward a new century, the Group will focus less on language as a tool to define products, and more to do with giving form to increase our products's meaning."

The Paradox of Technology. Achieving this goal means addressing the most basic question in all of computer design: the paradox of technology. In the past, it was enough to design objects that were easy to understand by giving the user visible clues that indicate bow the product functions. But as technology gains in complexity, much more is required. "The problem with the PC is that the design does not communicate the meaning behind all that complexity," says Jonathan Ive.

The technologies and infrastructures that now control the PC's destiny—such as microcircuitry, bus architecture and the Internet—have no meaning other than themselves. The bits and bytes that computers process have no physical substance. They come from everywhere and nowhere, invading our space until we hit the "off" button. By its very nature, data has no inherent meaning or emotion. It is inert, sterile, with no loyalty or conviction, no past or future. It simply is.

Fortunately, the object we use to access this data, the personal computer, *can* have a meaning derived from its physical presence, its shape, color, detailing and the relationship it has to our mind and body. It is this relationship, plus the marriage of the design to the interface on the screen, that is the key to computer design. The designer can not only influence this relationship, he or she can humanize (and thereby give meaning to) a technology on which we all increasingly depend, turning what was once a dull machine into a symbol that describes more than itself.

The Power of Form. Central to any understanding of design is the realization that form is the most powerful tool we have to convey a product's function, identity, context and meaning," says Ive. A great form not only provides the cues necessary to understand a product, it can tell a story or reveal itself in ways that makes using the product a pleasure.

Form can also address the central paradox of modern computer design: as the underlying technology grows more powerful, and the feature set and functionality of the computer increases, the product's *meaning* becomes more ambiguous.

"It's easy to forget what a complex blend of technology and functionality we mean when we say the word computer," says Ive. "A decade ago, it wasn't necessary to explain what the product did or what it meant to the user. In frogdesign's day, it was enough to establish a set of aesthetic cues and design a CPU, a monitor, keyboard and mouse to fit that formula."

Compared to today's computers, it was much easier to treat the first Macintosh as an icon with its limited power and modest functionality. Because it was simple and self-contained, the user could visually digest that first Mac, identify with it, and even fall in love. But giving a product as complex as Spartacus that same quality is immensely more difficult.

"When an object functions as a word processor, a fax machine, an electronic mailbox, a television, an audio system, a gateway to the Internet, a window to your family on the other side of the world, a laboratory for creating digital art and a tool that can help you design a home, a food mixer or a backyard landscape, there is no easy icon to draw upon," says Ive, "no mental image that will give the product a coherent meaning to everyone who uses it." Yet the simple story-telling power of form can go a long way toward closing this gap, giving significance to a product that would otherwise be confusing.

Defining User's Perceptions. "As we have struggled in recent years to define the sensory experience of the computer in its broad-

est sense, we now understand that as industrial designers we relonger design *objects*," says Ive. "We design the user's *perceptions* what those objects are, as well as the meaning that accrues from their physical existence, their function and the sense of possibilithey offer."

On the most basic level, IDg not only designs computers, prir ers, displays or other things. They design experiences. The desig itself represents only half the equation. It's the interaction with the user that completes the picture, allowing the design to come to lif making its existence complete.

"Our recent work—such as K—suggests the direction we will tal in this regard and the radical moves we will make with the desig of future products. If we succeed, tomorrow's computers will mea more to people than the grey boxes of today, and *much* more tha the aggressively-styled grey boxes whose styling is rooted in the quest for differentiation.

"Rather than follow that trend, we will embrace the customer never before, giving them the opportunity to dominate the design we create and understand them on an emotional level. As App designers, we will continue to deliver power, ease of use and funtionality that is second to none. But the fruit of our work will b *shaping the perceptions* of those who use those products ... The more we learn about our customers and users, the easier it will b to reach that goal. Ultimately, the pursuit isn't differentiation for own sake, it's value," says Ive. "Value is defined by usable, engaing and emotive solutions."

How will IDg make the computer more humane? By making digital and mechanical components and the relationship between the object and the interface on the screen more intuitive, accentuaing the sensual and poetic quality that allows a product to enter of world, change our behavior and make us better than we we before.

Less Style, More Humanity. "We're tired of restyled computers says Ive. "The very act of styling distracts the designer from the trickier issues of object meaning. 'Style wars' may excite corporal marketing departments, but styling and differentiation for its ow sake is bad for users, because it robs the computer of its unique identity and reduces it to just another lifestyle produe Differentiation has never been a goal at Apple. It has been a consequence—the result of an ongoing effort to humanize technolog understand what it means, and convey that meaning to users ever where. Our goal at Apple has never been to *look* or *feel* different says Ive. "The goal is to *be* different."

