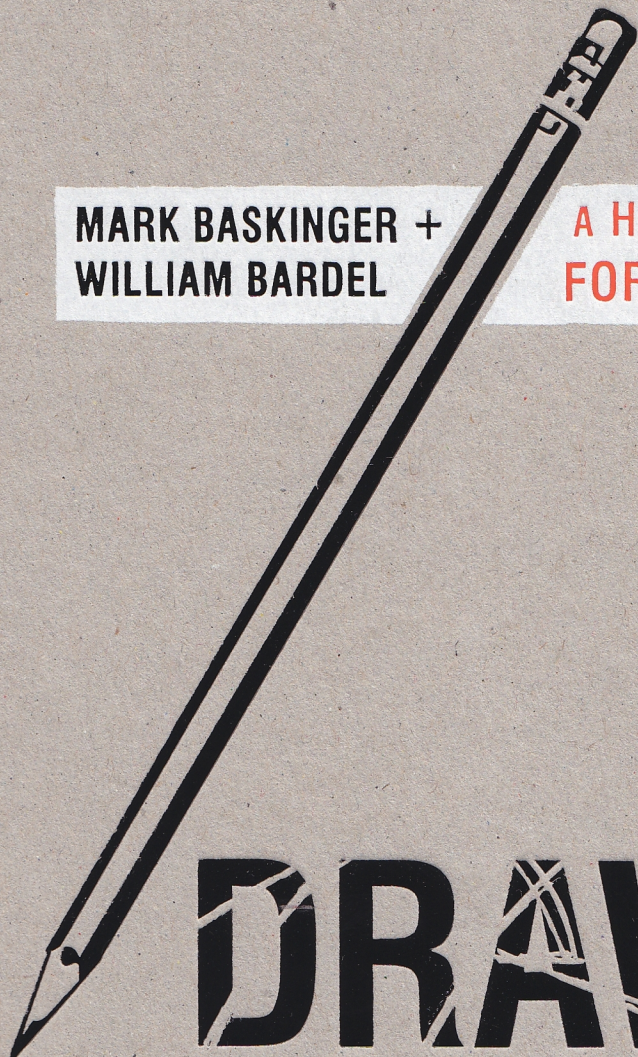MARK BASKINGER +
WILLIAM BARDEL

A HAND-DRAWN APPROACH
FOR **BETTER DESIGN**

DRAWING
IDEAs

DRAWING IDEAs

A HAND-DRAWN APPROACH FOR BETTER DESIGN

MARK BASKINGER + WILLIAM BARDEL

MARK: For Ana and Ben, whose boundless creativity is an inspiration

WILL: Dedicated to my parents; my wife, Susan; and my children, Madeline and Harrison, for all their love and support

CONTENTS

WITH AN ABUNDANCE of tools and technology available to create and communicate, why draw by hand? What does the pencil offer?

Your ability to draw is a fast, powerful means for thinking, reasoning, and visually exploring ideas—providing visual information for self-reflection and focused discussion with your colleagues, teams, and clients. Whether it is of a product, service, information, or system, a hand-drawn sketch communicates the essence of your idea and illustrates its potential. The simplicity of connection between mind, eyes, hand, and pencil shrugs off the layered burden that complex technology often adds. Such simplicity ensures fresh thinking and communication that is quick, clear, and immediately visible. As an act, drawing effectively encourages observation, evaluation, and helps spur collaboration and action. To understand the potential of drawing your ideas, this book focuses on key drawing behaviors: (1) drawing to record ideas or examine things from real life; (2) drawing to clarify and explore ideas further and expand upon previous ideas; and (3) drawing to explain ideas to others. Each sketching behavior serves a distinct role in the design process and contributes to developing and sharing your ideas.
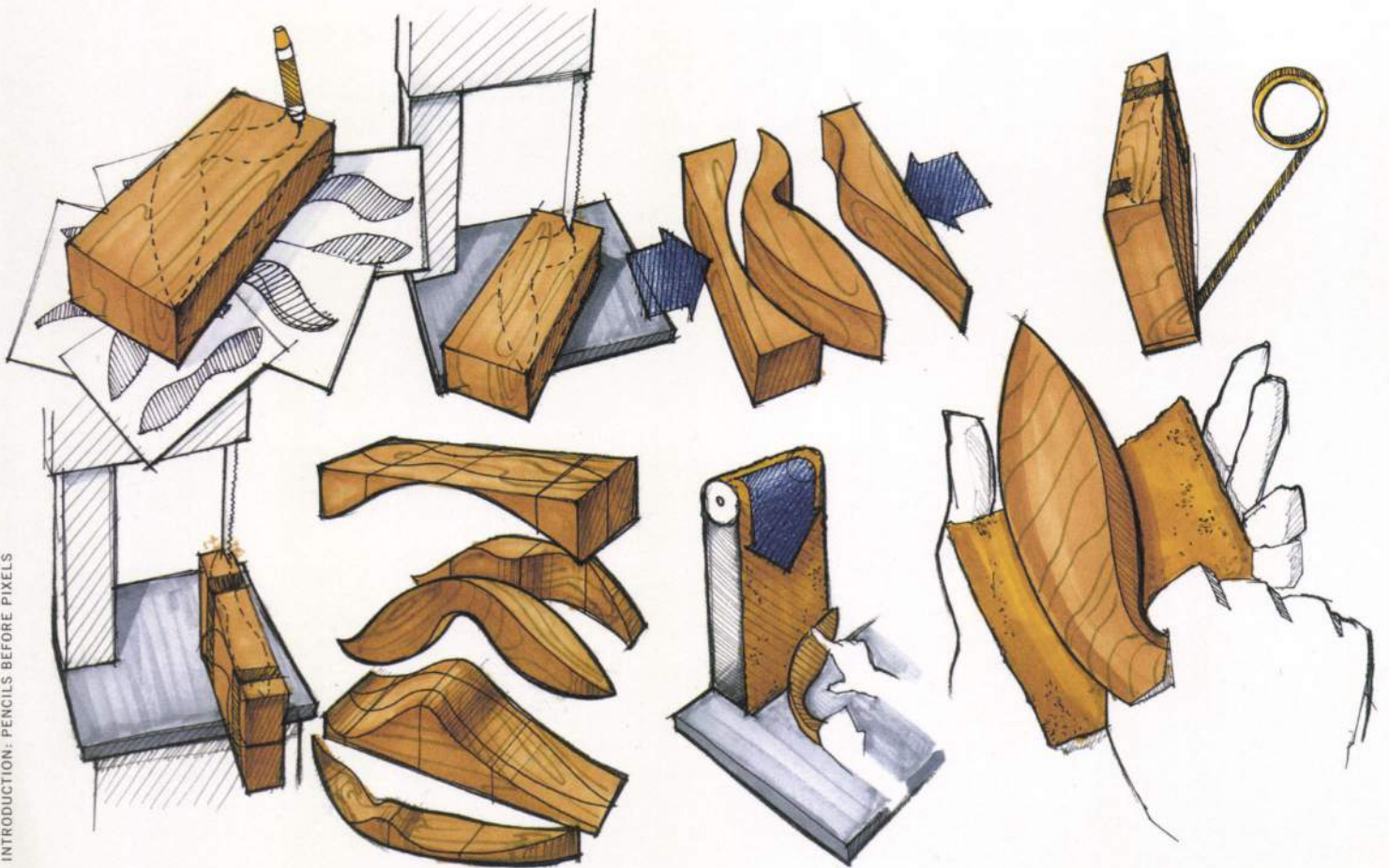
Establishing a clear view of any complex design problem can be a challenge. The act of drawing helps you to see and think with a deeper level of engagement. Knowing how to use drawing to record and explore your ideas can help you observe problems and possibilities, effectively breaking them down into identifiable components, sequences, interactions, and modules. The perspective and focus that a good sketch provides assist in memory and are the foundation to a stronger ideation process, one that carefully studies situations and produces inventive solutions.

Like most people, you want to share your idea but are probably self-conscious about your drawing skills, especially in public while your audience watches; we all have these white-board moments when nerves kick in. Drawing a sketch can—and should be—empowering. It is an opportunity to command attention and persuade in compelling fashion by *showing*. Imagine the impact of confidently and fluidly drawing your ideas. This is the goal and why knowing how to draw remains a valuable asset for presentation and explanation. Drawing positions you to lead or direct conversation. Knowing how to clearly explain your ideas in visual form facilitates discussion and promotes understanding.

Drawing Ideas is a collection of various techniques, practices, and strategies derived from real-world applications in design practice, university-level design drawing courses, and our Drawing Ideas® workshops held within conference and business contexts.

The goal of this book is to inspire by breaking down design drawing techniques, visual communication approaches, and a wealth of examples from the sketchbooks and portfolios of creative professionals and students. To afford easy reference and application, our book's structure is aligned with key steps in the design process (observe, design, communicate). To help you integrate drawing into your work, we also include helpful callout tips and contributor essays based on frequently asked questions from our workshops and courses.

it's a matter of perspective

the power is in your hand

about this book

book organization

Drawing Ideas is divided into five sections, each with a specific focus. These can be read independently or together as the book moves from personal to public drawing perspectives. Parts 1 and 2 provide an overview of basic practices and techniques that are the foundation to good drawing. Part 3 introduces notational sketching, detailing how to record and explore ideas as part of the design process, and part 4 expands on this, describing how to use explanatory sketches to communicate these ideas to others. A brief workshop on Team Drawing introduces methods for using drawing as a platform for shared discussion and for generating effective team and stakeholder participation. Part 5 addresses the use of narrative to enhance explanatory communication.
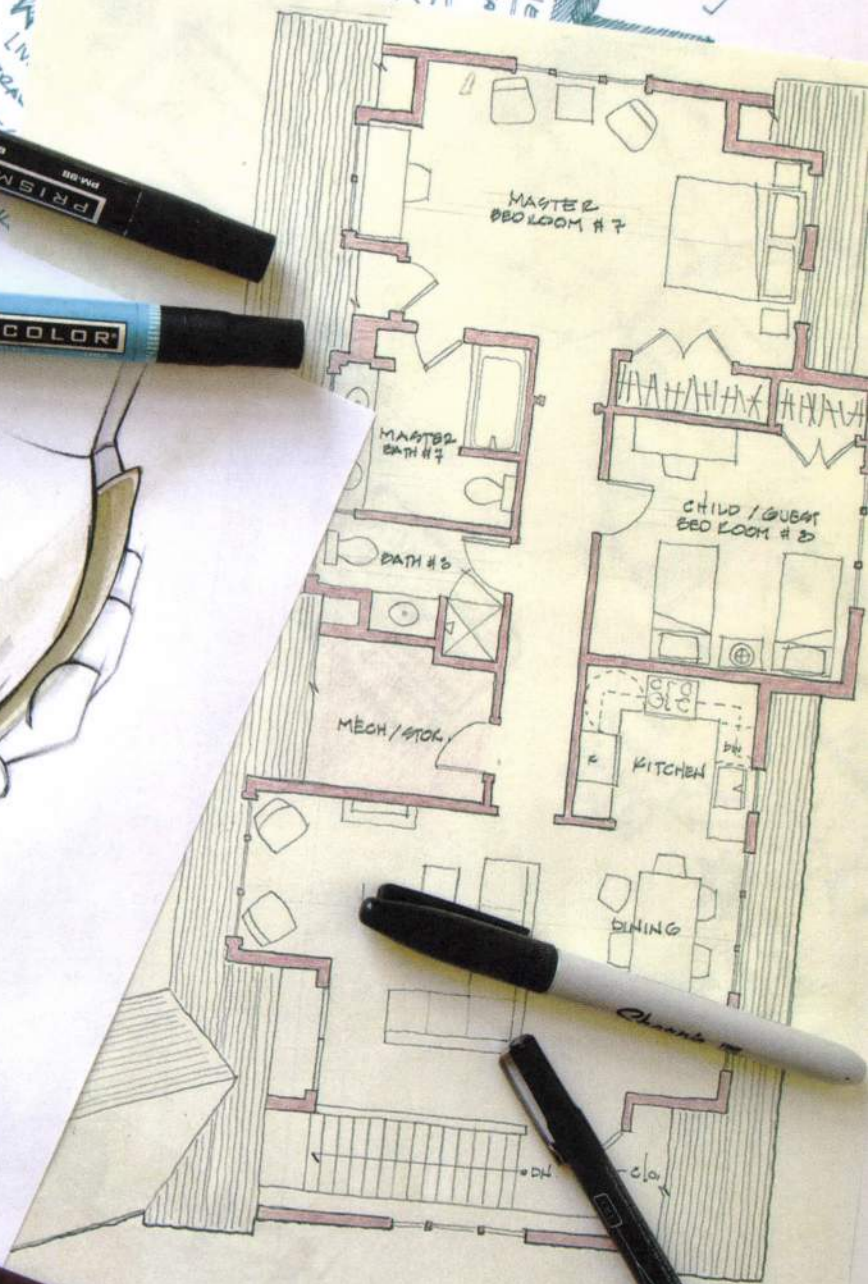
what kind of drawer are you?

Drawing Ideas is applicable for a broad range of skill levels, from novices to experts. We include content aimed at specific audiences as well as generalized information that you will be able to adapt to your specific drawing needs.

For drawing novices, the entire book offers a wealth of information, including a drawing boot camp with practical instruction that clearly explains the fundamentals of how to create drawings that communicate clearly and effectively. Throughout the book we include methods and techniques that will help you quickly ramp up your skills and become more confident with your sketches.
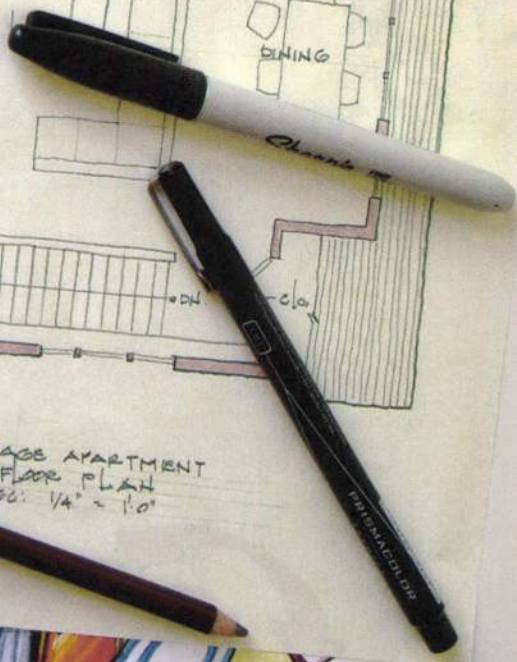
For out-of-practice drawers, *Drawing Ideas* provides both inspiration and techniques to reintroduce basic methodologies with which you may be familiar. Drawing skills diminish quickly when you're a bit out of practice. Reviewing the basics in this book will help get you back into shape quickly, and the more advanced considerations in this book will further improve your skill level.

For experts, *Drawing Ideas* offers new considerations on how to structure and apply drawing. These range from often-overlooked basic tricks to advanced techniques. In particular we recommend parts 4 and 5, which introduce explanatory principles, organizational methods, and narrative structures to make your sketching more compelling.

In our careers, the ability to draw has enabled us to innovate, lead, direct, persuade, and effectively express ideas. It also has helped us invite others into conversation and bring out the best in our interdisciplinary teams. This book serves as a broad resource to provide some clarity about drawing for creative visual practice, strategy, and planning—even beyond the disciplines of design.

PMI

PRISMACOLOR BLACK PM-98 USA

PRISMACOLOR

MASTER
BEDROOM # 7

MASTER
BATH # 7

BATH # 8

CHILD / GUEST
BEDROOM # 8

MECH / STOR.

KITCHEN

DINING

DN

GARAGE APARTMENT
FLOOR PLAN
SC: 1/4" = 1'-0"

ENTRY
ENGAGEMENT
EXTENSION
EXIT

FACULTY OF
ALUMNI OF
STUDENTS OF
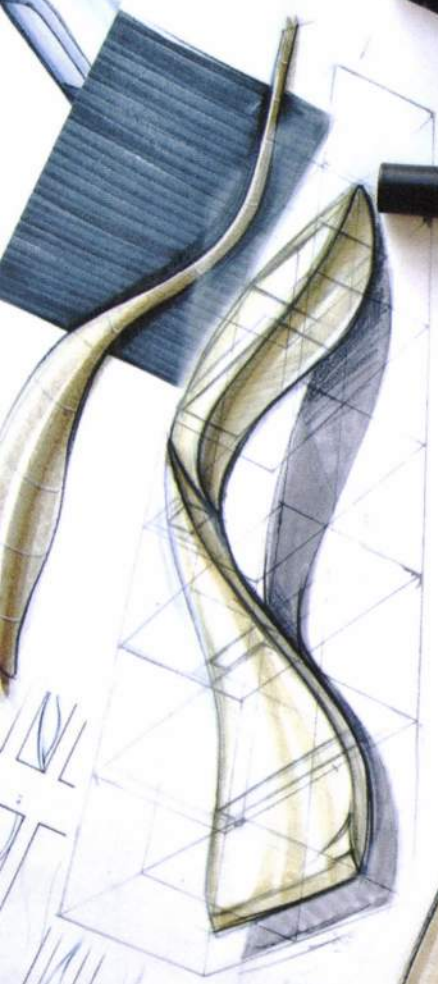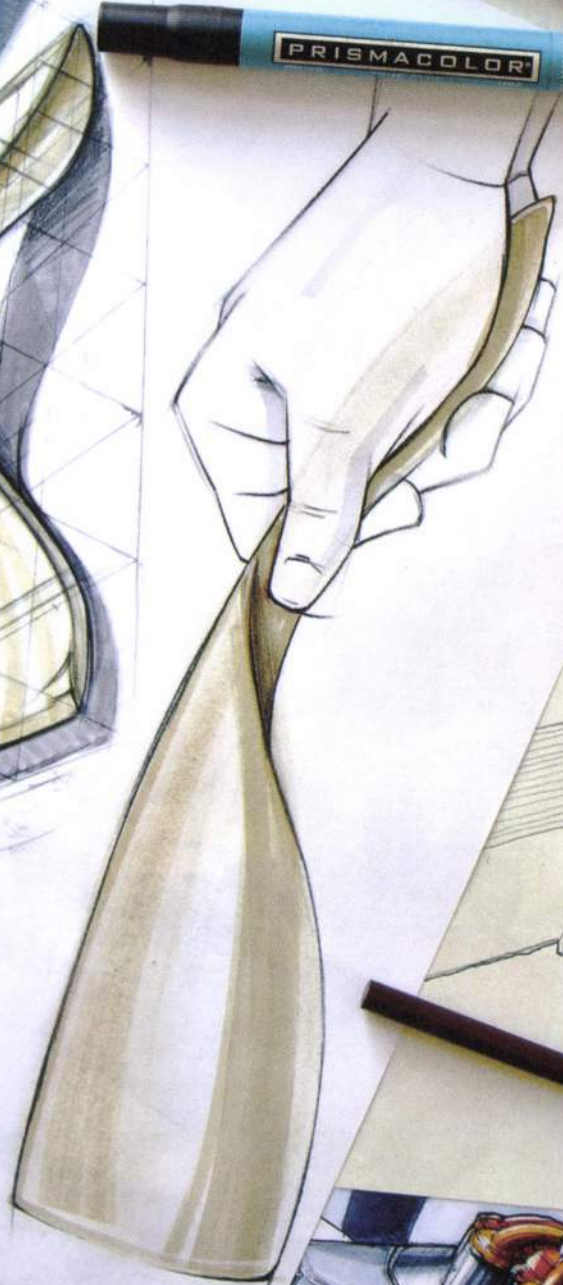
1

SKETCHING + DRAWING BASICS

IN THIS SECTION, WE INTRODUCE THE BASIC MECHANICS AND TECHNIQUES for drawing by hand. We also present essential approaches to representing the physical and visual world to enable you to build an understanding of how you think through ideas. This section includes best practices for sketching with an emphasis on structure and achieving a correctness of form—working from basic marks on paper to using perspective systems to represent physical space. Sketching & Drawing Basics focuses on the *how to sketch* with supportive rationale for the *why to sketch*. We expect that you will gain an understanding of how to assess the quality and effectiveness of your sketches, work from a variety of exercises and examples to improve your sketching ability, and develop your own expressive style. You should feel comfortable enough to draw in this book. Mark it up with notes and ideas, and make it a reliable companion.

In this book, we will present many ways to make drawings more effective employing visual form, craft, composition, and layout/structure. We view drawing and sketching as a means of visual storytelling, an applicable and important skill for all design disciplines that helps creative professionals communicate their ideas to themselves and to others. In the following sections of this book, you will learn a variety of methodologies for hand-generated visualization, including notational, exploratory, and explanatory sketching. We demonstrate methods and discuss approaches for planning, preparing, and generating your drawings in the most effective and evocative ways.

PLANNING YOUR DRAWINGS

THE BEST SKETCHES visualize ideas through good, compelling form; without substance, the form is empty—and without form, the substance has no voice. Sketches need to transfer information and interpret complex information into definable chunks or messages. How they are visualized depends as much on personal aesthetics as on experience.

The rule of thumb is to develop sketches in a straightforward manner while allowing them to be expressive. A few years ago, a Carnegie Mellon design student named Anna Carey coined the term "freshture" in the context of a drawing class. Her insightful, pithy term seemed to sum up the qualities of good sketches the class was describing—fresh and gestural. *Freshness* or crisp qualities to strokes, so that they look like they are held in tension, make sketches appear more kinetic. Letting *gesture* influence mark-making by purposefully missing outlines and overdrawing in key areas adds another quality. Said another way, good sketches are accurate and precise in structure and message but rough in expression. This approach allows some flexibility in the reading of the sketch and takes the formality and rigid qualities away to make the drawing more visually accessible. Keeping "freshture" in mind may help to ensure that a sketch reads clearly as a preliminary thought and is not misinterpreted as a final drawing or concrete idea.

"freshture"

the visual quality of freshness;
exhibiting dynamic gestural
energy in structure & composition

6 tips for achieving "freshture" in idea and concept sketches

Sketches that show intent, embody clear simple messages, and are rendered in expressive ways tend to be more positively received. Sketches with "freshture" appear more lively and depict a certain energy yet have a precision in form and proportion that makes them understandable and believable. Following are some tips for achieving these qualities in your concept sketches.

ABSTRACT

GATEWAY

GATE NAME

COLUMN

STORY
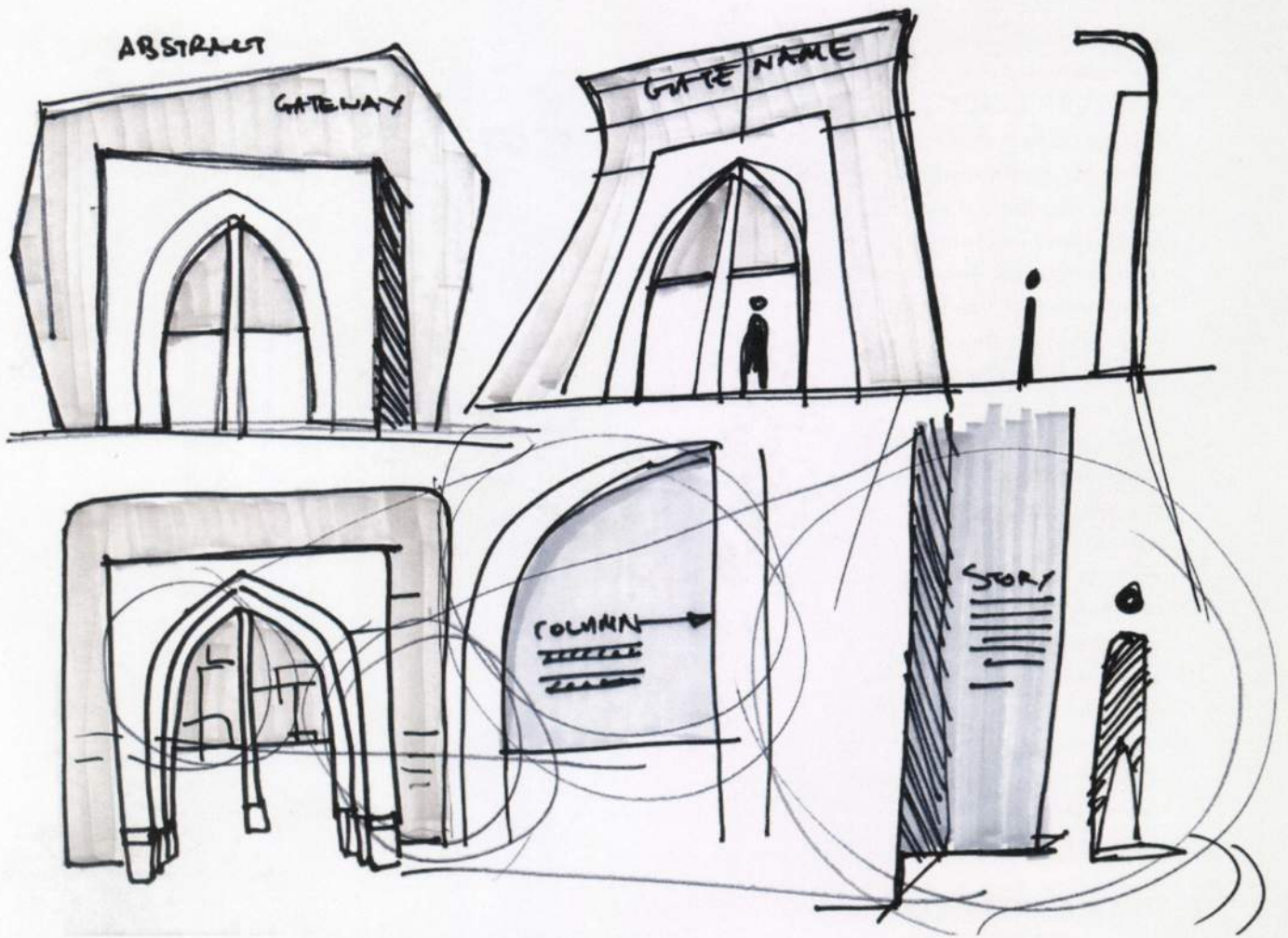
1. FOCUS ON THE PRIMARY MESSAGE

Keeping each sketch focused on illustrating one aspect of the idea will keep the message simple and increase the likelihood that a viewer will understand an idea. A group of three or four sketches used to describe a single idea will make a stronger statement than one solitary sketch could.
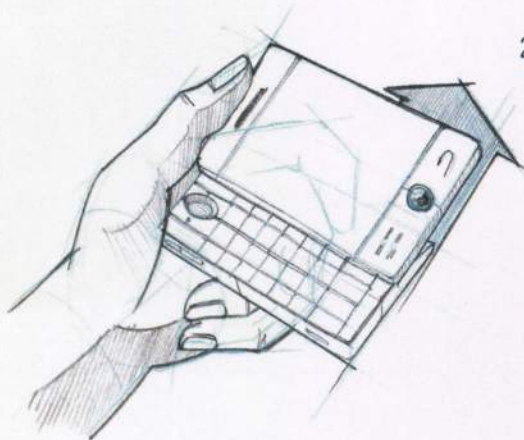
2. SHOW THE UNDERLYING STRUCTURE

Many expressive sketches show the underlying framework, structure, or presketch as part of the sketch. Using nonphoto blue pencil, a thin pen, or gray marker to create this framework allows you to layer heavier, bolder lines on top to create depth and visual interest.

3. OVERLAP LINES

Precise corners that form 90-degree relationships or ensure that the trailing line of an ellipse meets exactly with the leading line are not as important as you might think. Corners that overlap slightly and circles that are drawn over twice have a more expressive quality to them that is both visually engaging and inviting; however, too much over-drawing and overlapping can make a drawing look scratchy and inaccurate. There is a balance between lines that are too loose and too tight that varies depending on the complexity of your subject.
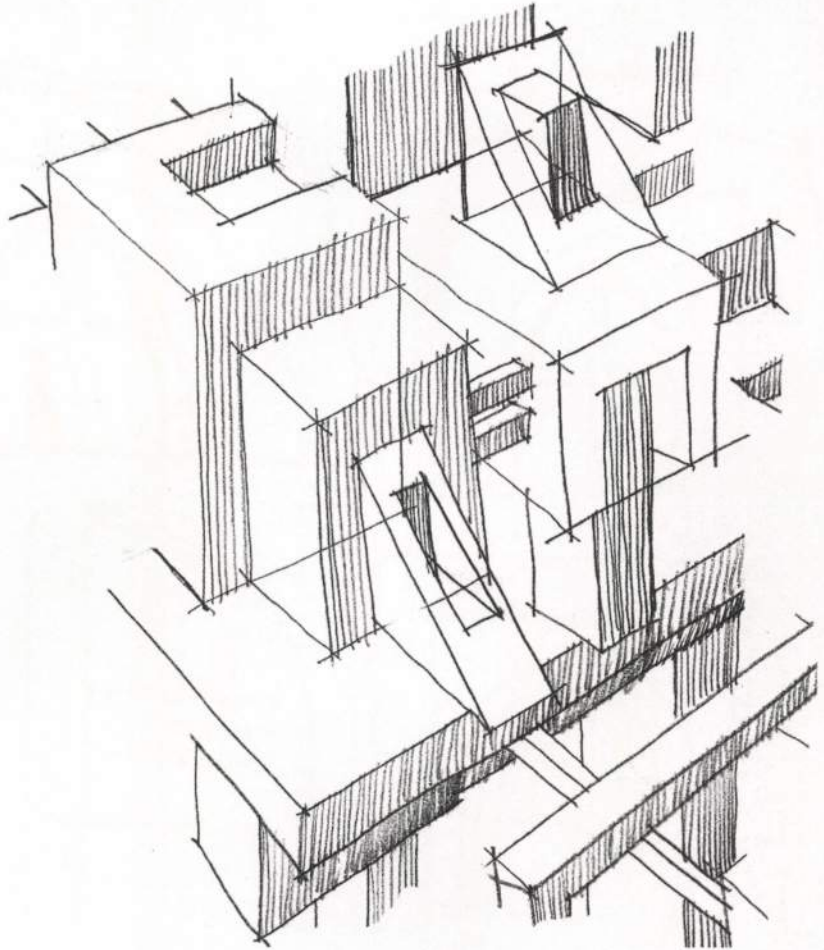
4. DRAW ACCURATELY

Accuracy of drawing will better support your message and the intent of the sketch. Disproportionate sketches will make your ideas seem less sophisticated and important. If you intend to draw a square, then don't draw a rectangle. If you are drawing two rectangles to be the same, then make them look like they are, in fact, the same.
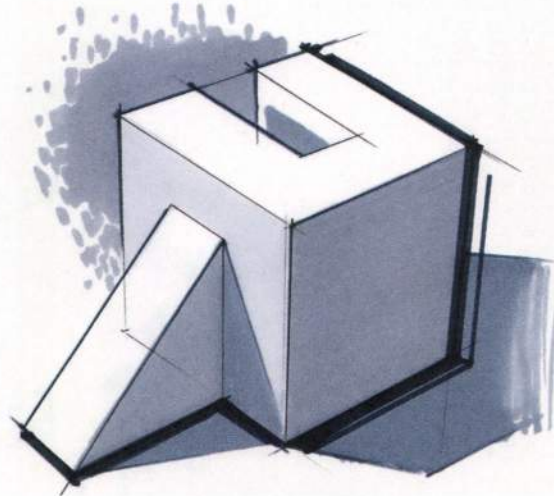
GOOD SKETCHES ARE ACCURATE AND PRECISE IN STRUCTURE AND MESSAGE, BUT ROUGH IN AN EXPRESSIVE WAY.
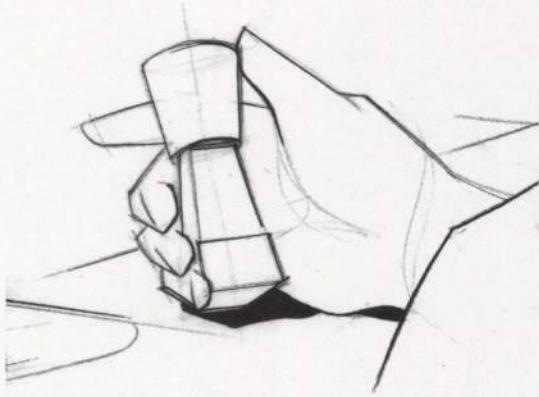
5. CONTROL THE USE OF LINE WEIGHTS

Line control and accuracy are important in more formal sketching. Good use of offset line weights will give a drawing more visual depth and enable a clearer reading of form. In product drawing, you can use heavier line weights where you would expect a shadow to appear. Often, you might see a heavy outline around the entire assembly to help group and/ or differentiate parts.
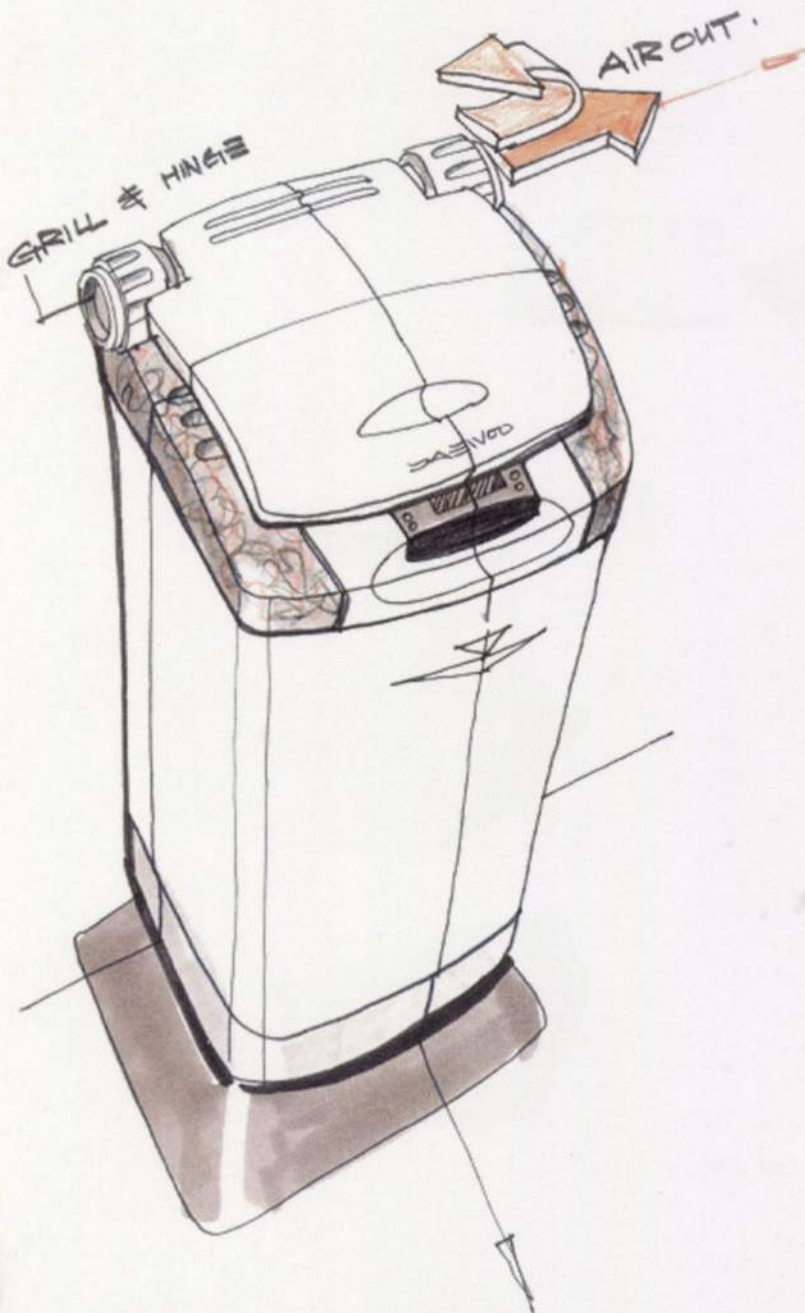
## 6. USE COLOR AND DETAILS TO COMMUNICATE

Judicious use of color can really inform the viewer and aid readability through differentiation and coding within the sketch. Use of spot colors, tone, and details (like arrows and notation) provides information and visual interest in a drawing; however, too much color or detail may create visual noise and detract from your message.

GRILL & HINGE

AIR OUT.

Rough but accurate (right)
Refined but not too concrete (below)
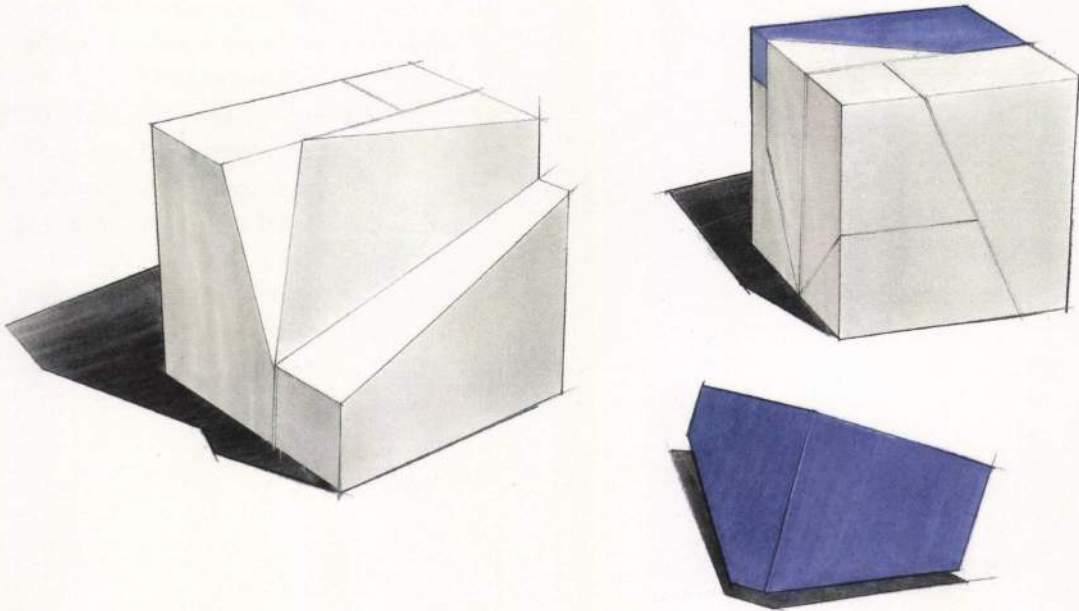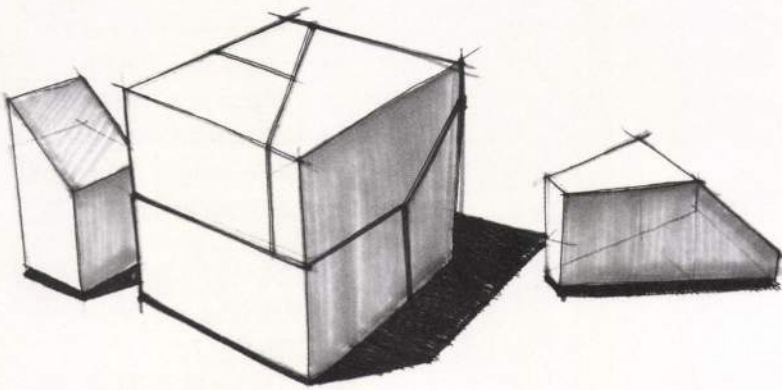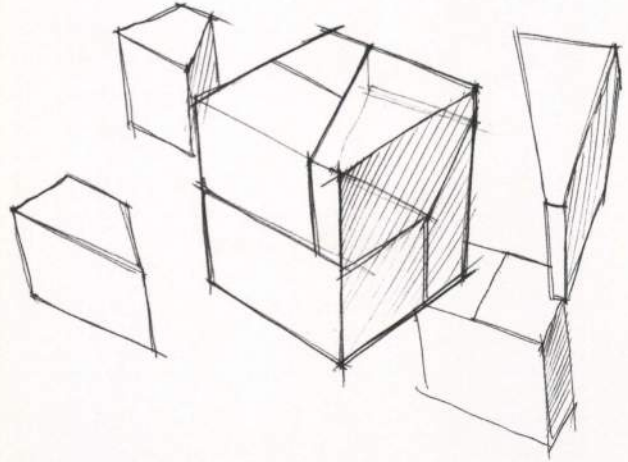
Rendered and highly accurate

Sketches range in fidelity and quality from rough to precise, each with its own use in supporting the perceived advancement of a concept through the design process. Rough ideas rendered roughly may have meaning for the author but may not translate well to an audience. These audience sketches still must be accurate in structure to carry the intent and meaning. The goal is to structure them in such a way as to look unfinished or unrefined. Rough is not inaccurate, but it might be incomplete, thereby enabling the mind to fill in and complete the image. This is effective in engaging your audience and allowing them to think through the ideas more carefully, leaving room for interpretation and for viewers to fill in with their imagination.

Keeping it rough helps people focus on the big picture when it's important. An expressive sketch that is fairly rough invites conversation about an idea. The more precise a sketch is, the more concrete an idea appears. For designers, preserving a degree of roughness is advantageous—the rougher the sketch, the clearer it is that your drawing is a draft in progress and therefore subject to less nit-picking scrutiny by your peers and clients. Resist the temptation to show too much detail until it is absolutely necessary.

Persuasion is an interactive art in itself. To really sell an idea, lead viewers toward making some conclusions for themselves and see some of their thinking reflected in the sketches. They need to feel that they helped shape an idea into its final form.
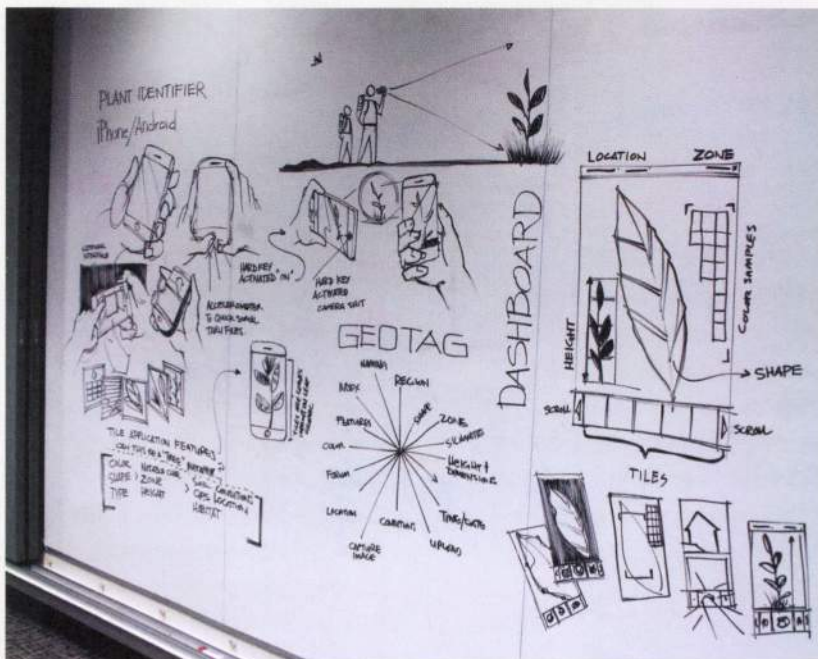
Q My drawings at the white board are awful. How can I make them better and become more confident sketching in front of people?

A It is difficult to draw on white boards due to the lack of feedback from the slick surface, its vertical orientation, and standing in front of others who are watching your every move. Practice may be necessary, so set up a white board at home or go into the office early to warm up. When you are drawing in front of an audience, you have their attention, so take your time to make good drawings that demonstrate your intent.

ROUGHNESS VS. PRECISION IN IDEA AND CONCEPT SKETCHES

Idea and concept sketches differ in their intent and application. **Idea sketches** are typically representative of a designer's personal exploration of ideas. In many ways, idea sketches (or ideations) are records of a dialogue between the designer and the subject. Typically, we start with this level of exploration to understand our own ideas—a process that can be fairly informal. **Concept sketches** are used to communicate ideas to others, to demonstrate thinking and detail attributes of an idea. As such, they represent a latter stage in the idea generation process, as they aim to bring coherence to your ideas.

Research

QUICK SKETCHES FIELD NOTES ETC.

Idea Generation

ROUGHLY ROUGH SKETCHES
*FAST, QUICK BUT ACCURATE!

Notation & Diagrams

Rough Sketches
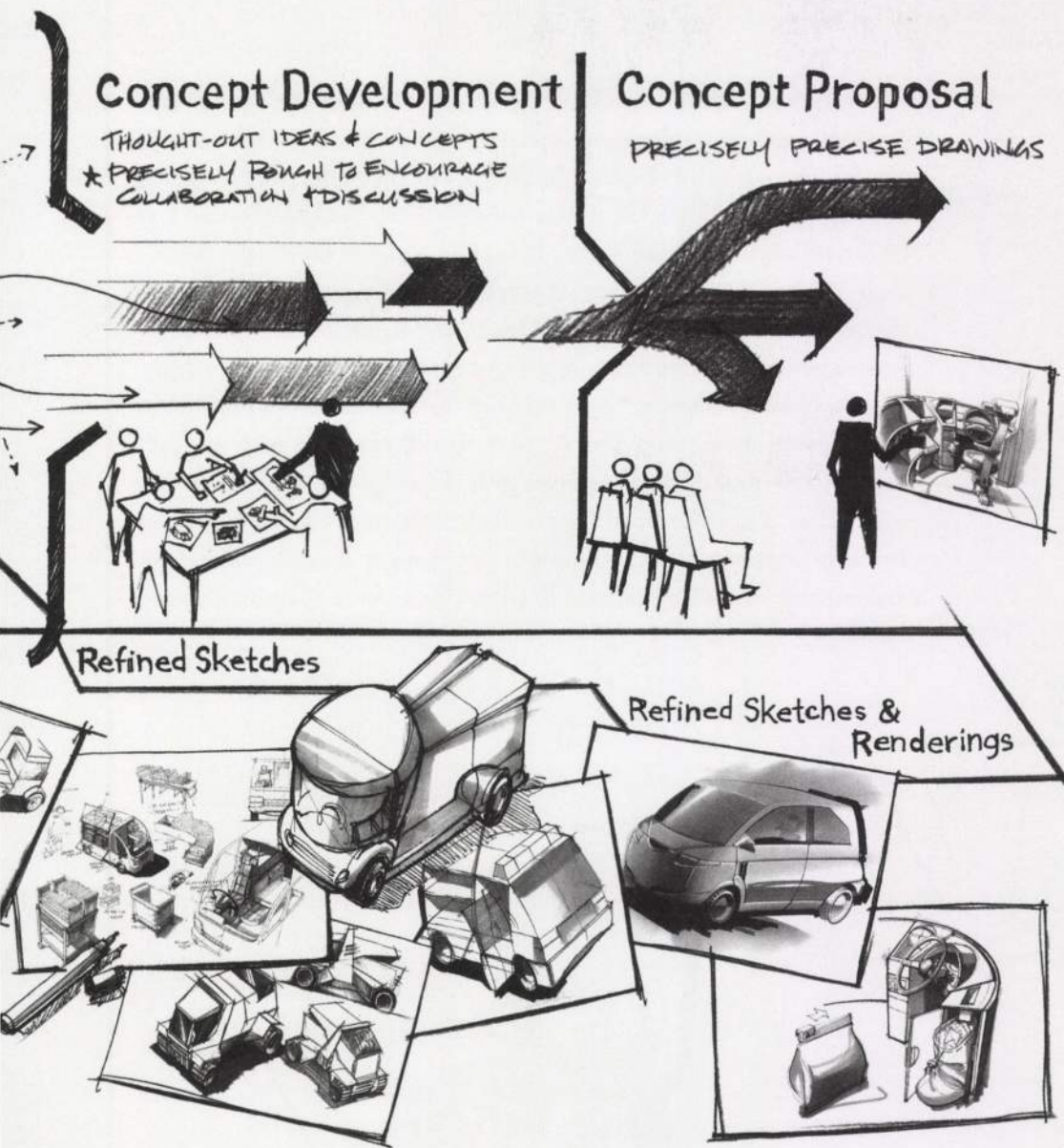
STAGE 1: Idea Sketches for Personal Exploration

"Roughly rough" idea sketches tend to be personal in nature, communicating best to the author who can mentally fill in the gaps that exist on the page. These sketches tend not to connect with an audience due to their low fidelity and highly personal nature.