Achieving that difference is the job of Daniele DeIuliis, who designs for the Mac Color Classic and Blackbird personified the Espresso design language. "As we developed Espresso, we began use design in a more detailed way. As our product line grew, we evolved a rhetoric of design that allowed us to give each product individual look without diminishing their overall Apple identity. As we move forward, we will expand on that."

Highlighting this change, DeIuliis cites the eMate. Compared to past Apple products, he says. "eMate is specific, even a bit idiosyncratic. It looks like it was designed for one person rather than an audience. Rather than address users in a general way, each new product will engage the user in a personal dialog. As the design becomes more localized, we will think of the user as an individual rather than part of a group and give our products more personality and energy."

There will still be a six-color badge on every product, says De Iuliis, "but we will build on that identity, make it more expressive and specific, and wind up with products that are a lot more personal."

As eMate and Spartacus suggest, IDg will also move away from opaque injection-molded ABS in favor of new materials. "On Blackbird we used metal latches and other exotic materials. On Spartacus, we incorporated leather palm rests and a metal bale. In the process, we've added other elements to our pallette, such as translucent plastics" and other materials that IDg is not allowed to talk about—yet.

As Apple's Third Decade product line is introduced later this year, there will be great anticipation about what kind of designs IDg will offer. For months, the models have been covered with drop cloths to ensure that *no one* outside the company sees them. Those who have taken a peak agree that Apple's upcoming products will look and feel as new as anything the public can imagine.

At times fanciful, at times austerely beautiful, the new designs convey less of an industrial aesthetic—that cramped Silicon Valley look that is now a cliche—and more the look of the land, sea and sky with which we are all familiar.

Previewing the Third Decade. The last four plates in this book offer a taste of things to come. One shows a detail of an upcoming portable product that resembles a porpoise or whale gliding through a sargasso sea. Another shows the corner of a Newton product that

looks so leaf-like that it could easily be alive. Another shows the side of an upcoming CPU looks like a vast desert landscape with a lonely road that meanders toward the horizon. The final image shows a motion detail a top-secret product whose flexible architecture and evanescent quality are unlike anything we have ever seen. "When we think of the Macintosh today, we think of it less as a machine and more as a philosophy," says De Iuliis, " a level of pleasure that we try to embody in every product we do."

As IDg moves beyond design language into uncharted territory, the potential for chaos is real. "But a certain level of chaos is inevitable," says DeIuliis. "We will continue to design so that when the consumer sees something for the home, education or business, the message will be clear." Beyond that, the future looks wide open. "It's a mistake to think that you can control the future by forcing products to have a certain look," says DeIuliis. "The moment you think you've succeeded, everything changes. The best you can do is stay nimble, believe in yourself and try not to stay in the same place too long." If the four new products IDg has allowed us to see are any indication of Apple's future, then we're about to see the most startling comeback in American business history.

CONVENTIONAL WISDOM SAYS THAT IT TAKES THIRTY YEARS FOR ANY NEW technology to become truly pervasive. The telephone, the automobile, radio, motion pictures and television all followed this thirtyyear time frame. In all likelihood, the personal computer will do the same. But the PC we use ten years from now will bear scant resemblance to the computers we use today. How will it look? Like Spartacus? Will it be a Network Computer? An inexpensive portable like eMate? Or a full-featured PowerBook like Epic or Hooper? Since no one knows, only one thing is certain: the future is still up for grabs.

With the personal computer now in its twentieth year, the next ten years will be a very interesting time, particularly for the Industrial Design Group, who will be there shaping what we see, feel and think.

DRAMATIS PERSONAE: KEY INDIVIDUALS IN THE HISTORY OF APPLE'S INDUSTRIAL DESIGN



Steven P. Jobs The most innovative entrepreneur of his time and a guiding force in the evolution of the personal computer. Steve Jobs was born in 1955, grew up among the apricot orchards that would later be known as Silicon Valley and at the age of 15 met his future partner Steve Wozniak, who was already trying to build his first computer. By 1975, having dropped out of Reed College and travelled to India, Jobs returned to Silicon Valley and began attending meetings of the Homebrew Computer Club with Wozniak. Once Wozniak had completed the first Apple computer, Jobs secured orders for 50 of the machines, and cofounded the company with Wozniak and a third partner on April Fools Day, 1976. In January 1977. Jobs and Wozniak incorporated the company with A.C. "Mike" Markkula and began work on the Apple II, with Jobs hiring Jerry Manock to design the case. The success of the Apple II soon allowed Apple to dominate the fledgling PC industry and begin developing an entire line of products. In December 1979, Jobs toured Xerox PARC, viewed the technology that would revolutionize the PC in the years to come, and incorporated these ideas first into the Lisa (1978-82) and later the Macintosh (1981-83), for which Jobs assembled the team, supplied the basic design idea (an all-in-one unit with an upright stance and a minimal footprint) and received co-credit with lerry Manock and Terry Oyama for the final design. Convinced that Apple's products needed a more sophisticated look and feel, Jobs launched the Snow-White design project in 1982, which brought Hartmut Esslinger to the firm in 1983. Along the way, he spearheaded the Macintosh marketing campaign and oversaw the growth of Apple into a two billion dollar company. Slow sales for the Macintosh in 1984, however, led to friction between Jobs and CEO John Sculley, which precipitated Jobs's departure in September 1985. Jobs founded NeXT Computer, Inc., and the computer animation firm Pixar, which released the Academy Award winning featrue film *Toy Story* in 1995. In December 1996, Jobs sold NeXT to Apple for \$433 million and became interim CEO in July, 1997 (see page 285).

Jerry Manock Born in Los Angeles, CA in 1941, Jerry Manock received a Masters degree in Product Design from Stanford University in 1968. worked at Hewlett-Packard and Telesensory Systems, then became a freelance designer in 1976. In January 1977, he met Steve Jobs and designed the case for the Apple II, giving it a simple slab-like design that would become his trademark. As Apple's first industrial design manager, Manock was responsible for hiring many of the firm's early industrial and product designers. His design for the Apple III (1978-79) was followed by the Macintosh (codesigned with Terry Oyama and Steve Jobs). He also comanaged the SnowWhite project (1982-83), which brought Hartmut Esslinger to Apple,



then stood by as Esslinger's firm frogdesign set up shop in California and displaced Manock and the other in-house designers during the summer of 1983. His authority gone, Manock completed follow-up work on the Macintosh, left Apple in October 1984 and moved to Vermont, where he resides today.

Bill Dresselhaus Born in 1944 and raised in Lincoln, NE, Bill Dresselhaus received his Masters degree in Product Design from Stanford in 1973 and shared office space as a freelance designer with Jerry Manock in 1979, who invited Dresselhaus to join Apple and design the Lisa computer. Giving it a distinctive, if somewhat blocky look, Dresselhaus wrapped Lisa in a shell of interlocking parts and pushed the display forward, toward the user—a daring move at the time. A variation of this design would later be used on the Macintosh. Disappointed by Lisa's reception, Dresselhaus resigned from Apple in 1983 and now works as a freelance designer in Portland, OR.

Terry Oyama Born in 1941 and raised in Hawaii, Terry Oyama attended Art Center College of Design in Pasa-



dena, worked for Singer, GVO and Litronic before joining Apple in 1980 to work in the Apple II division. He codesigned the Macintosh (with Manock and Jobs, 1981-83), creating its now-famous front facade, and later collaborated with Manock and Rob Gemmell on the SnowWhite project. After Hartmut Esslinger won the SnowWhite competition and took control of Apple's industrial design effort during the summer of 1983, Oyama left Apple to join Radius Systems, where he would later design the hugely popular Pivot display.

Rob Gemmell Born in 1958 and raised in Ohio, Rob Gemmell attended Ohio State University and worked for Richardson-Smith, National Cash Register and LucasFilms, before joining Apple in 1981 to work in the Apple II division and complete work on the Apple IIe in 1982. Later that



year, Gemmell gave Steve Jobs the idea that eventually led to the SnowWhite project, which brought the German designer

Hartmut Esslinger to Apple in 1983. As Esslinger set up his frogdesign office in Silicon Valley, Gemmell continued work on his most important project, the Apple IIc, giving it a SnowWhite-inspired designonly to discover that Esslinger had created his own "pure" SnowWhite version of the product. which conflicted with Gemmell's design. Ultimately, Jobs preferred Esslinger's approach and ordered that Gemmell's version be changed. After the IIc. Gemmell declined to work at frog's studio. Instead, he transferred from ID to Apple Creative Services in 1984, left Apple in 1985 to join Commodore Computer, and later became an art director and partner at the design and media consultancy CKS Partners.

Jim Stewart Born in Alameda, CA in 1946, Jim Stewart graduated from San Jose State University in 1970, worked at GTE and Hewlett-Packard and joined Apple in 1980 to design peripheral products. Stewart co-managed SnowWhite with Manock and Gemmell, assumed Manock's Macintosh duties in October 1984, left Apple to rejoin H-P, and



returned in 1987 at Richard Jordan's suggestion to rebuild Apple's in-house Industrial Design Group (IDg). As IDg director, Stewart managed the first attempt to develop a post-SnowWhite design language. called Goldilocks and the Three Bears, which failed, then oversaw a series of projects, including the ill-fated Macintosh Portable. In January 1989, Jordan removed Stewart as IDg manager, naming Bob Brunner to that position in 1990. Stewart then managed printer and imaging projects at IDg, left Apple in 1994, and now works as a design manager at Microsoft.