STAGE 2: Idea Sketches

"Roughly precise" sketches may be very basic concept sketches, CAD models, or wireframes. These sketches, done by hand or computer, point toward shared understanding. Generally, the form of these sketches is expressive and accurate, not scratchy and incomplete.

STAGE 3: Concept Sketches

"Precisely rough" sketches incorporate strategically "sketchy" features, such as over-drawn lines, to show intent with a clear message but with an appearance that is somewhat more informal and less concrete. They leave little room for interpretation but present an invitation for collaborative discussion on functionality, features, part/pieces, and so on.

Concept Development

THOUGHT-OUT IDEAS & CONCEPTS
* PRECISELY ROUGH TO ENCOURAGE
COLLABORATION & DISCUSSION

Concept Proposal

PRECISELY PRECISE DRAWINGS

Refined Sketches

## Refined Sketches & Renderings

STAGE 4: Refined Sketches

"Precisely precise" sketches are depicted in the most exacting way, leaving little or no room for discussion or feedback. These sketches are used for presentation purposes and serve to communicate ideas that are highly resolved. In product design, these may take the form of a marker rendering or CAD rendering.

In interaction design or graphic design, they may be sample screens or mock-ups rendered in Photoshop, Illustrator, or the like to represent as close to the real thing as possible. While not technical drawings like blueprints, these drawings do serve to illustrate more exacting qualities of the idea or concept.

WHEN SITTING DOWN to sketch, you have to be in the right frame of mind to generate ideas; otherwise, you may find it to be frustrating and unproductive. Expect that not all of your drawings are going to be great, and that's okay. You want to keep record of your less successful sketches so that they can better inform your next sketch. Therefore, pitch your erasers. If you continually erase, then you are effectively starting over again and again and again . . .

An open attitude and expectation of discovery are ideal for drawing your ideas effectively. Expecting the unexpected is the first key in allowing your eyes, mind, and hand to work in concert without forcing a desired outcome. Sometimes your drawings will evolve over the page; other times they will be precisely executed. Sketching under duress or extreme time constraints can have a detrimental effect. Find a quiet, well-lit place to help you to focus for a sustained period of time.
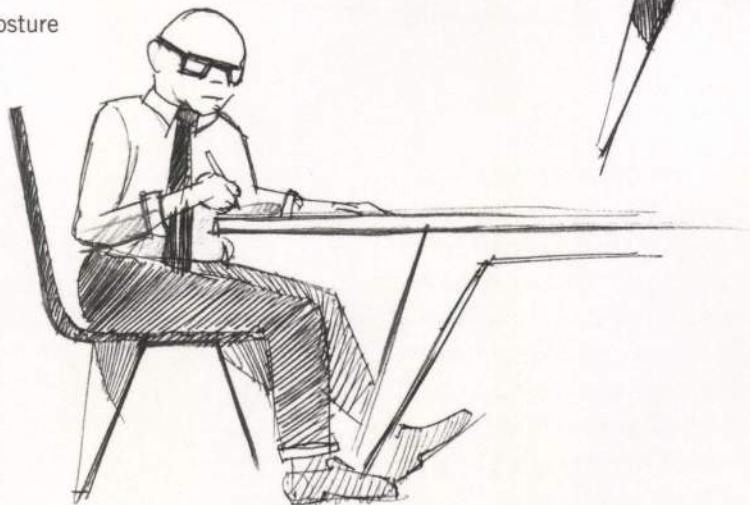
Too far away
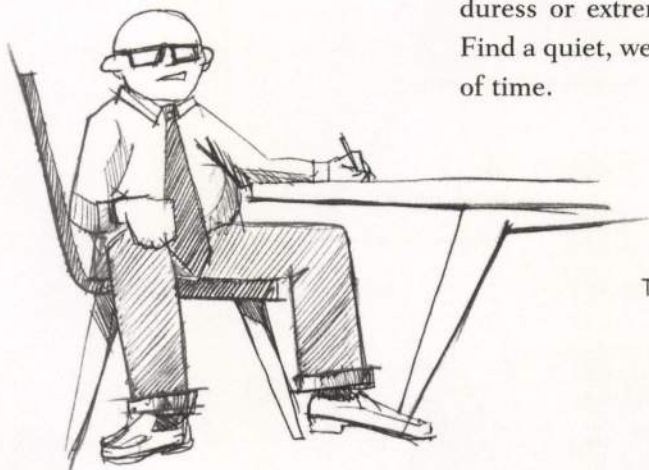
Too hunched over

Good posture

Proper posture can improve the quality of your drawing. Sit with your back relatively erect, allowing your elbows to reach the table surface, with the page centered directly in front of you. Angle the page slightly and move it back and forth for a comfortable position. Avoid hunching or leaning too far over the page.

How you hold your drawing tool is really important for two reasons: (1) a proper grip enables you to manipulate the tool with ease and control; and (2) with the appropriate amount of tension, a proper grip will also allow you to draw for a longer period of time with minimal effort. A proper grip should be loose enough that you can pull a pencil out from your pinching fingers with ease but tight enough that if you raise your hand over your head, the pencil does not fall out.
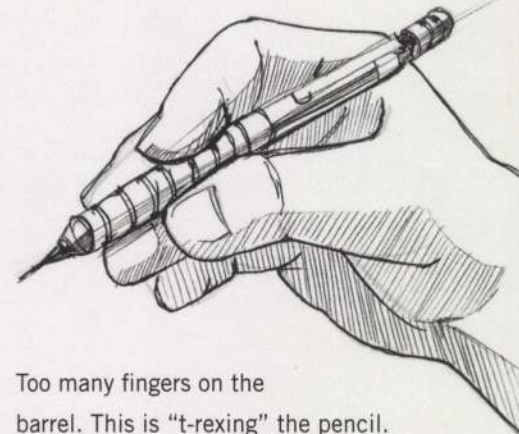
When you grip a pencil or pen, you should pinch with your thumb and index finger using the first knuckle on your middle finger as a rest. If your middle finger floats to the top of the barrel so that you're gripping with three fingers, you'll engage your forearm muscles, which creates fatigue and tension on your wrist. Drawing for a sustained period of time takes both focus and physical discipline. Therefore, a proper grip will enable you to work more efficiently.

Pens and pencils perform differently. The *slower you move* a pen, the heavier its stroke will be, whereas the *heavier you push* on a pencil, the heavier that stroke will be. In both cases, you want to avoid making deep impressions into the paper surface. Light pressure will enable you to work faster and to build up strokes to make them darker. Rotating your pencil or pen a quarter-turn after each stroke keeps pencil tips sharp and enables the nylon tip on pens to wear evenly. You'll be surprised at how well this works.

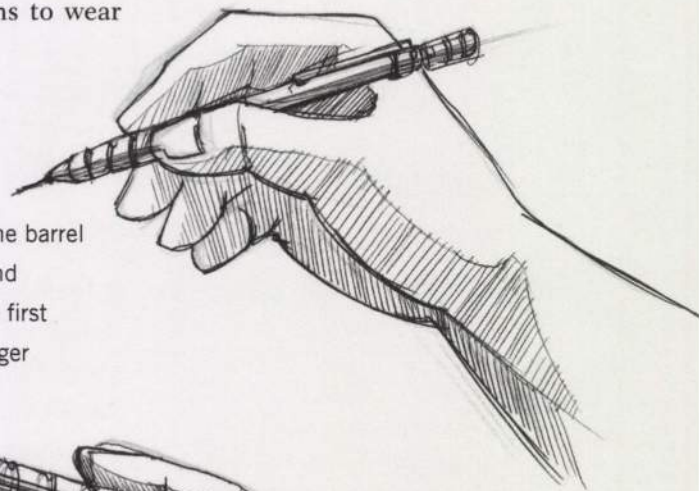Too many fingers on the barrel. This is "t-rexing" the pencil.

a brief note about setting goals

Setting attainable goals for your sketching is key to developing a good skill set and healthy attitude. You should always try to push yourself beyond your capabilities, but attempting to accomplish too much can be detrimental to your development. When you sit down to sketch, look at the blank page for a few seconds and try to visualize some alternatives for how you may start sketching, considering organization, layout, and content.
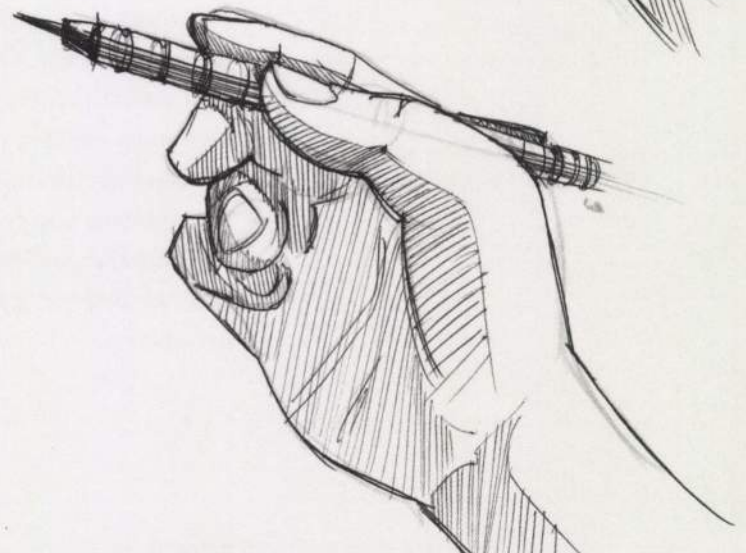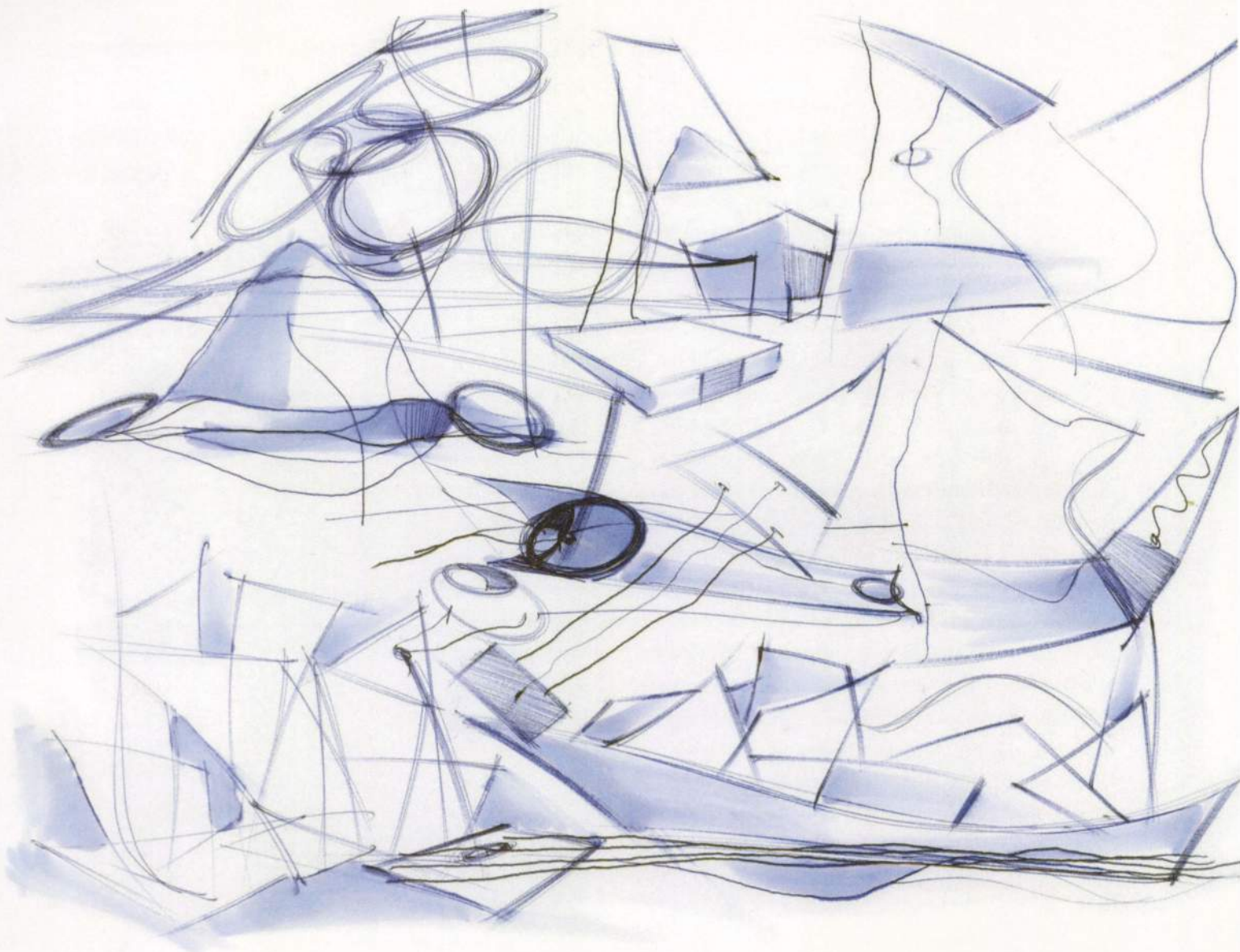
Good grip. Pinching the barrel between the thumb and pointer, resting on the first digit of the middle finger

fear of the blank page

A blank sheet of paper can't hurt you, but it can cause apprehension and place pressure on you to make the correct and best sketch right away. Putting down a primitive sketch or doodle first allows you to "break the surface." Sketch pages are not intended to be the cleanest, most pristine drawings; they should capture and record your thought process. Often, you'll see industrial designers draw a cube or a primitive version of their concept in doodle form. This necessary stage enables your brain, hands, and eyes to warm up and begin to focus on the subject. Putting a title block or frame on the sheet first enables you to ease into the white space by setting parameters for your sketch. Once some structural elements appear on the page, you can better organize your sketches and will have already warmed up a bit.
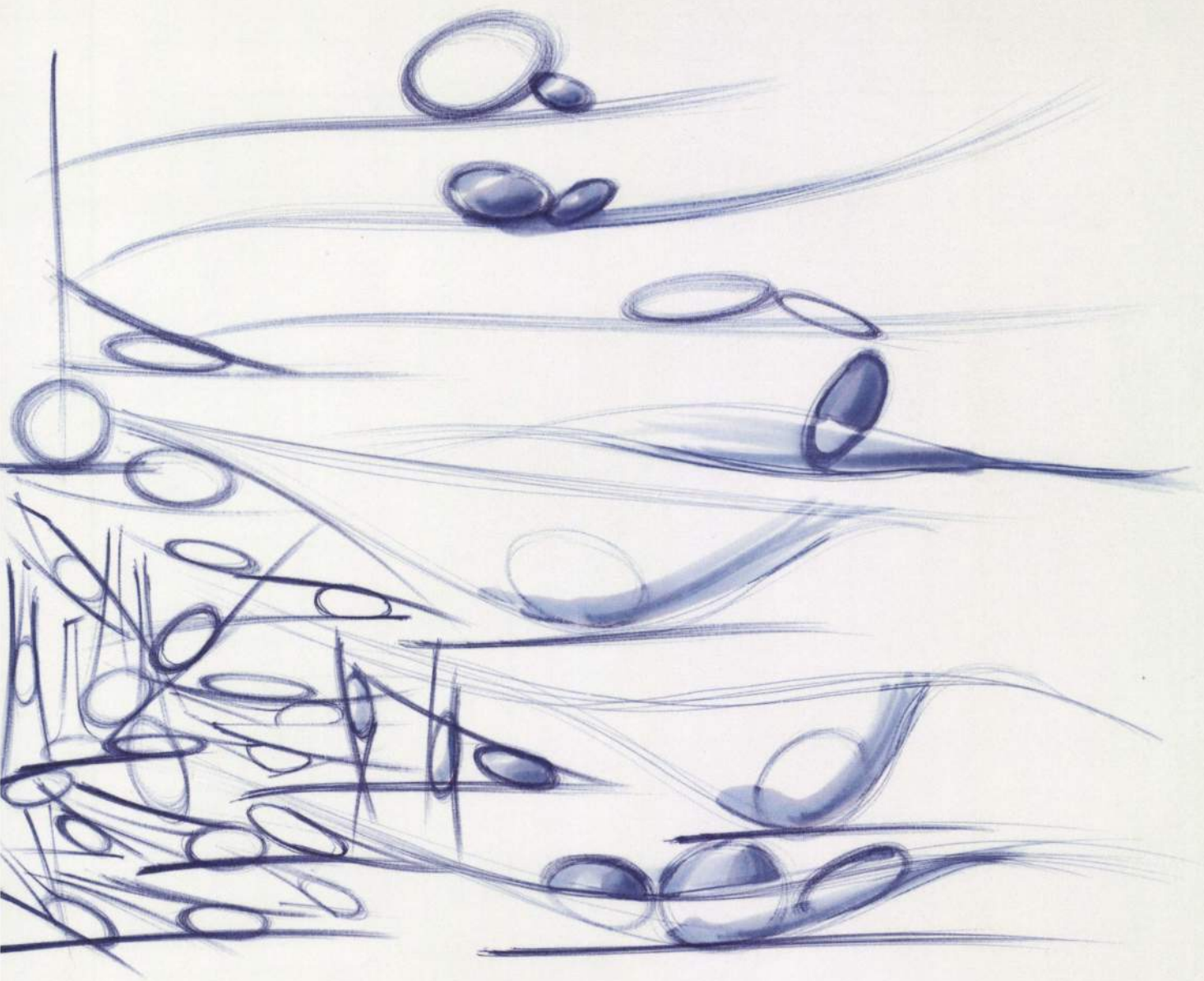
These sketches may seem like simple doodles, but designer Matt Zywica creates them to help his eyes, mind, and hand warm up before he begins sketching ideas.

LATE DAY SUN
GOOD AMBIENT
ILLUMINATION
*GREAT FOR
PHOTOGRAPHY

7pm
6pm
5pm
4pm
3pm
2pm
1pm
12pm
11am
10am
9am
8am
7am

WEST

MID AFTERNOON
HIGH LIGHT =
BEST ILLUMINATION

MOVE CHAIR TO OPPOSITE SIDE OF DESK
TO MINIMIZE CAST SHADOWS ACROSS
WORK AREA

EARLY MORNING
LOWLIGHT =
LOW SHADOWS

EAST
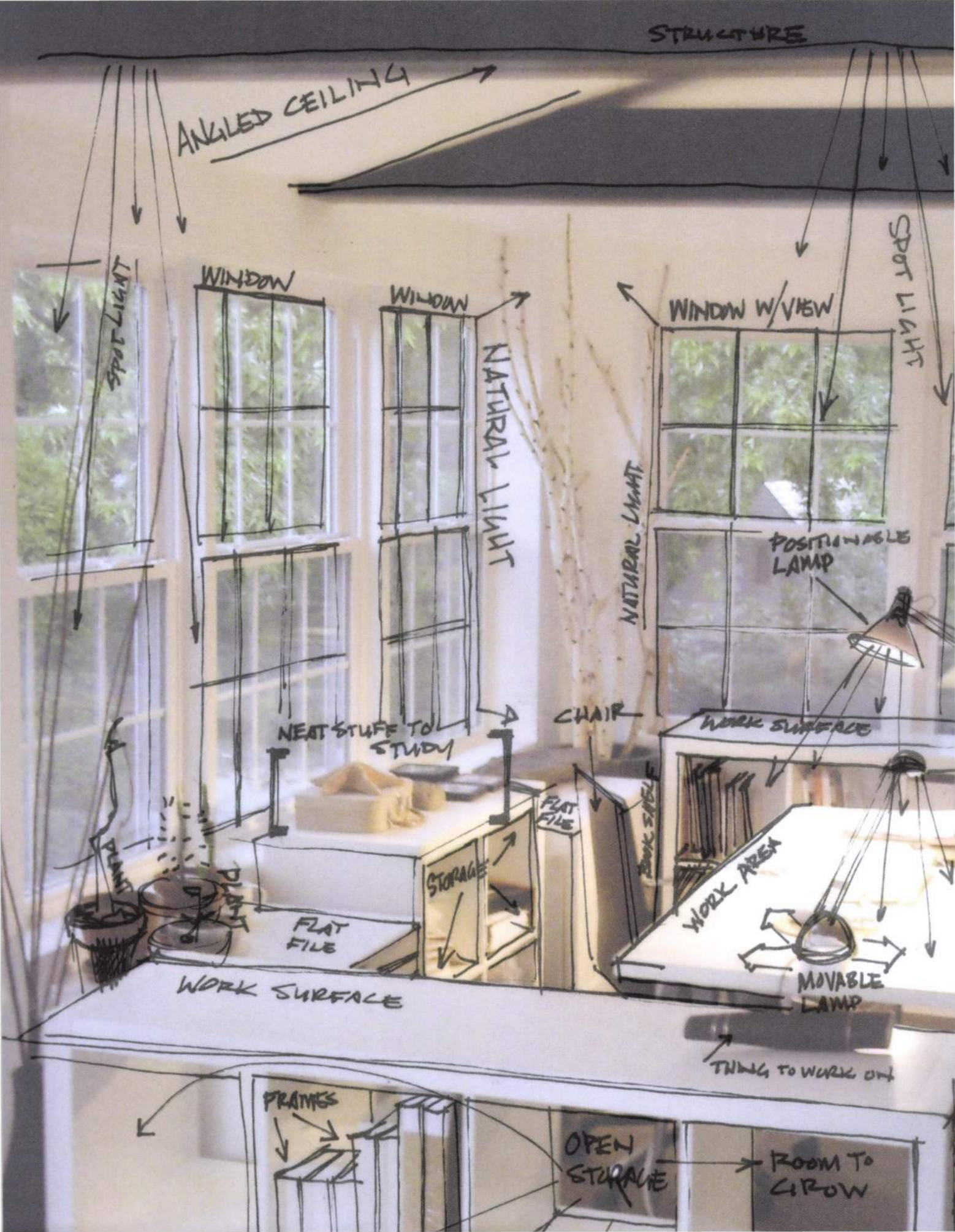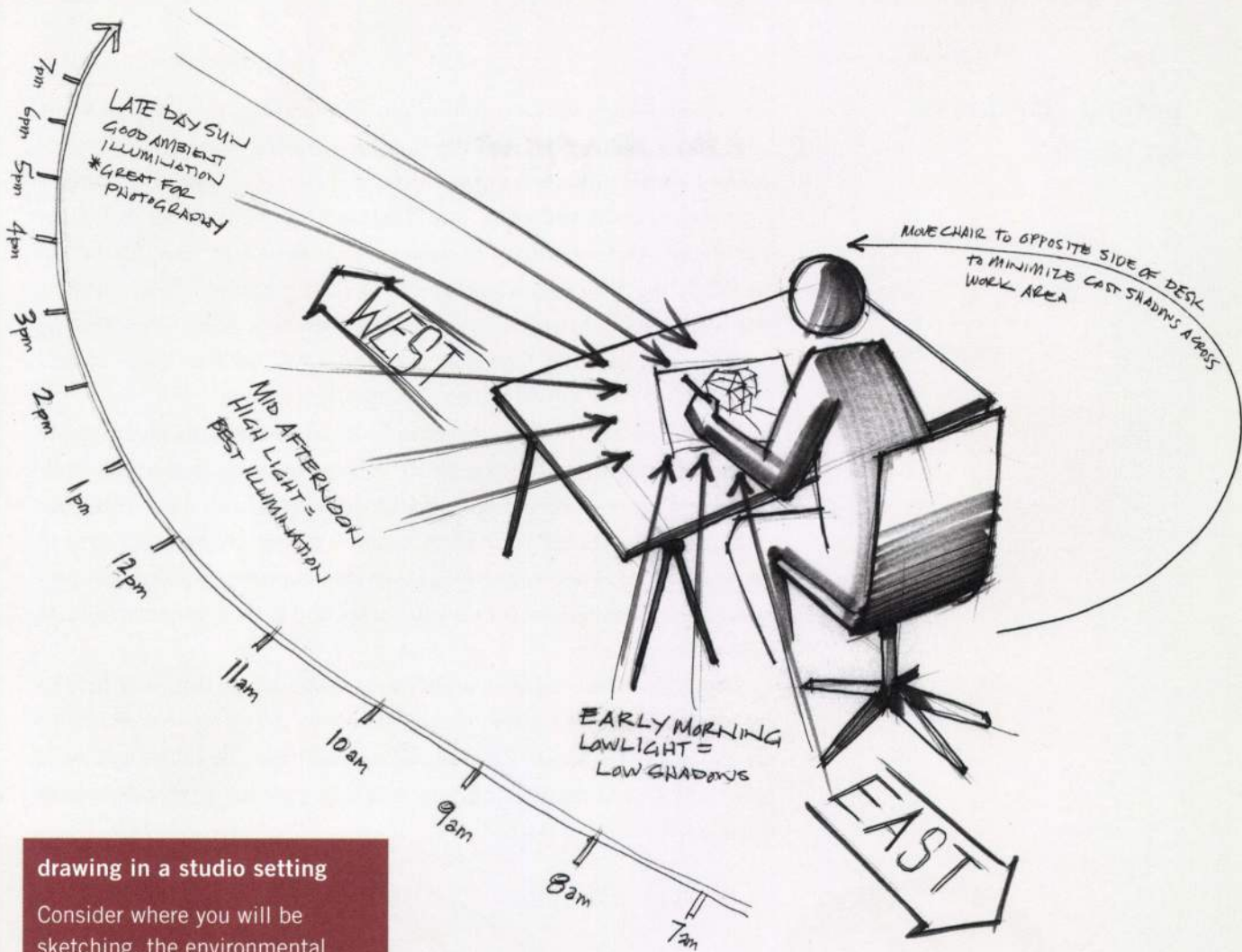
drawing in a studio setting

Consider where you will be sketching, the environmental conditions (lighting, for example), how much time you have, and how private or public the space is. If you have the luxury of constructing your own environment, consider the amount of natural light, storage, and flexibility of furniture.

Arranging your office/studio in relation to the sun will allow you to take advantage of natural light and a variety of lighting conditions throughout the day. Be cautious of cast shadows on your work area, as these can be distracting. Bright, direct light reflects strongly on white paper. Aim to have filtered sunlight over your work area to provide comfortable ambient lighting.

Positioning your desk to take advantage of the sun angles may provide better lighting conditions for drawing.

HIGH SUMMER SUN

LOW WINTER SUN

WEST

EAST
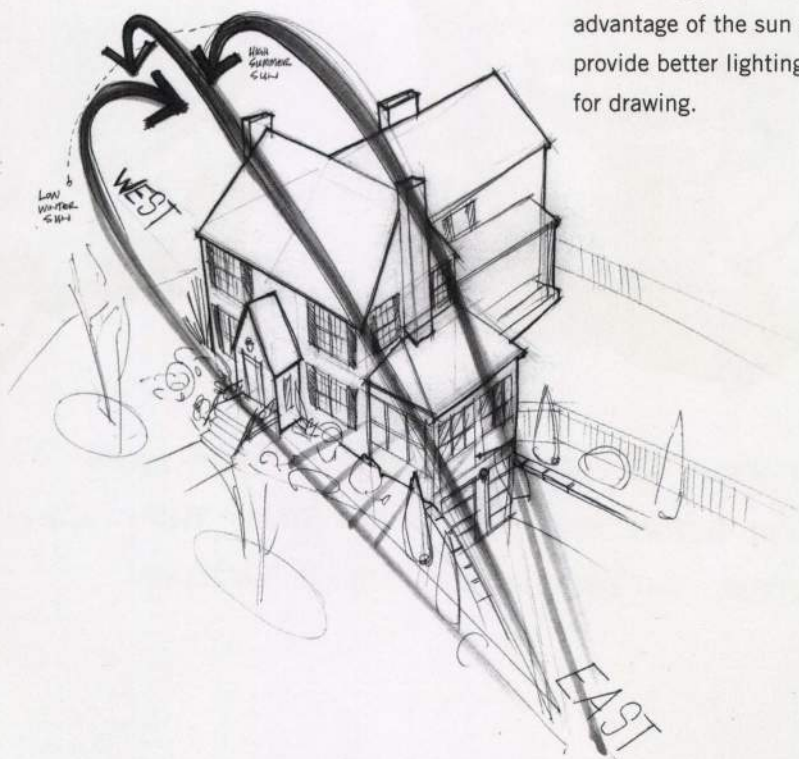
getting your ideas on paper

The act of designing is a combination of observing, thinking, making, forecasting, validating, and developing—moving from fuzzy, loosely defined constraints to concrete ideas and criteria. Similarly, drawing your ideas occurs the same way. Sketches can be built up in fidelity and detail starting with a nonphoto blue pencil or gray marker to establish the general proportions and configuration. Then layering line work, shading, and hatching on top will define the form. During this process, you may find that your ideas will become more clearly realized and have a fresh, "sketchy" quality to them.

Work consistently to move ideas forward and provide an adequate record of your thought process. If you move too quickly with half-visualized ideas or very loose, scratchy drawings, you may stifle your thinking and prevent your ideas from evolving or growing. Aim to generate copious amounts of sketches that capture your thought process so that you can reflect on your ideas and project forward to form new ones.

Don't abandon an idea until you've sufficiently explored it. The car sketches at right show a day's worth of drawings that evidence an evolution of ideas. Periodically spread your sketches out on a table and look at them as a group; you'll be able to see trends in your thinking.
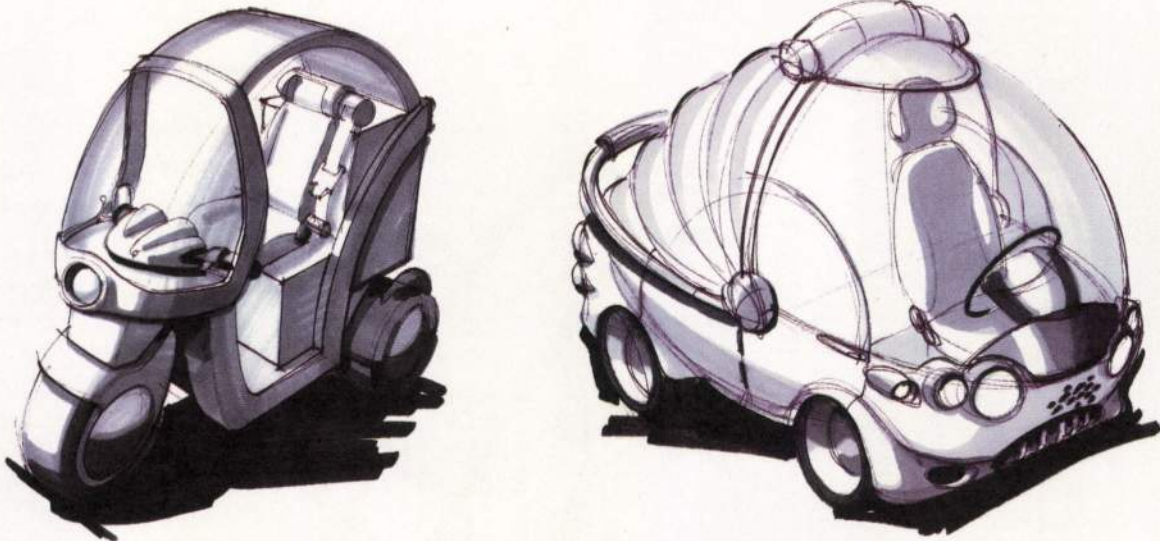
YOU WANT TO KEEP RECORD OF YOUR LESS SUCCESSFUL SKETCHES SO THAT THEY CAN BETTER INFORM YOUR NEXT SKETCH.

Sketching your ideas on paper enables you to spread the various pages out to see all of your ideas at a glance.
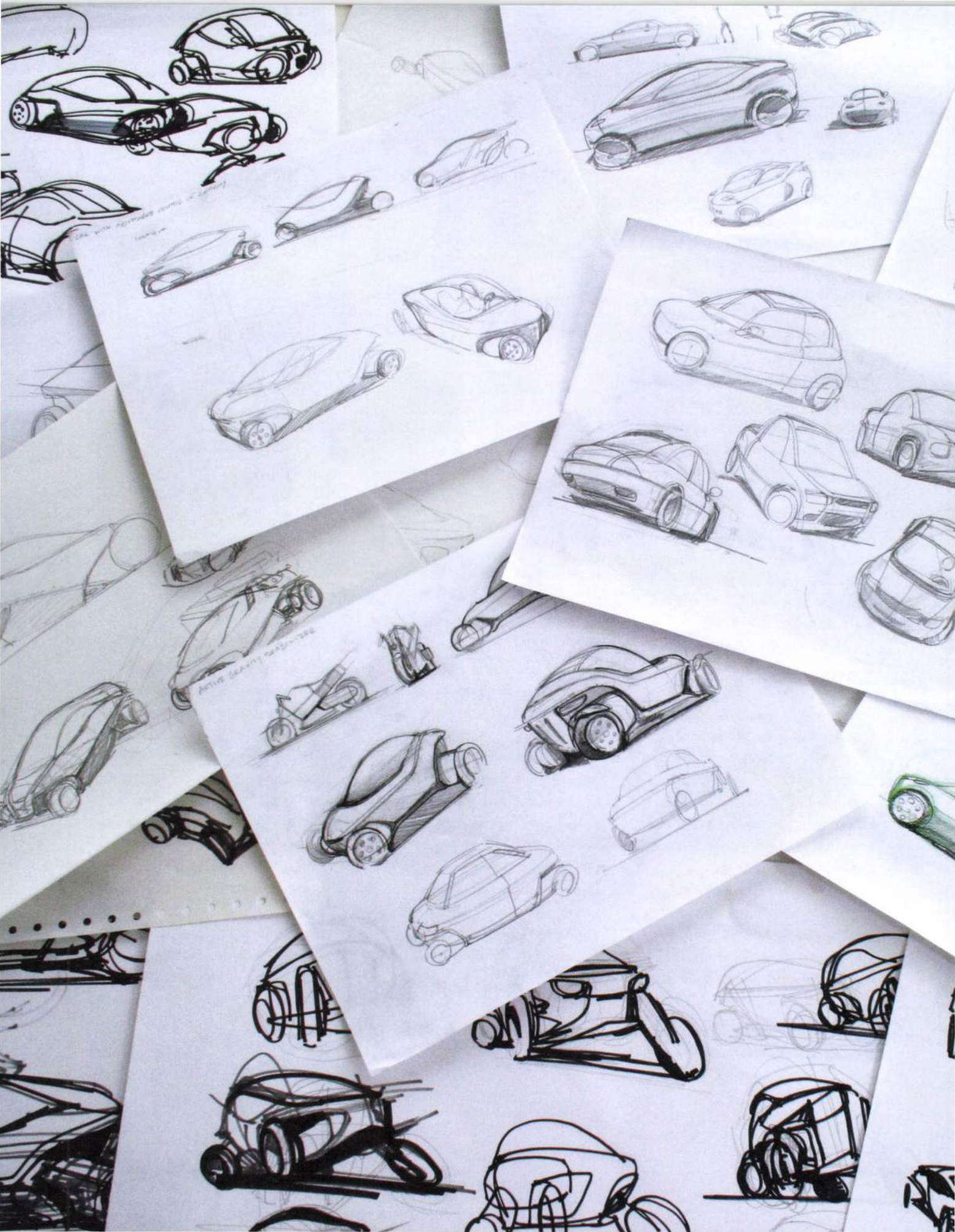
JUST KEEP SKETCHING, SKETCHING . . .

Many years ago, Mark Arends, professor of industrial design at the University of Illinois and author of *Product Rendering with Markers*, said that it takes about one thousand sketches to build confidence and competence. Behind this is the concept of muscle memory and getting your eyes and hands to work in concert with your mind. With so many sketches under your belt, you will also develop a more critical eye and should be able to discern effective sketches from ineffective ones. With competence comes confidence and eventually expertise that can be shared with others.

There are times when you may try to sketch but the ideas just don't flow. In this instance, it is useful to keep your pen moving and keep sketching but change the subject. In many designers' sketchbooks, you'll find doodles of robots, cartoon characters, letterforms, and, of course, cubes. Purposeful doodling in this case is important to keep your mind active and your muscles moving freely. At some point, you'll most likely find some inspiration and switch back over to the task at hand.


PIN IT UP & STEP BACK, FREQUENTLY

Pinning up your sketches provides perspective and helps you check how effectively your sketches communicate from a distance. Is the big idea apparent? Is there enough contrast and line weight to see details? Viewing your sketch in the context of its physical borders will help to identify larger layout issues that you might otherwise miss, enabling you to make adjustments in the context of actual viewing distance.

DRAWING THROUGH THE FORM

"Drawing through" is an approach to building up your sketch from its elemental structure to a detailed form by using a variety of line weights and showing surfaces, edges, and features on the hidden sides. This transparency enables you to see where and how to join components to bodies, work out mechanics of structure, and check the accuracy of perspective. You can use a combination of mediums to draw through an object; each has advantages.
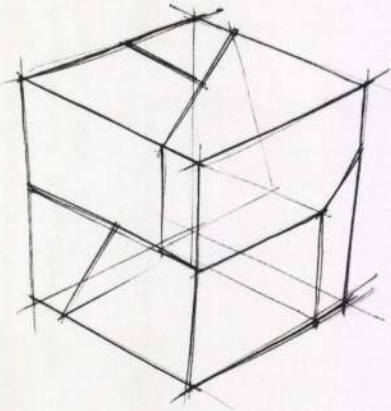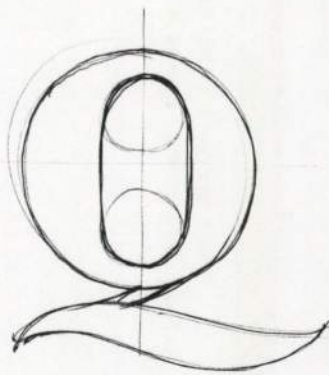
EXAMPLE 1

You can try two pencils that vary in weight and density: .05 HB and .09 B to create distinction between lighter lines used for basic construction and darker, heavier lines used to detail the form.
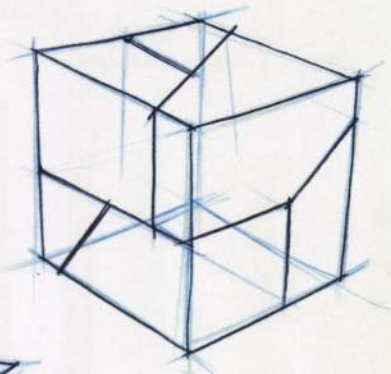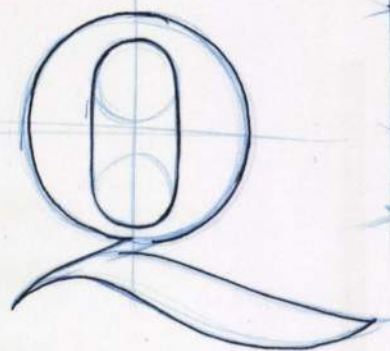
EXAMPLE 2

Nonphoto blue pencil and black Prismacolor pencil enable you to create a dynamic drawing with some added visual interest. The blue structure can be deleted through a quick photocopy or dropped out in Photoshop, leaving only the rich black form. The softness of Prismacolor pencils allows you to vary the thickness and density of a line by drawing with varying amounts of pressure and speed.
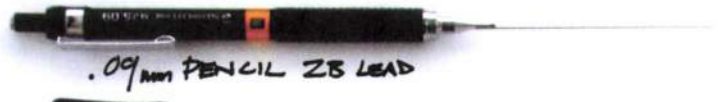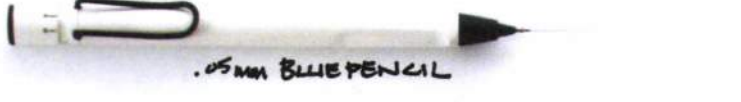
EXAMPLE 3

Using a 10%, 20%, or 30% gray marker to rough in the structure provides a lightweight, loose form from which you can add more definition. Pencil or pen can be used to detail the form to create a sketch with added visual depth.
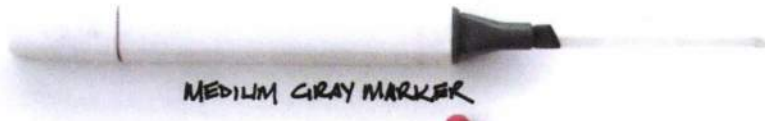
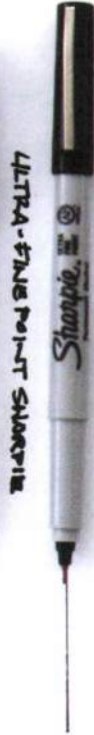LEAD GRIPPER

.09mm PENCIL 2B LEAD

.05mm BLUE PENCIL

MEDIUM GRAY MARKER

FINE POINT BALLPOINT PEN BLUE INK

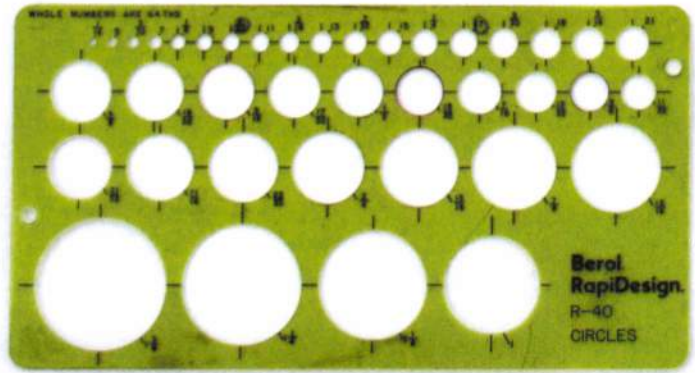FINE POINT BALLPOINT PEN BLACK INK

FINE POINT BALLPOINT PEN RED/BLACK/BLUE INK

SHARPENER

FINE POINT SHARPIE

ULTRA-FINE POINT SHARPIE

NONPHOTO BLUE PENCIL

PRISMA-STICK

Artline DRAWING SYSTEM 0.3

Artline DRAWING SYSTEM 0.5

Artline DRAWING SYSTEM 0.8

NYLON TIP BLACK PENS

STONE/JAR HOLDING PAPER DOWN

COLORLESS ERASER

LOW-TACK TAPE

RETRACTABLE KNIFE W/SNAP-OFF BLADES

CIRCLE TEMPLATE

Berol RapiDesign. R-40 CIRCLES

SELECTING MATERIALS CAN be a daunting task, as there are so many choices for drawing pens, paper, sketchbooks, and tools. You don't need many materials to create effective sketches, but you do need the *right* ones. Following are some considerations when making material selections for paper, drawing tools, and sketchbooks—three essential ingredients in your sketching arsenal.

Not all white paper is truly white. Shown here are sheets of "white" paper. Note the differences in brightness and apparent tone.

Bienfang Extra Bright Marker 340

Hammermill Tidal MP / 20lb / 92 brightness

Hammermill Jet Print / 24lb / 94 brightness

Bienfang Graphics 360 Marker Paper

Hammermill Laser Print / 24lb / 96 brightness

Borden & Riley #39 Chalk White Layout Bond / 16lb

pen and paper

Designers are always looking for new pens and pencils—it's a bit of an issue we seem to have. The feel of a pen and the quality of line it creates can have an impact on the visual quality of your sketch. To find your new favorite drawing tool, we recommend looking for those that feel comfortable in your hand, provide crisp, even strokes, and work well with the paper you intend to use. With a seemingly infinite variety of pens available, you should test them out before purchasing. Once you find a pen that works well, stick with it.

Paper choice is an often-overlooked, important aspect to sketching. Rough paper will make lines look shaky or stuttered and is best when used with pencils. Uncoated paper will make your markers bleed past bounding lines and bleed through to the page below. Standard copy, inkjet, and laserjet papers should suffice, but look for those with at least 94 ISO brightness and that are thick enough to provide an opaque surface.

Uncoated and heavily textured papers may perform poorly with certain mediums, like markers and pens. Bienfang Graphics 360 paper is very common because it is well suited for markers, colored pencils, and chalks. Its semiopaque quality enables you to see through to underlaid drawings, and its plastic-like surface enables marker ink to sit on the surface for blending. Select paper that is less prone to bleeding and will tolerate the ink of markers and pens. Certain marker papers also seem to enhance the color quality of markers and chalk pastels.

WHILE WE HAVE TONS OF SUPPLIES IN OUR STUDIOS, OUR DAILY SKETCHING TOOLS ARE LIMITED FOR PORTABILITY.

tool sets

We recommend keeping a set of your favorite tools handy wherever you sketch: a black fine-line pen, a black heavy-line pen, a black ballpoint pen, a pencil, and a medium gray marker. This is a basic suite of tools that enables you to function in a variety of sketching capacities. Should you require some spot color, simply add your favorite colored pencil or marker into the mix.

Should you require a straightedge to make better lines, a small ruler will serve you well. Erasers, shape templates, pencil sharpeners, a full range of markers, watercolors, and other tools can be part of an expanded set of tools to support your sketching. For versatility and interest, periodically swap tools out and change up the contents of your preferred tool set.

WILL'S TOOLS

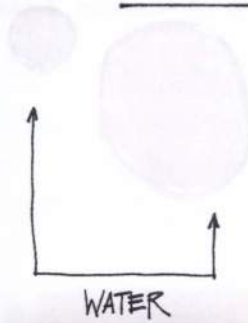PRINCETON ROUND WATERCOLOR BRUSH

TICONDEROGA HB PENCIL

0.3 STAEDTLER PIGMENT LINE PEN

PILOT PRECISE V5 ROLLING-BALL PEN

FELT-TIPPED PEN (THIN)

WHY WATERCOLOR?