John Sculley A graduate of Brown and Wharton Business School (with a brief stint as an industrial designer in New York sandwiched in between), John Sculley had risen to the presidency of PepsiCo when Steve Jobs and Mike Markkula tapped him to become Apple's President in 1983. Sculley worked closely with Jobs comanaging the Macintosh launch and Apple's explosive growth, then grew disenchanted, replacing Jobs as head of Macintosh R & D, with Jean-Louis Gassée in June 1985. As the only Apple executive ever to have worked as a designer, Sculley exerted considerable influence over Apple's ID: inspiring the concept for the Knowledge Navigator (1987), working on the Macintosh LC (1989), cancelling Figaro in favor of a smaller pocket-sized Newton (1991) and developing a close relationship with IDg director Bob Brunner. Sculley's insistence that the first Newton ship in 1993, before it was ready, led to an embarrassing launch and helped precipitate his resignation that same vear.

Susan Kare Raised near Philadelphia, a graduate of New York Uni-versity, graphic designer Susan Kare moved to San Francisco in the early 1980s and was asked by her friend (and



Apple programmer) Andy Hertzfeld to supply screen icons, fonts and interface standards for the Macintosh. Using fine-tip pens and the smallest graph paper she could find. Kare created a memorable collection of icons representing the folders, documents, tools, the Trash Can, details for windows, letterforms, drop-downmenus and the "smiley face" Mac startup icon that became central to the Macintosh experience. Today, she works in San Francisco specializing in electronic design.

Hartmut Esslinger Born in 1941 in Bueren, West Germany, Hartmut Esslinger studied design at Schwäbisch Gmünd Technical College and founded Esslinger Design in Altensteig in 1969. Working for AEG, Wega, Essinger developed a cult folming among European and



nican designers. In 1982-83, reparticipated in (and won) SnowWhite competition and a \$1 million-per-year ontract with Steve Jobs, thus making his newly-renamed firm inclusion the sole-source provider of Apple's industrial As corporate design manager, Esslinger gave Apple's modents a fresh and cohesive White look. The first mase typified by the Apple IIc and the Apple IIGS, was crisp playful. The second phase, lound on the Macintosh II, Mac and LaserWriter II, had a more corporate mien. frog also produced portable concepts 1984-85) that culminated in the Madintosh Portable (1989). This jobs remained at Apple, friendship with Esslinger made frogdesign a powerful First within the company; but lobs resigned in September 1985, the situation changed dramatically. As soon - Esslinger delivered the final Me II design in December Apple's product design mininger Richard Jordan gradumy replaced frog with a new -house ID Group directed by Stewart. Undaunted, singer went on to design Seve Jobs's Next Computer, successful products for Bard-Bell and Acer, and now reads a design firm whose influence is felt all around the world.

Stephen Peart Born in 1959 Ser Durham, England, Stephen graduated from the Royal College of Art in 1981, emod Esslinger Design in Germany in 1982, altered the course of their "Digital Design" Show White concepts, and accompanied Esslinger to the SnowWhite presentation in March, 1983. A key member of frigdesign's California team, Feart gave shape to nearly every monter, keyboard, mouse and display that Apple developed between the years 1983 and 1987. His most memorable designs include the ImageWriter II. LaserWriter I and II, ADB Mouse and ImageWriter LQ. After leaving frog in 1988, Peart founded Vent Design Associates and continued to work for



Apple, supplying Goldilocks concepts as well as the design for the Apple Adjustable Keyboard (1992). He now serves as president and lead designer at Vent in Campbell, CA.

Anthony Guido Born in

Portsmouth, NH in 1960, Tony Guido graduated from Ohio State University in 1982, taught design in Germany, and joined Esslinger Design in Altensteig to work on the SnowWhite concepts in January 1983. As part of frogdesign's California team. Guido took part in many projects, including the Apple IIc and IIGS, the Macintosh SE, the Jonathan concept and the Macintosh Portable. After leaving frog in 1987, Guido and ex-frog partner Sigmar Wilnauer designed Twister concepts for Apple that predate the first PowerBook.



Today, Guido directs the graduate design program at the University of the Arts, Philadelphia.

Herbert Pfeifer Born near Altensteig, Germany in 1946, Herbert Pfeifer studied design at Schwäbisch Gmünd Technical College and began working with Hartmut Esslinger in 1969. After the first SnowWhite meeting that introduced Esslinger to Apple in April 1982, it was Pfeifer who made the sketches that Esslinger took with him to his first meeting with Steve Jobs in May. Playing a quiet yet pivotal role in the development of the SnowWhite design language, Pfeifer provided a redesign of the Manock / Ovama Macintosh in 1983 (that was not used), ran interference for

Esslinger during the Apple IIc project, managed frog's California studio and tried (in vain) to improve the situation between frog Apple after Steve Jobs's departure in 1985. In 1989, Pfeifer co-founded the design firm Montgomery Pfeifer in San Francisco.

Brad Bissell Born in San Jose in 1957, Brad Bissell attended UCLA and the Rhode Island School of Design, joined Apple in the summer of 1983, then transferring to frogdesign after Hartmut Esslinger took control of Apple's ID effort. While at frog, Bissell designed a SnowWhite



follow-up to the original Macintosh (1984) that was never pursued, the AppleTalk connector family and the Vertical LaserWriter concept (with Stephen Peart). After leaving frog in 1986, Bissell collaborated with Peart on Goldilocks concepts (1987) at Vent and later designed concepts for Apple called Rebound and Transformer (1993) that later evolved into Jay Meschter's design for Bongo.

Jean-Louis Gassée Born in Paris, Jean-Louis Gassée joined Apple France in 1979, rose to become President of that division in 1984, and was picked by John Sculley to succeed Steve Jobs as head of Macintosh R & D in June 1985. As such, Gassée oversaw development of the Macintosh II family (1985-87), demanded that Richard Jordan regain control of IDg the after Goldilocks debacle, and oversaw development of the Macintosh Portable, Figaro and the "low cost" computer family (all 1988-90). As tensions mounted with Sculley, Gassée left Apple in 1990 to start Be Labs, a software company in Menlo Park, CA.

Richard Jordan A graduate of the Stanford Product Design program, Richard Jordan joined Apple in 1978, worked on a long series of projects (from the Apple III and Twiggy to the Macintosh II) and was tapped by J. L. Gassée to manage Apple's Product and Industrial Design groups in 1985. In 1986-87, Jordan phased out frogde-



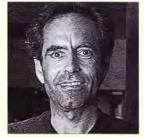
sign's participation in Apple's product development, managed Apple's new in-house ID group in 1988-89, conducted a worldwide search for a new ID manager, asked Italian designer Giorgetto Giugiaro to create a post-SnowWhite design language (which never materialized) and hired Bob Brunner to manage IDg in 1990 and craft Apple's new design language, later called Espresso.

Gavin Ivester Born in San Jose, CA, Gavin Ivester joined Apple fresh out of high school in 1981, worked his was up from parts sorting in the engineering department to the join the Industrial Design Group (1982-86) while attending San Jose State. In 1987, Richard Jordan tapped Ivester to design the Macintosh Ilcx, the first major Snow White prod-



uct handled by an in-house Apple designer. In later years, Ivester co-designed the Knowledge Navigator (1987) and concepts for Goldilocks, oversaw completion of the Macintosh Port-able (1988-89), Personal designed the LaserWriter (1989) and supplied concepts that led up to the PowerBook (1989-90), which he co-designed with Bob Brunner. In 1991, Ivester reached his peak at Apple with the design of the PowerBook Duo, then followed it with an early concept for the first Newton MessagePad, at which point he left Apple in 1992. After foray running his own design firm, Tonic, Ivester now works as creative director of the footware division at Nike.

Larry Barbera Born in 1950. Larry Barbera graduated from Ohio State University in 1973.



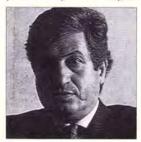
worked at the design firm Richardson-Smith moved to California to work at Hewlett-Packard, and joined Apple IDg in 1987. There he worked on the Columbo tower concept (1988), the Mac IIsi (1989), both co-designed with Mike Nuttall, and the Macintosh Color Classic (with Daniele DeIuliis, 1990). He oversaw the Hook (1991) and Bongo (1992-94) developments and managed IDg's printer and display projects in 1994-95. Having served as an Apple designer for eight years (the equivalent of two lifetimes), Barbera left in 1995 to join Design Edge in Austin, TX.