SINCE WATER IS AVAILABLE EVERYWHERE, WATERCOLOR IS A VERY PORTABLE WAY TO ADD A RENDERING WASH TO YOUR SKETCHES. THE UNPREDICTABILITY OF THE WATERCOLOR MEDIUM ALSO FORCES YOU TO STAY LOOSE AND WORK WITH YOUR MISTAKES.
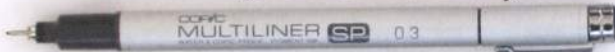
WATER

PAYNE'S GRAY WATERCOLOR PAINT
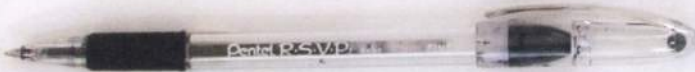
PAYNE'S RAW UMBER WATERCOLOR PAINT

MARK'S TOOLS

OLFA RETRACTABLE BLADE KNIFE
(FOR SHARPENING PENCILS)

0.3 COPIC MULTILINER PEN

PILOT BRAVO! PEN
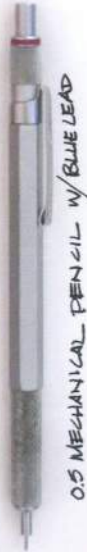
PENTEL FINE BALLPOINT PEN

30% GRAY MARKER

GENERAL'S DRAUGHTING PENCIL No. G314

PRISMACOLOR COL-ERASE BLACK PENCIL

0.5 MECHANICAL PENCIL w/BLUE LEAD

ALUMINUM TIN FOR CARRYING SUPPLIES &
USE AS A STRAIGHT EDGE
FOR MAKING LINES

personal sketchbooks

A comfortable size for a sketchbook is 10¼" x 14" (260 x 356 mm). This is enough space to draw a few sketches on each page but not so large as to sacrifice portability; however, you should consider the size constraints of your bag/backpack as well as space limitations for where you may be sketching (in the middle seat on a plane, for instance). A basic count of fifty pages enables each book to remain lightweight and still capture a few weeks' worth of work. More experienced sketchers may find smaller books more advantageous, but for beginners, a small page size can discourage good drawing skill development. Specifically, a small page size can hinder drawing from your shoulder (causing you to instead draw from your wrist) and keep you from creating iterative drawings (variations of the same sketch on a single page for comparison).
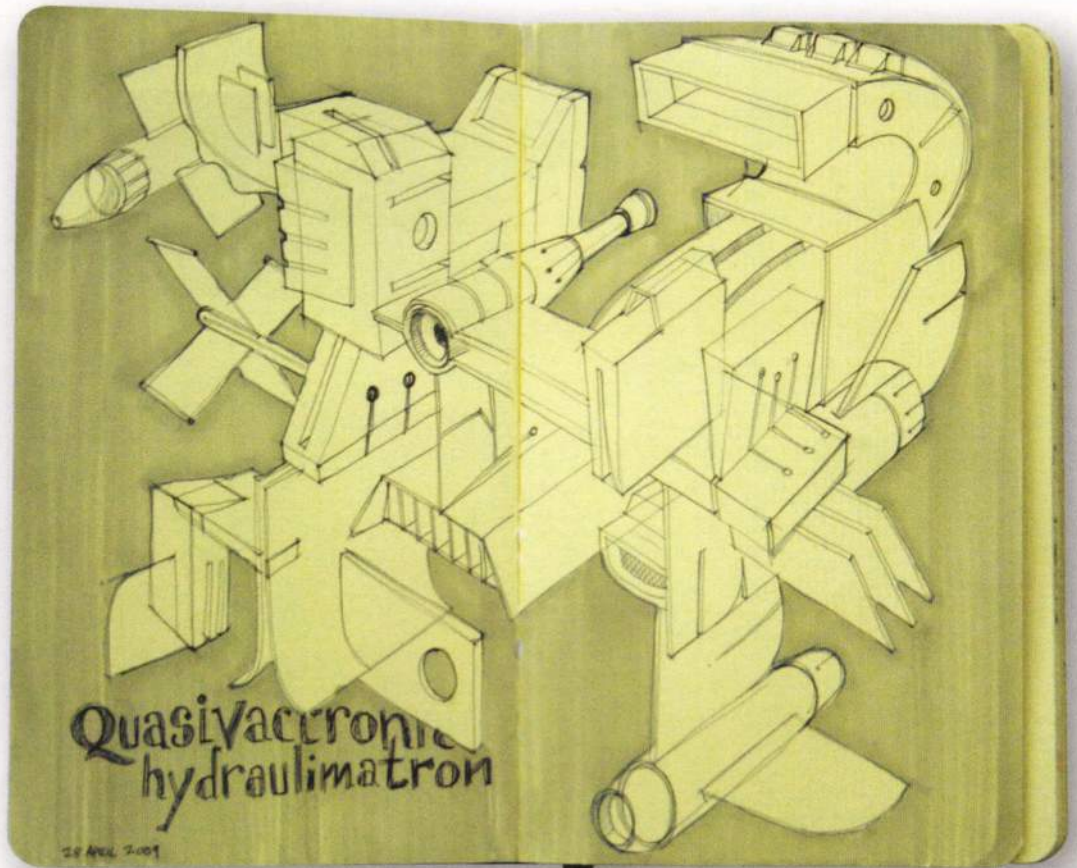
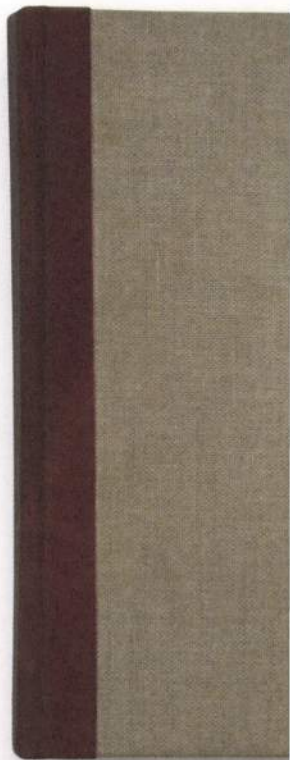Moleskine A / hardcover / 5" x 8¼" (127 x 210 mm)
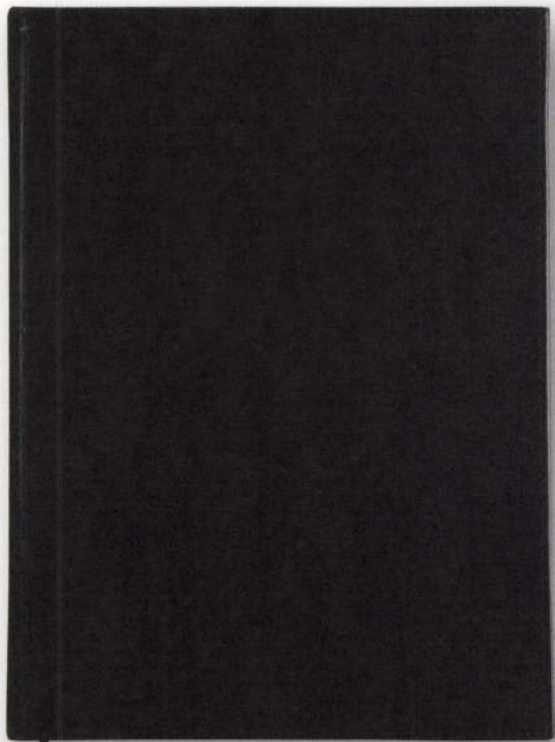
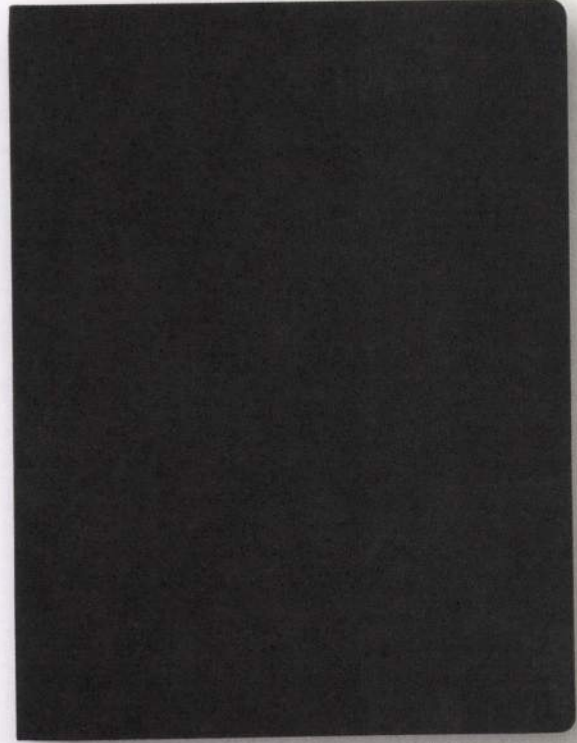Global Art Materials / hardcover / 7½" x 10"
(191 x 254 mm)
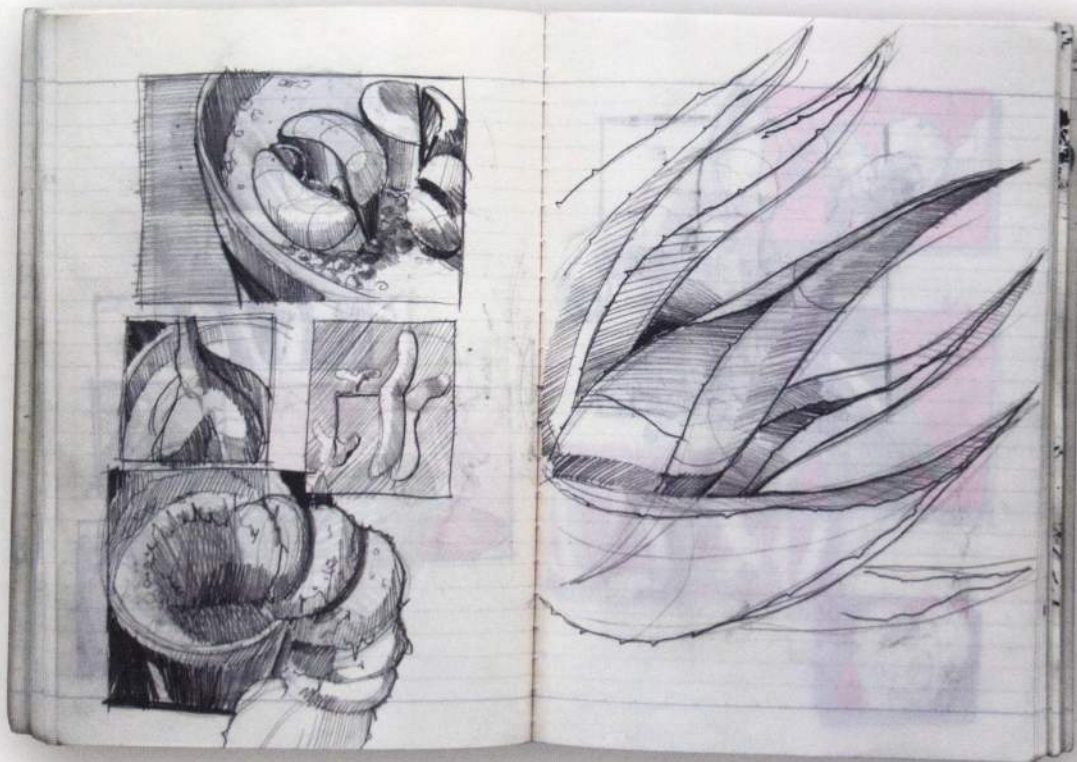
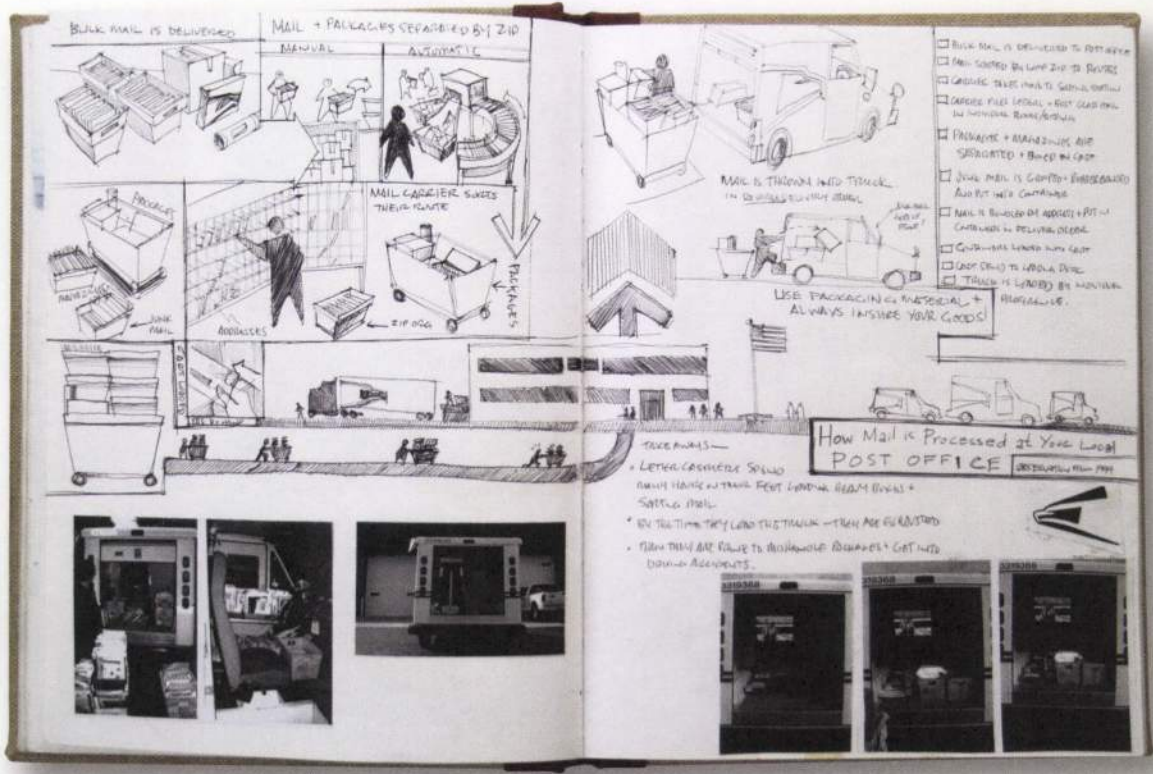Lined notebook / softcover / 7" x 10" (178 x 254 mm)

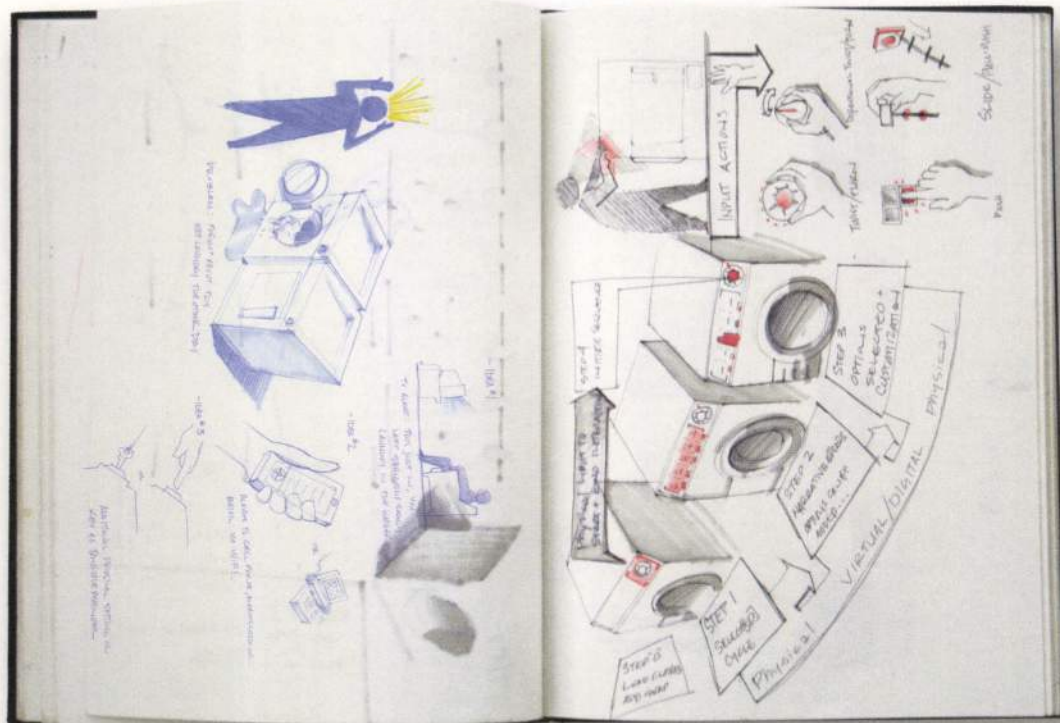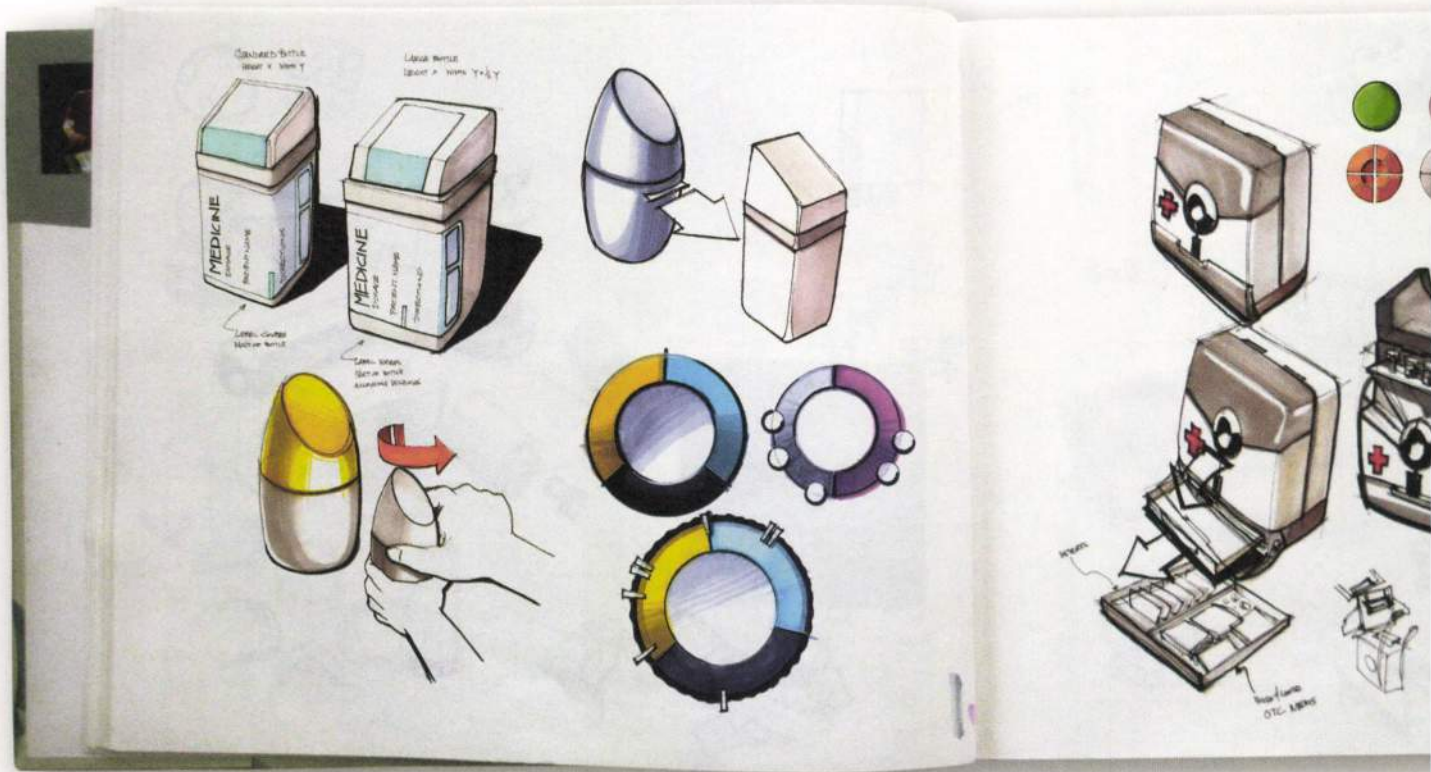Custom / leatherbound / 9½" x 12" (241 x 305 mm)

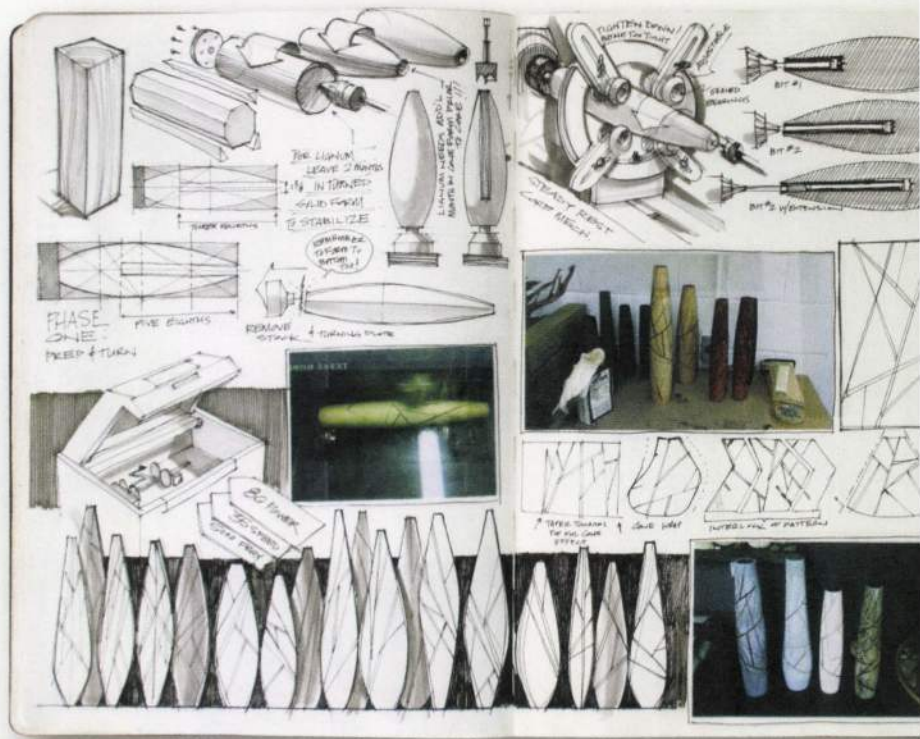Moleskine B / softcover / 7½" x 10" (191 x 254 mm)

Michael Roger Press / 8" x 10¼" (203 x 260 mm)

Strathmore acid free / 8¼" x 11½" (210 x 292 mm)

Custom / hardcover / 10¼" x 14" (260 x 356 mm)

Moleskine / hardcover / 8½" x 12" (216 x 292 mm)

top 10 characteristics of good personal sketchbooks

The sketchbook is your playground to experiment and try out ideas, techniques, and mediums; it can also be your journal and notebook. So, knowing why you are sketching and what you hope to gain from sketching is important. Following are some characteristics of effective and functional sketchbooks.

1 FORMAT

MAKE SURE THERE IS ENOUGH DRAWING AREA TO ENCOURAGE SKETCHING AND IDEA DEVELOPMENT ACROSS THE PAGE OR SPREAD. CONSIDER WHETHER YOU LIKE PORTRAIT (VERTICAL) OR LANDSCAPE (HORIZONTAL) FORMAT BETTER. AVOID THE GUTTERS OF THE SKETCHBOOK IF YOU ARE GOING TO PHOTOCOPY OR SCAN SPREADS.

2 PAPER

PAPER SHOULD HAVE A SMOOTH OR FINE GRAIN TO ENABLE CRISP LINES. ROUGH PAPER WILL DESTROY NYLON-TIP PENS AND YIELD SCRATCHY LINES. IF YOU ARE USING MARKERS, CONSIDER BUYING BOOKS WITH THICKER PAPER SO THAT THERE IS LESS CHANCE OF BLEEDING THROUGH. PERIODICALLY MIXING IN A DIFFERENT TYPE/COLOR OF PAPER MAY KEEP THINGS EXCITING.

3 SIZE

INSPIRATION FOR IDEAS CAN HAPPEN ANYWHERE AT ANY TIME. THIS IS PERHAPS WHY THE POCKET SKETCHBOOK IS REGARDED AS SUCH A GOOD FORMAT FOR NOTATIONAL AND EXPLORATORY SKETCHING. SEEK SIZES THAT FIT IN BACKPACKS AND BAGS TO FACILITATE CARRYING AT ALL TIMES. YOUR SKETCHBOOK SHOULD BE YOUR CONSTANT TRAVEL COMPANION.

4 FOLD-FLAT SPINE

LOOK FOR HINGED COVERS THAT ALLOW THE BOOK TO OPEN FLAT AND ACCOMMODATE SCANNING AND PHOTOCOPYING FOR PRESENTATION AND DOCUMENTATION. WIRE BINDING FOLDS FLAT BUT IS WEAK AND PAGES TEND TO FALL OUT.

5 PAGE COUNT

SMALLER PAGE COUNTS THAT ALLOW A FEW WEEKS OF WORK ARE BEST AND WILL HELP YOU TO GENERATE A SERIES OF VOLUMES OVER A SHORTER AMOUNT OF TIME. SIMPLY BINDING LOOSE SKETCHES WITH A CLIP DOES NOT CREATE AN ARTIFACT. YOU WANT TO LIVE WITH YOUR SKETCHBOOK AS A COMPANION, BUT IT SHOULDN'T FALL APART IN TRAVEL.

6 BINDING

STRONG BINDING IS IMPORTANT FOR DURABILITY. LOOK FOR BOOKS THAT HAVE STRONG CONSTRUCTION THAT KEEPS SKETCH-BOOKS FROM FALLING APART IN USE. IF YOU ARE MAKING YOUR OWN BOOKS, CONSIDER STRING-BINDING TECHNIQUES TO ADD AN AESTHETIC QUALITY AND ELEMENT OF REFINEMENT TO THE SKETCHBOOK. THE STRENGTH AND DURABILITY OF BINDING ALSO DETERS PAGE REMOVAL.

7 COVERS

CUSTOMIZABLE COVERS CAN ENCOURAGE INDIVIDUALITY AND SHOW YOUR PERSONALITY. COVER MATERIALS SHOULD BE DURABLE AND PROVIDE ENOUGH STRUCTURE FOR THE BOOK TO REMAIN RIGID. FLIMSY BOOKS ENCOURAGE SHAKY DRAWING, ESPECIALLY WHEN USED IN THE FIELD AS OPPOSED TO YOUR STUDIO OR OFFICE.

8 INDEXING

DATE INDIVIDUAL PAGES, AND PUT THE DATES THAT YOU START AND FINISH A SKETCHBOOK ON THE COVER. THIS CAN PROVE USEFUL WHEN REVISITING BOOKS AT A LATER DATE, FILING, OR INDEXING.

9 MEDIA

TRY A VARIETY OF MEDIUMS TO FIND ONES THAT WORK FOR YOU. THE BEST SKETCHES COME FROM A HARMONY AMONG THE ARTIST, MARK-MAKING MEDIUM, AND PAPER TYPE.

10 INTEREST

THE BEST SKETCHBOOKS BECKON YOU TO SKETCH. YOU WANT TO FEEL COMFORTABLE IN THEM. EXPERIMENTATION IS THE BEST CURE FOR IDEA DROUGHT.

SKETCHBOOK
CONSTRUCTION
101

THERE ARE A variety of sketchbooks on the market, each with different paper, covers, and features; however, should you be cost-conscious and very particular about paper, constructing your own sketchbooks creates a personal artifact tailored to your preference. Constructing your own sketchbook is easy if you have the tools and the time. Generally, the effort is worth it for the cost savings alone, as handmade sketchbooks may cost as little as one-fifth the price of a store-bought one and allow you to determine a size that is most portable and effective for your sketching. It can be fun, too. There are a number of format variables to consider, such as page size, layout orientation, page count, and paper quality. The best approach to start is to experiment and see, through use, how best to tweak them so that they match your needs.

We recommend 11" × 17" Hammermill Jet Print paper (ISO A3 paper size or similar), trimmed to size, as it is inexpensive and available at most office supply stores; ten books can be made from one ream (pack). Covers can be crafted from thick cardboard or chipboard and wrapped with colored paper (about 2 inches larger in length and width to completely wrap around the edges of the board), enabling quick and easy customization. Bind your personal sketchbook with string as an attractive way to discourage removing pages; it is important to keep your good and bad sketches together to assess progress and show a trail of development from start to finish. Bad sketches should be redrawn, never removed.

Shown at right are some typical tools needed for constructing your own sketchbook. Following are step-by-step instructions of the construction process for making a book sized 10¼" × 14" (260 × 356 mm). You can use this guide to create sketchbooks of nearly any size that suit your needs. Sometimes it's convenient to have a couple of small books as well as a larger one for different situations.

55 SHEETS WHITE INK-JET PAPER

CHIP BOARD/ILLUSTRATION BOARD
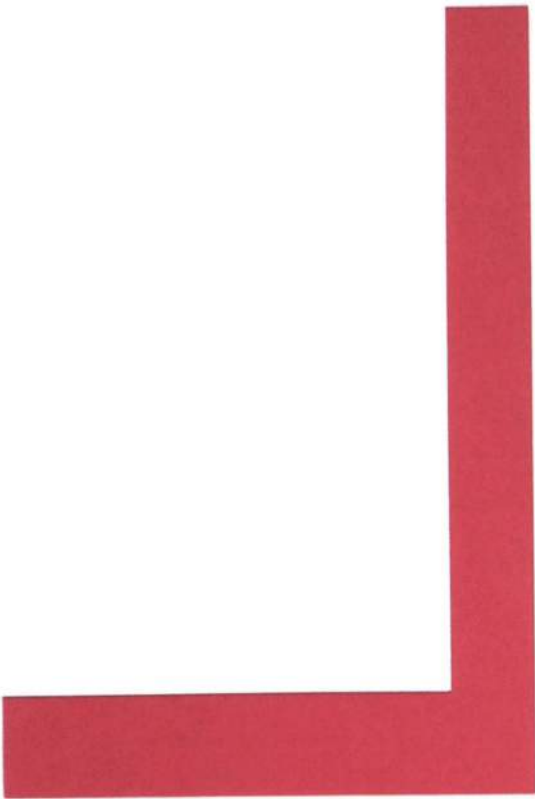
POWER DRILL

11"x17" COLORED PAPER

PLIERS

RULER/T-SQUARE

BURNISHER

MASKING TAPE
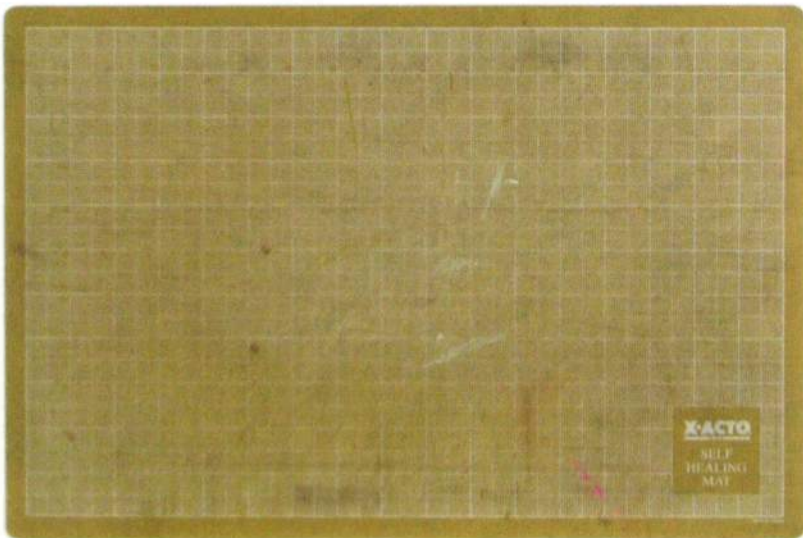
SPRAY MOUNT

EMBROIDERY NEEDLE

EMBROIDERY FLOSS

SCISSORS

NAILS

DRILL BIT

ERASER
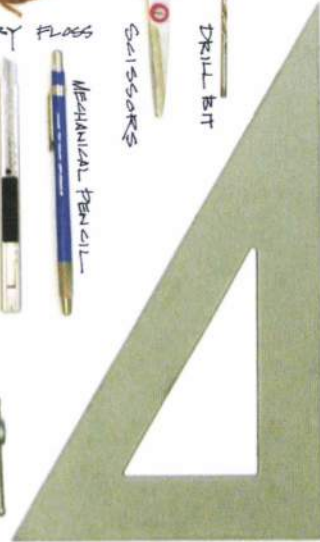
RETRACTABLE KNIFE

MECHANICAL PENCIL

CLAMPING PADS

CUTTING MAT

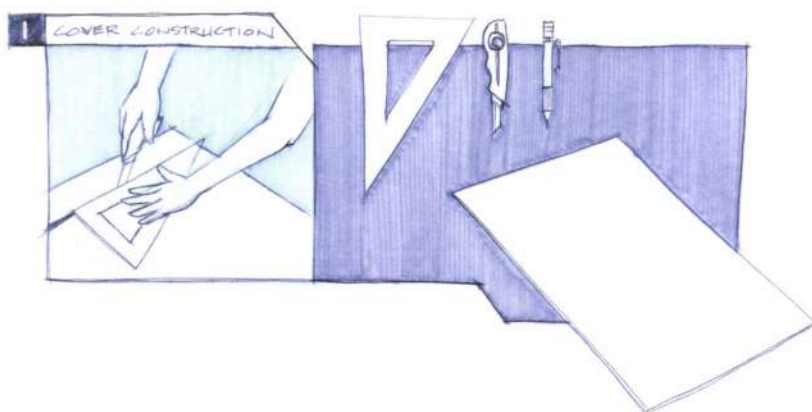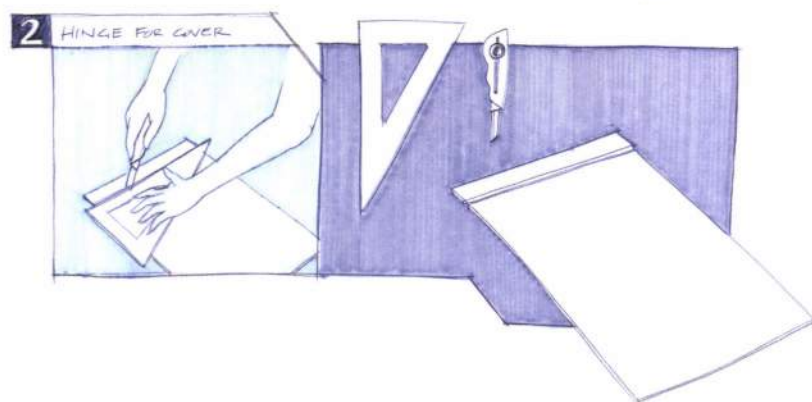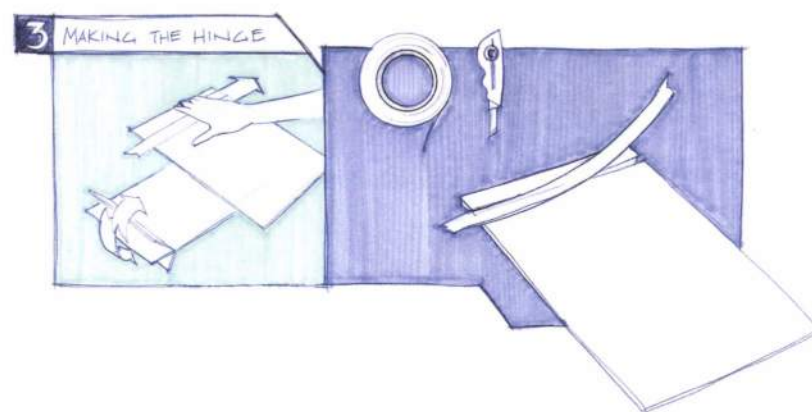TRIANGLE

C-CLAMPS

CUTTING THE COVER TO SIZE

Cut two pieces of the heavy board to 10¼" x 14" (260 x 356 mm). This will be the structure for the front and back covers.

CUTTING THE HINGE

Cut an inch (about 2½ centimeters) off the heavy board pieces so that they now measure 10¼" x 13" (260 x 356 mm). These long, narrow pieces will become the spine.

MAKING A HINGE

Use masking tape to attach the 1" (2½ centimeters) piece to the heavy board. Leave a small distance between the two pieces you are joining. This distance should be no greater than the thickness of the board itself. Use tape on both sides of the heavy board for strength. Repeat this procedure for each cover.
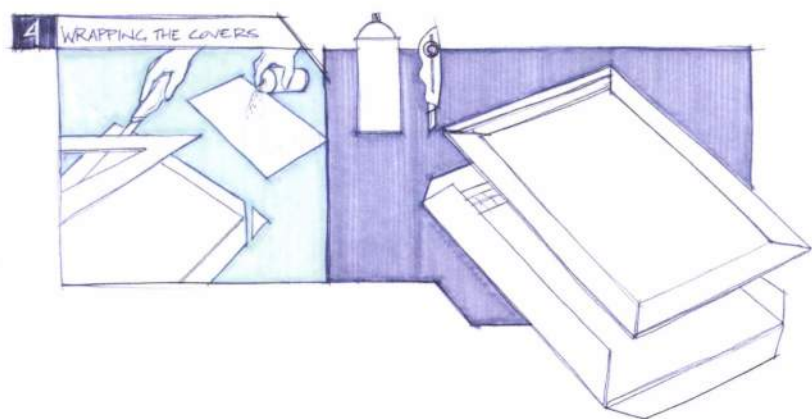
WRAPPING THE COVERS

Use spray mount to adhere the heavy board cover to the 11" x 17" (ISO A3) colored paper. Cut the corners at 45 degree angles. Fold over and adhere to create a tightly wrapped cover.

1. COVER CONSTRUCTION

2. HINGE FOR COVER

3. MAKING THE HINGE

4. WRAPPING THE COVERS

MAKING A BACKING

Use a metal ruler and a retractable knife to cut 57 sheets of 11" x 17" (ISO A3) ink-jet paper down to 10¼" x 14" (260 x 356 mm). Use spray mount to cover the entire exposed area on the insides of the covers. Adhere one sheet of paper to each area.
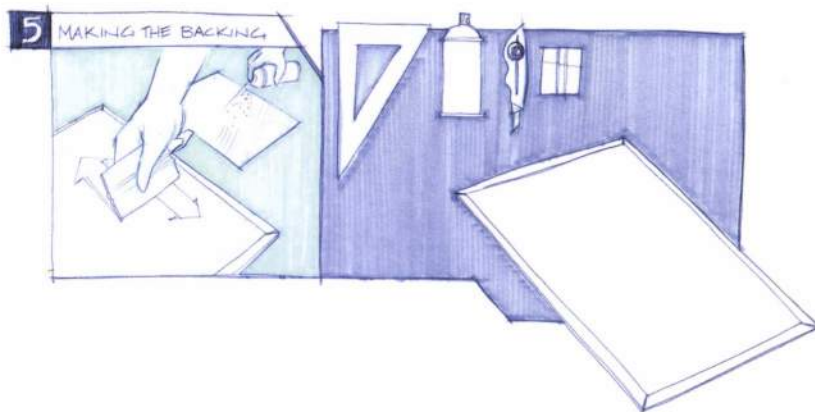
CLAMPING

Align the remaining fifty-five sheets of ink-jet paper between the two covers to form the sketchbook. Use C-clamps to hold the book together throughout the binding process. Insert scrap pieces of heavy board where the clamps touch the covers to prevent damage from the clamps.
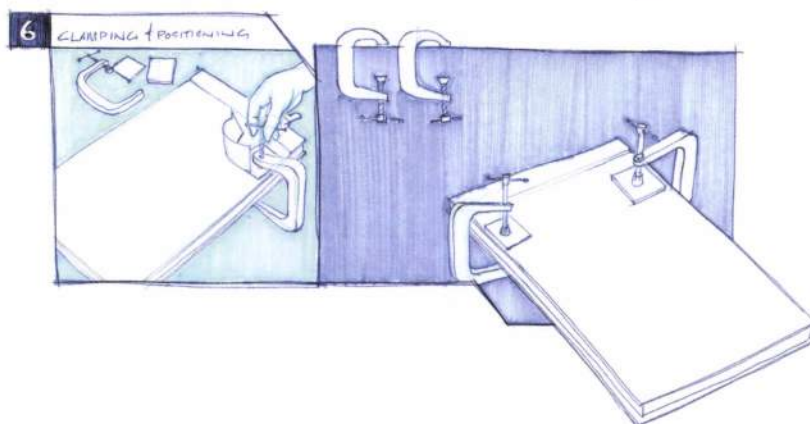
DRILLING

Drill five holes with a small drill bit. The size of the bit should be slightly larger than the thickness of the embroidery needle you'll be using in the next step. A finishing nail can also be used instead of a drill bit; make sure to cut the head off the nail before using it in the drill.
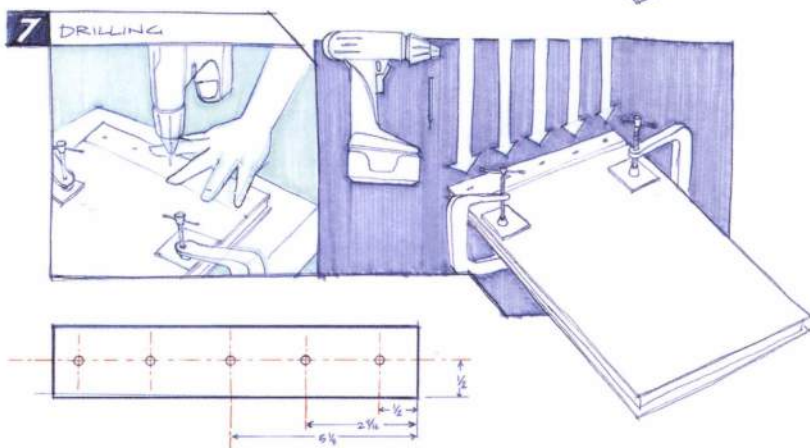
BINDING

Use a threaded needle with about 40" of thread to bind the sketchbook. Double threading is not necessary. Leaving about 8" of thread hanging from hole A, come up and around the edge binding and back through hole A.

8B STRING BINDING
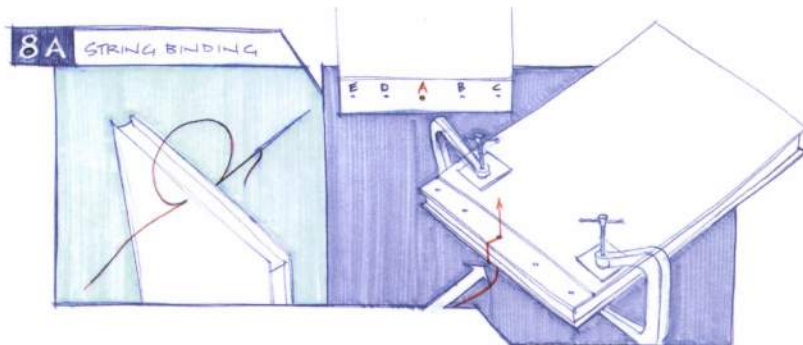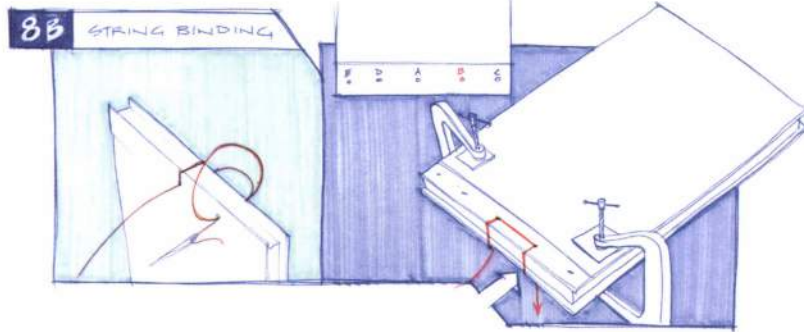
Go over and down through hole B. Go up around the edge binding and back down through B.

8C STRING BINDING

Go underneath and up through hole C. Go around the far edge and back through hole C. Then go around the binding edge and back through hole C a third time.
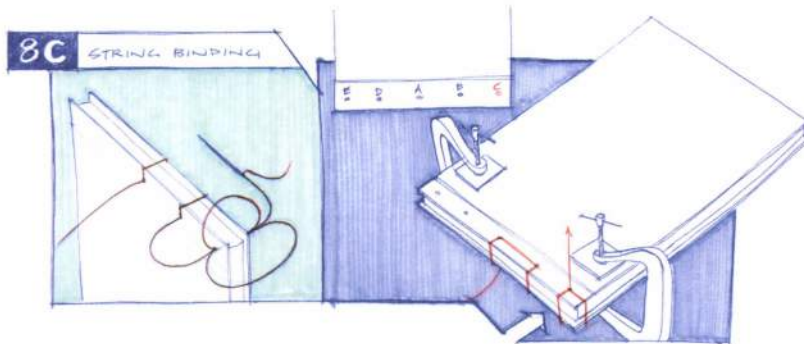
8D STRING BINDING
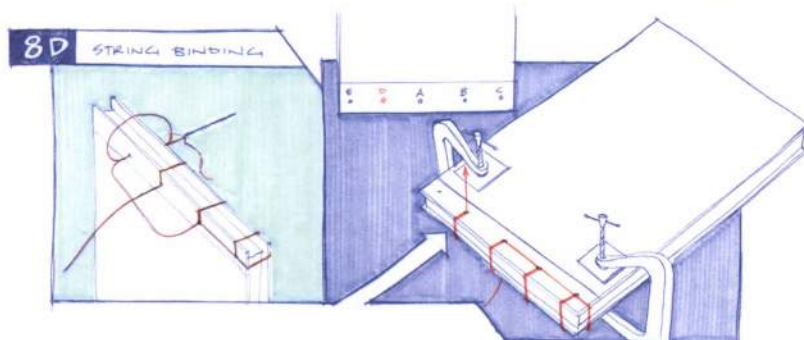
Coming up through hole C the third time, go over and down through hole B. Along the bottom, skip hole A and come up through D. Go around the binding edge and back up through hole D.

8E STRING BINDING
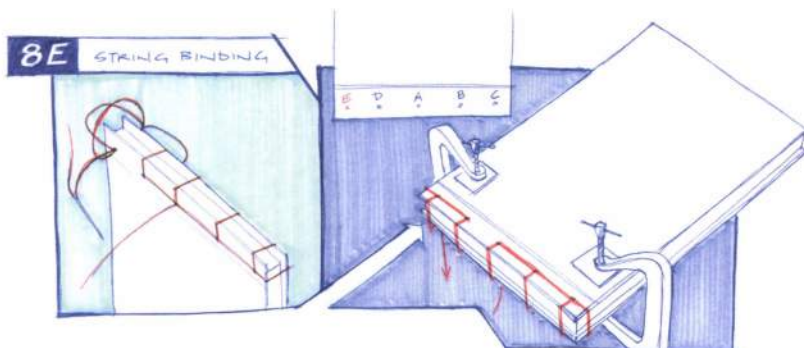
Go over and down through hole E. Like hole C, go around both edges and down through E.