Ray Riley Raised near Philadelphia, Ray Riley graduated from the University of the Arts. Philadelphia, in 1984, moved to Silicon Valley in 1986 and joined Apple IDg in 1988.



where his first project was the Macintosh LC, designed with Bob Brunner in 1989. Having supplied Jaguar concepts in 1989, Riley managed Giugiaro's Jaguar designs in Turin during the spring of 1990, designed a Jaguar-inspired CPU and display (Fridge and Telecaster) in 1991-92, managed Newton projects and co-designed the first Pippin product for Bandai in 1993-94. After leaving Apple in 1995, Riley now oversees design of personal accessories at Nike.

Giorgetto Giugiaro Born near Turin in 1938, Giugiaro spent his early career designing cars for Bertone, before starting his own firm Ital Design in 1968, which designs and engineers concept and production automobiles for major European and Asian manufacturers. His product design firm, Giugiaro



Design, founded in 1974, had already done award-winning work for Nikon and Seiko, when Richard Jordan asked Giugiaro to come up with a new design language to replace Apple's SnowWhite language in 1989. During the next two years, Giugiaro and his co-designers Nicola Guelfo and Sergio Casolegno produced concepts for Jaguar and models for Figaro, a precursor to Newton, which never went into production. Though Giugiaro's design language project was derailed after Jordan hired Bob Brunner to manage IDg in 1990, his 1990 Jaguar concepts helped influence Brunner's final Jaguar concepts, which later evolved into the Espresso design language. By 1991, Giugiaro's relationship with Apple came to an end.

Robert Brunner Born in San



Jose, CA in 1955, Bob Brunner studied industrial design at San Jose State University, worked at the design firms GVO and Interform after graduating in 1981, and co-founded Lunar Design in 1985. Over the next four years, Brunner and co-designer Ken Wood created a series of concepts that persuaded Richard Jordan to let Brunner design the Macintosh LC (with Ray Riley, 1989), the key component of Apple's "low cost" computer family and a huge success in the marketplace In January, 1990, Brunner joined Apple as director of the Industrial Design Group, where he managed the studio, designed the final Jaguar concepts (1990), co-designed and managed the PowerBook (1990-91), supplied concepts for Figaro in competition with Giugiaro (1990) and provided the aesthet-

ic and philosophical underpinning for the new Espresso design language. By hiring world-class designers such as Daniele Deluliis, Tim Parsey and Jonathan Ive, Brunner elevated IDg to the top ranks of the corporate design world. Under his management, IDg received more design awards than any other American corporation. The final project under his reign, began in 1992 with the Pomona design investigation, for which Brunner made a foam sketch of all-in-one Macintosh designed as a simple curved plane-which evolved into the Twentieth Anniversary Macintosh (designed by Jonathan Ive, 1993-96). In January 1996, Brunner left IDg and is now a partner at Pentagram Design in San Francisco.

Susanne Pierce Raised in suburban Philadelphia, Susanne Pierce began her career at Apple as a freelance assistant to Ray Riley on the laguar project. On her own initiative, she produced portable concepts in 1989 that persuaded Bob Brunner to hire her for IDg, where she collaborated on the PowerBook and Newton MessagePad 100. Her design for the ADB Mouse II (Topolino) is a classic example of Espresso aesthetics. Later concepts for Mac-Like Things (1992) led



to her prize-winning design for Baby Badger (1993). Leaving Apple in 1996, Pierce now works as a freelance designer in San Francisco.

Jay Meschter Raised in suburban Philadelphia, Jay Meschter graduated from



Syracuse University, and joined IDg in 1991. His first product, the DuoDock (1991), blended the linearity of Snow-White

with Espresso curvature—making it a key transition point between one design language and the next. Later projects, code-named Show and Tell (1993), Bongo (1994), and Mongoose (1996) demonstrate Meschter's stylish yet flexible approach to design. Today, he works with Ray Riley in the personal products division at Nike.

Ken Provost and Bob Bellicitti operate IDg's computer-aided design center, which translates the designer's drawings into high-resolution models and develops computer



files that are later used to cut tools for the final product. Once relegated to the production of precision machinery, CAD is now fundamental to the craft of industrial design. Ken Provost was born in 1951 in Scotia, NY, graduated from the University of Oregon and first worked for IDg on the



PowerBook in 1990. An impressive CAD modeller, his work can be found on many of the most difficult IDg creations: including the Power-Book 500 (Blackbird), the QuickTake 100 (Venus) and The Twentieth Anniversary Macintosh (Spartacus), Bob Bellicitti was born in 1957 in San Jose, graduated from San Jose State University, managed IDg's model shop in 1991 and has worked with Provost in the CAD center since 1993. performing feats of 3-D magic on the Hammerhead / Sousa displays, the M2 PowerBook and many other products.