8F STRING BINDING
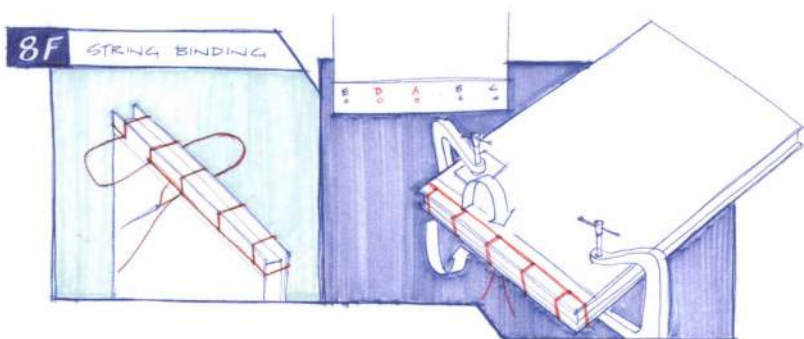
Go under and up through hole D. Then go over and down through A. Pull the two trailing strings tightly. Turn the book over and knot the loose ends.

Material selection is highly personal, as your tools do affect the visual quality of your sketches. Consider trying many tools and materials before making large-quantity purchases so that you can determine what tools really do work best for you. Ask to try the tools of others and consider their recommendations, but realize that with every new tool, you may need some time to become familiar with its capabilities. Our rule of thumb is that we always try a tool in the store before making a purchase. While many stores have cheap scratch paper available for this reason, always have your sketchbook handy to see exactly how a tool will perform for you.

While you don't necessarily need a lot of tools, especially when first starting out, you do need a range that you feel comfortable with. Aim to always carry some form of pen and pencil for line work, and a gray maker for tone. Alternatively, nylon-tip pens and watercolors are fine, too. Find what works best for you; although a regular ball-point pen and no. 2 pencil are often perfectly suited for sketching.

Once you are equipped with your supplies, you should feel compelled to sketch as part of your daily routine. As we will discuss in this book, building confidence in your sketching comes from hours of practice, yet breakthroughs in ideas happen somewhat serendipitously. Daily sketching will keep you "in shape" to best visualize your ideas when they occur. Always having your sketchbook handy will be of obvious benefit.

2

DRAWING BOOT CAMP

WELCOME TO DRAWING BOOT CAMP. WHETHER YOU ARE JUST STARTING out and learning to sketch for the first time (or since you were a child) or you are more advanced, the approaches presented here will help you develop your basic drawing skills. In this chapter, we will explore fundamental approaches to seeing and sketching elements, forms, and objects, and emphasizing structure. We introduce techniques, methods, and themes that break down the physical world into identifiable form typologies. We'll start with straight lines and build toward rectangular elements, planes, and cubic forms. This sequence, working from flat graphic marks to complex volumetric representations in space, is essential in building sketching proficiency.

We have included some typologies of visual forms that will help you to use drawing to break down the complexity of the visual/physical world to see inherent structures, patterns, and organization. This is an important skill for designers who must be able to make representations based on what they know about the world and to visualize ideas based on new and creative thought.

These forms are the basis for more complex drawing of objects, environments, symbols, figures, and more. Building a proficiency in these basic forms will enable you to broaden your application of your sketching, working from simple two-dimensional shapes toward constructing the appearance of three-dimensional space.

Our sequence here is intentional; freehand straight lines serve as the structure for cubic forms drawn in perspective, which in turn serve as primitive building blocks for more advanced drawing.

STRAIGHT LINES, SQUARES, planes, and cubes are the primitive building blocks for most drawings. We use straight lines to set boundaries, to establish proportions, and to form all rectilinear shapes. They are also the easiest to draw and the easiest to judge for correctness. Being able to sketch a straight line by hand without the assistance of a ruler or straightedge takes a bit of practice, but once accomplished, you may find new confidence in your drawings. On a sheet of paper, you can practice drawing lines at varying lengths, paying careful attention to deliberately make lines of particular lengths, densities, and thicknesses. This exercise serves as a great way to build muscle memory, the physical memory of the motion involved for drawing a line.

The easiest, most effective way to draw straight horizontal or vertical lines is to draw or "pull" the line toward your body's center, using your belly button as an imagined end point. Body position and posture are important. The farther away your arm is from your body's core, the less muscle control you have to maintain accuracy. Pulling toward you—as opposed to pushing away—uses stronger muscle groups within your arm and core to help keep your line straight. Consistent speed and pressure ensure that the line remains uniform in thickness and density from start to finish. Drawing from your shoulder, rather than your wrist, will enable you to engage larger muscle groups to better control your lines. In general, it is best to engage your whole arm while drawing, as this will help you overcome the body's tendency to move in arcs.

Stroke: A mark made by a pen, pencil, or paintbrush in one direction across paper.
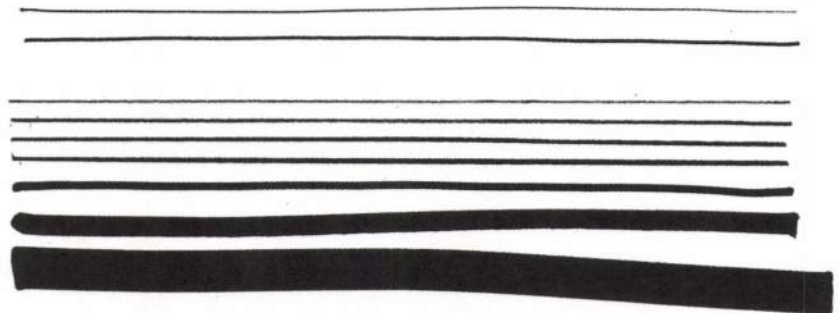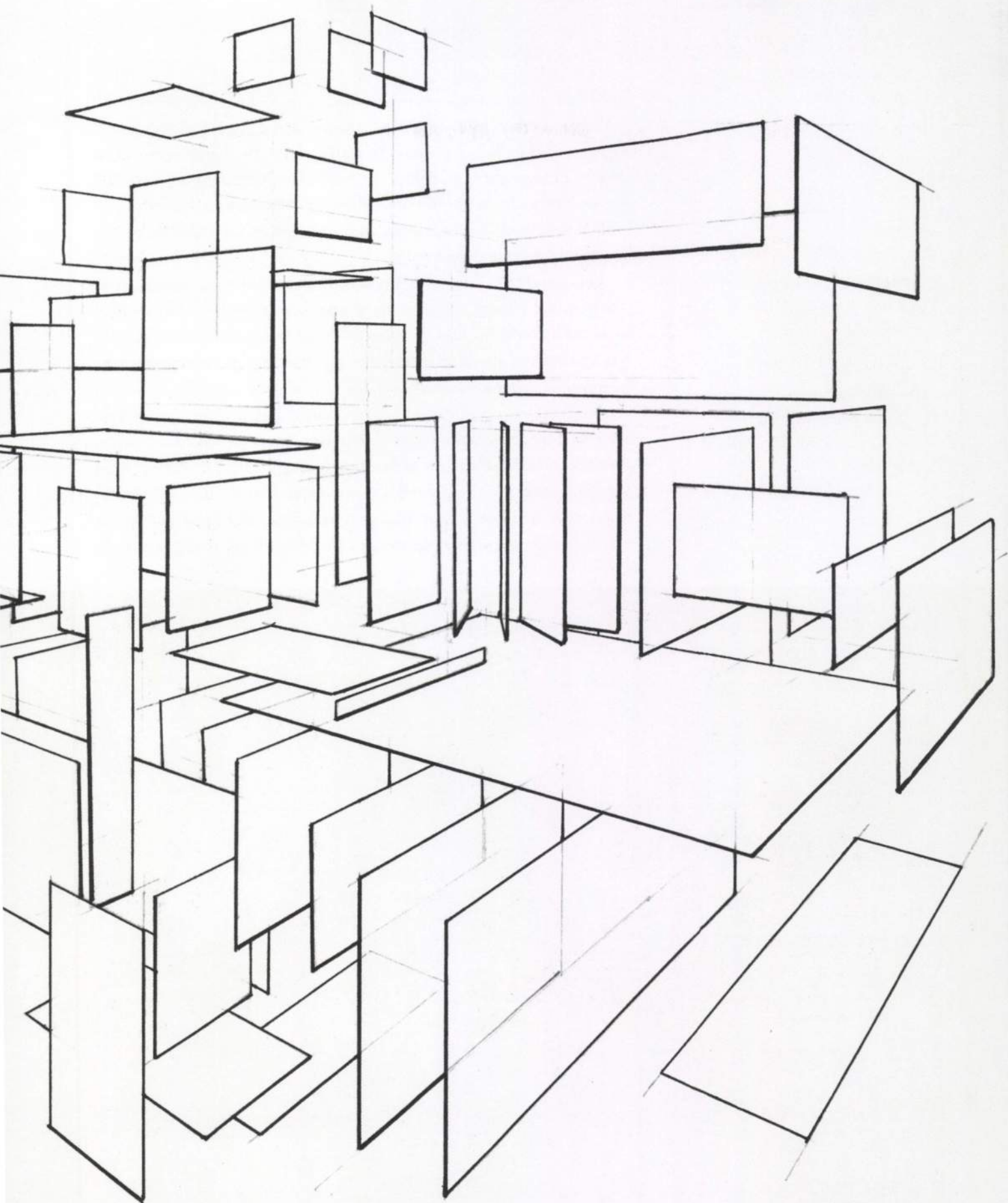
basic lines

Weight: The thickness of a line, also called *stroke weight*.

Density: The richness or darkness of a drawn line resulting from varying amounts of ink, pigment, or graphite.

Variation of line weight can be effective in delineating details and surfaces. A thin line weight provides a solid base for a drawing, because a thin line can then be enhanced with thicker pens. The goal of line weight is to define the form in a direct manner with few strokes; scratchy, stuttered lines should be avoided for smooth, controlled line work. Lines should start and end at very specific points to appear clean and descriptive.

For sketching, .01 and .03 nylon-tip pens will serve as a basis. A .08 pen and a black Prismacolor marker can then be used to offset lines with thickness and density. When drawing, consider the viewing distance of the audience and your drawings' potential methods of reproduction (scanner, copier, fax, digital camera). Thin lines may read effectively up close (at arm's length), but heavier, bolder line weights may be necessary if you are presenting drawings to a group at a distance. Similarly, many photocopiers, scanners, and printers have trouble capturing the subtleties in thin line work, thus, enhancement with additional line thickness may ensure a more consistent translation from original drawing to electronic form to printed form.
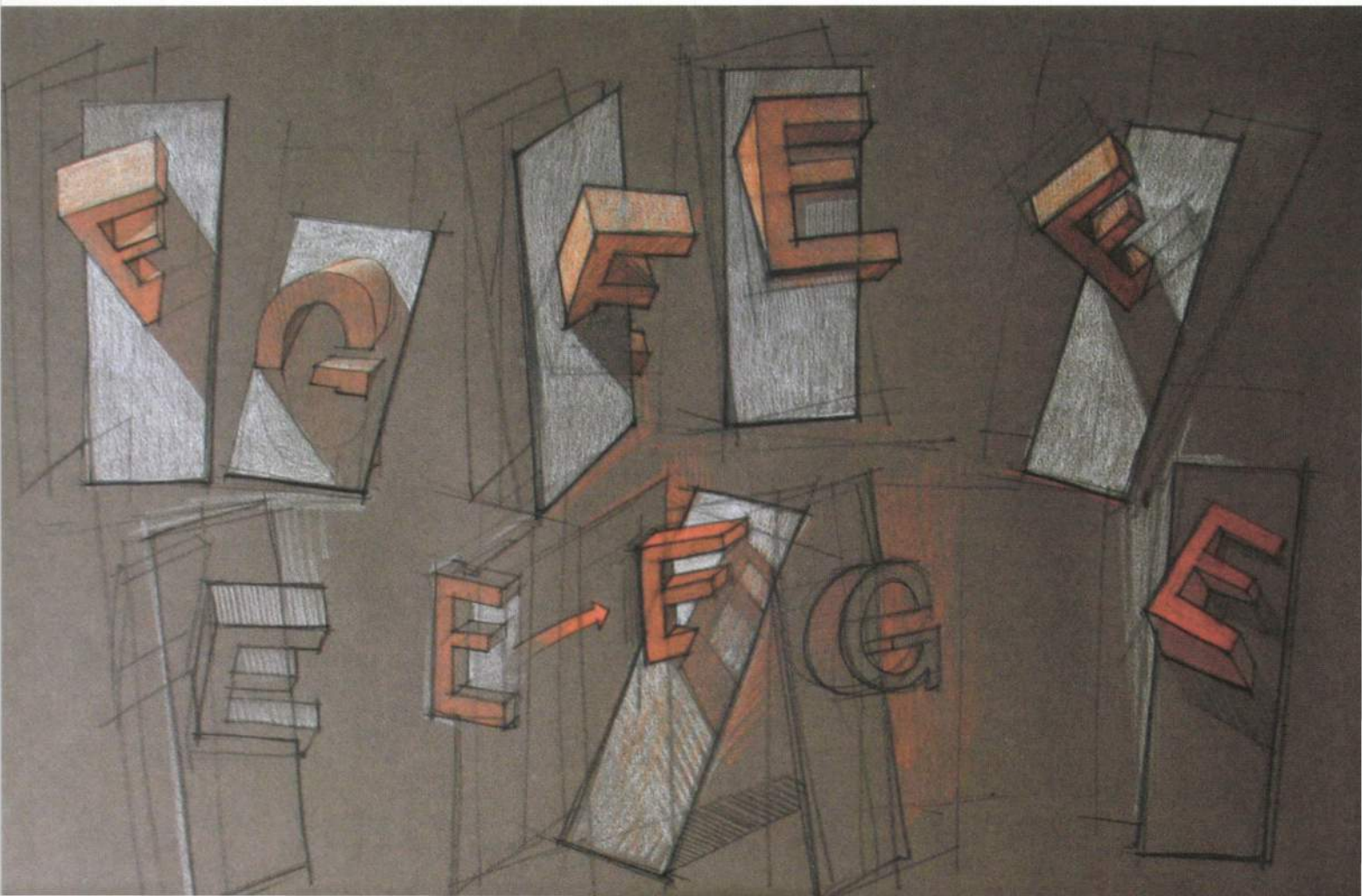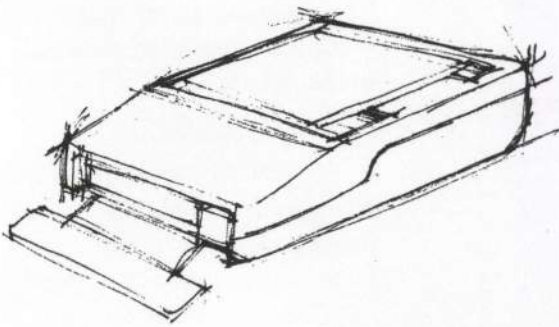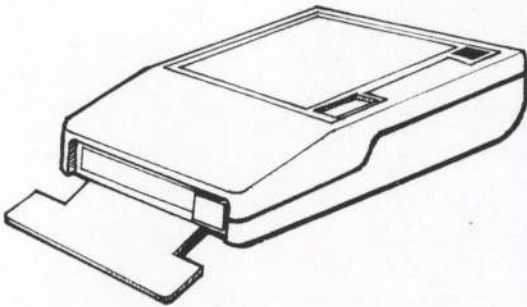
Scratchy/inconsistent
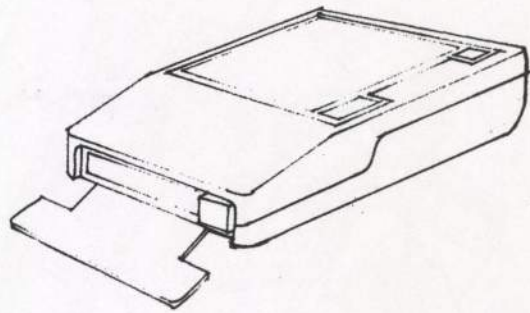
Stuttered/inconsistent

Offset line weights
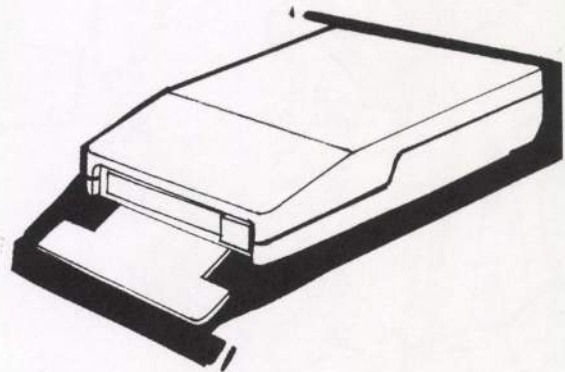
Vignette for emphasis
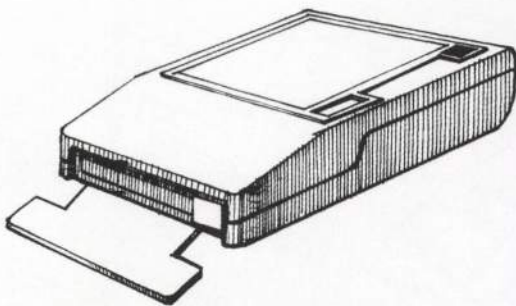
Tonal enhancement
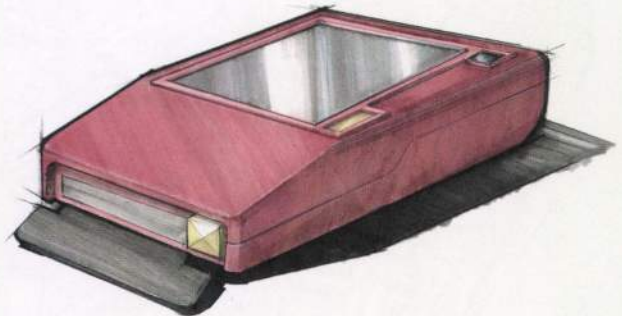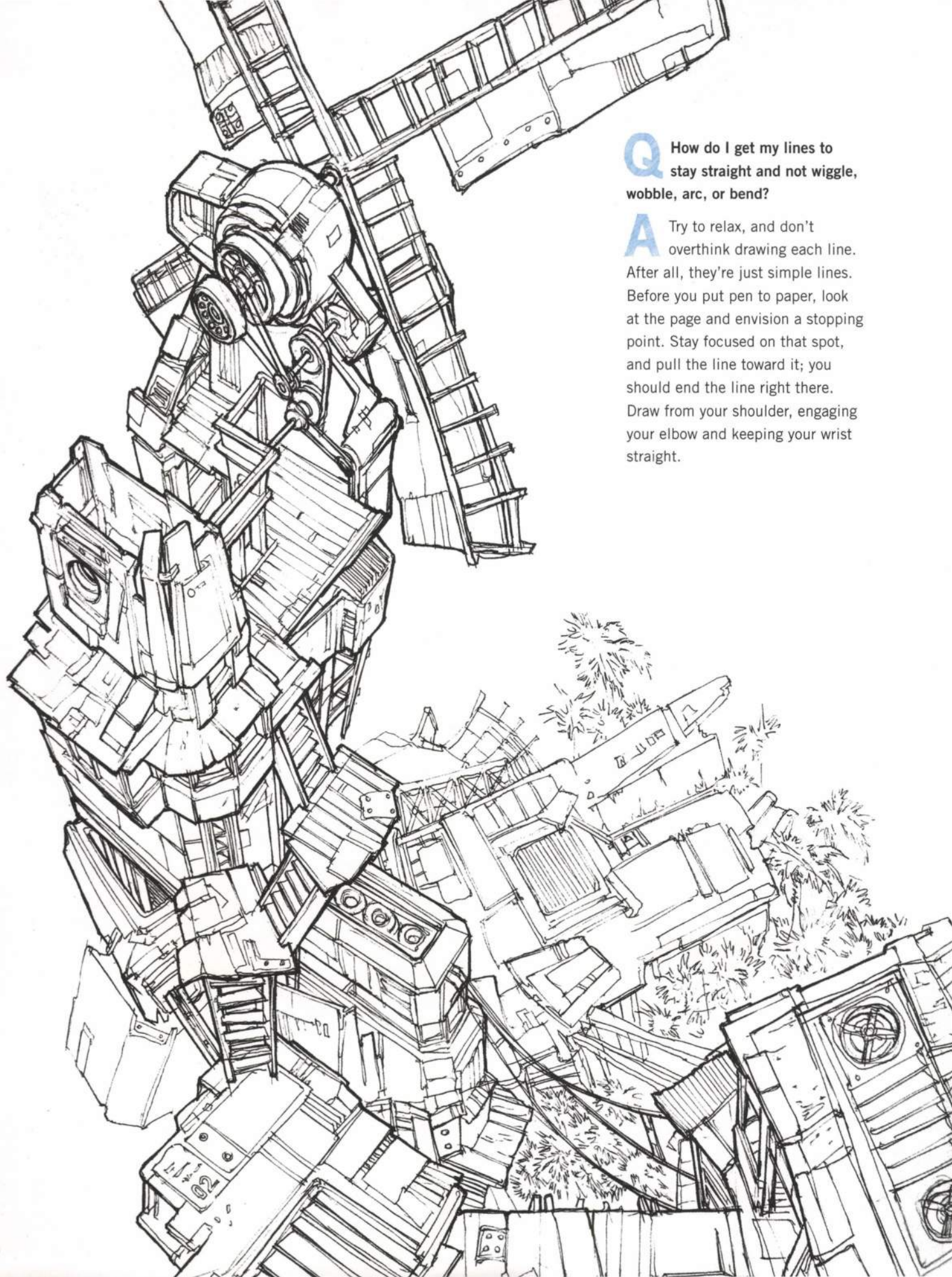
Rendered

A Try to relax, and don't overthink drawing each line. After all, they're just simple lines. Before you put pen to paper, look at the page and envision a stopping point. Stay focused on that spot, and pull the line toward it; you should end the line right there. Draw from your shoulder, engaging your elbow and keeping your wrist straight.

Once you can draw straight lines of specific lengths, practice making squares and rectangles. These are essential shapes for making frames, callout boxes, screens, and thumbnails for page layouts. Draw them with four distinct lines, lifting the pen off the page at the end of each stroke. To build better muscle memory, alternate between vertical and horizontal strokes, aiming for 90-degree relationships at the corners to avoid "squarecles" (squares with rounded corners) and "L7s" (squares constructed from two drawn strokes that tend to look incomplete).
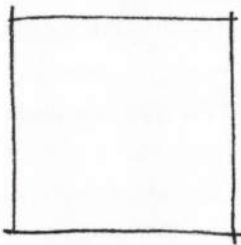
Square from four lines
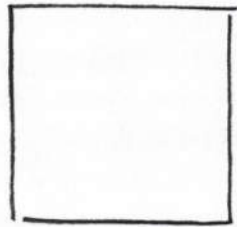
L7 (square from two L-shaped lines)
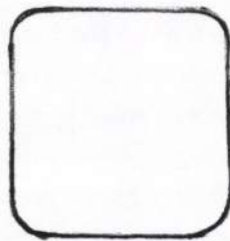
Squarecle

Hatching: Shaded area with closely drawn parallel lines.

Q **Why do my drawings look "hairy"? How can I make more confident lines and forms?**

A Over-drawing lines to describe objects makes a drawing look scratchy or "hairy." If you misdraw a line, go over it once more to correct it. You need not go over numerous times to correct a mistake, as you'll only draw more attention to it.

When hatching, pay careful attention to evenly spacing each hatch line to maintain a uniform tone. Hatching can run horizontally, vertically, or at a slight angle.

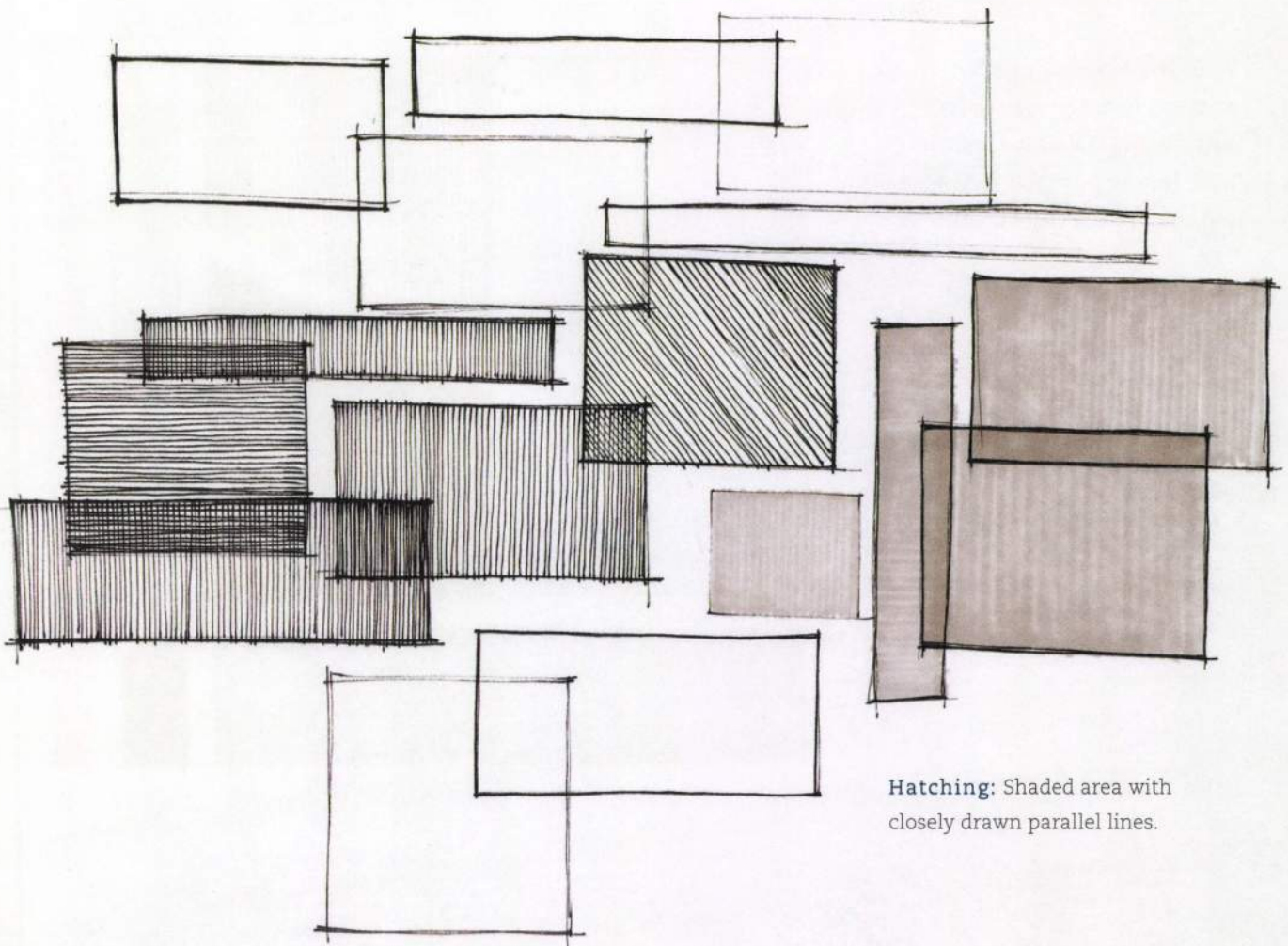A good exercise for building proficiency with squares and rectangles is to make a composition of elements on a page in one thin line weight. Play with positioning, composition, overlap, and proximity, but pay careful attention to proportions. Squares must demonstrate square proportions. Next, enhance certain areas with a thicker stroke to visually pull some objects forward and create a sense of depth. Now you can experiment with visual hierarchy, making some forms more apparent than others. You can then use a variety of pens, pencils, and markers to add tone by hatching with parallel lines to practice making quick, confident, and consistent strokes. When hatching, pay careful attention to evenly spacing each hatch line to maintain a uniform tone. Hatching can run horizontally, vertically, or at a slight angle. Avoid cross-hatching that will create open white shapes between the strokes, as this will appear more like a pattern than a consistent tone. This exercise is applicable when creating screens, wireframes, and basic rectilinear shapes. Building proficiency in sketching simple boxes greatly increases speed, improves form, and makes your sketches look crisper.
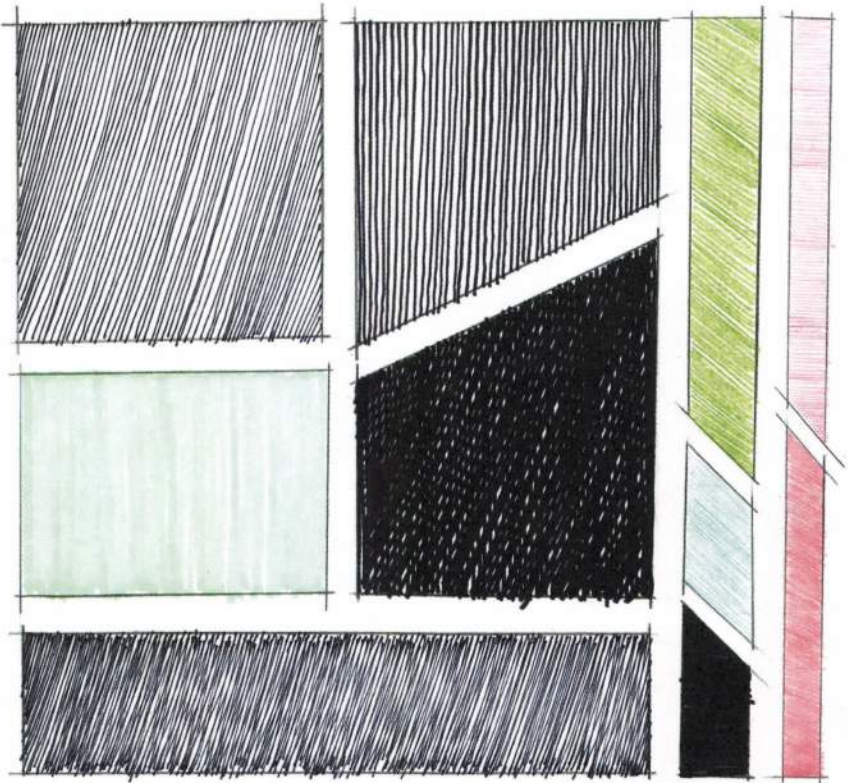
Basic line weight
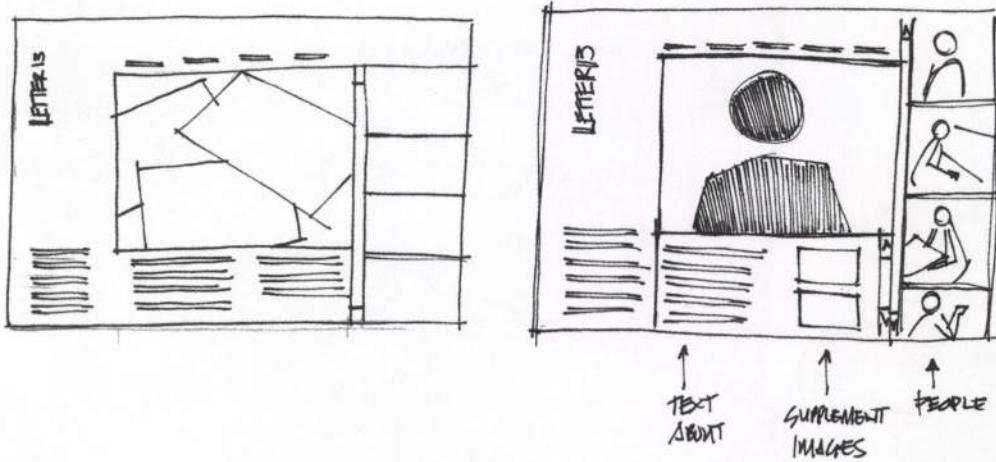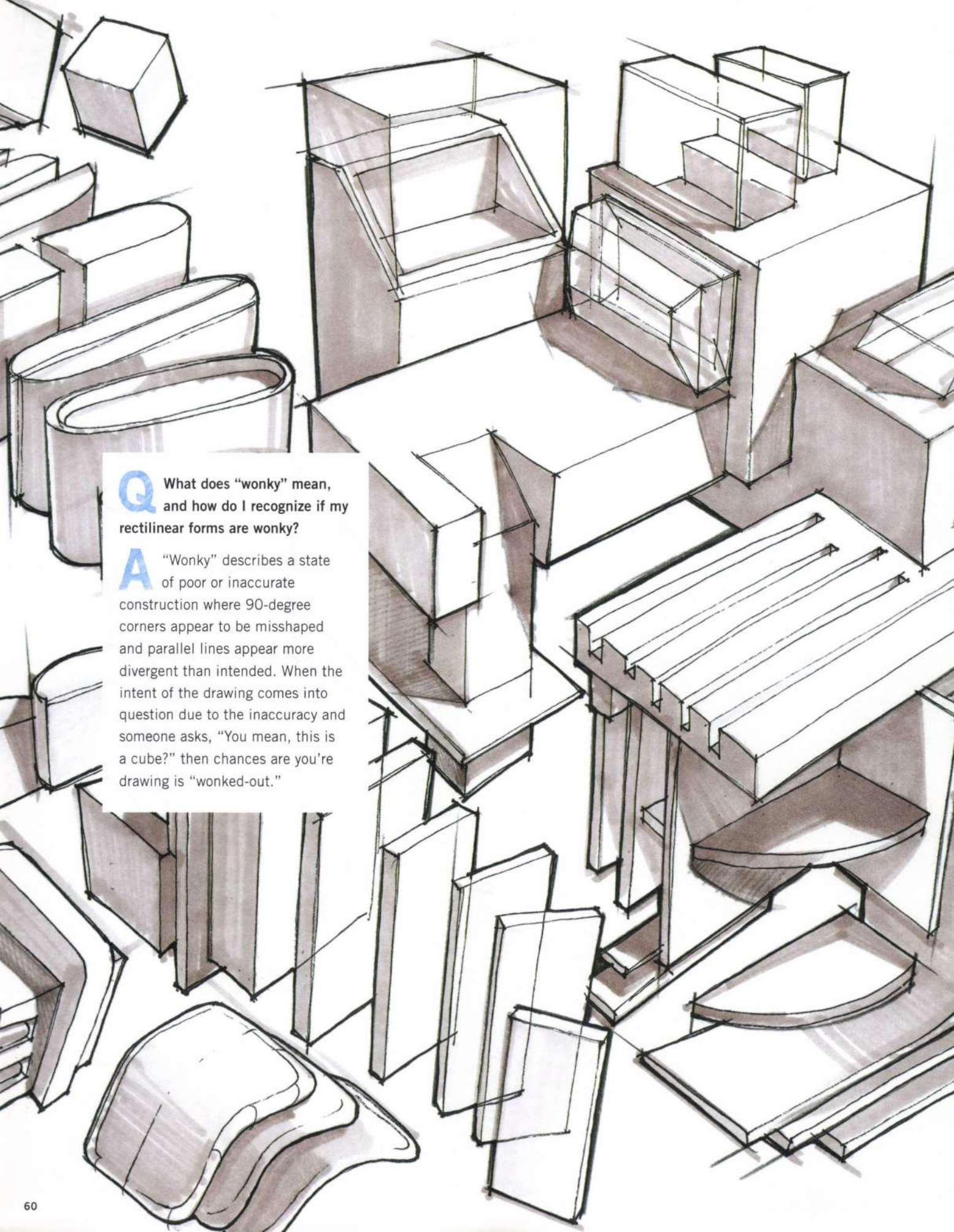
Enhanced line weight
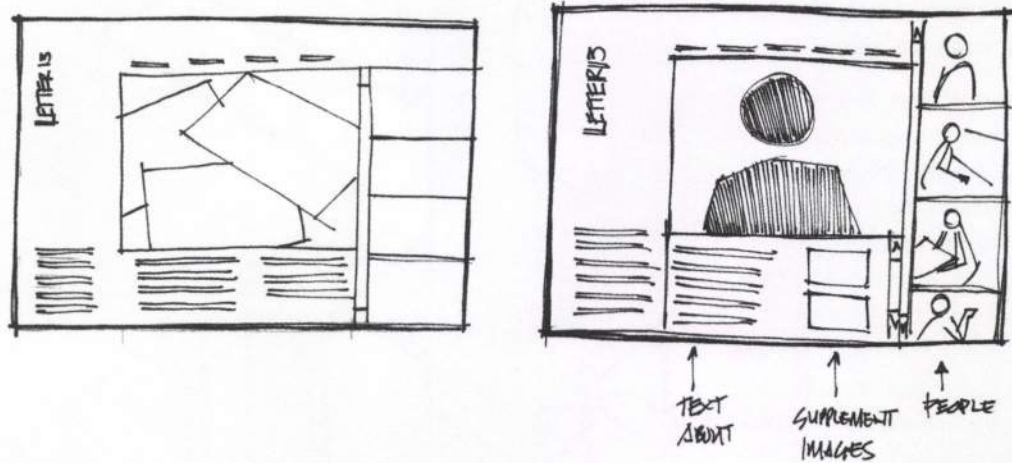
Enhanced line weight with tone
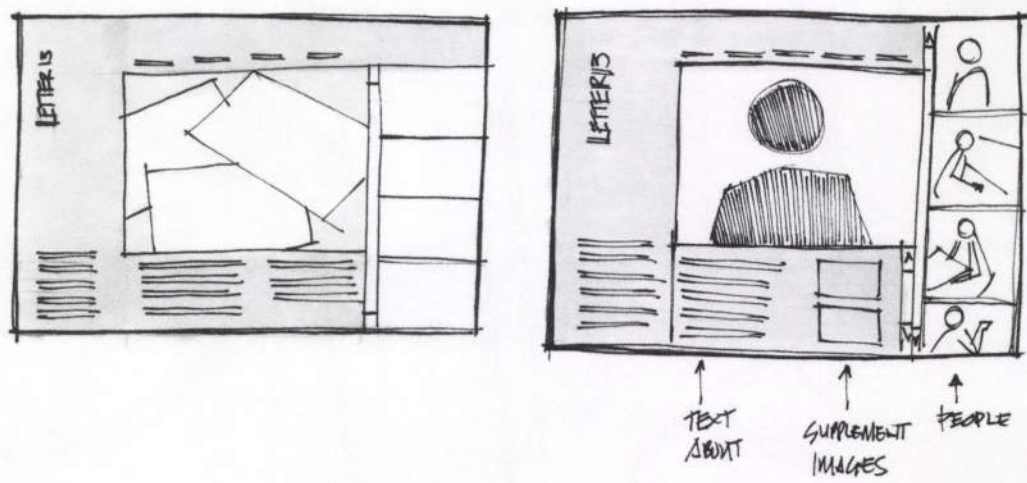
What does "wonky" mean, and how do I recognize if my rectilinear forms are wonky?

A "Wonky" describes a state of poor or inaccurate construction where 90-degree corners appear to be misshaped and parallel lines appear more divergent than intended. When the intent of the drawing comes into question due to the inaccuracy and someone asks, "You mean, this is a cube?" then chances are you're drawing is "wonked-out."

Many designers have the need to sketch three-dimensional objects and to employ conventions of two-point perspective (using vanishing points to create the illusion of three-dimensional space on the page). Building from straight lines and rectilinear forms, you can easily create the illusion of space. We typically use two-point perspective systems to draw objects and to create the illusion of space, because we can more easily craft these abstractions to appear more in sync with the way we perceive the world.

The cube is the fundamental building block for any geometric form in perspective drawing. Knowing how a cube exists in space in proportion makes perspective drawing easier to understand and practice. Basically, a cube is constructed of six sides or planar faces. As previously described, drawing all of these faces will help ensure an accurate cube; this is called "drawing through" to show the hidden lines and structure. In the following text of this section, we will show examples of how planar and cubic construction are used to create a variety of shapes, from complex rectilinear forms to derivative cylindrical and curvilinear ones.
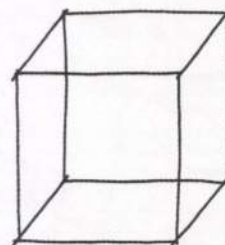
Knowing how to draw a cube will enable you to construct more complex drawings in two-point perspective and use the cube as a unit of measure to scale the subject matter in your drawings appropriately.

basic construction of three-dimensional forms

Oblique
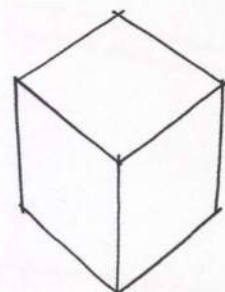
Isometric/parallel lines
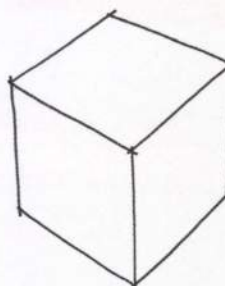
Two-point perspective
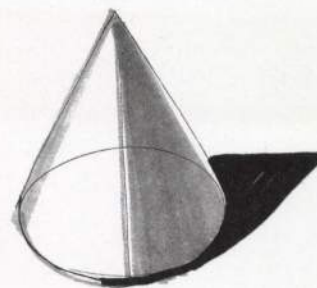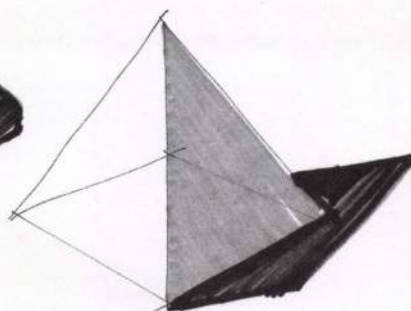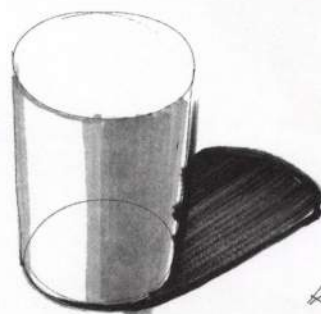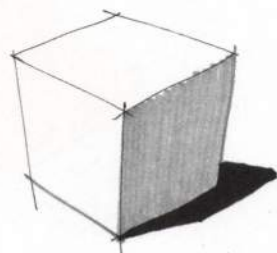
Derivative primitives

7:45

DTA

TECH

THE ROLES OF
DRAWING

ERIC ANDERSON is a professional industrial designer and an associate dean at Carnegie Mellon University who teaches courses in visualization and industrial design.

It wasn't long ago that manual drawing was the dominant tool in design education and practice. The values of drawing have shifted, and the need for what I define as visual intelligence has emerged to challenge the foundation of what many generations of drawers and makers have held sacred.

The role of drawing in design has changed from gatekeeper—you can't go forward unless you can draw and represent in a particular way—to supporting the larger goals of thinking and studying design by creating appropriate visual dialogues to advance conversations and outcomes. For drawing traditionalists, this has been a turbulent evolution, as the value of pencil and paper is now scrutinized by more and mistakenly abandoned as the visual needs of a complex world grow greater. Today, existing technology tools really can support a broad scope of multifaceted visual communication needs and have become useful in the creative design process.

However, drawing still has an important role! Its core value is to help shape ill-defined data into visual statements that support and advance conversations. The now-more-focused role of drawing is to support what I call visual intelligence activity, defined as the ability to reason with complex information using varied tools (manual and digital drawing and modeling), methods, and strategies to shape goal-driven mental constructs and desired external visual experiences. This is a significant shift from traditional skill-building ideologies in design education, which tend to be linear.

> Visual intelligence has emerged to challenge the foundation of what many generations of drawers and makers have held sacred.

TWO-POINT PERSPECTIVE

FOLLOW THESE SIMPLE steps for sketching a cube and creating the illusion of three-dimensional space. Once proficient, you should be able to envision a cube before putting pencil to paper and freehand draw a cube at any angle or in any position.

STATION LINE

VANISHING POINT   VANISHING POINT

HORIZON LINE

PERSPECTIVE LINES

NEAREST ANGLE

90° CONE OF VISION

HL

A

HL
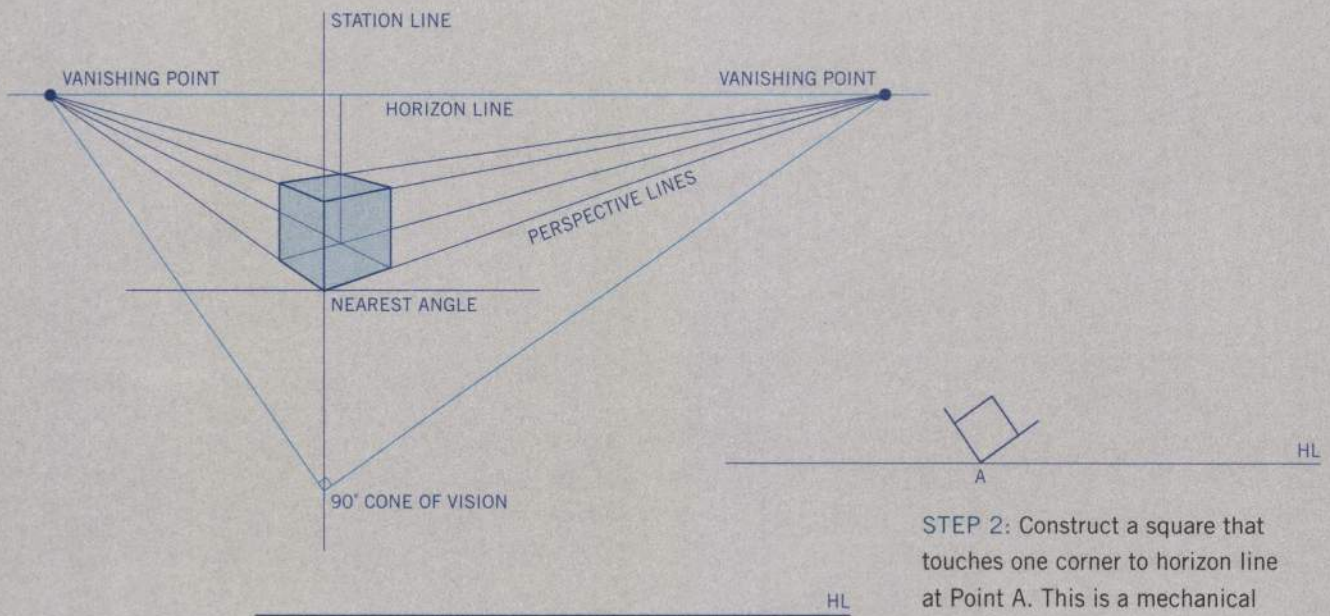
STEP 1: Lay out a horizontal line. This will serve as the horizon line (HL) or the farthest distance you can see on the perceived surface plane within the page space.