Daniele De Iuliis Born in Bristol, England in 1961, Daniele De Iuliis was trained at London's Central School of Art and Design, joined the San Francisco office of ID Two in 1983, where he made concepts



for Goldilocks (1987) and joined IDg in 1992. Given the task of injecting Espresso aesthetics into Apple's product line, De Iuliis's treatment for the Macintosh Color Classic (1992, designed with Larry Barbera) and Comet printer (1992-93) set the standard for all later Espresso products. His work on the PowerBook 500 (Blackbird, 1993-94) pushed industrial design into the realm of Art achieving an almost perfect balance of form, function and meaning. On a smaller scale, he worked similar miracles with the Newton Message-Pad Charging Station (Crib) and the Newton MessagePad 2000 (Q). The most eloquent of IDg's designers, DeIuliis is now spearheading a major shift in IDg's approach to design.

Tim Parsey Born near London in 1960. Tim Parsey graduated from the Central School of Art and Design in 1981, joined the San Francisco office of ID Two and accompanied Daniele Deluliis to Apple in 1991. As Studio Manager, Parsey helped to interpret the new Espresso design language and implement it throughout Apple's product line. His designs include the follow-up to the StyleWriter (Speed-Racer, 1991), the Newton Message-Pad 100 (Junior, 1992-93) and the Color StyleWriter Pro (Fantasia, 1993). The most didactic of IDg's designers, Parsey pushed Espresso to its outer limits, proposing that



Apple segment its products into business and consumer lines and generating designs for consumer items such as

TVs and telephones. Amon his last Apple designs was small kid-friendly version of Spartacus (called Sparky Parsey is now VP of Design a ACCO in Chicago.

Lawrence Lam Born in th San Francisco Bay area and a 198 graduate of San Jose State Lawrence Lam worked at a nun ber of Silicon Valley design shop including Matrix, before joinin Apple IDg in 1991 to oversee con pletion of the PowerBook Due the Juggernaut investigation an later Blackbird. Lending his expe tise to a wide range of portabl products (including the M2, Epi and Hooper PowerBooks), Lar managed several in-house desig investigations and played a pivota role in the creation of the Nautilu concepts. After a brief stint work ing with Gavin Ivester at Tonia Lam now works as a produc design engineer in Apple PowerBook division.

Masamichi Udagawa Bor in Tokyo, Masamichi Udagaw graduated from Chiba Universit in 1987, attended Cranbroo Academy, and joined IDg in 1997. His first concept was for a note book-sized Newton with Macintosh-style interface (Folio A master of form, Udagaw designed the PowerBook 530



(M2), giving it as much expressio as its tight dimensions woul allow, and designed a portabl StyleWriter printer as an accompaniment. After the launch of M in 1995, Udagawa left Apple to start his own design firm Antenna, in New York City.



Switzerland in 1969, Van de Loo studied at the Art Center College o Design in Montreux and

Pasadena, graduated in 1992 and ioned IDg that same year to begin work on Apple's first handheld digital camera, the QuickTake 100 Venus). Among his many concepts, the most interesting was a netchook-sized Newton (Bic).

Bart Andre A 1991 graduate of the Univer-sity of California at Long Beach, Bart Andre first worked at Apple during a summer internship in 1990 huilding models for the Advanced Technology Group. Hired by Bob Brunner for IDg in 1992, Andre designed a handheld CD-ROM player (Popeye, 1992), a kitchen computer / printer / fax appliance



(Palladin, 1992-93), the Hummerhead and Sousa displays (with Jonathan Ive, 1993-94), and a promising series of leather-, fabfic- and metal-trimmed PowerBook concepts (Nautilus, 1995) that influenced the design of the PowerBook 1400 (Epic).



Cal Seid A native of Portland. OR, Cal Seid graduated from San Jose State in 1983, worked for design firms in Oregon and Silicon Valley, and joined IDg = 1993 to design and manage several CPU projects, including the entry-level ELB and Show and Tell designs in 1993, the Bongo all-in-one computer and Outrigger CPU in 1994. Highly respected among Apple's engineers and product designers, Seid now manages the day-today activities of the Industrial Design Group.

Jonathan Ive The director of Apple 's Industrial Design Group was born in London in 1967, studied ID at the University of Newcastle, cofounded the London partnership Tangerine in 1990 and designed concepts for the Juggernaut design investigation in 1992 that won him a job at IDg that same year. His design for the Newton MessagePad 110 (Lindy) in 1992 set the highest standard of any product Apple had yet produced. He followed it with the Hammerhead and Sousa displays (co-designed by Bart Andre) and the Twentieth Anniversary Macintosh (Spartacus) in 1993-96. After Bob Brunner's departure, Ive took over management of IDg, rising to the level of senior director, which places him just two positions below the current interim CEO Steve Jobs.