STEP 2: Construct a square that touches one corner to horizon line at Point A. This is a mechanical way to establish cubic proportions when you translate this flat form into two-point perspective. Changing the angle of the square to the horizon line will change the angle of the cube to the viewer.
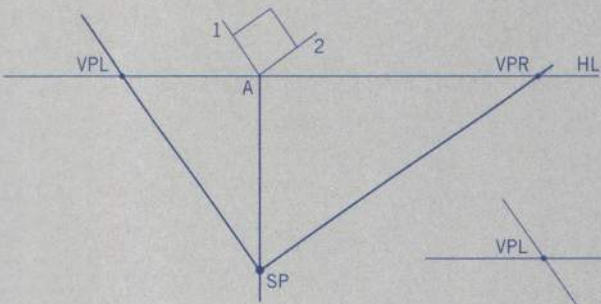
STEP 3: Drop a vertical line from Point A where the square touches the horizon line. Set the station point (SP) on line A; this establishes the limits of the viewing plane. Run lines from the station point to the horizon line to mark vanishing points right and left (VPR and VPL) and establish the field within which you will draw. These lines run parallel to the sides of the square above and set the vanishing points.
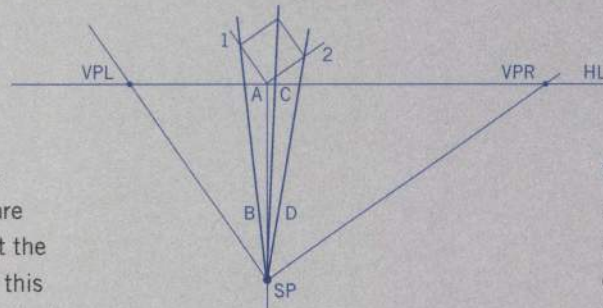
STEP 4: Draw lines (B, C, D) from the corners of the square to the station point. These will help determine the proportions for the cube's sides in step 6.
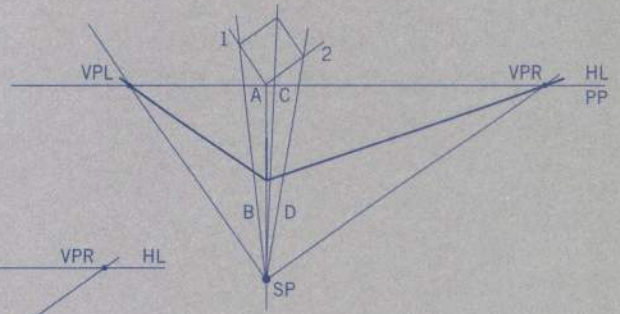
STEP 5: Establish the height and position of the cube in the viewing plane by drawing a vertical line on line A, between the horizon line and the station point. This is the leading edge of the cube and determines its size. From the bottom of that line, draw lines back to the vanishing points to establish the cube's lower edges.
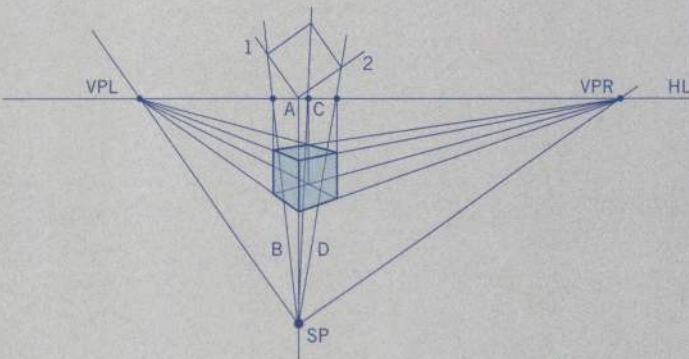
STEP 6: Draw lines from the top of the leading edge back to the vanishing points. Drop vertical lines from the intersection points of lines B, C, and D with the horizon line to establish the vertical edges of the cube. Where these lines intersect the perspective lines, draw lines back to the opposite vanishing points to establish the back edges. Define the bounding line of the cube with a heavier stroke weight.
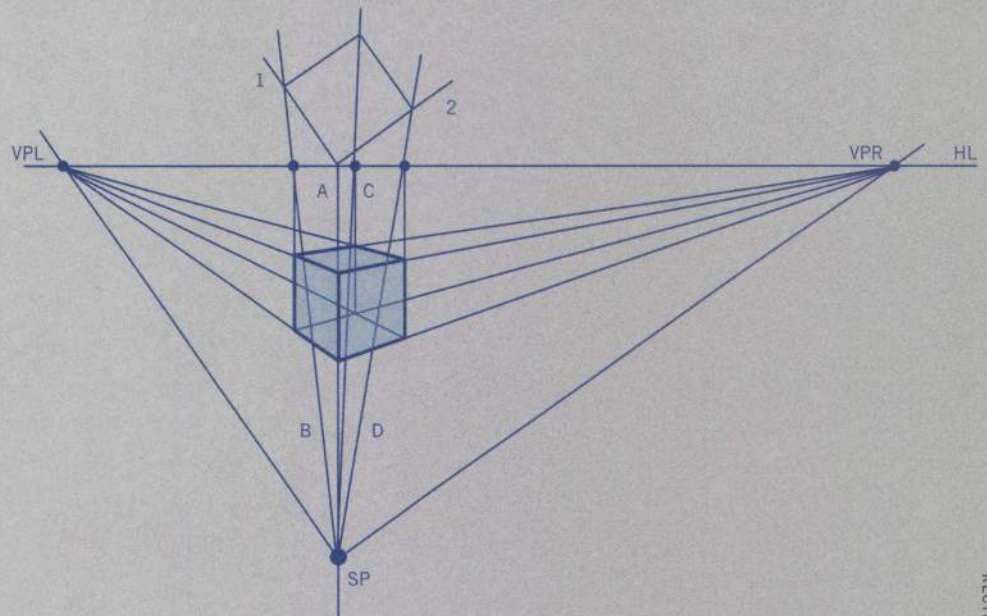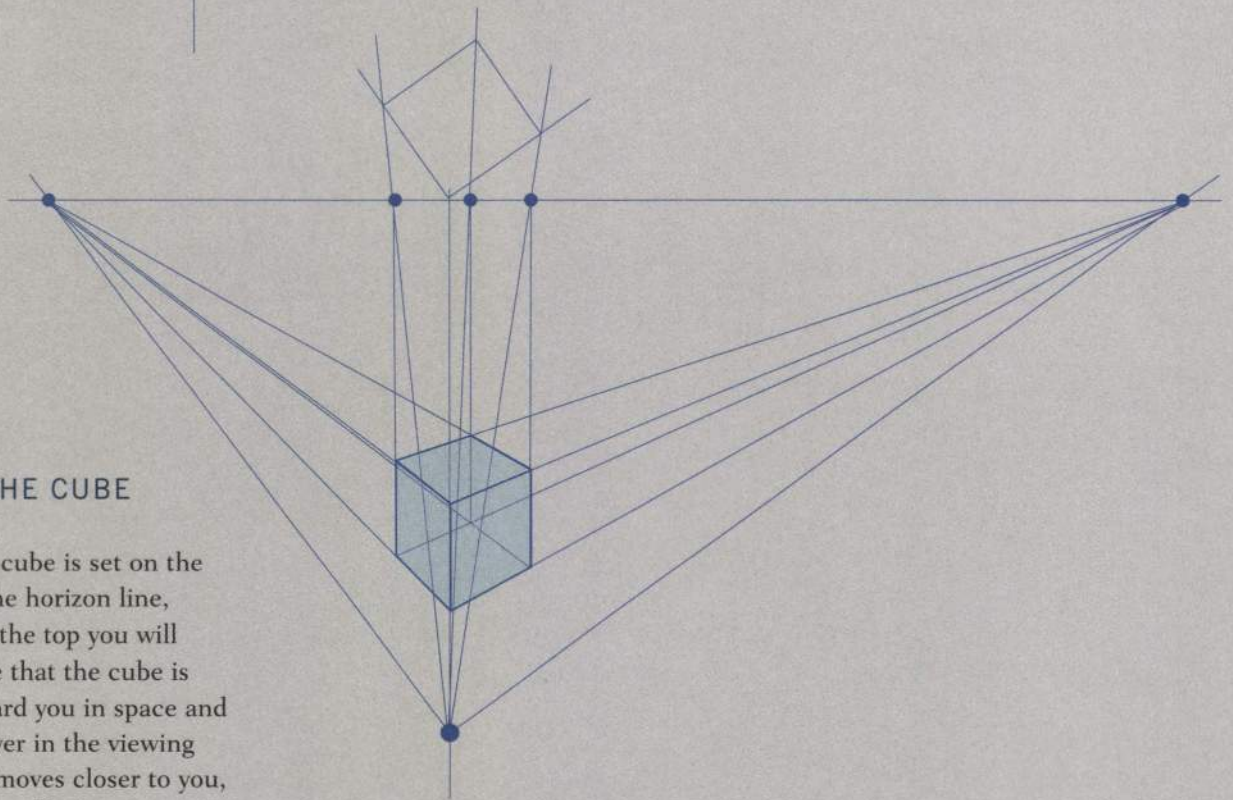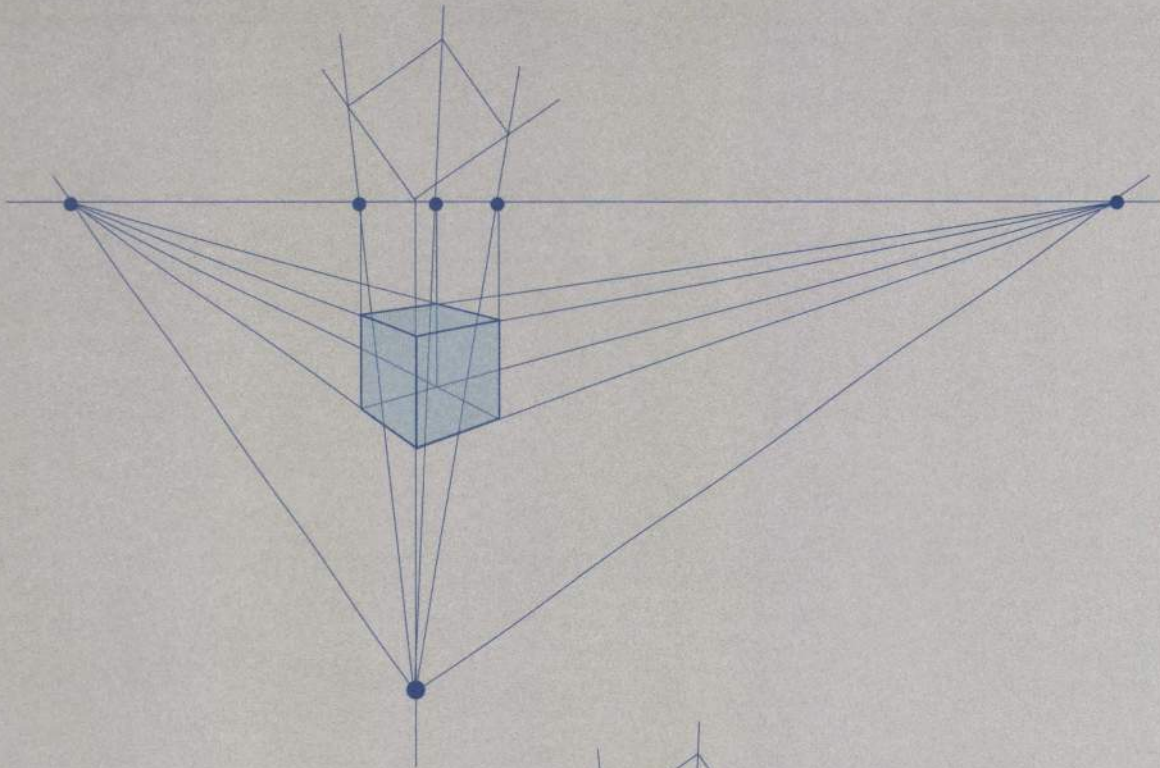
SEEING THE CUBE IN SPACE

The lower a cube is set on the page from the horizon line, the more of the top you will see. Imagine that the cube is moving toward you in space and is sitting lower in the viewing plane. As it moves closer to you, your vantage will change to have more of a top view. If the cube sits too low on the station line, you'll notice it will begin to distort.
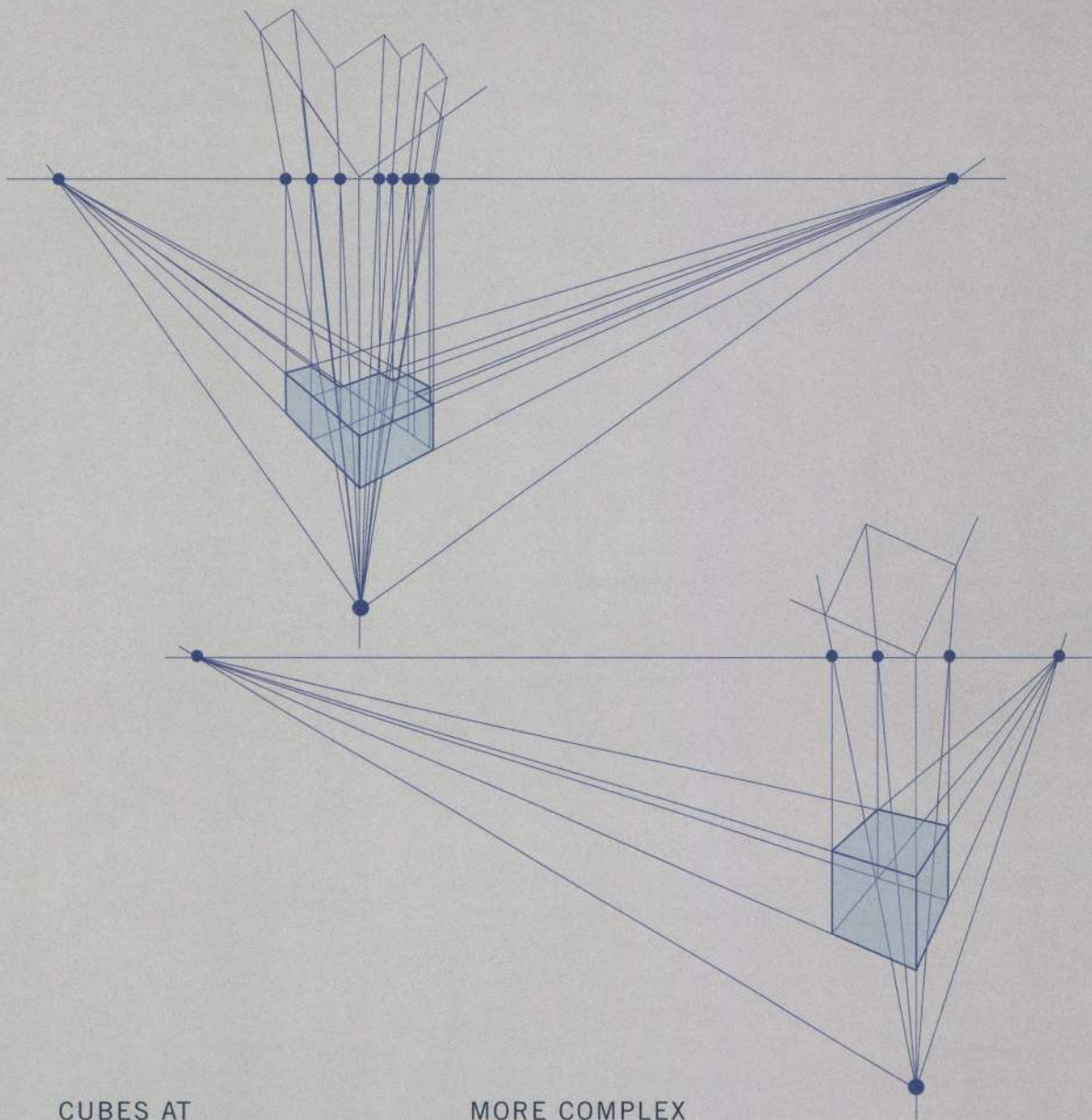
CUBES AT DIFFERENT ANGLES

Changing the angle of the square in relation to the horizon line positions the cube differently in space. As you rotate the square on the point at which it touches the horizon line, envision that you are moving the cube around an axis at its leading edge. Notice how the position of the square relative to the horizon line enables you to see more or less of the faces of the cube.

MORE COMPLEX CUBIC FORMS

Imagine that the cube is really the plan view of a space or a building. You can project this plan view into perspective using the same method described in the two-point perspective demonstration. Instead of a simple square, map the floor plan of a hypothetical building touching the horizon line. Continue with the same sequence of establishing vanishing points, field of vision,

and height for the form. With the addition of more points, lines, and planes in this complex shape, try using tracing paper overlays to construct each step on a different layer. You will be able to see through each layer to the layer below but also slide in an opaque sheet of paper to mask out previous steps to add clarity in the drawing as you go through each step.
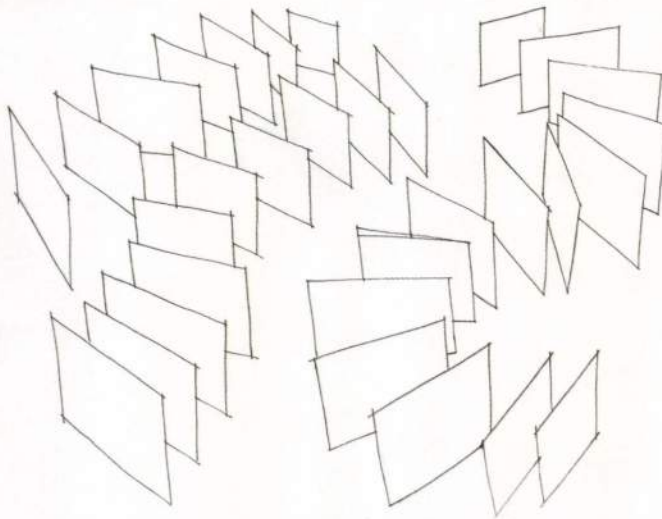
"FREEHANDING" PERSPECTIVE

As mentioned earlier, the cube is the fundamental building block for any geometric form drawn in perspective; the plane is the primary component of all cubic forms. To practice working in freehand two-point perspective, sketch planes from a variety of angles. Remember to keep the side edges vertical and the horizontally oriented edges converging back in space toward the vanishing points.

Shown above is a warm-up exercise of sketching planes in space. Note how each plane converges back to a different vanishing point because they are situated in a varied fashion on the imaginary ground plane. Also look carefully to see some poorly constructed planes that tend to diverge when their lines should be converging. The quickest way to check for proper convergence is to measure the back vertical line with a ruler from the bottom corner to the top—it should always be shorter in length than the front most vertical line, or leading edge.

Planes, arrows, and notations are enhancement features in wireframe layouts and information architecture flowcharts that make schematic drawings more visually appealing. Simply sketching each screen from a website or software concept as a plane on an invisible surface using two-point perspective can make for a dynamic sketch that will improve visual impact and enhance overall understanding of the system. When you sketch a digital system (like a website, software, or application), consider where the visual focus should be and build from there. Moving across and into the page space to bring elements closer to the viewer provides emphasis for more important information. This is where two-point perspective adds greater visual interest to a sketch over a flat schematic.

In the following chapters, we'll be covering arrows and notation that enhance schematic drawing with clarity, focus, and dynamic details.
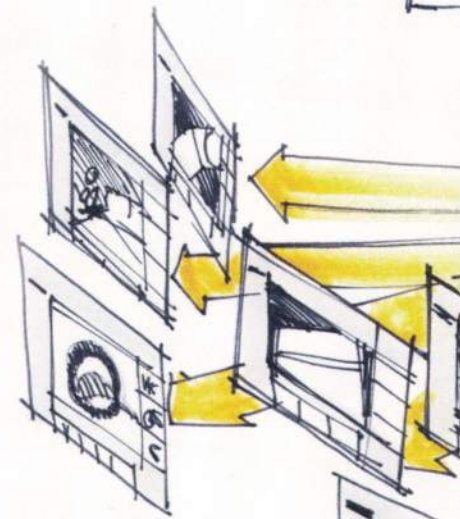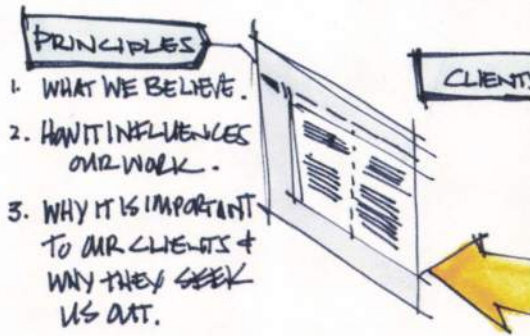
MAIN

LANDING

LETTER13

ANIMATED CLIP
FILL 13 WITH VISUAL

LETTER 13
LETTER 13
LETTER 13

BUBBLE FILL →13

WATER FILL →13

RANDOMIZED IMAGE SET

ABOUT US

TYPE CLOUD

CONTACT

Pgh

CONSTELLATION MAP

EARTH

GEAR & STUFF

SHIRT

SKETCH BOOK

BOOK

VESSEL

PRINTS
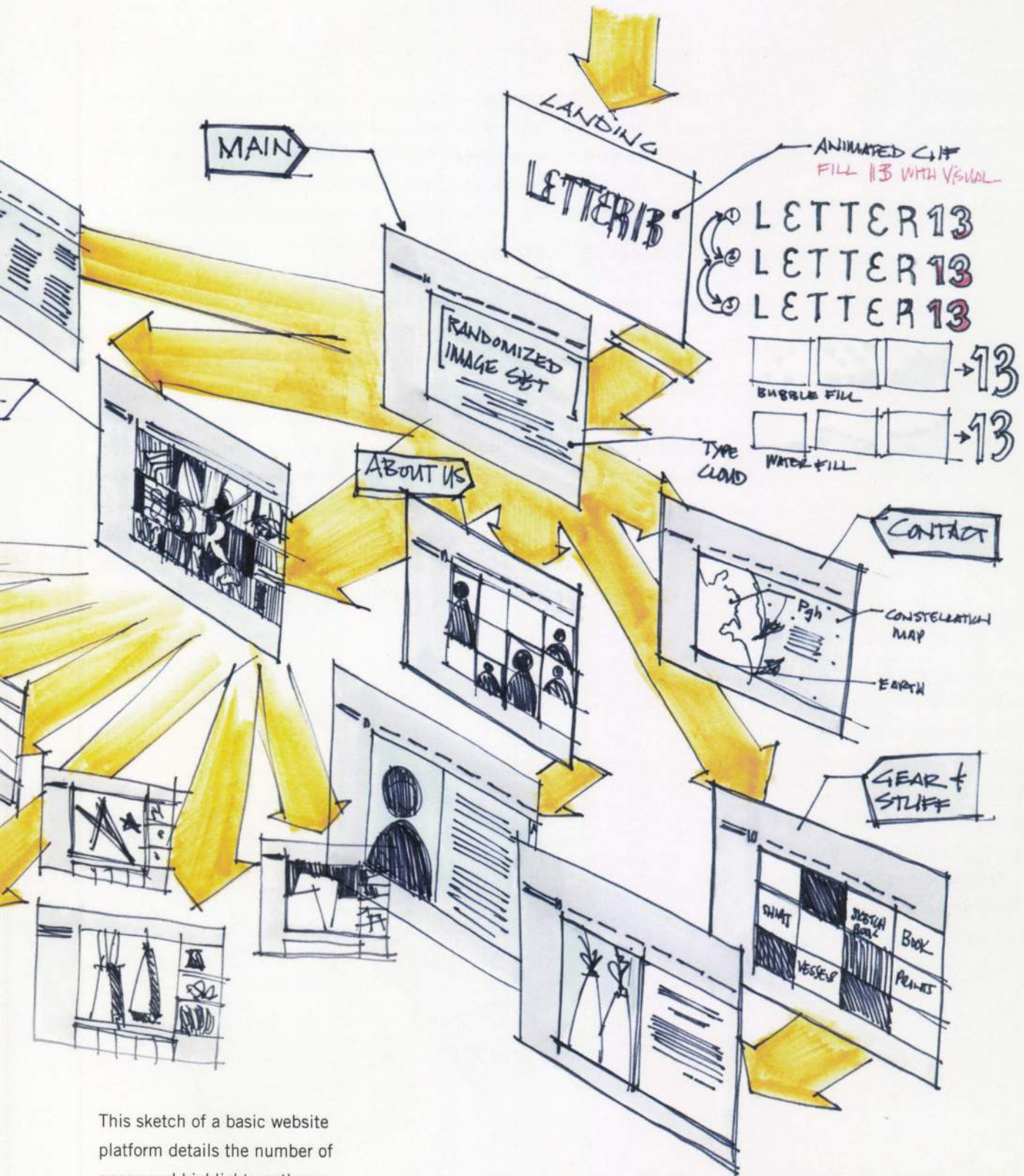
This sketch of a basic website platform details the number of pages and highlights pathways. Seeing the website in this format enables a different perception of its size, scale, and complexity.

orthographic projections

Drawing product concepts in perspective can be challenging, as you are thinking through the formal qualities at the same time you are trying to portray it in space. When drawing product forms, it may be easiest to begin with an orthographic projection of the object to understand shape and proportions. An orthographic projection is a way to represent a three-dimensional object in two dimensions by depicting the form from a perpendicular viewpoint to each face or side. These views can be mapped onto a rectilinear volume to position the form in space; this is the forming process. Think of this as drawing each of the six views of an object—front, sides, back, top, and bottom—and mapping them onto a flattened cube. Projecting through the rectilinear volume will enable you to section and draw the form in proportional ways during the dividing process. Now that the structure is in place, details like features, curved surfaces, tone, color, enhanced line work, and notation can be added. Once you understand the object form, you can try different viewing angles—moving parts in and out, exploding an assembly into components—or show how to construct it, thereby "animating" it.

Draft an object (like your cellphone) as an orthographic sketch to show front and side views to establish proportions. Next, simplify it into basic geometric shapes to form it using two-point perspective and divide it along its parting lines. Redraw it with details and features; then animate it to show how it might work, move, or operate.
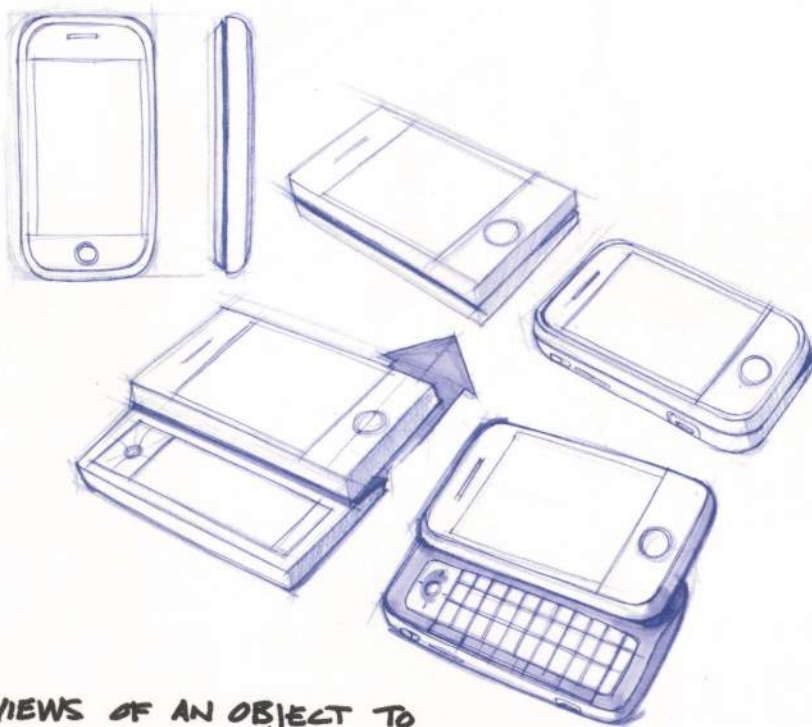
USE FRONT AND SIDE VIEWS OF AN OBJECT TO PLAN FEATURES AND FORMAL QUALITIES BEFORE TRYING TO PORTRAY IT IN SPACE.
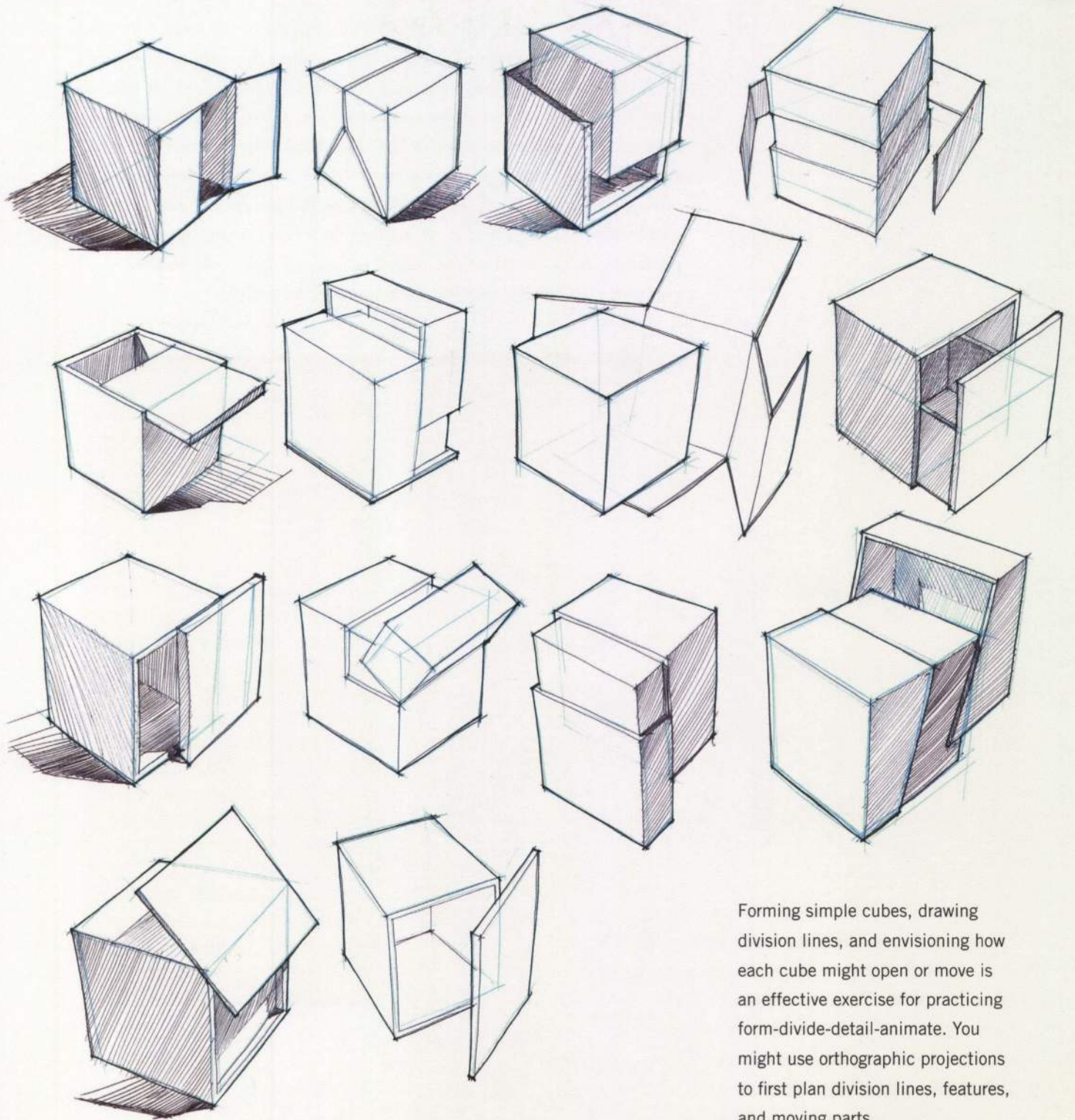
Forming simple cubes, drawing division lines, and envisioning how each cube might open or move is an effective exercise for practicing form-divide-detail-animate. You might use orthographic projections to first plan division lines, features, and moving parts.

CURVILINEAR FORMS, PLANES + ARROWS

CURVILINEAR LINES SHOULD also be pulled toward your body and stop at an envisioned point on the page. Aim to draw these lines with a uniform thickness and density, as they may tend to trail off toward the end. The most pleasing curved lines are called *fair curves*—those that run across the page and do not loop back over themselves. Avoid squiggly lines when practicing curved lines, and consider using fair curves to develop a greater sensitivity to the perceived speed, pitch, amplitude, and spacing. Notice that when two curved lines come in proximity to each other the negative (white) space diminishes, and you perceive greater tension between the two lines.
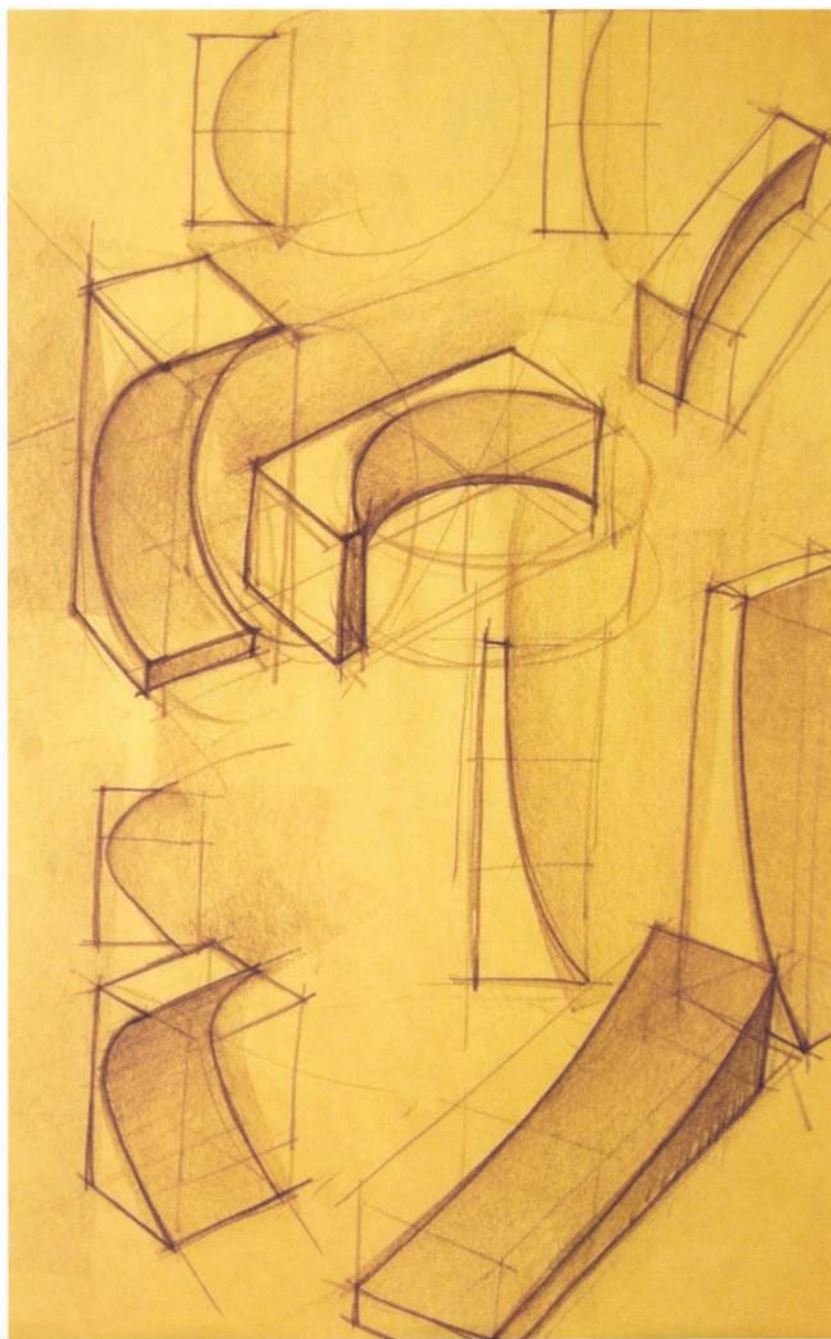
sweeping fair curves

Fair curves are elegant, sweeping curves that don't double back on themselves. These curves tend to be more pleasing to the eye and are easiest to control when sketching. Fair curves can be simple sweeps or compound curves. Playing with the starting, stopping, and apex points of each curve will dramatically change its appearance and how people will read it. Try a variety of horizontal and vertical curves that look fast or slow, and consider what visual qualities suggest these traits. When drawing curvilinear lines, pull all lines toward your body to control starting and stopping points. Alternatively, pushing lines away from your body will create a dense starting point and a trailing-off/tapering effect as the line sweeps.
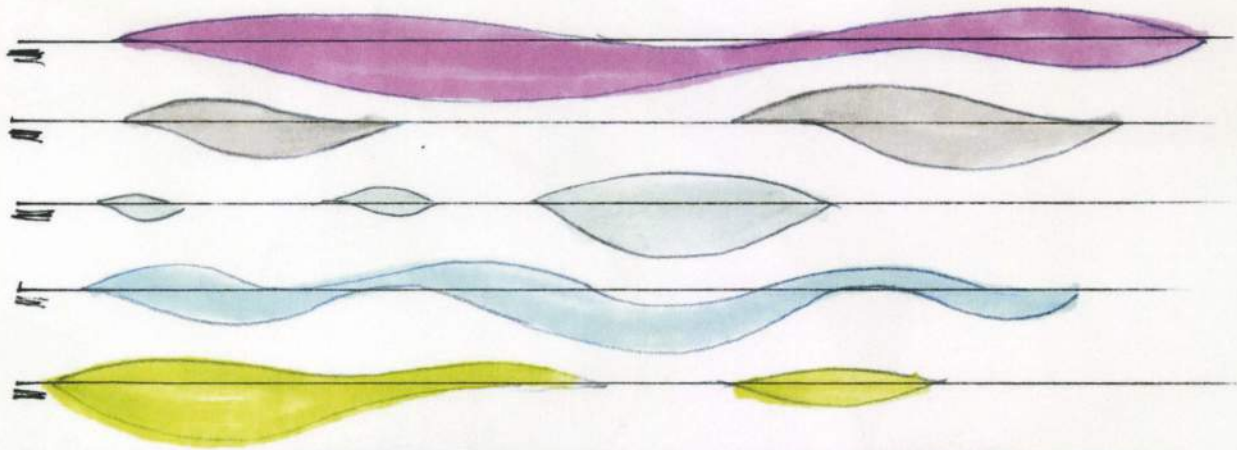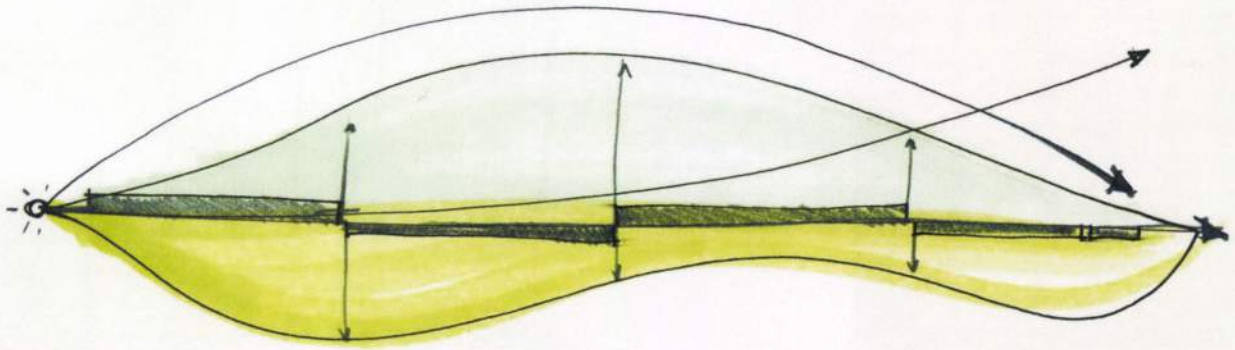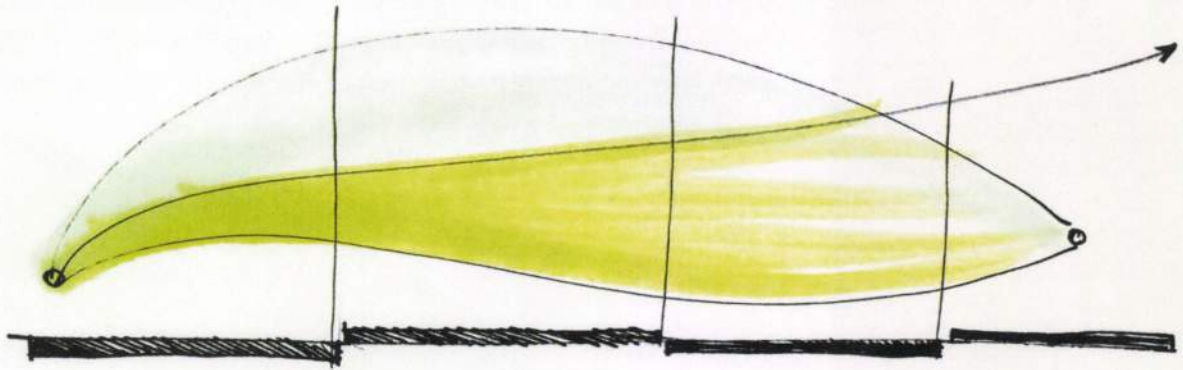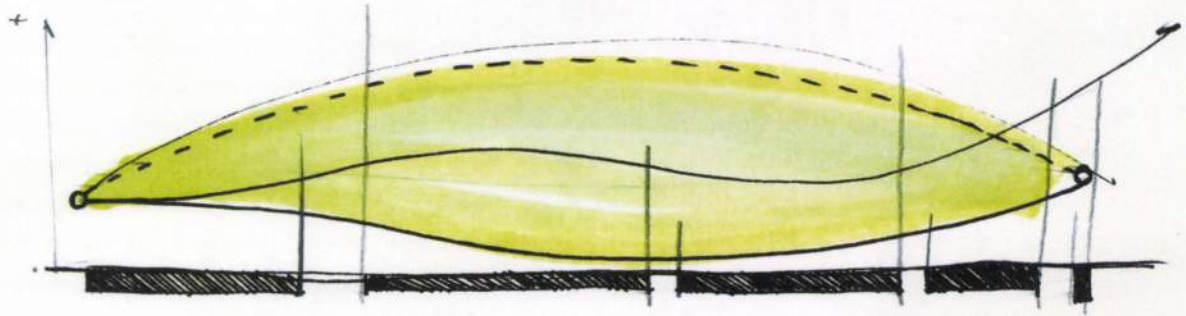
JUNE   JULY   AUGUST (1)   AUG (2)

curved planes

Curved planes are similar in structure to rectilinear planes when drawn in two-point perspective but can easily appear misshapen or distorted. The most readable curved planes exhibit three qualities: (1) they are composed of fair curves; (2) they have minimal distortion among their curved edges; and (3) they only curve along two edges, not all four. When you draw a curved plane, think about the physical effect gravity would have on this plane, and then try drawing an assortment of planes falling from the sky to test curves, position, and angle. Try drawing simple curved planes that move in both horizontal and vertical directions. Use varying line weights to distinguish between the object line (outer edge) and the contour lines that

ribbons

Ribbons are more elongated, curvy planes that can be drawn from a variety of angles; however, the most effective ribbons have minimal twisting and distortion. Understanding how to draw ribbons translates well to drawing action arrows that describe physical movement of pieces/ parts/components. When drawing ribbons, focus on projecting contours perpendicular to a drawn curvy line, as this will enable you to maintain accurate proportions as the ribbon moves through space. Of course as the ribbon goes back farther toward the horizon line, the proportions will change as the form vanishes into the distance. Also note that ribbons and arrows should have no thickness; therefore be cautious in connecting the appropriate lines. Drawing through the form will allow you to see the underlying structure so that unintended twisting and thickness will not occur.

describe the surface. The use of contour lines will aid the communication of the undulations of the surface and provide some visual depth for your drawing. Contour lines provide surface information that communicates more detail about shape, character, and form. When adding contour lines, envision the curvature of the plane in space, and draw a contour that appears similar to the curved edges on either side of it. Sometimes we call this the "goldilocks theorem of contour lines," as the back edge may be a more active curve and the leading edge may be more static—therefore the contour lines in between must share features or appear similar to both, creating a "just right" transition.
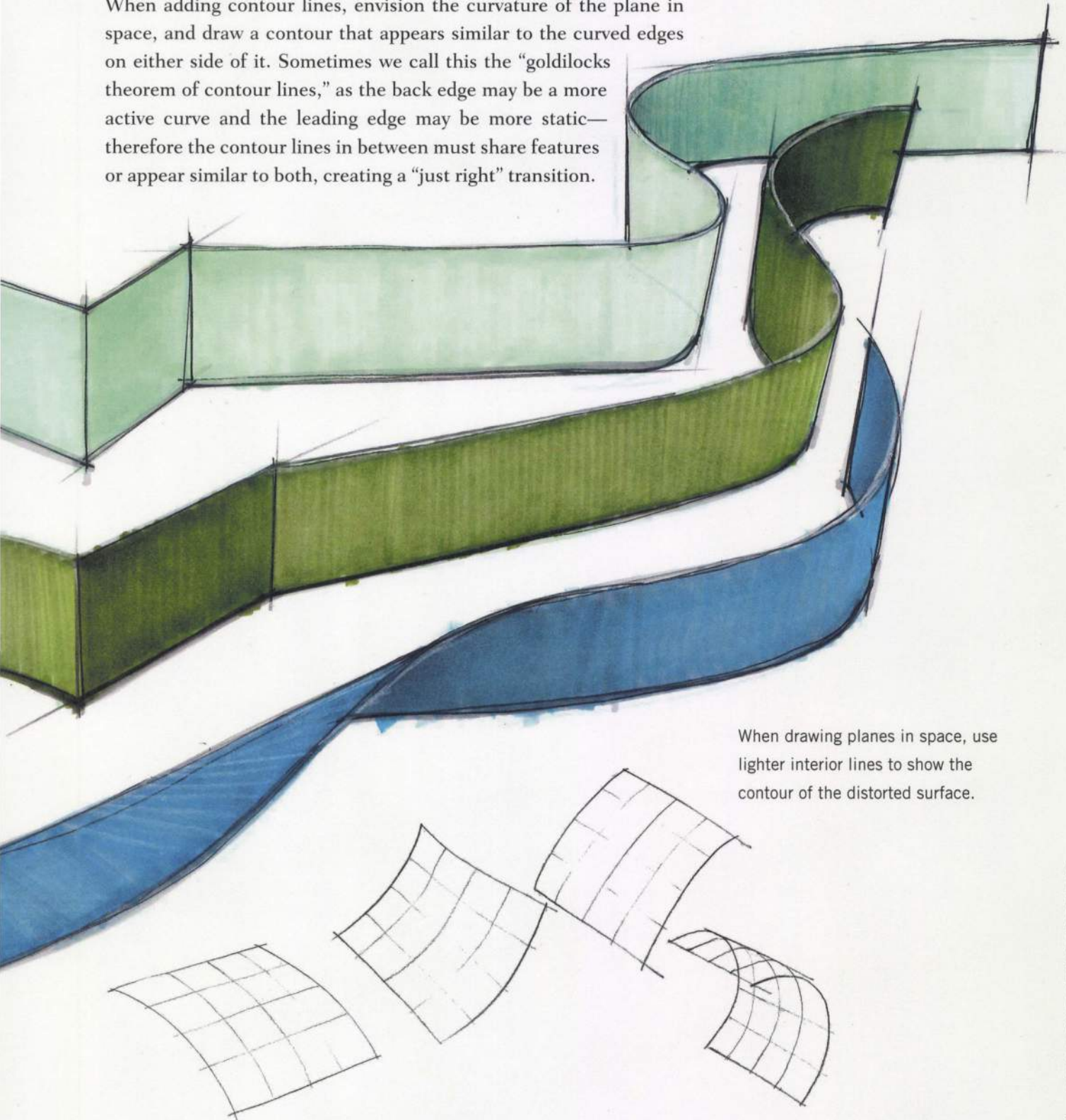
When drawing planes in space, use lighter interior lines to show the contour of the distorted surface.

DEMONSTRATION

using a grid to divide a plane

Overlaying a grid pattern onto a plane set in perspective will provide a structure to explore curvilinear and faceted planar faces. The following instructions provide a step-by-step process for finding the center of a rectilinear plane in flat orthographic view, one-point perspective (using one vanishing point), and two-point perspective (using two vanishing points). The plane can be drawn at any angle in space, but the more of the planar surface you can see at this stage, the more informative detail your curved or faceted plane will provide. To see more of the surface, lower the plane in the viewing space to set your vantage.

ORTHOGRAPHIC VIEW

ONE-POINT PERSPECTIVE

TWO-POINT PERSPECTIVE

Make a plane
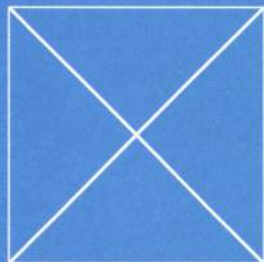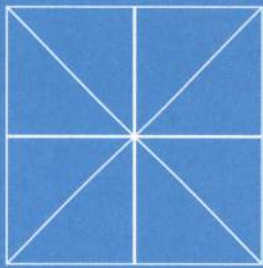
Find the center

Make quadrants
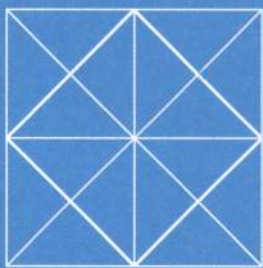
Find the center of each quadrant
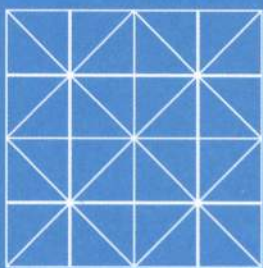
Run perpendicular grid lines
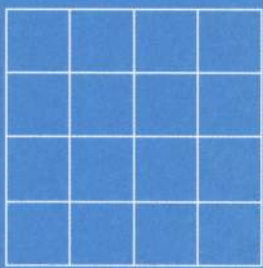
Square plane with grid lines
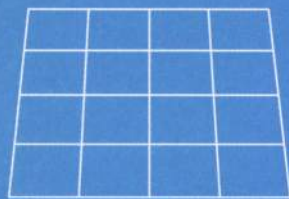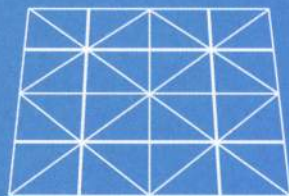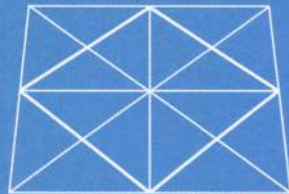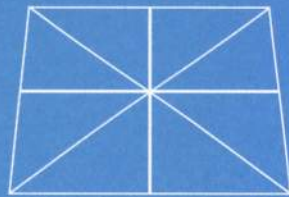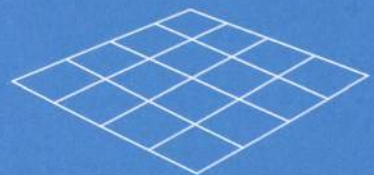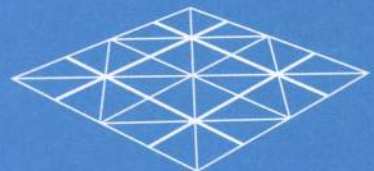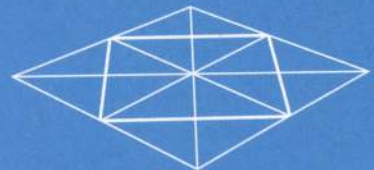
DEMONSTRATION

using planes to create three-dimensional forms

Curvilinear planes can easily become distorted and confusing. If the surface is too warped or wrinkled, details and information may be obscured by the complexity of the lines. In general, try to use simple curves/sweeps as a basis; then move on to compound curves. You might try planar faces that have both simple and compound curves to create transitional surfaces. The more complex the curves, the more you may need additional contour lines to delineate the surface transitions. Notice that the curves in these examples are all fair curves—those that do not loop back on themselves and create simple directional surfaces. Try some complex wrinkled, faceted, or wavy surfaces by projecting vertical lines from the intersections of the grid lines on the flat plane. Use varying line weights so that the complex plane stands apart from the construction lines.
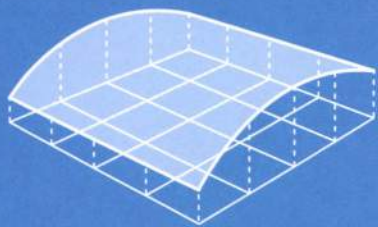
Simple curves
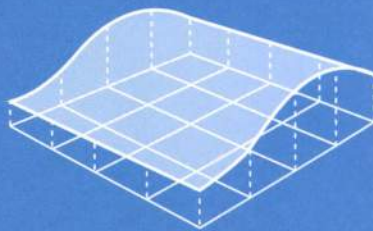
Compound curves
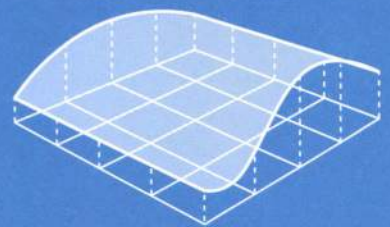
Simple and compound curves
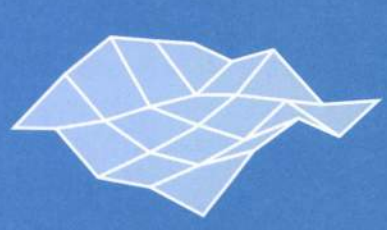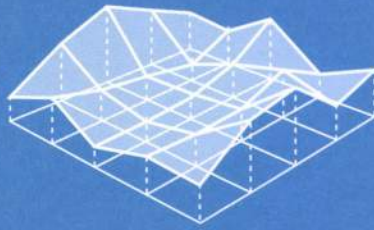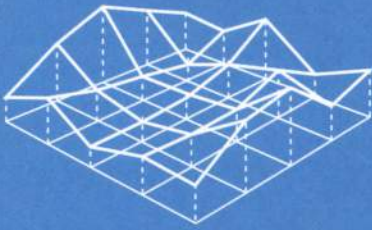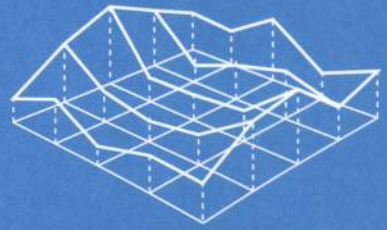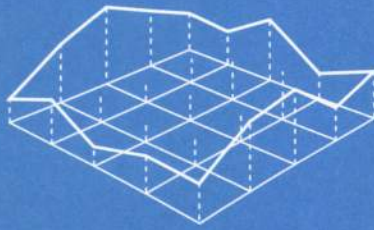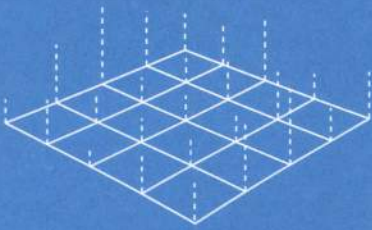
Wrinkled planes
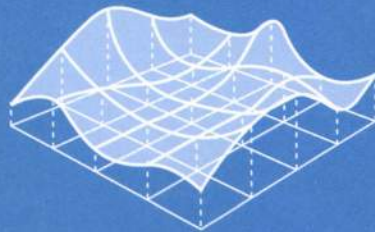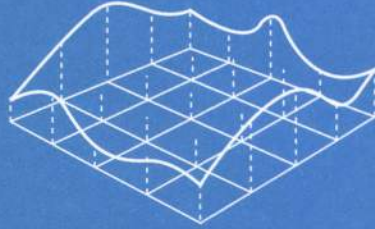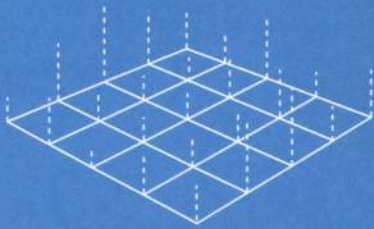
Wavy planes

USING CURVED PLANES TO CUT & SHAPE

Once you draw a good curved plane, you can apply a grid to define its surface and project an outline to give thickness. This is the easiest way to draw curved surfaces with features on them, such as falling leaves. Try using curved planes as cutting planes through the surfaces of cubes to make simple cuts and transform simple shapes into more complex object forms.

Practicing simple forms like this will enable you to sketch more complex curvilinear forms like mobile phones, car bodies, and furniture.
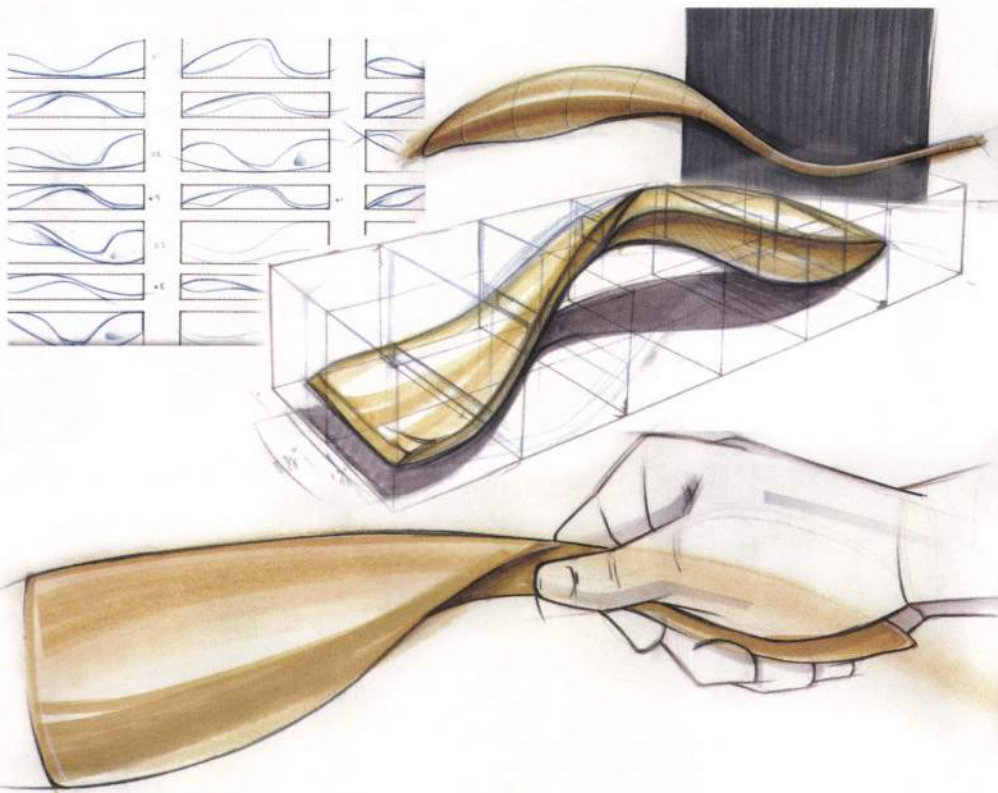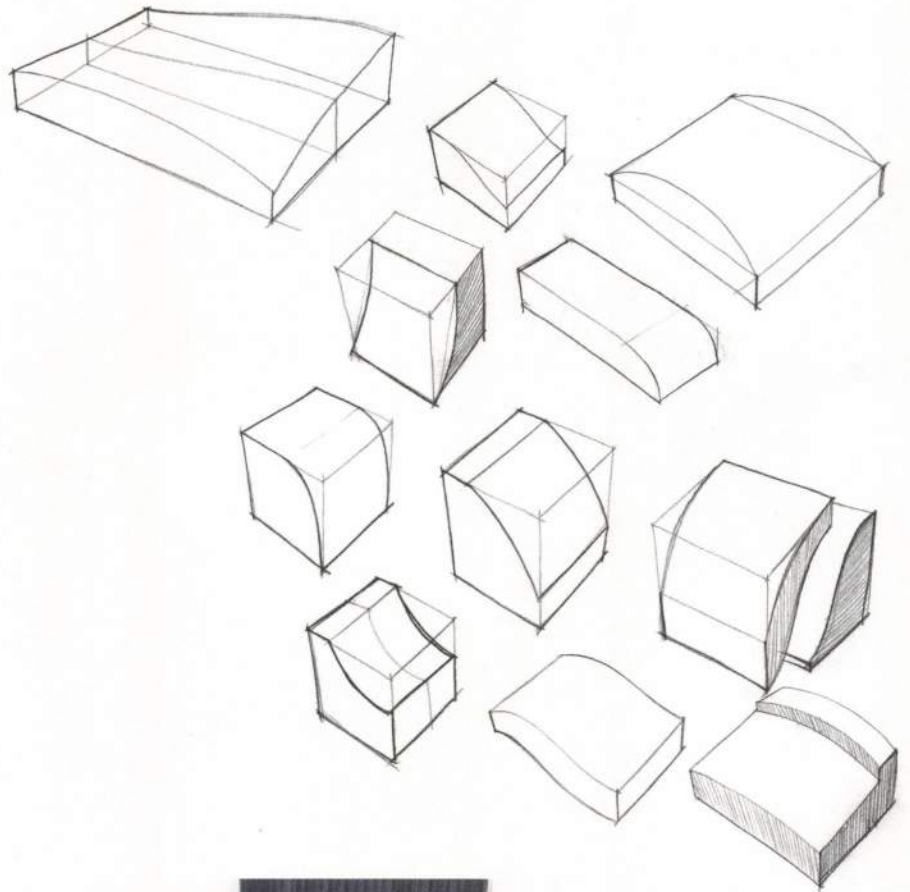
You can use drawing to improve your understanding of the natural world by translating plants and leaves into planar geometry. Aim to capture the essence of your subject by first stripping away the details to create a gestural structure. Details can be added with a denser line weight; tone can be added through hatching.
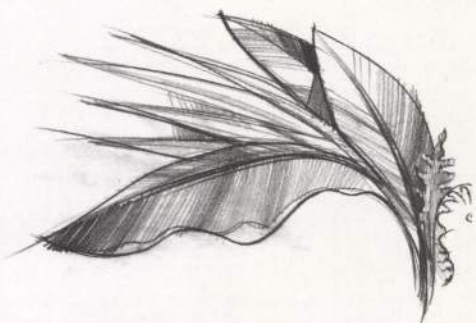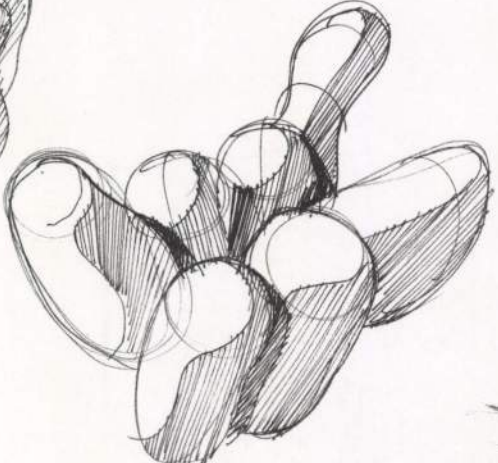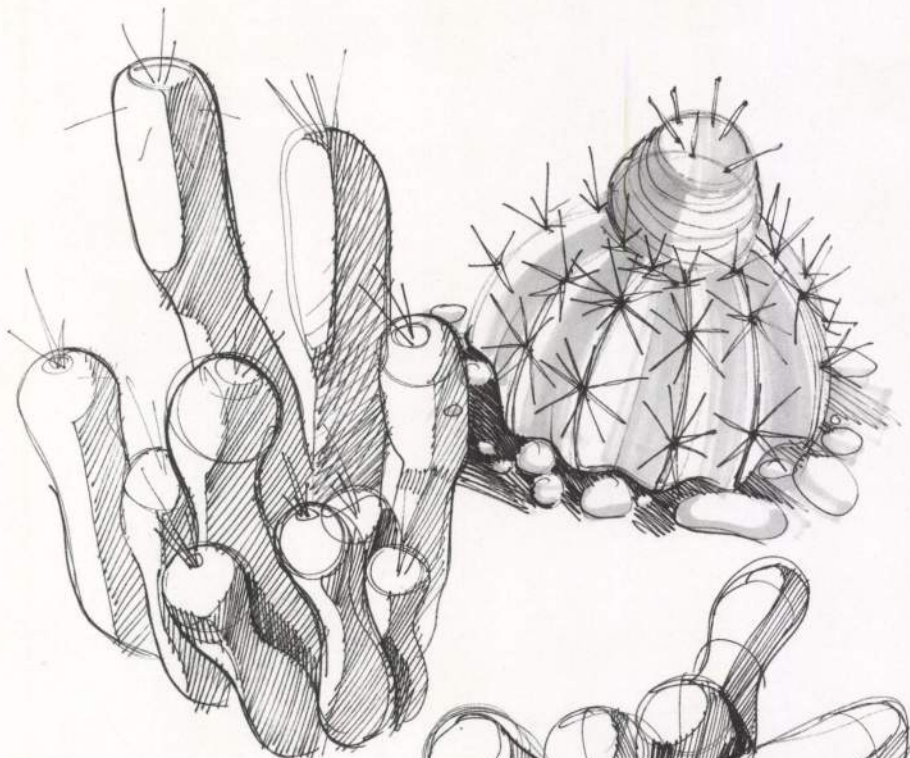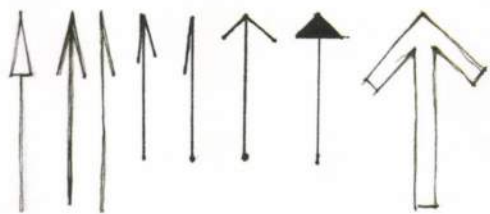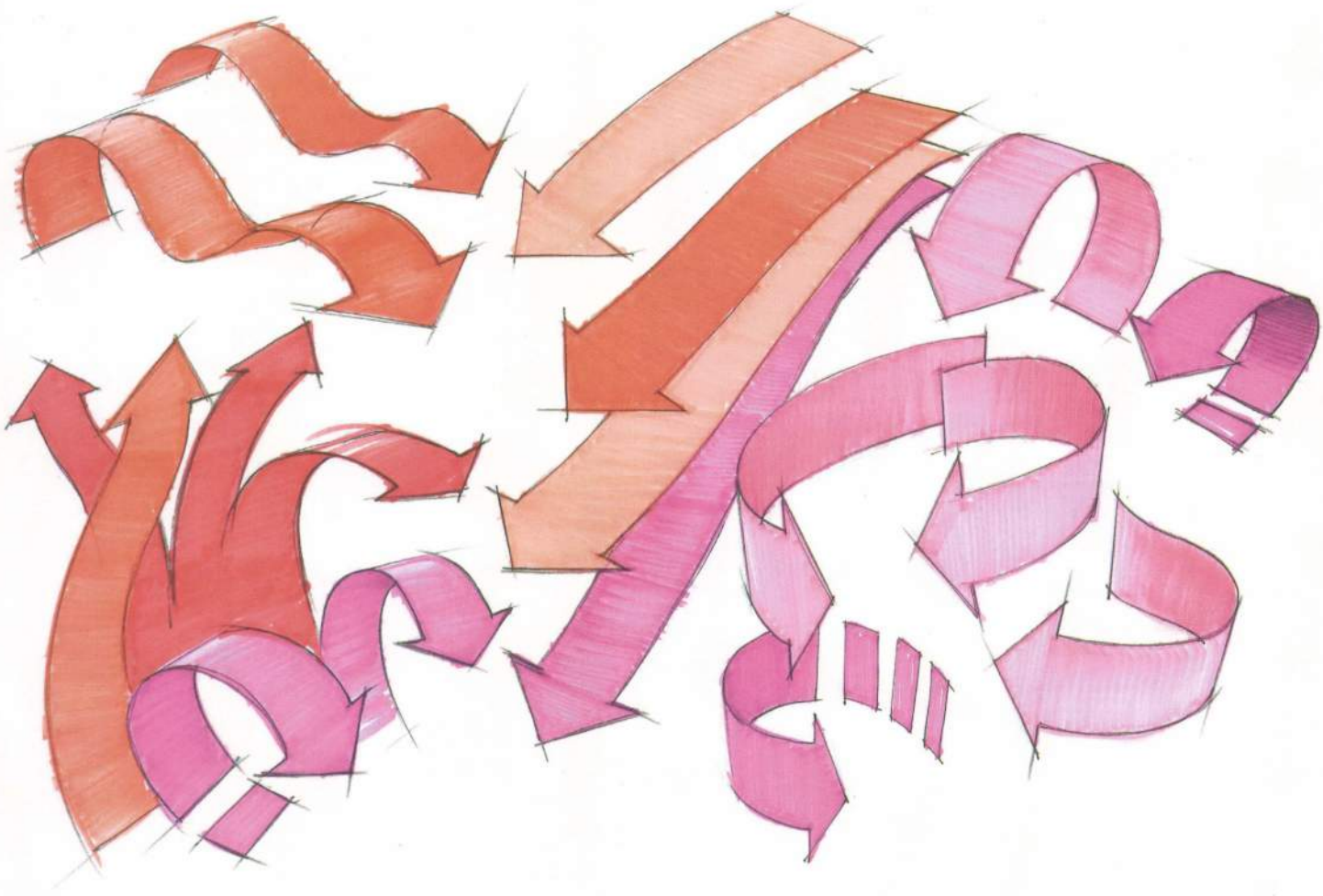
Detail arrows, directional arrow
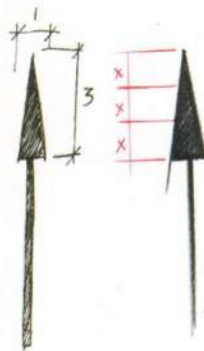
Detail arrows, proportion 1:3
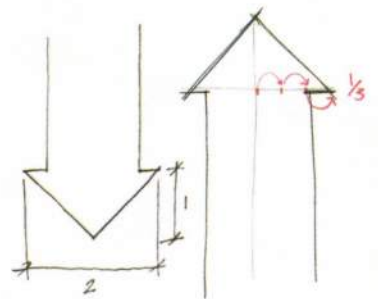
Action arrows, proportion 2:1

There are three basic types of arrows: detail arrows, directional arrows, and action arrows. Detail arrows are used to make notation and to call out specific features and components. These are most often seen in technical drawing and orthographic projection and are distinguished by their ultrathin line with a triangular leader (proportion 1:3). Directional arrows are used to indicate desired movement and orientation, such as those in maps or navigation signs. Their stroke and shape are usually bolder for enhanced legibility at a distance. Both directional and action arrows can also be used as graphic elements to help the viewer move between sketches or to make linkage between sequential ideas. Often these arrows appear in the background as vignettes with thin line weight and no tone or color. Action arrows are most commonly used to show movement of components and have an appearance akin to a length of masking tape with a wide flat triangular leader. They are often seen colored orange with no thickness and casting no shadow—used to help the viewer understand direction, duration, and qualities in movement. Typically we use orange because action arrows depict movement and imply a transfer of energy, so the association of the bright color orange seems to fit and has become the convention.
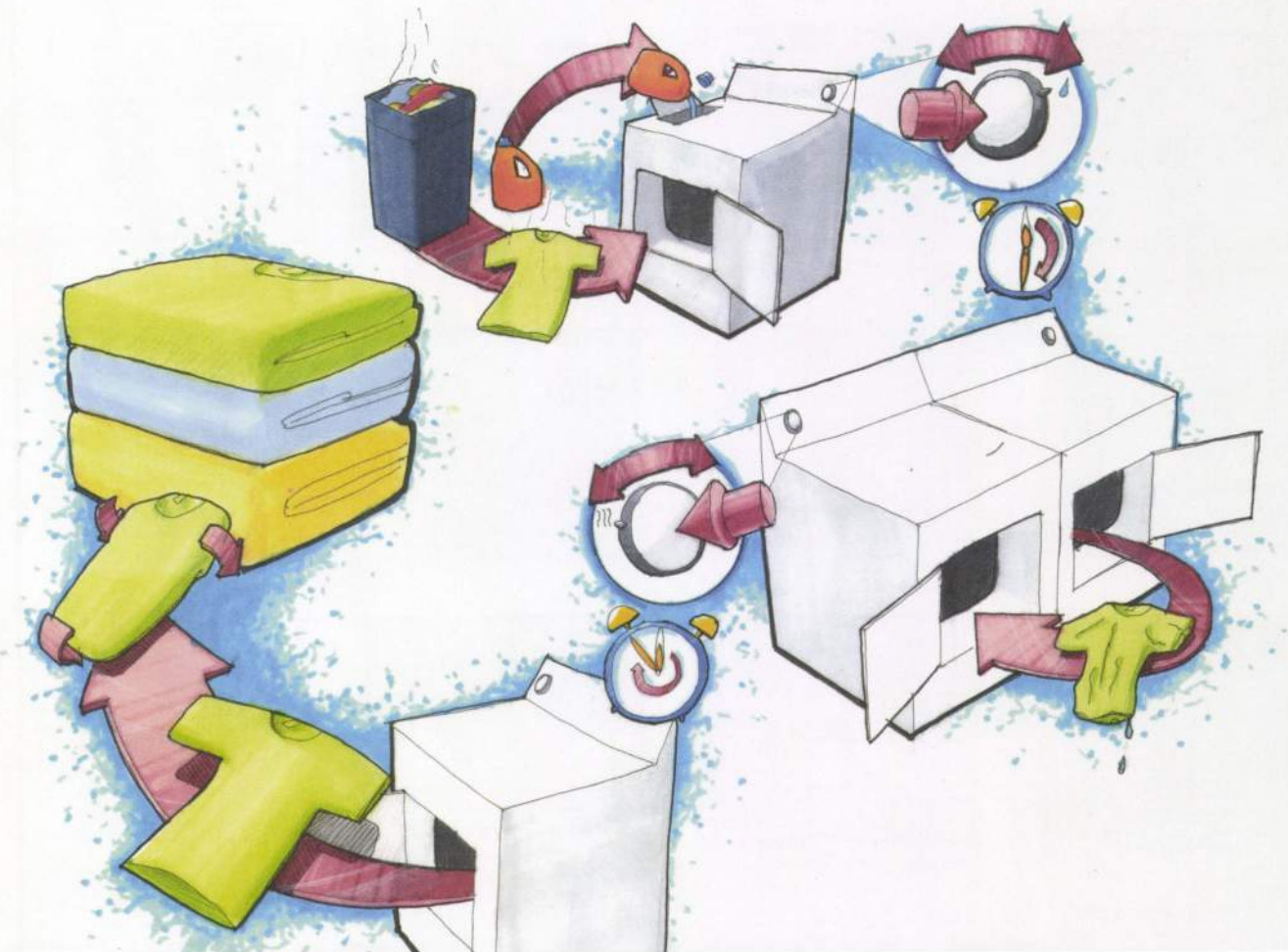
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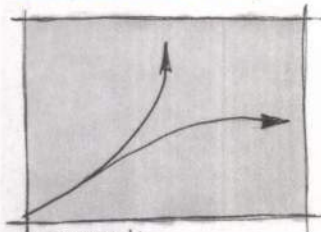
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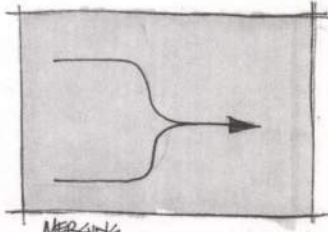
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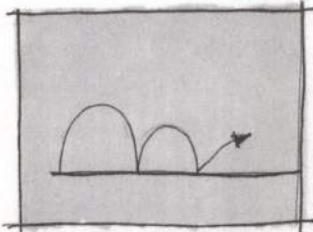
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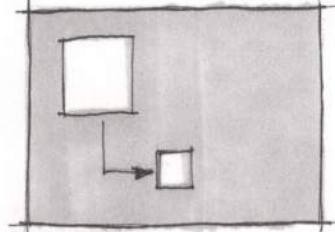
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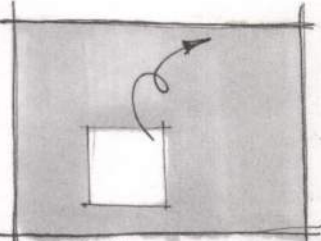
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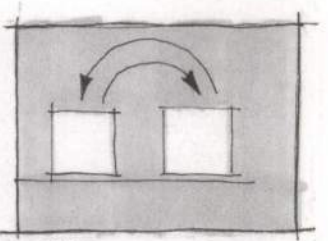
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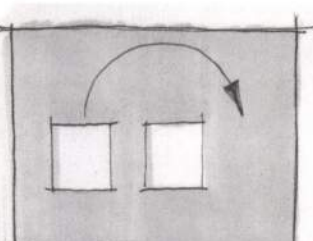
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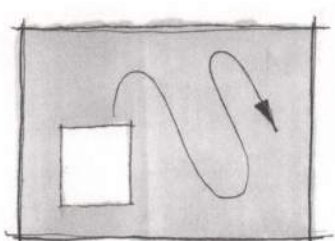
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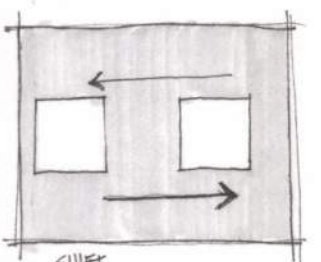
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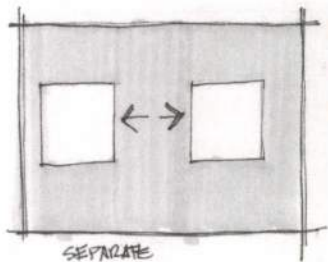
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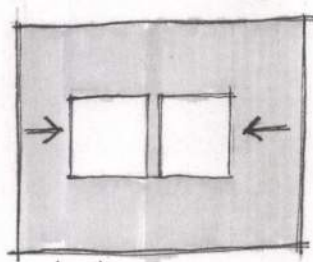
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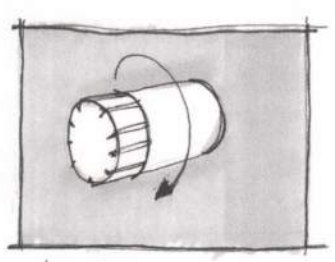
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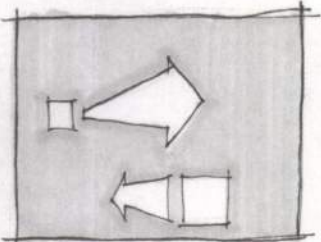
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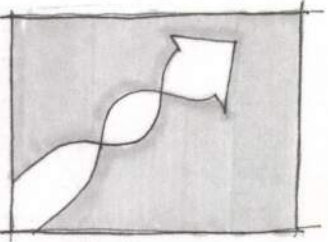
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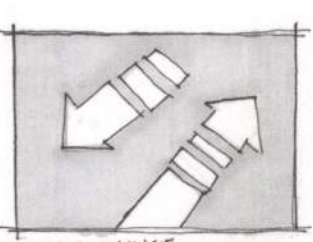
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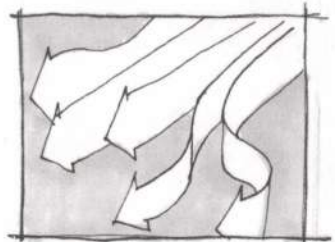
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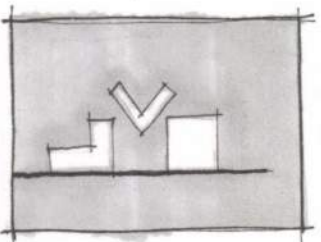
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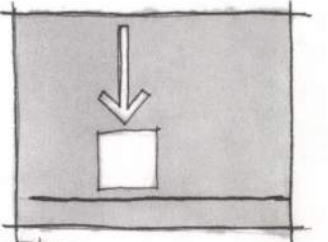
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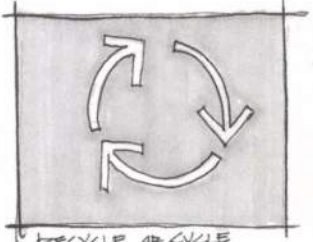
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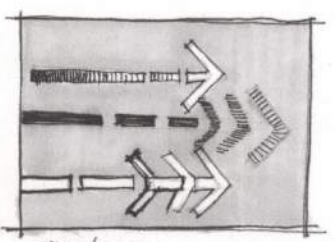
FADE/DISOLVE
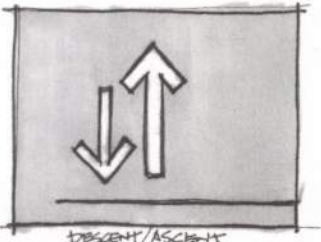
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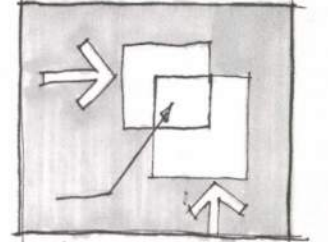
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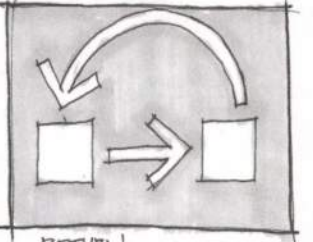
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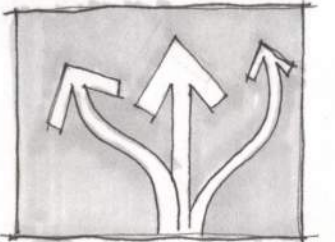
ANIMATE/FLOW
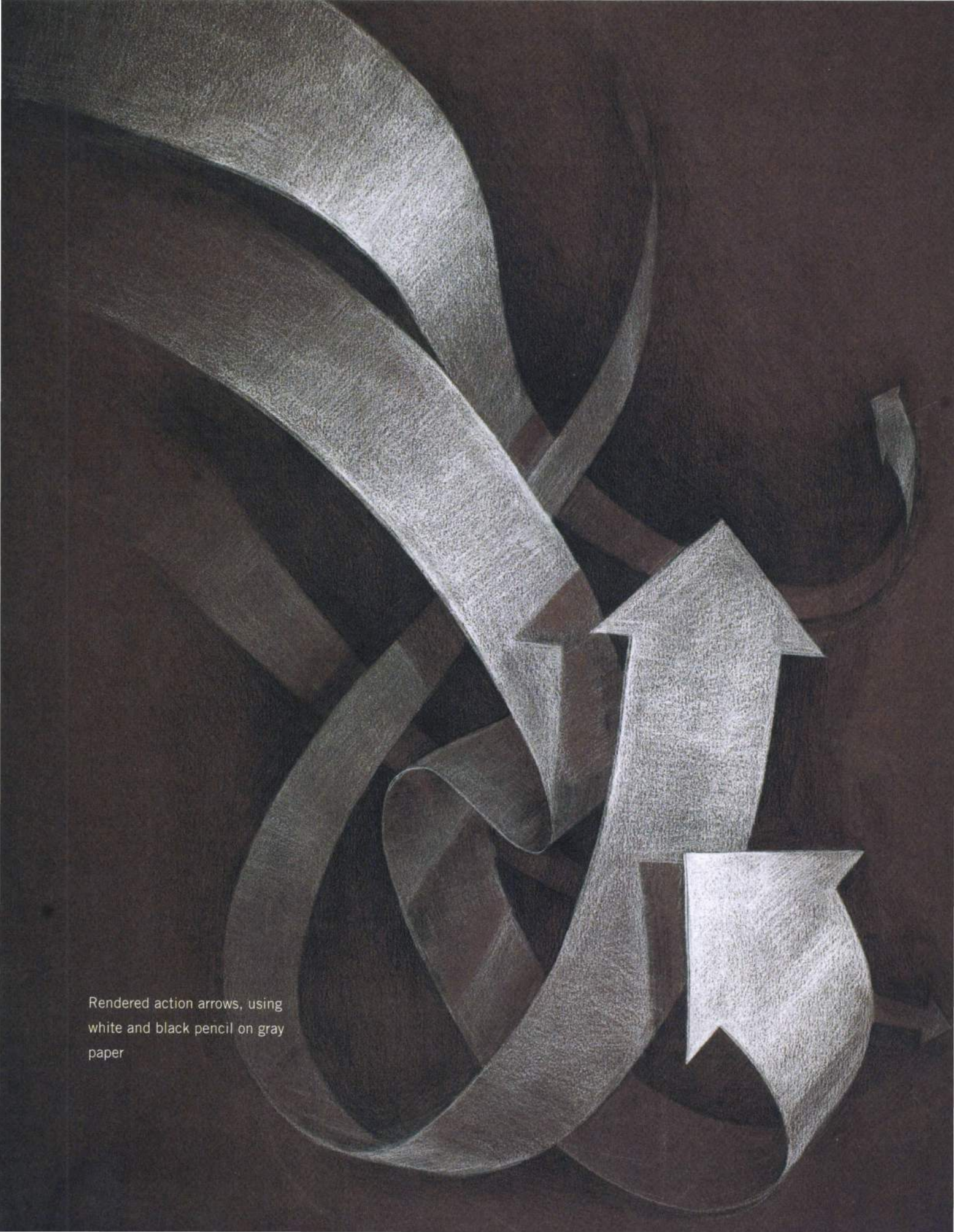
Rendered action arrows, using
white and black pencil on gray
paper

ROTATIONAL FORMS

ROTATIONAL FORMS ARE any three-dimensional objects that have a profile and a center point axis from which the profile is rotated. Think of a can of soda or a paper coffee cup. When looking at them from above, they appear circular, and we can see that they have a shape defined by a profile that revolves around a center point. Essentially these are cylindrical forms—geometric figures with straight parallel sides and a circular section. More complex rotational forms include chess pieces (bishops, castles, and pawns), water bottles, wineglasses, and the like with sides that may not be straight and parallel but rather angled, curved, and detailed with features.
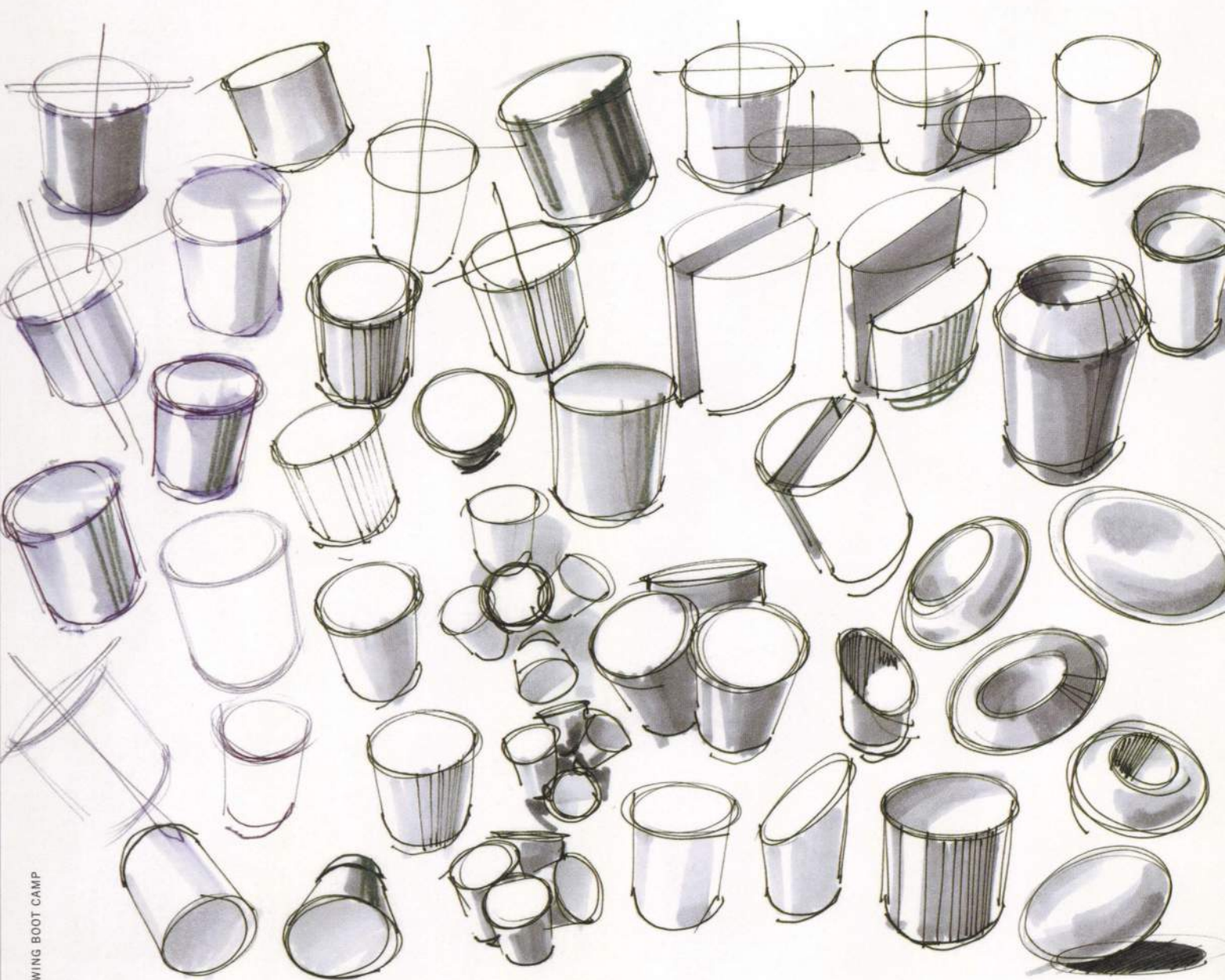
When we look directly down on a coffee cup, the opening appears as a circle, but if we hold that coffee cup in front of us, that circle turns into an ellipse. Moving the cup from left to right, high to low, perpendicular to askew to the floor changes our view of the circle to a foreshortened circle or ellipse. Thus, an ellipse is a circle viewed from an oblique angle in space. The key to drawing cylindrical forms is that the circular surface closer to the eye (the ellipse defining the top) must appear narrower than the circular surface farther from the eye (the ellipse defining the bottom). Put another way, as a cylinder recedes farther away from you in space (up, down, or back), the ellipse farther away from you appears to be more circular. Keep this in mind as you work through the following circle, ellipse, and cylinder constructions.
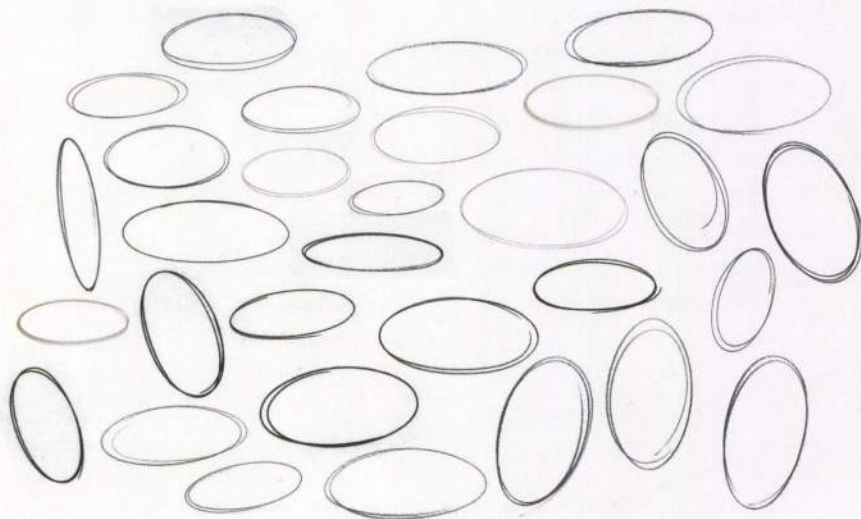
dropping in circles & ellipses

A quick, effective method for freehand sketching circles and ellipses is to sketch the form in the air, hovering the pencil tip just above the surface of the paper but allowing your hand to make contact with the paper. Doing this once or twice allows your muscles to practice the movement, so all you must do is drop the pencil point down through the movement; this technique is called "dropping in." You effectively envision the sketch before it is marked.

When drawing circles and ellipses, rely on your shoulder to provide the rotational point to make the circular motion, keeping your elbow and wrist tight. Try both clockwise and counterclockwise movements to see which is easier for you. Keep circles and ellipses expressive and loose in quality. It's okay to over-draw lines and to not end exactly at the same point where you started.

DRAWING AN ELLIPSE
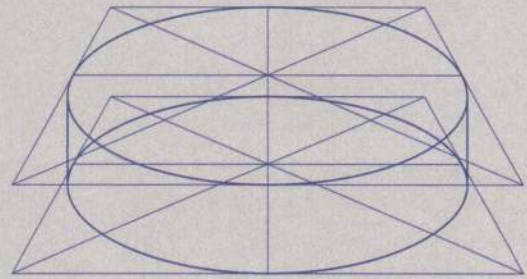
TO BETTER UNDERSTAND the structure of an ellipse, let's first look at a circle scribed within a square.
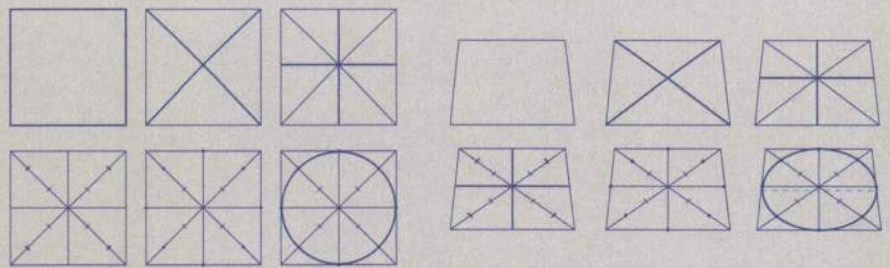
First construct a square and find the center by drawing lines from the corners. Then bisect each bounding edge with perpendicular lines through the center of the square. Divide each of the four angled lines into thirds, measuring from the center toward the corners of the square. Draw a circle that runs tangent to the sides of the square at the bisection points and intersects the angled lines two-thirds from the center.