Looking forward, Ive intends to keep Apple management focused on the value that IDg provides. "We must challenge the company to reinvent itself at every level," he says. Breaking away from the Bob Brunner approach and Espresso, Ive promises that Apple's next products "will be targeted to individuals rather than large unfocused groups." The result, he says, "will be the most exciting and meaningful designs that Apple has ever delivered."

Zealand-born Danny Coster brings a fresh sensibility to IDg that first showed itself in the whimsical concept Time Capsule (1994) and the mighty K2 tower CPU (1996), which combines unparalleled user access to internal components

with a distinctly architectural

look. A 1990 graduate of

Coster

New

Danny

Wellington Polytechnic, Coster's background in furni-

ture and sports equipment design allows him to take a more expressive yet intuitive approach to the design of desktop and portable products that will be released over the coming year.

Chris Stringer Born in

Australia in 1965, Chris Stringer graduated from London's Royal College of Art in 1986 and joined IDEO in Palo Alto in 1992-96, where his work included design language programs for Dell Computer and amusing light switch concepts that won him an ID Design Review award in 1995. That same year, he joined Apple IDg as lead PowerBook designer, where he and co-designer Richard



Howarth will recapture the strength that Daniele Deluliis gave to Blackbird and move beyond it in ways that users will enjoy.

Thomas Meyerhöffer A

native of Stockholm, Apple's newest superstar graduated



from Art Center College of Design (Montreux) in 1991. collaborated on the interior of the new Porsche Boxster, and designed computer displays for NEC as a consultant at IDEO in Palo Alto before joining Apple in 1995. His first design, the eMate 300, represents a clean break from the past both in its level of expression and the manner in which it was designed-targeting the product to a specific niche (the K-12 education market) rather than a large ill-defined audience. Exuberant yet functional, physically alluring yet cheap to manufacture, the eMate design indicates the direction that Meyerhöffer's upcoming consumer and educational products will take.

Richard Howarth Born in Lucasa, Zambia, Richard Howarth is a 1993 graduate



of Ravensbourne, near London, worked as a student apprentice at Sony in Japan and at IDEO before arriving at Apple in 1996. Working with Chris Stringer, Howarth is now developing high-end PowerBooks that will once again place Apple's portable line at the forefront of design innovation.

Doug Satzger Born in Cincinnati, OH in 1960, Doug Satzger graduated with a degree in industrial design from the University of Cincinnati in 1985, joined Mike Nuttall at Matrix Product Design in 1987 and was part of the original group that formed IDEO in 1991. Two years later, Satzger joined Thomson Consumer Electronics as a program leader, where he designed televisions and a wide range of consumer products. In



1995, he returned to IDEO, helping to establish their Chicago office, then Apple in August, 1996. After a brief stint managing the design of Apple's imaging products, Satzger now focuses on input devices, such as keyboards and mice, giving each new design an emotional depth that is balanced by the physical and economic challenges that manufacturing imposes.

Chris Harris Chris Harris provides the interface between IDg's CAD center and the model shop, where 3-D concepts are made using computer-controlled lathes and conventional hand tools.

John Van Dam and Barbara Thompson assist in the creation of CAD and foam concepts in IDg's model shop, where hours of careful handwork and close attention to detail make the finished concepts shine.

Carter Multz The most recent addition to IDg's CAD facility. Carter Multz was born in Los Gatos. CA in 1964, raised in San Jose and received a degree in industrial design from San Jose State in 1992. An expert in Unigra-phics and Alias surface modelling, Multz has worked on the design of missiles for Westinghouse, show cars for Ford Motor, and products for the Palo Alto consultancy Lunar Design before joining Apple in July, 1997.

Steve Jobs In a return that was dramatic yet not totally unexpected, Steve Jobs transitioned from unofficial advisor to interim CEO and board member in July, 1997. Over the past six months, while also serving as CEO and chairman of the computer animation firm Pixar, Jobs has reshaped every aspect of Apple's operation: negotiating an historic alliance with Microsoft, appointing a new board of directors, streamlining Apple's product line, ending the Mac OS licensing pro-



gram, spearheading Apple's new build-to-order program and shepherding the completion of Apple's next-generation operation system (codenamed Rhapsody) and making sure that the Industrial Design Group gives Apple's new products a unique quality and sprit. Until the next full-time CEO is named, no one will be more responsible for Apple's near-term survival. In recognition of his service to the computer industry. Jobs has received the National Medal of Technology (in 1985), the Jefferson Award for Public Service (1987) was named Entrepreneur of the Decade by Inc. Magazine (1989) and received a Lifetime Achievement Award by PC Magazine (1997)

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