Now take that square plane and lay it down into two-point perspective to create the illusion of a plane sitting in space. Follow the previous steps to draw an ellipse into this square plane. Try inserting a parallel plane directly beneath the ellipse you just drew to create a basic cylinder (top illustration). Note that the vertical sides of the cylinder flow into the top and bottom ellipses and do not create corners.

constructing ellipses
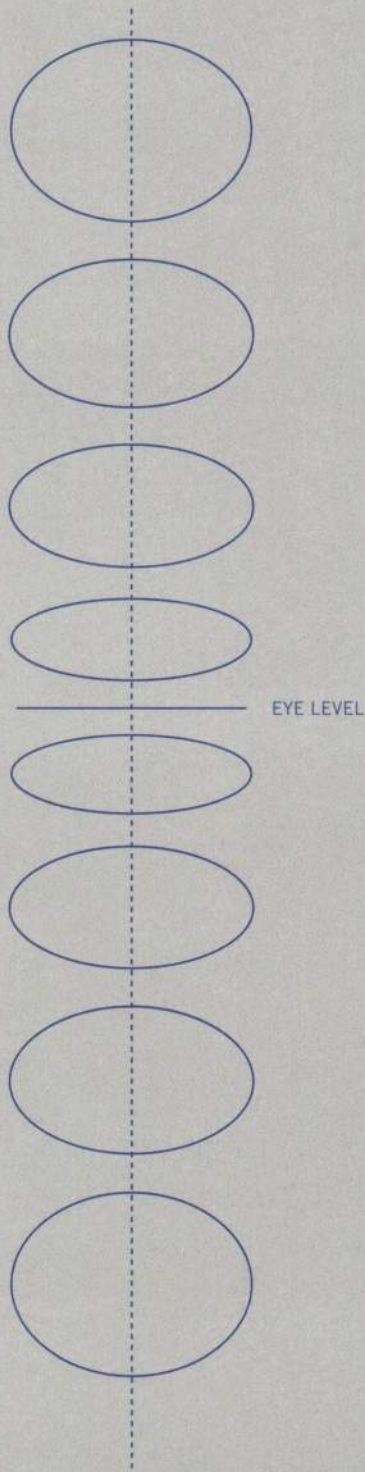
Drawing accurate circles and ellipses may seem difficult at first but can be quite easy with the technique explained here. Drawing a vertical or horizontal line through the middle of the ellipse will demonstrate its bilateral symmetry. This is a simple test to see if you've constructed your ellipse properly. The most difficult part is getting the right proportions. Ellipses are comprised of four equal parts that are defined by two perpendicular lines through the center from their longest dimension and their shortest dimension.

PERSPECTIVE CENTER LINE

ACTUAL CENTER LINE
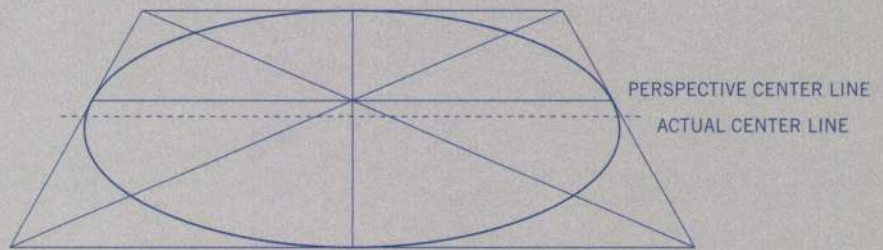
EYE LEVEL

As a circular form moves above or below eye level in space, the ellipse will appear rounder and less foreshortened. The farther from eye level the circular form is, the rounder it will be. Consider that if you drop a quarter on the floor and look directly over it, it will appear to be a circle. All other views will involve some foreshortening and cause the ellipse to appear narrower. At eye level, circular forms will appear as a line. In other words, at eye level, you'll be looking at the side of the circle.

The solid line depicting the perspective center is positioned slightly behind the actual dimensional center line. You can find the perspective center line in any ellipse by constructing a square plane around it and drawing intersecting lines from the corners. The actual center line describes the longest dimensional section that bisects an oval.

CONSTRUCTING CYLINDERS

ELLIPSES DRAWN ON an angled plane will set a circular form in perspective. The longest distance between two points on the ellipse is called the *major axis*. Note that the major axis does not align with the angled lines used to set the ellipse. The major axis runs through the perspective center of the ellipse and sits perpendicular to the *minor axis*, which is the shortest distance between two points on the ellipse. This 90-degree relationship will help you to project an ellipse into a cylinder.
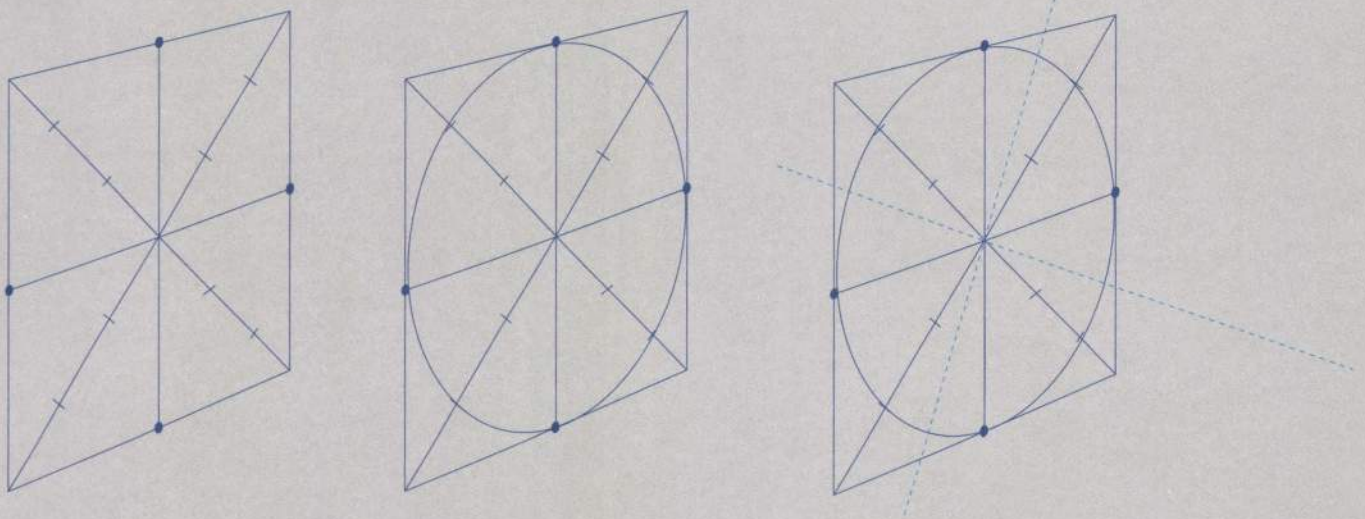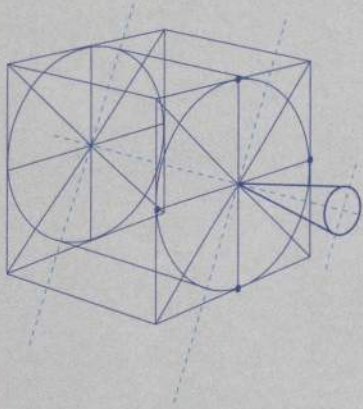
When projecting an ellipse into a cylinder, follow the direction of the minor axis to extend the path of projection. Not only does the minor axis connect the two closest points on the two-dimensional ellipse passing through the center but it also provides the axis through the middle of the three-dimensional cylinder. Shown here, a cone is aligned in perspective to point at the center of the cylinder—note how the cone follows the minor axis. Also note how the cone pierces the cylinder at the center following the minor axis.

Constructing cylinders from ellipses is easy. Remember, the sides of the projected volume standing vertically must be parallel to each other in both one-point perspective (shown immediate right) and two-point perspective (the other two cylinders). Note that despite rotating the box around the cylinder, the ellipses remain the same. This is due to the fact that as the orientation of the cylinder stays vertical, the minor axis remains the same.
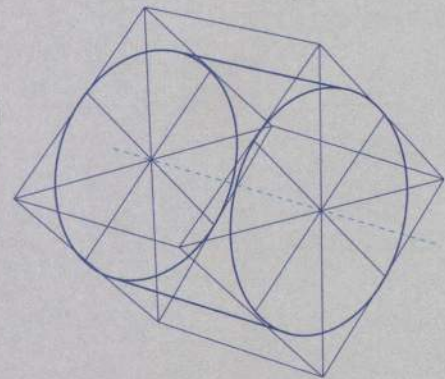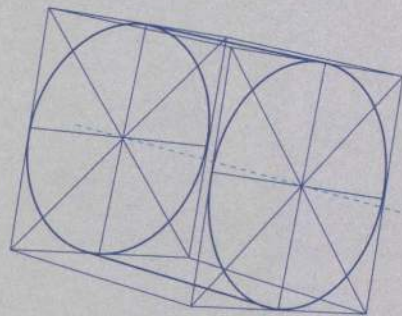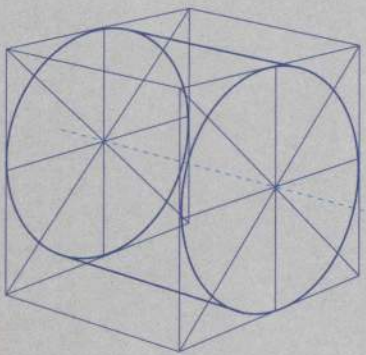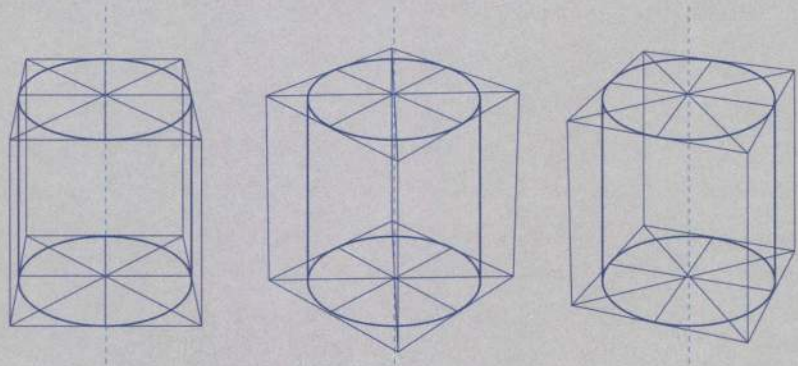
The same is true for horizontally situated cylinders. Rotating the box around the minor axis or axis of rotation will not change the ellipse; however, changing the viewing angle or moving the construction box will change the ellipses in the cylinder accordingly.

Similarly, if a cylinder is kept in position but spun/turned on its horizontal axis, the ellipse does not change. Only when you move the position of the cylindrical form in space (left, right, up, or down) will the ellipse change.

ROTATIONAL PROFILES

FORMS OF ROTATION are solid bodies drawn in two-point perspective that incorporate a shaped profile or contour revolved 360 degrees around a center line/axis. Much like a cylinder is formed by revolving a rectangle around a center line, other, more complex shapes can be created in the same way by first designing the shape to be revolved. Orthographic sketches establish the profile that will be revolved and can be used not only to plan a sketch, but to evaluate the accuracy of a sketch by comparing the side, front, top, bottom, and/or back views of the object. Shown here are thumbnail orthographic projections for a container planned in blue line pencil and then turned into perspective volumes.

Working from an orthographic side view or profile of an intended rotational form will enable you to delineate the proportions and features to maintain when transforming into a perspective drawing. Note that this process can be reversed. You may try drawing a segmented rotational form first and then draw a plane through it to map out its profile.
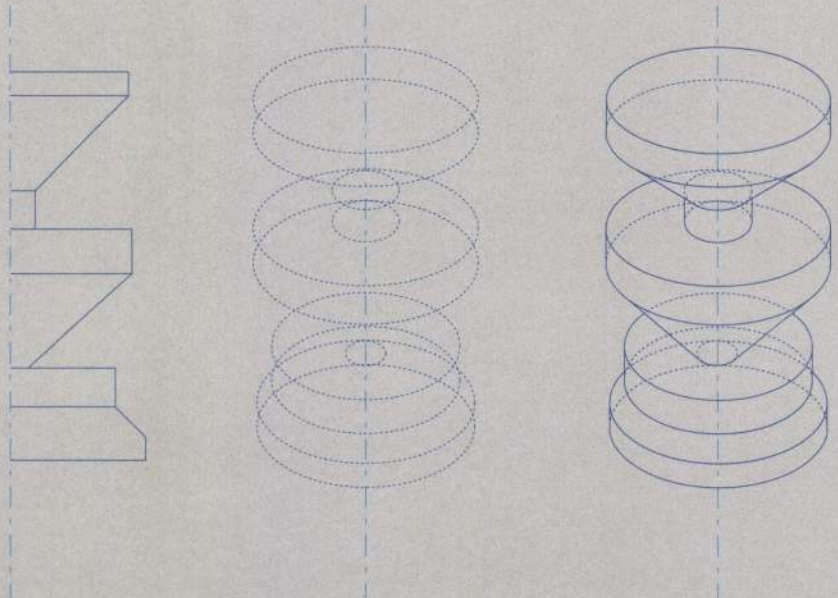
SKETCHING A SEGMENTED ROTATIONAL FORM

First establish a profile on a planar surface that scribes half of the proposed rotational form. A profile is the traced edge of the object that delineates its silhouette. Add a center line that will be used as the axis of rotation. This demonstration shows a segmented rotational form that is vertically oriented to the ground plane. This same methodology applies to rotational forms that are horizontally oriented to the ground plane.

Next, rotate this plane in succession around the center line. Typically, we use eight planes rotated around the center to provide enough reference points for an accurate drawing. You may choose to use fewer planes than demonstrated here should your form be easy to envision and sketch from your head. As you rotate the plane around the center line, try to maintain proportions and features of the profile as they foreshorten in space.
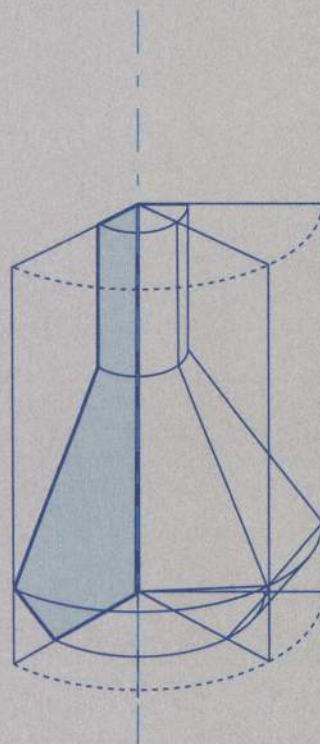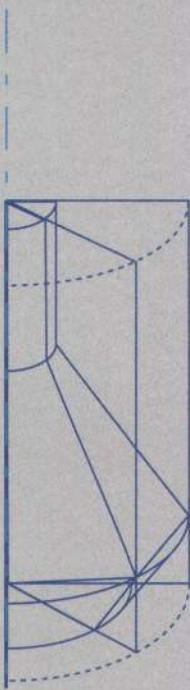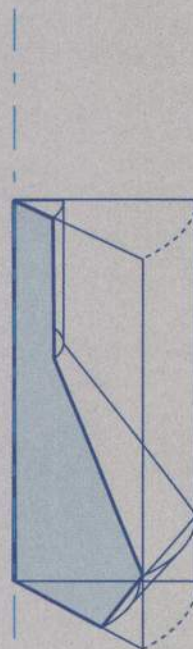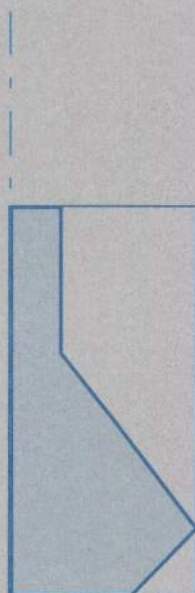
Continue to rotate these planes through the form to establish the volumetric object. Use the points at which the segments connect in your original profile to guide ellipse placement. Remember that as the plane rotates around the center line, its vertical edges will remain perpendicular to the ground plane while its horizontal edges will converge toward vanishing points on the horizon line.
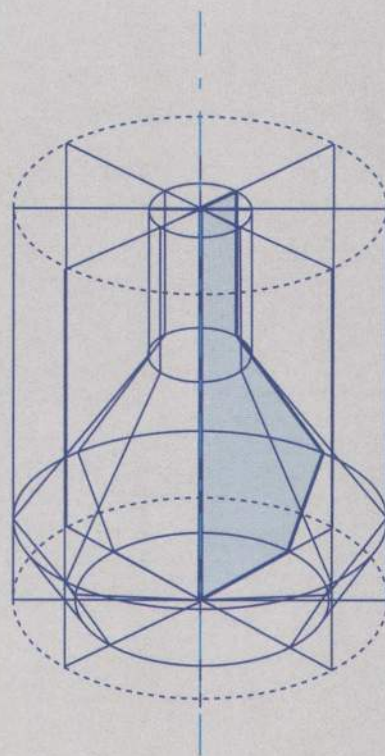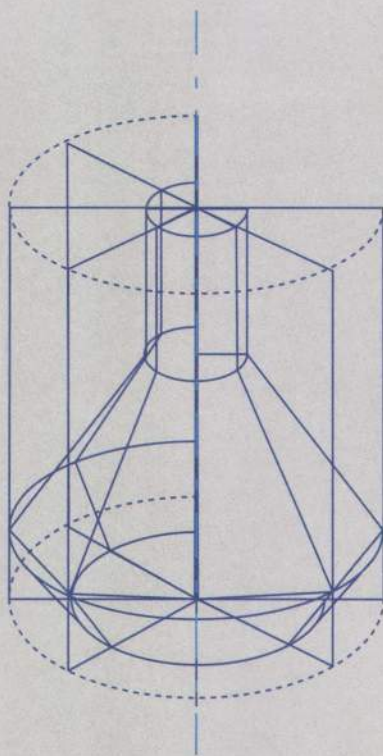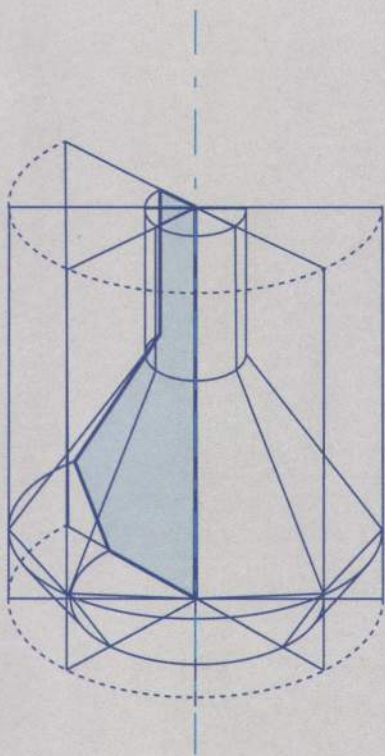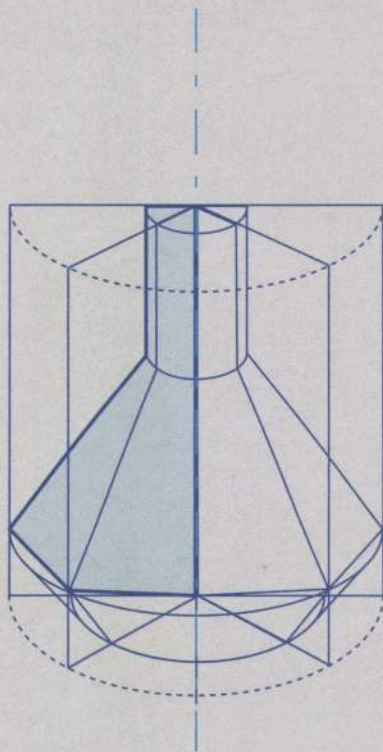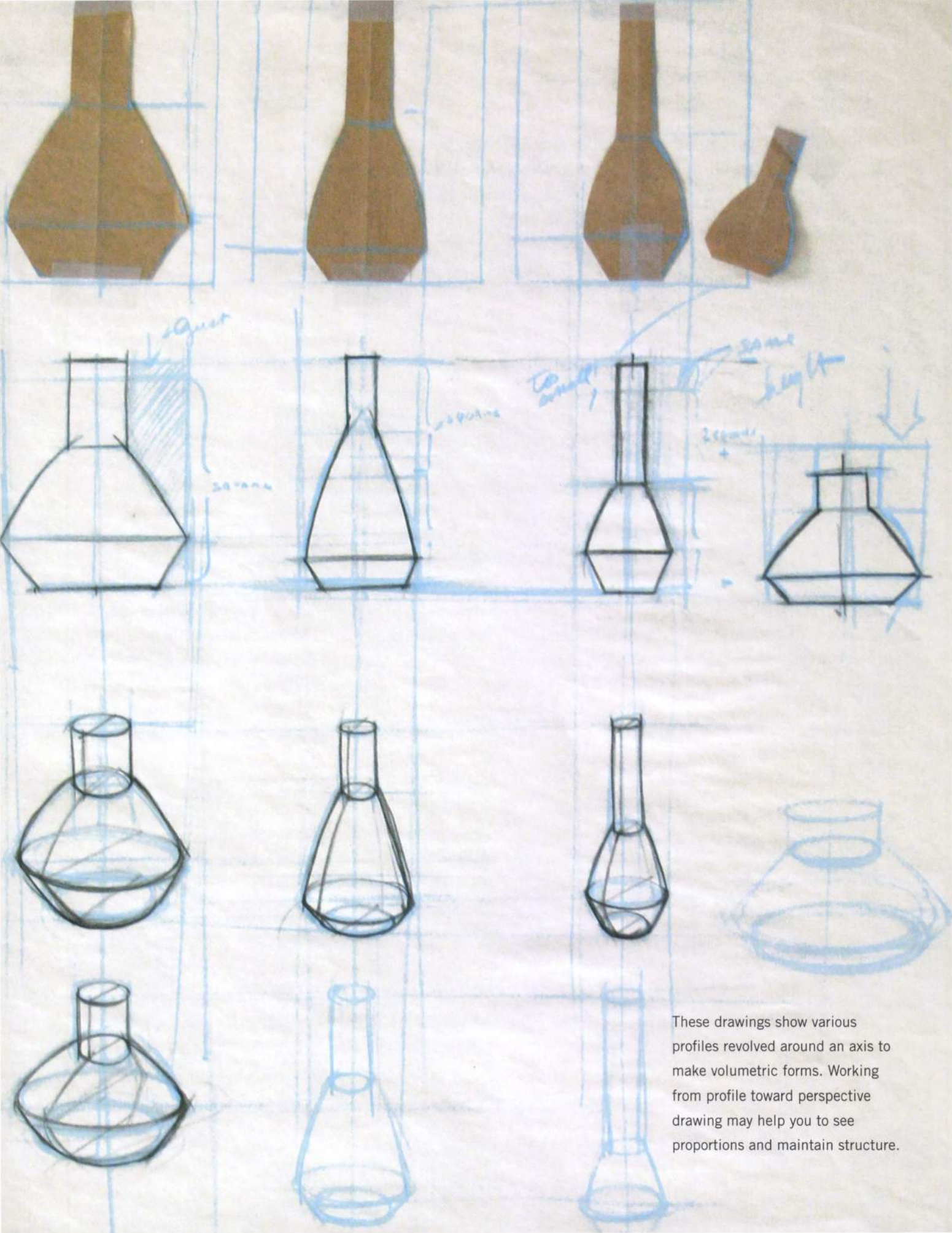
These drawings show various profiles revolved around an axis to make volumetric forms. Working from profile toward perspective drawing may help you to see proportions and maintain structure.

form-divide-detail-animate with cylinder-based forms

You can apply the "form-divide-detail-animate" method that we covered with cubic forms to slice, dice, add to, subtract from, explode, and recombine a volumetric form. This activity works well in helping you to better understand the structure within rotational forms and is particularly useful in sketching product concepts for which you are designing the form and considering manufacturing issues such as wall thickness, dimensions, and internal components.

You can practice form-divide-detail-animate by first constructing basic volumetric cylinders—this is the forming process. On these cylinders, draw contour lines across surfaces to further describe their volume and hint at potential division lines. Turn these contours into parting lines or separation lines to divide these objects into individual pieces. Then move and shift these pieces in space to animate your sketches. Consider removing pieces or adding components to make more complex forms. The goal is to build proficiency with cylindrical forms by engaging your mind through playing with these forms, so the more inventive you can be with adding and subtracting, the more fun you'll have and the more adept you'll become with rotational object forms.

Once you are confident in your cylinder construction, move on to more complex forms, like cones, or objects that are constructed as assemblies of rotational forms. In the top image at right, designer Jason May practices basic rotational form-making by moving a vessel-shaped object through space. In the bottom image, Caryn Audenried makes cuts and separates objects into pieces to explore and practice rotational forms.

When sketching rotational forms, consider first forming a basic volume such as a cylinder or another simple rotational volume to work with. Once you draw division lines across the surface to plan movements, separations, or subtractions of parts, you can add further detail features to enhance the form.

THE MORE INVENTIVE YOU CAN BE WITH ADDING AND SUBTRACTING, THE MORE FUN YOU'LL HAVE AND THE MORE ADEPT YOU'LL BECOME WITH ROTATIONAL OBJECT FORMS.
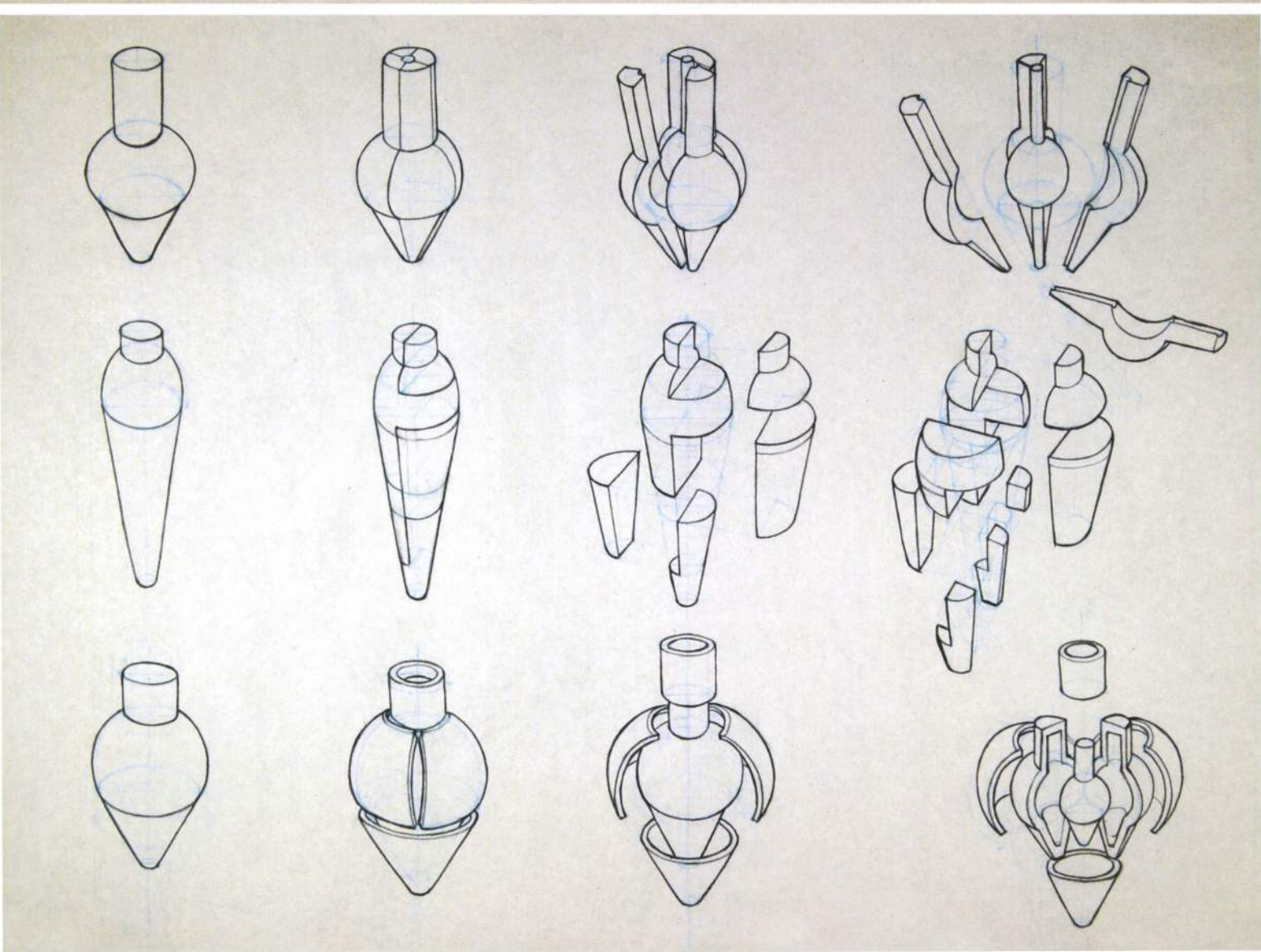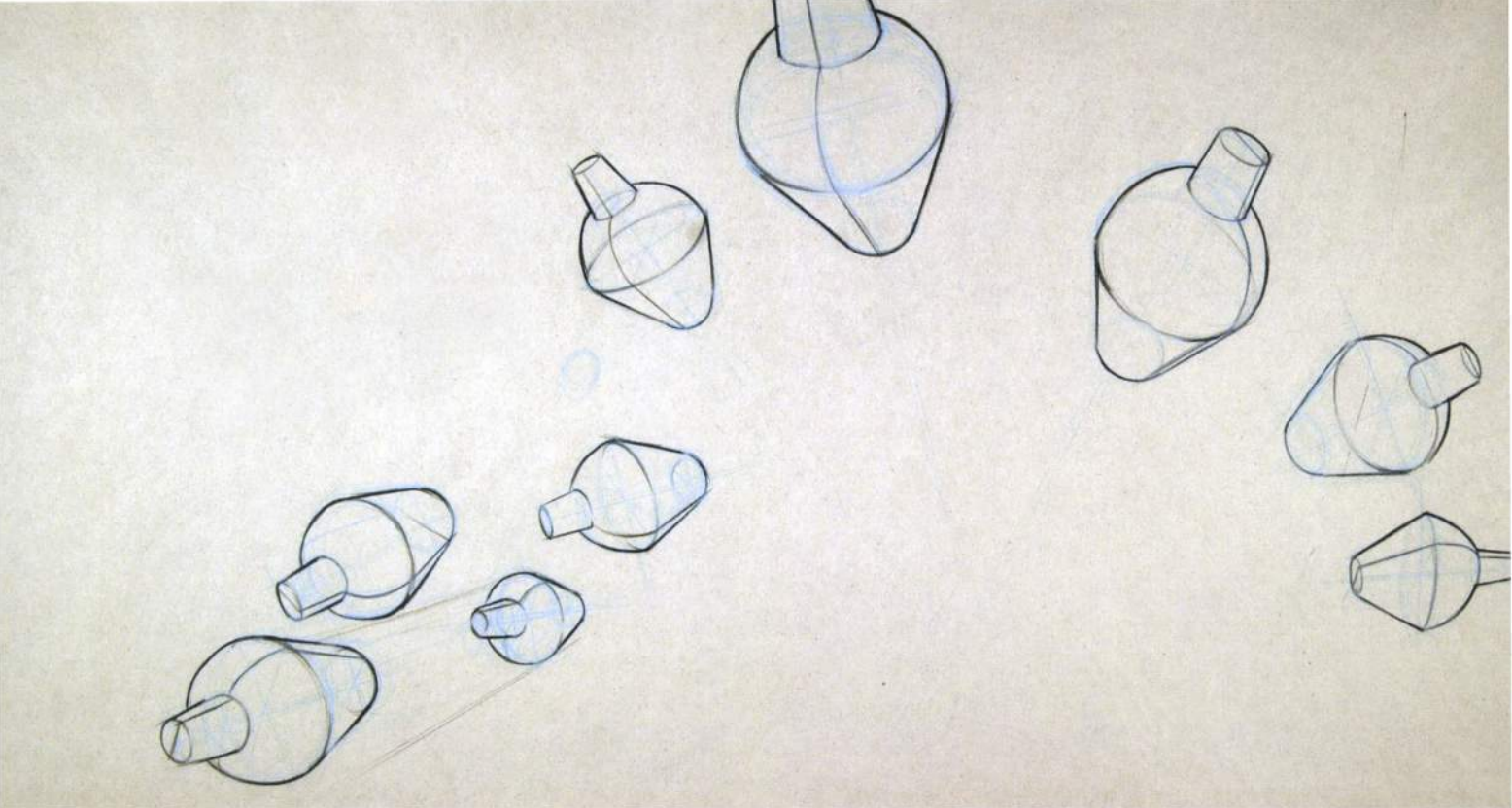
INTEGRATING THE HUMAN FIGURE into sketches provides a sense of scale and context that reinforce the concept of human-centered design. These figures do not require a lot of detail; in fact, the more simplified they are, the less they distract from the design itself (where you want the viewer to focus). There is a balance between too detailed and too simplified that conveys the figures as embodying accurate proportions and conveying some gestural quality yet remaining abstract. Stick figures and "starfish men" are quick solutions for representing figures, but their amateur appearance doesn't effectively communicate action. To visualize, persuade, *and* earn respect for their ideas and ability, designers must employ a higher level of sophistication in sketches than their nondrawing clients.

Stick figure   Starfish man   Blobular figure
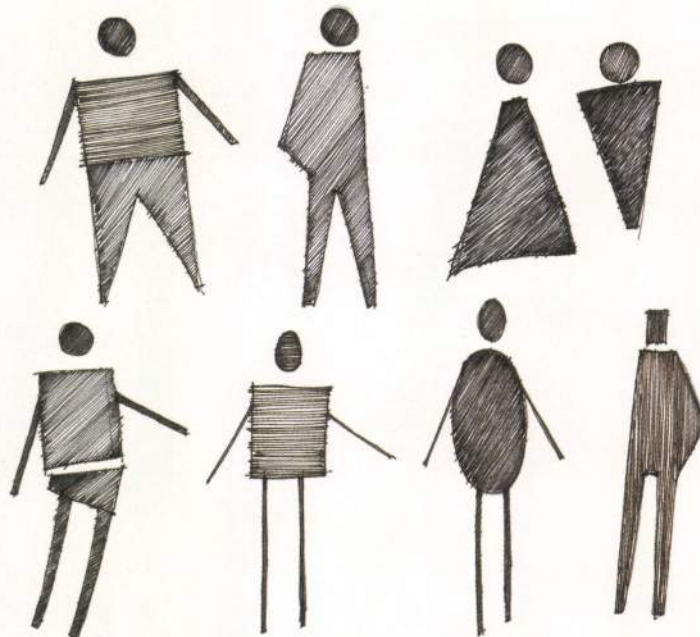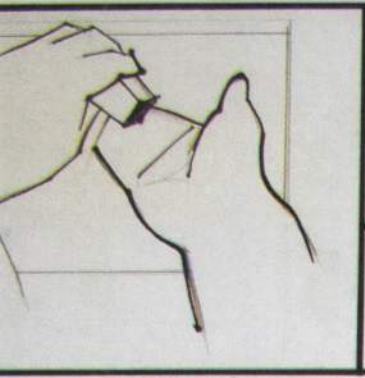
ZOOM OUT

PAWS

SKETCHING PEOPLE

1 PEOPLE
2 BEHAVIOR
3 CONTEXT
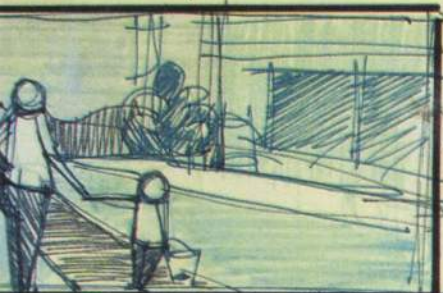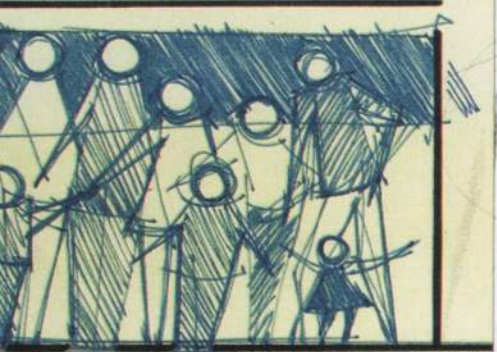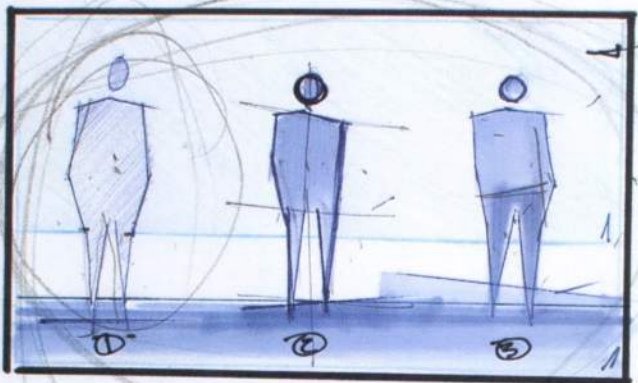
1 PAPERMATE BLUE BPP
2 PAPERMATE BLUE BPP
PRISMACOLOR CLOUD BLUE M
3 PAPERMATE BLUE BPP
PRISMACOLOR CLOUD BLUE M
PRISMACOLOR BLUE SLATE M
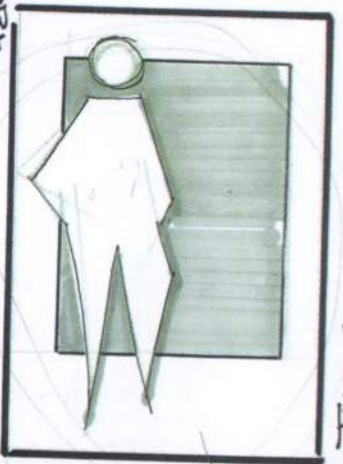
ZOOM OUT
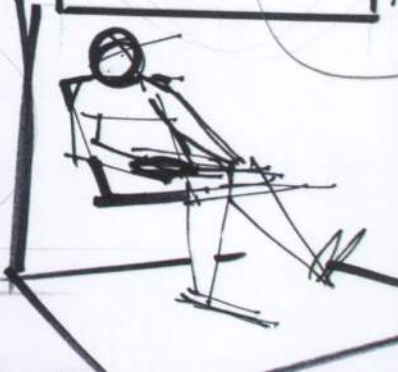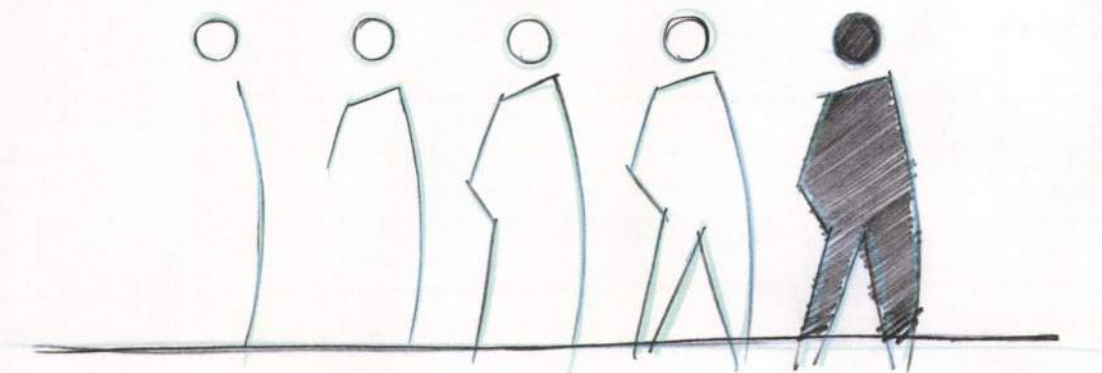
Steps for drawing a simple figure
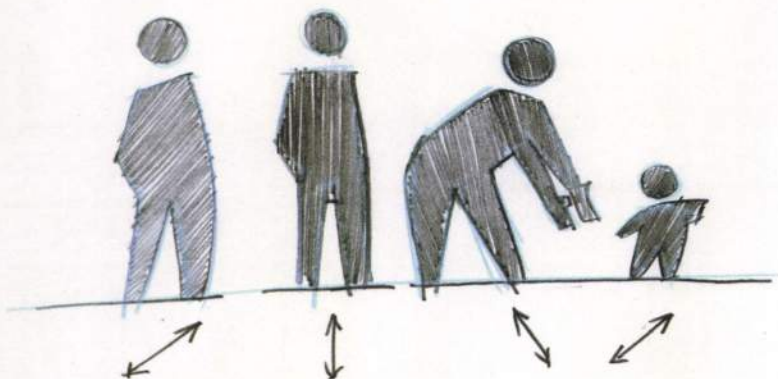
Strokes that enhance direction and movement

Time-based sequence of silhouettes

An easy (and quick) way to sketch people is to simplify them into silhouette figures with a primary action or gesture. Think of the human figures you see on roadwork signage but with more accurate proportions and a bit more detail—yet still abstract representations of the human form. By simplifying these figures, you emphasize the role they are playing to demonstrate activity, action, or behavior with regard to your concept.

Start with a gestural line to delineate the curvature of the spine or the front curve of a body in motion. This line captures the essence of a figure's pose (bent, crouched, straight at attention, reclined at rest, and so on) and defines the height, orientation, and direction of the figure. Simplifying the head to a disembodied circle keeps the sketch abstract and emphasizes the gesture of the integral body. Adding consistent tone to figures can be done with a black marker or with a thin pen. Regardless of the medium, orienting strokes in the direction of the movement of the figure's body will help to emphasize the action. These simplified figures serve as a designer's shorthand and are quick and easy to produce. Gestural figures add more character to your sketches over stick figures, which can appear lifeless.

In the following pages, you will find more examples of figures to reference. As you build proficiency with gestures and silhouettes, try more gestural figures engaged in more complex actions.
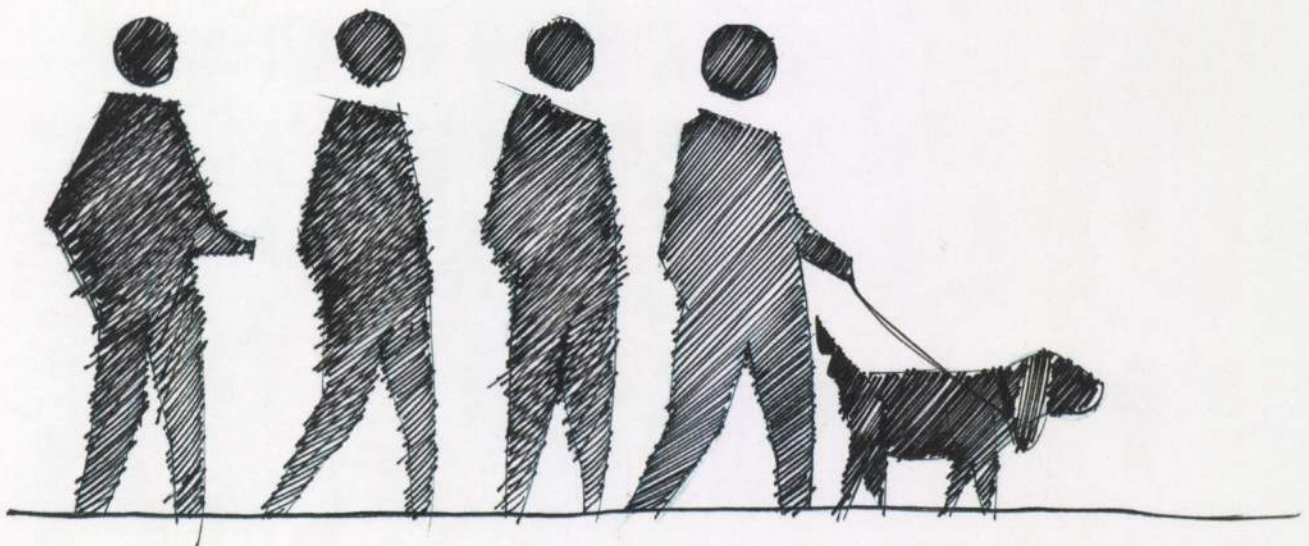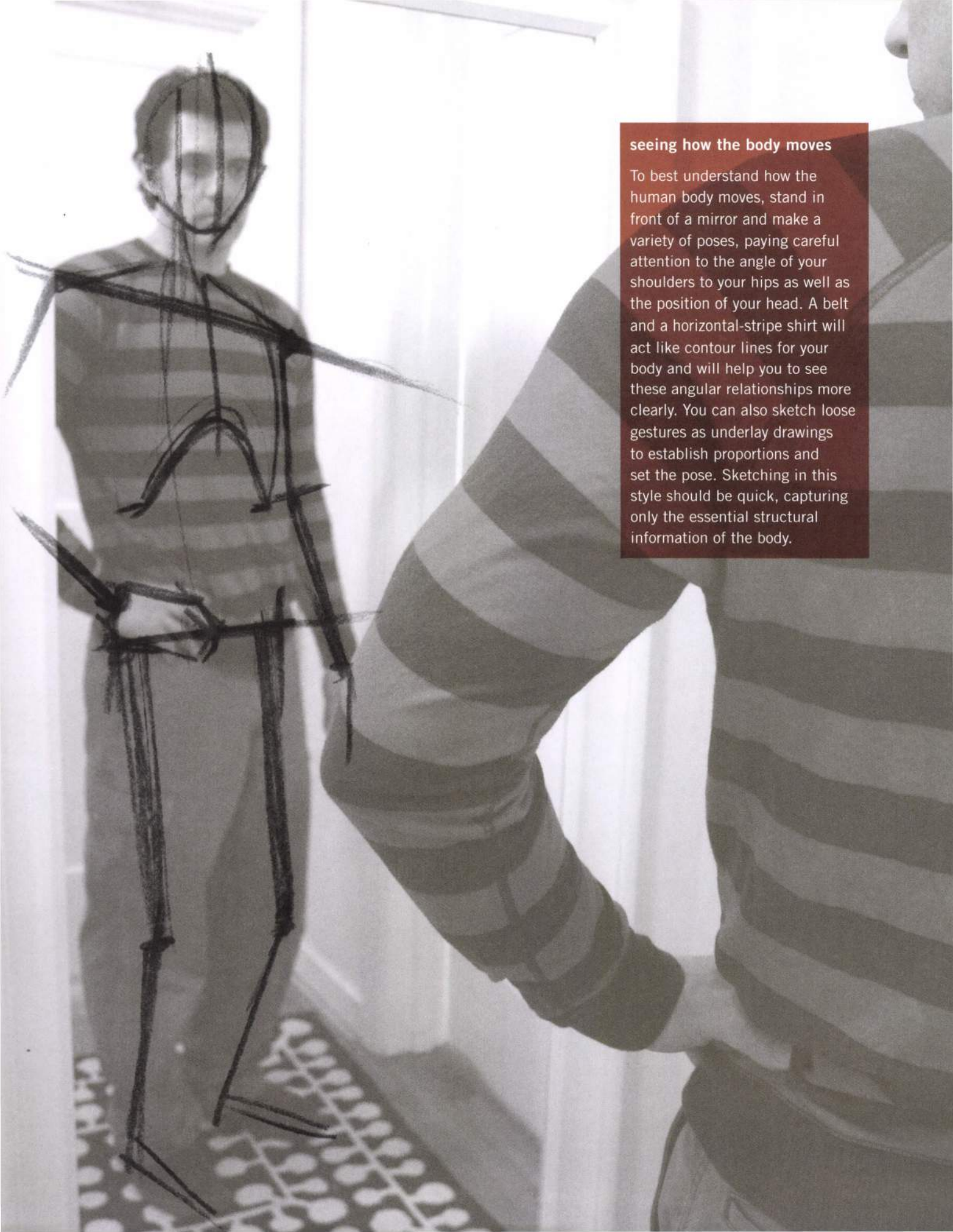
To best understand how the human body moves, stand in front of a mirror and make a variety of poses, paying careful attention to the angle of your shoulders to your hips as well as the position of your head. A belt and a horizontal-stripe shirt will act like contour lines for your body and will help you to see these angular relationships more clearly. You can also sketch loose gestures as underlay drawings to establish proportions and set the pose. Sketching in this style should be quick, capturing only the essential structural information of the body.

Wireframe figures enable you
to work quickly in establishing
proportions, stance, and action.

advanced human figures

Drawing the human figure in a higher degree of reality can be challenging. Gestural studies or bodies in movement or stasis help you to understand the proportions of the human figure and how it moves through space. Creating substructural drawings in fine line or non-photo blue pencil to capture the underlying architecture will help you progressively build up the sketch and help you draw the form.

Remember to focus on the orientation of the shoulders to the hips. This angle provides the most information for the pose, so getting this relationship right makes the drawing believable. Other considerations for advanced human forms include the position of the head relative to the shoulders; the amount of face that is revealed with each head position; orientation of arms, legs, and feet to enhance action or interaction; and facial expression. Of course clothing, hairstyle, shoes, and other details also aid in communication.

Context/field studies
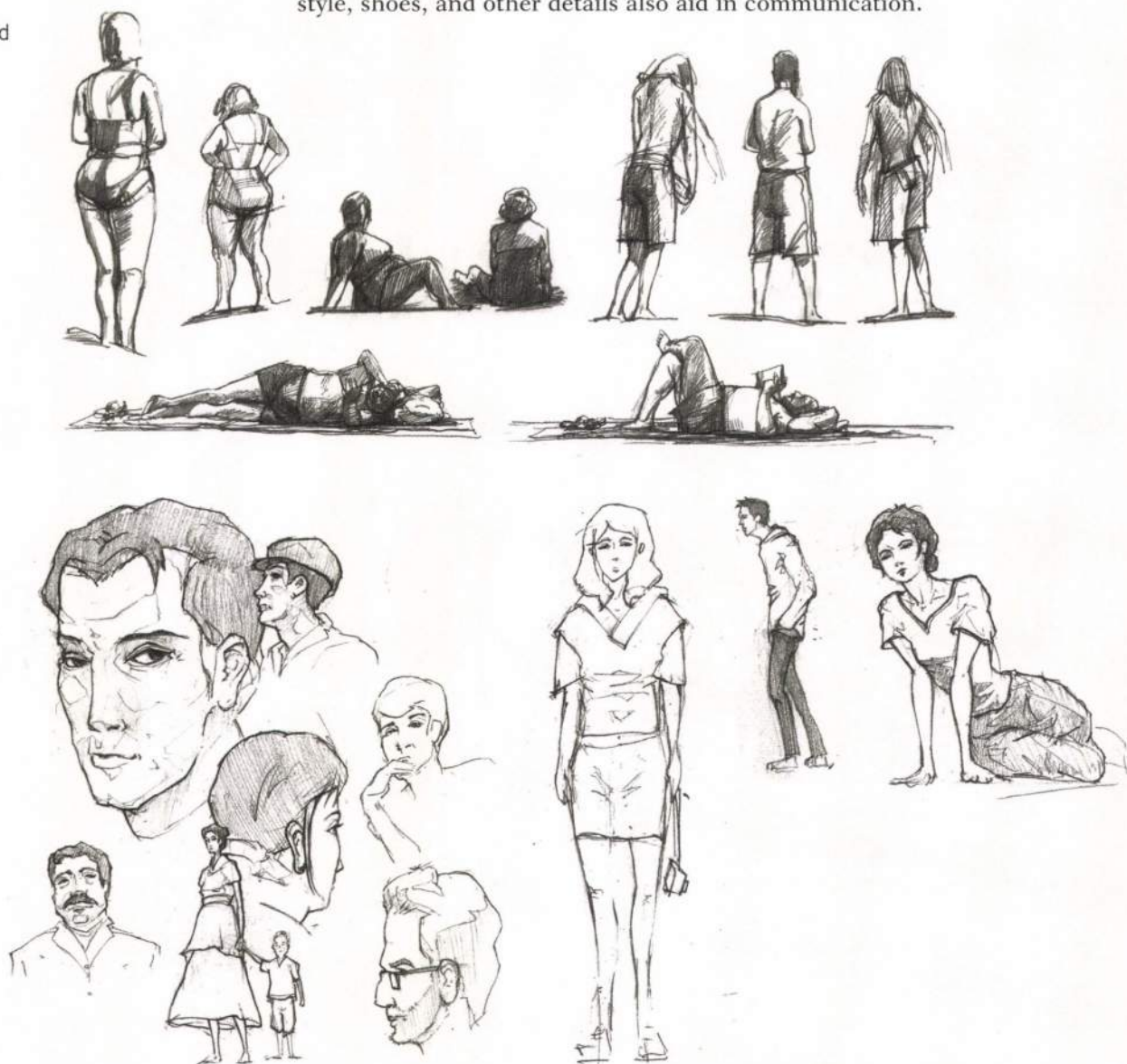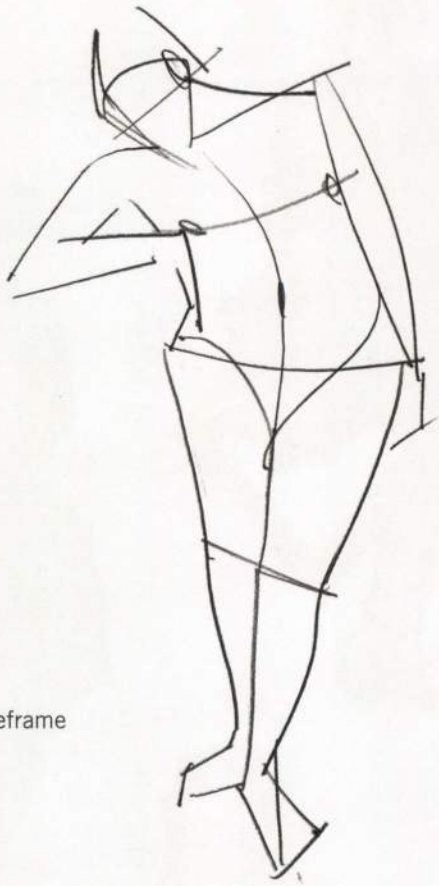
Wireframe

Contour line
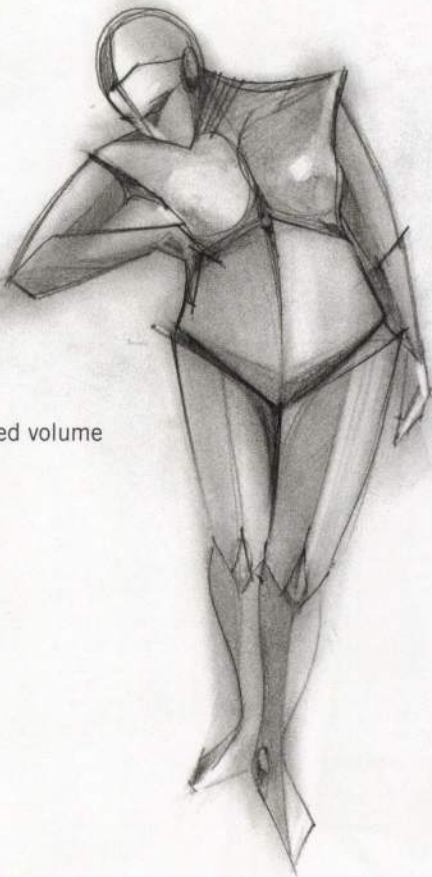
Shaded volume

Surface details

geometric humanoid forms

Human figures provide great subject matter for abstracting natural forms into geometric or mechanical forms. The act of interpreting the human form through an artful composition of geometric shapes builds competency in active looking, projecting/imagining, and experimenting. Seeing beyond the shrink-wrapped packaging (skin) of the human figure to envision the skeletal and muscular systems as mechanical systems leverages basic knowledge of rectilinear, cylindrical, and curvilinear forms. Simplifying organic forms into mechanical forms allows you to quickly depict complex natural structures but also serves to engage your eyes, hand, and mind in advanced study of the human figure. The act of transforming the human figure into an imaginative robotic form enables you to consciously consider the proportions, joints, angles, structures, and features of the human body. Imaginative practice like this pulls from what you understand about the real world but enables you to envision new formal relationships—great practice for designers who are charged with developing novel forms.
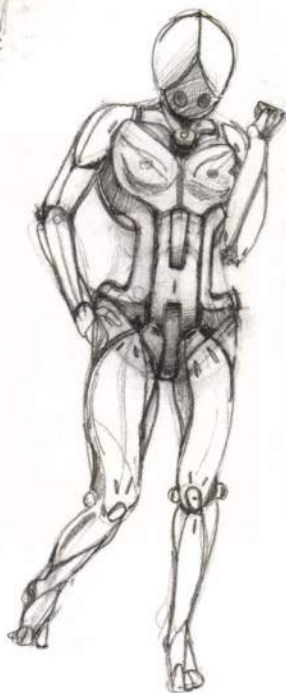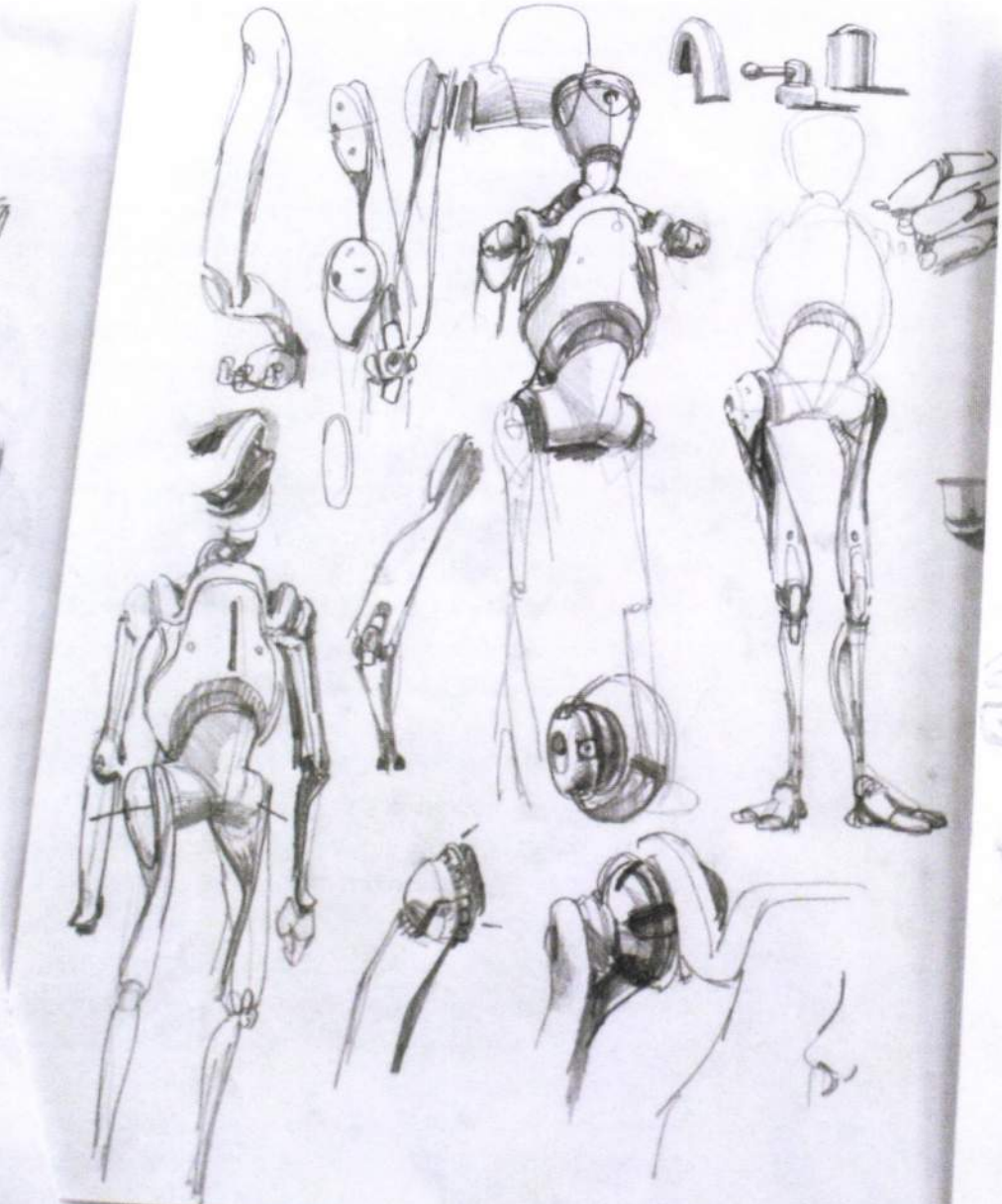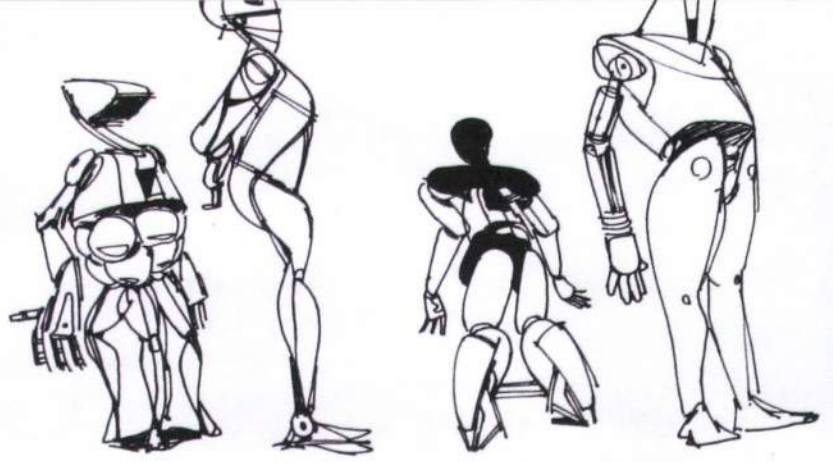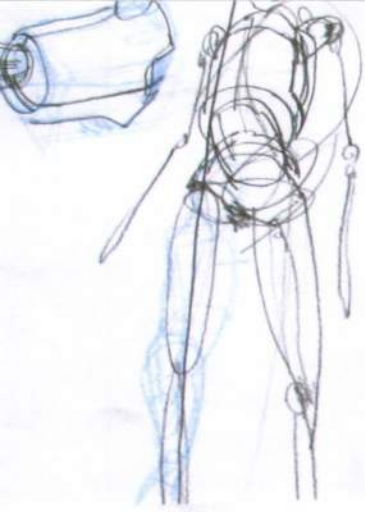
INTEGRATING HANDS INTO sketches shows multiple states of movement, grip, position, and manipulation during product or system interaction. Hands also provide a sense of scale and can be very suggestive of interaction; they are our primary tactile link between an object and our will to do something with it. Similar to the abstraction and simplification of the human figure described earlier, hands can also be treated the same way to emphasize action or interaction. After all, most of design sketching is not about photo-realistic representation of life but rather a focused message about an idea.
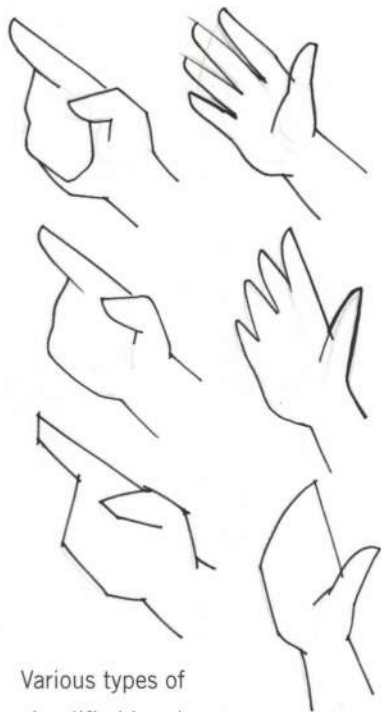
basic forms

Since you bring your hands with you wherever you go, they are great subjects to sketch to build skills in seeing, representing, and abstracting. Knowing the proportions of your hands and how they appear from a variety of angles and poses will help you to draw generic hands without having to find reference images. With practice, you will gain competency in drawing hands in a variety of poses and positions. When sketching hands, you must first decide how much detail is necessary: how many fingers will be visible and what position best describes the interaction one might have with the object. Blocking in the volume of the palm and general curvature of the fingers as a wireframe will set the sketch in position. Then all you need to do is add volume and detail to the fingers. Simplified mittens or white glove–like hands usually suffice in most idea sketches or at the white board, but in concept sketches, you may need more detail and enhanced line work. Always consider how much a hand's presence will improve or detract from the communication of the idea in order to determine the appropriate level of detail.

Like human figures, hands can be drawn with varying fidelity to their actual appearance, from abstract and blocky geometric to photo-realistic. When using hands in design sketches to communicate movement, interaction, and behavior, you must consider the amount of emphasis you want to place on the hand itself. Is the hand communicating attributes of a product or system, or is the hand the subject itself? Knowing the role that that hand is to play in a sketch will determine its visual form. In most circumstances, the subject of the sketch is the designed object or system; the hand serves as a basis to illustrate scale and behavior, and is a placeholder for the user/human subject. Hands are the expressive modifiers in sketches that show the presence of a human and the actions being taken.

Various types of simplified hands
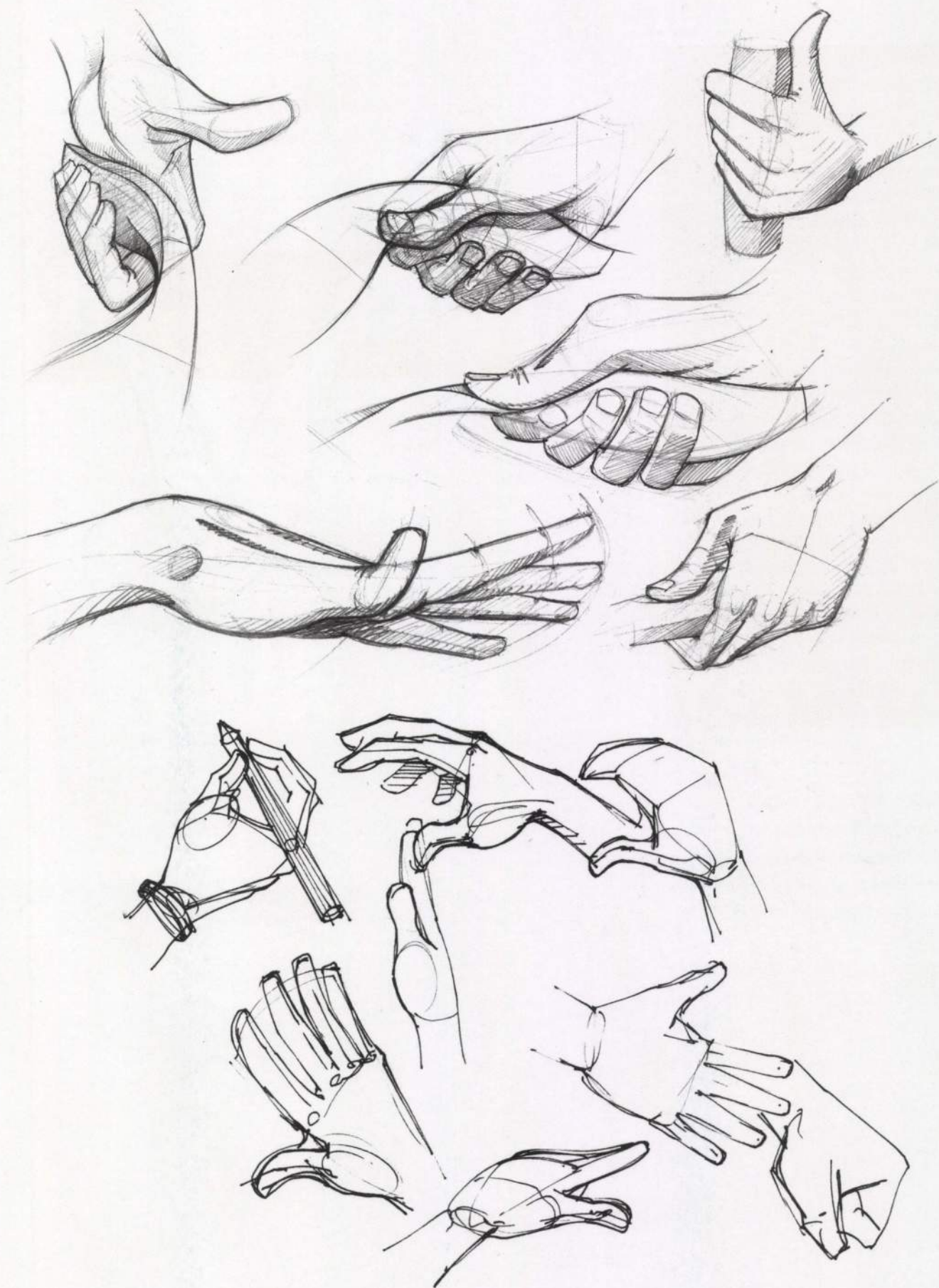
sketching interaction with hands

Although drawing your hands from a variety of angles is good practice, envisioning how an object fits into your hand and representing the hand moving through space (i.e., in a gestural interface) exercises your mind and forces you to think about the relationship of the object to the hand. Incorporating hands into your sketches provides a sense of scale and further emphasizes the connection between design and people. When sketching hands, it may be best to simplify them into basic shapes, paying careful attention to form and proportion. While hands provide key information, you may not want them to be the prime focus of your sketch, so try variations with line weight and tone to enhance and/or minimize their presence on the page.
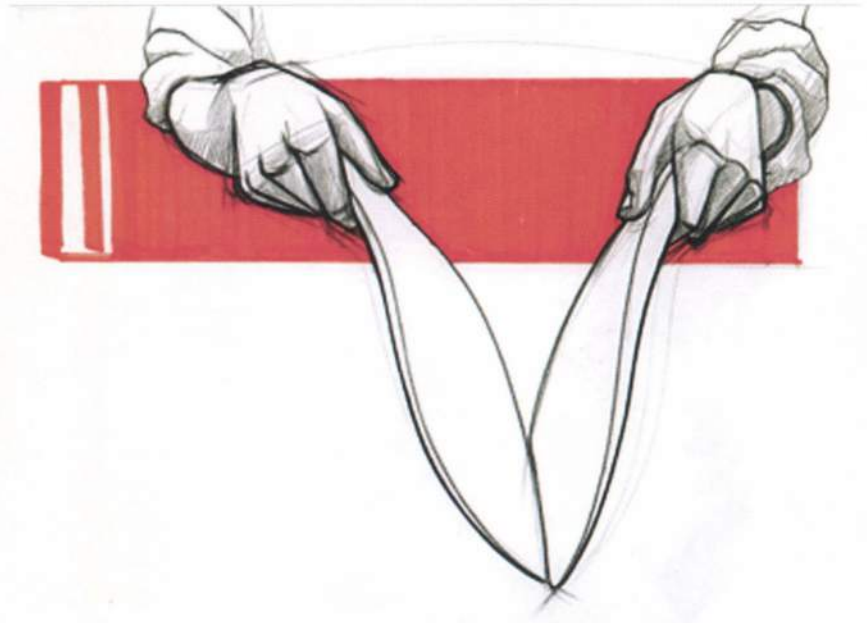
Before animating hands in some form of action using two-point perspective, first establish proportional relationships from one or two orthographic views.

RENDERING FORMS

RENDERING IS THE process of representing objects of a specific material as they appear under specific lighting conditions. It is a way to provide detailed information about the surface of an object or its shape with greater accuracy and realism.

Rendering focuses on interpreting an image from your mind rather than literally representing something from life. So, in a sense you must edit out certain details to focus on highlighting specific qualities. Rendering represents the ultimate idealized depiction of an object, and as such, often incorporates impossibilities with light and shadow. Consider concept renderings of cars that are publicized to build public interest. Quite often, you may see proportions exaggerated, parts missing (like mirrors and signals), and multiple highlights from many different light sources to make the car seem shinier. Renderings often suggest what a product could be, not always what it actually is. In this respect, renderings can serve as idealized representations that capture the "spirit" of a subject or idea, but they can also be used to simply represent the application of a material.

Rendering: a visual representation of something using color and shading to make it appear solid and three-dimensional.

rendering volumetric primitives

When rendering a product, it is helpful to dissect the form into primitive components—cubes, cylinders, cones, and spheres—to render the whole with more ease and effectiveness. By understanding basic volumes, you can isolate objects into components to render them more effectively. The basic volumes we most often use—cube, cone, cylinder, and sphere—are rendered with a hierarchy of tones based on the position of the light source. Typically, we position the light above the object to shine down on it, making the top surfaces brighter than any sides; however, we limit the range of contrast within the form so that the form remains coherent. Consider using markers that are the equivalent intensity of 10% to 60% gray with one drawing, unless the form is intended to be much darker, in which case you might shift the markers toward a range equivalent to 40% to 80% gray. This may take some trial and error to figure out; however, the diagrams opposite are intended to get you started blocking in tone with markers to define basic volumes. Remember, renderings are stylized, so you have a lot of freedom to be creative; the key is that tone is used to enhance the form.

Typical drawing markers provide for
a variety of line weights.
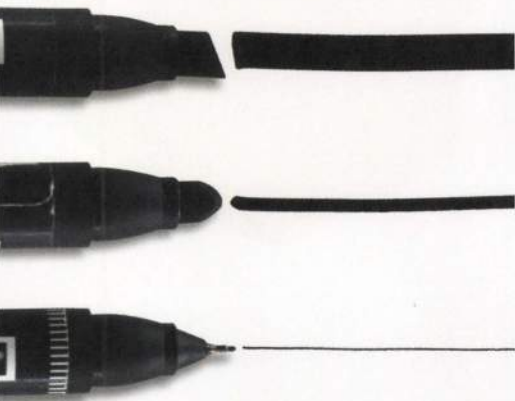
THE BASIC VOLUMES WE MOST OFTEN
USE ARE RENDERED WITH A HIERARCHY
OF TONES BASED ON THE POSITION OF
THE LIGHT SOURCE.
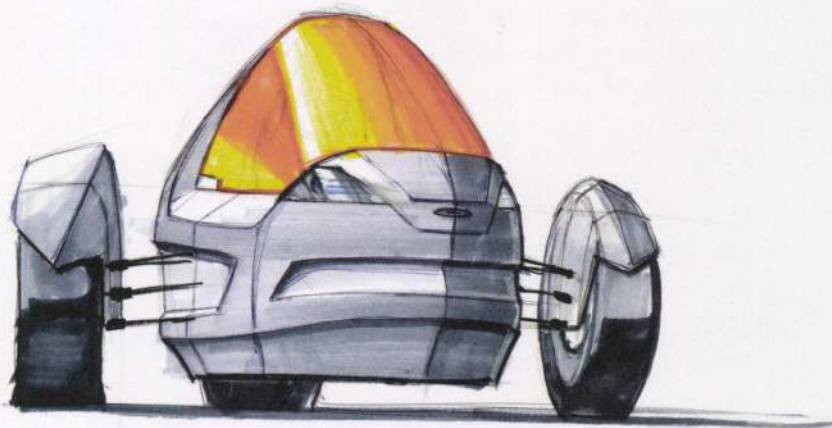
rendering tools

Markers have a variety of tips
that make different types of
marks and affect the quality
of shading. Prismacolor brand
markers have two different tips
on each marker that create
multiple stroke weights. The
combination of these tips can
provide a range of effects in line
weight. There are two basic types
of effects that these markers
can create: *wash* (a loose style
blending different values or
hues) and *structured* (a tight
setting of overlapping lines of
one value or blends of multiple
values or hues). Most markers
have a corresponding Prismacolor
pencil to provide a wide range
of line weights. You will find the
matching pencil number on the
label of the marker.
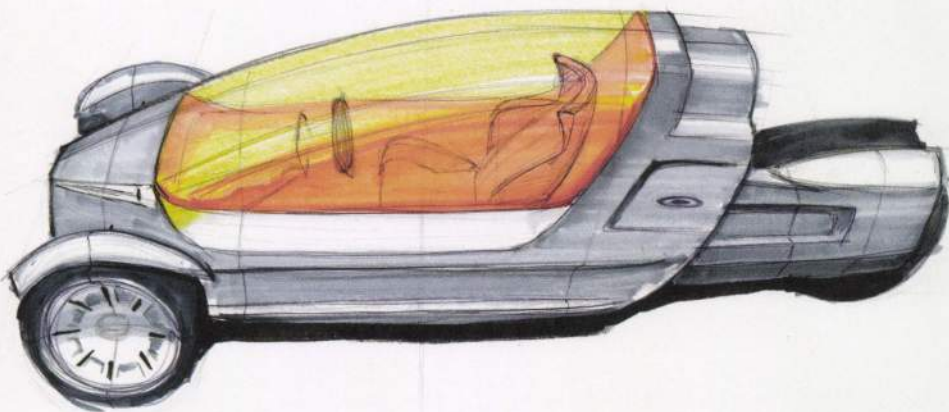
MATTE-FINISH CUBE

Establish the light source to create the shading on each plane, considering the top surface as the lightest, and the variation between medium and dark side surfaces. Blend the markers horizontally across the top surface to create a matte appearance by leaving no exposed white areas.

medium
light
light
dark
dark
light
highlight
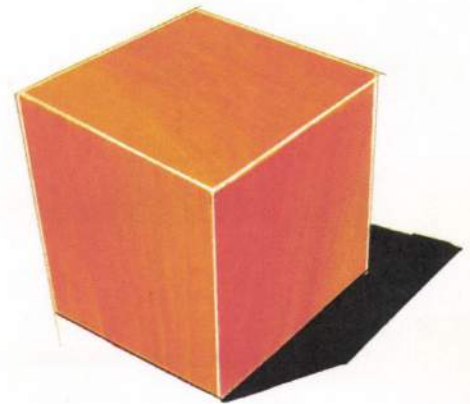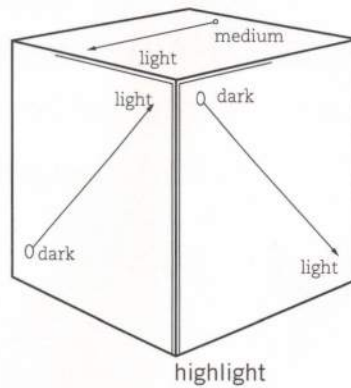
GLOSSY-FINISH CUBE

Establish the light source to create the shading on each plane. Draw streaks of lighter tone that move straight up and down if the cube is centered on the page. Leave some white areas for highlights to show great contrast. The illusion created appears to be a reflected or glossy surface with highlights moving toward the viewer's eye.

dark
dark
light
light
highlight
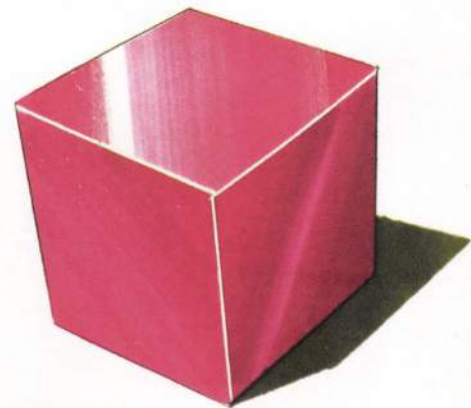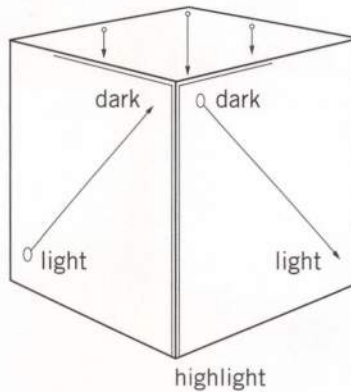
MATTE-FINISH CYLINDER

Run all strokes vertically with less contrast than the glossy cylinder. On the top surface, blend strokes horizontally to create a matte appearance. Again, halos provide reflected light from the environment.

shading
dark
direction of strokes
medium
halo
halo
core shading
highlight
reflected light
dark
dark
light

halo
highlight
shadow
halo
shadow
reflected light
dark
dark
light
gradation of vertical strokes
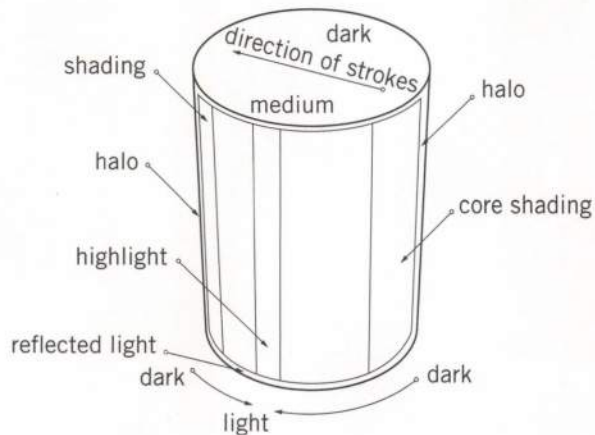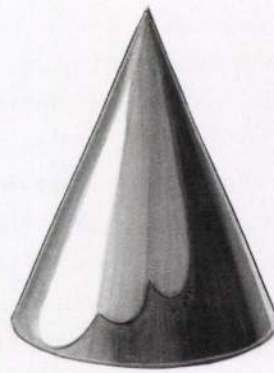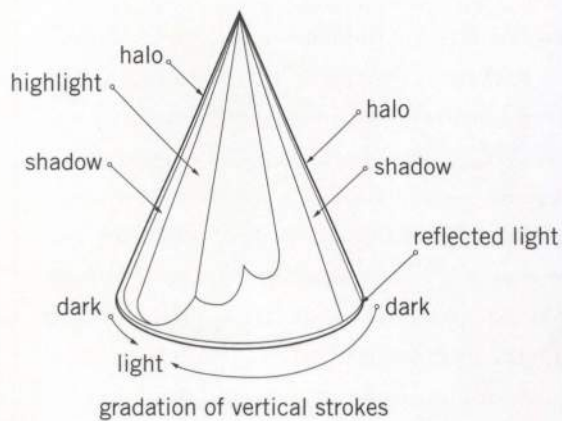
GLOSSY-FINISH CONE

Similar to glossy cylinders, glossy cones exhibit the same qualities except that all strokes converge toward the cone's point. In these examples of glossy cones and cylinders, the reflection areas (dark pointed shapes) are formed by envisioning that the objects are sitting on a darker, square-shaped ground plane. The points are reference to the corners of the ground plane surface and serve to emphasize the curvature of the cylinder and cone forms. You can try drawing both cylinders and cones, with and without this reflected element.

halo
highlight
dark
light
halo
dark
gradation of contour strokes
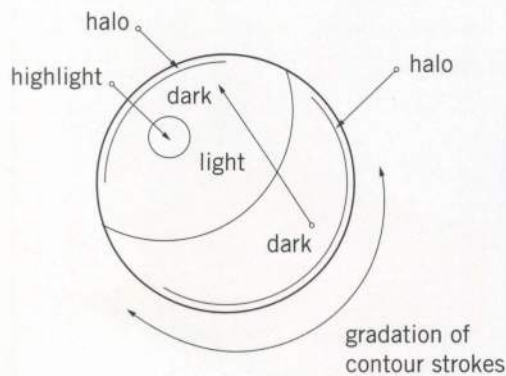
SPHERE

Curve your strokes to match the outside circular shape. A curved core with value gradation will appear more accurate.

halo
highlight
shading
halo
core shading
dark
reflected light
dark
light
gradation of vertical strokes

GLOSSY-FINISH CYLINDER

Run all strokes vertically to enhance the volume. The core contains the darkest color; the highlight is the lightest. Halos provide the illusion of reflected light that has passed around the object and is bouncing back from the environment. Glossy surfaces appear streakier than matte surfaces, which are blended.
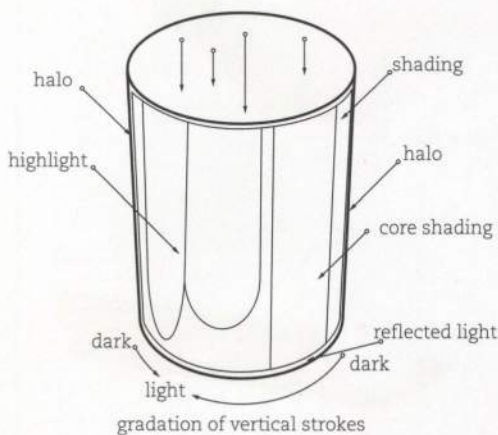
rendering materials

Rendering a specific material type is another way to add specific information and reality to a sketch. This style of rendering can be fun, but it is also more time-consuming, so you must have real purpose to sketch in this way. When used judiciously, this extra bit of reality and emphasis can make a drawing more dynamic and therefore more engaging. The risk, of course, is that your audience may see material choice as the sign of a "final" drawing. If your structural form is still a work in progress, material information might distract and invite premature feedback in unwanted areas.

We have included some examples of common materials often used in product-rendering for reference. Obtaining physical samples for reference can be especially helpful in understanding how orientation and light affect the appearance and interaction of different surfaces. We recommend looking for flat sheets, blocks, and cylindrical tubes. The drawings at right and below include metal, rubber, aluminum, glass, chrome, wood, concrete, and glossy red plastic. By employing the rendering techniques discussed earlier, you can develop your own approach for these materials.
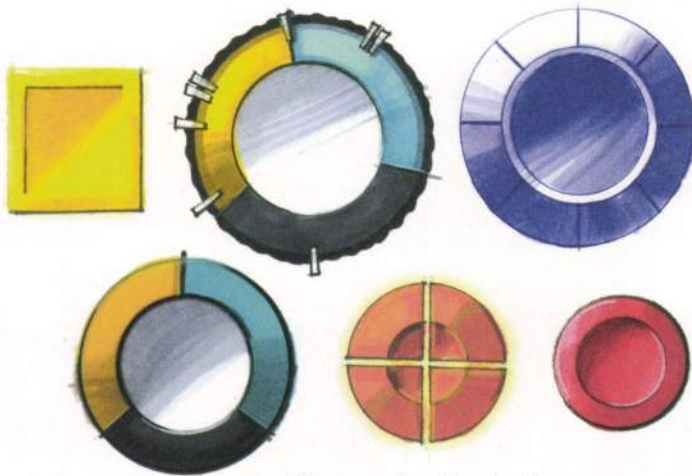
Pine/light wood

Glossy and matte plastic

Maple/toned wood
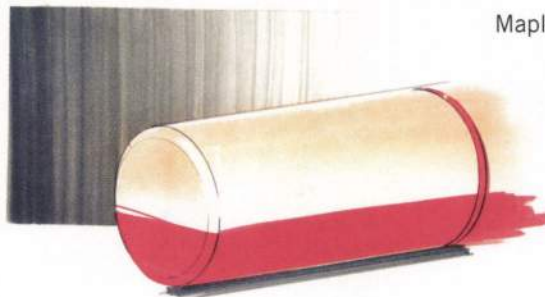
Glossy red plastic
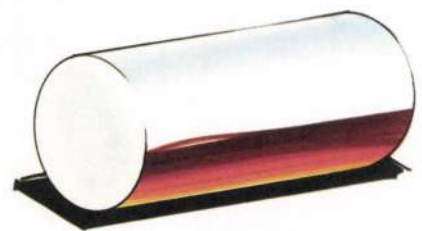
Chrome with desert sky reflection
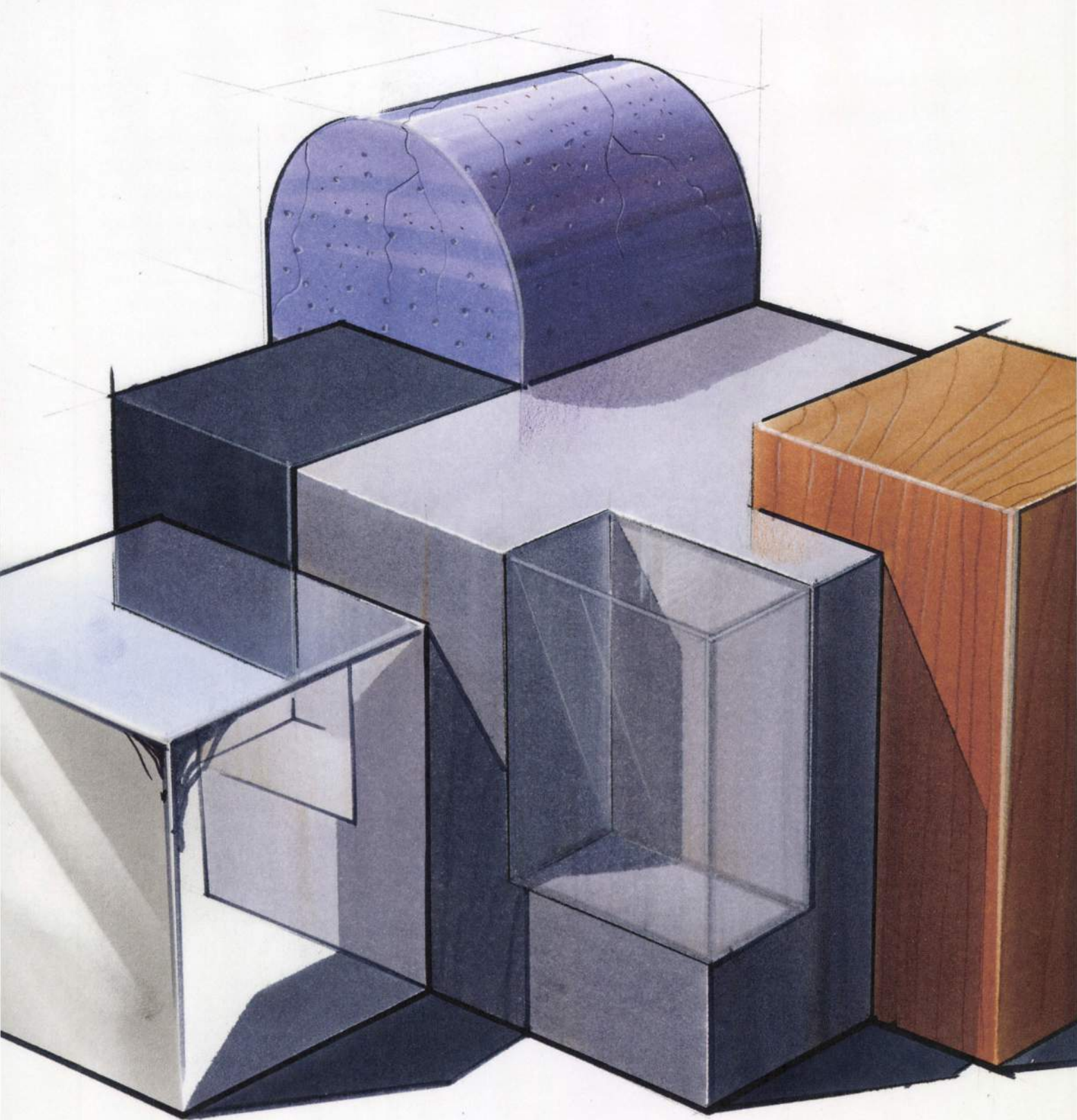
time savers for sketching and rendering

Renderings can take an hour, a week, or longer to complete. Chances are that you will have to create a number of renderings in a short amount of time to present concepts to your team or client. The following four techniques can help you create presentation-quality renderings quickly. Chalk pastels are versatile and quick; they complement markers nicely and can be used on any paper surface. Partially rendering drawings to emphasize key information is a conventional shortcut that can create a dynamic presentation. Using colored paper can be dramatic; pick a paper in the middle value of the product and create highlights, shading, and shadows with chalk pastels and markers. Orthographic renderings are quicker to develop than a perspective sketch, as they don't requiring foreshortening.

This (one-hour) partial rendering of a lighting device incorporates chalk pastel, colored paper, and an orthographic view to communicate the essential information of the concept.

Tone and color can enhance communication and make sketches more dynamic; the more tone and color assigned to a drawing, the more information it may communicate. For simple sketching, a couple of gray markers and two accent colors can define volume and depth of field. Alternatively, you can use a medium such as watercolor to apply a quick, loose color wash for a sketchy yet soft feel.

Where necessary, small touches of accent color can call attention to essential parts or activity. This "muted" strategy yields a more communicative drawing with a clearly constructed hierarchy of information. In addition, using cast shadows can provide a needed degree of reality and context to drawings. Shadows are rendered in black or dark gray and are, in many instances, used to visually lift the object from the page like a vignette.

Hue: Name for an individual color sample that distinguishes one color sample from another. An example would be blue, but the sample does not have to be pure blue, only able to be determined as a type of blue sample. There are thousands of hues, yet the average person may only be able to name a few.

Color: The property of reflecting light waves of a particular length; the primary colors of the spectrum are red, orange, yellow, green, blue, indigo, and violet.

Tone: The particular quality of brightness, deepness, or hue of a tint or shade of a color.

Blending cyan, magenta, and yellow markers enables you to custom mix a variety of primary colors (red, yellow, and blue) and secondary colors (orange, green, and purple).

RED   GRAY

GREEN

PURPLE
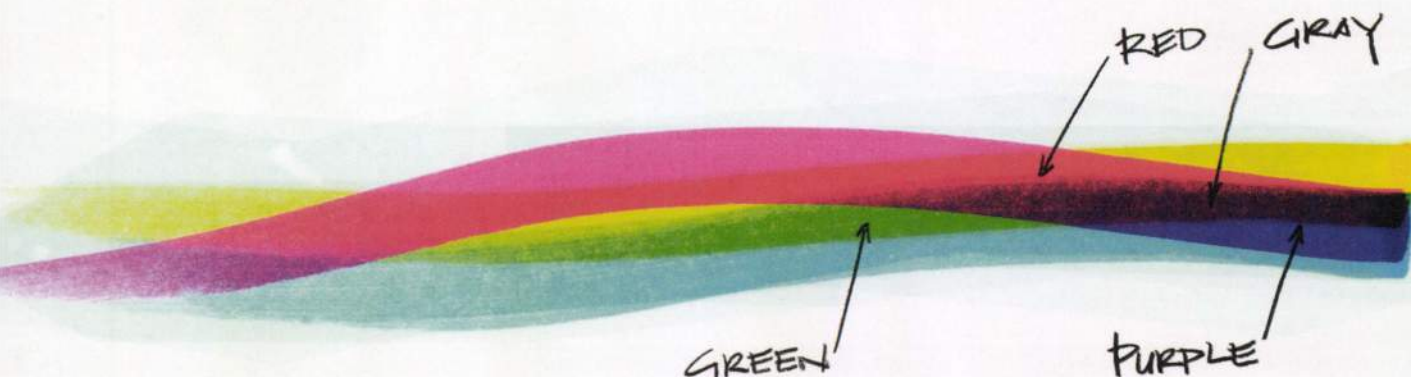
shading

Shading gives form to objects and makes sketches more realistic. Aim to sketch objects using four degrees of value: white, light gray, dark gray, and black. These values simplify the many degrees of value that can be seen on an object in real life. Bolder, higher contrast areas tend to attract more attention and provide greater emphasis.

Shading on a curved surface gradually changes from light to dark; this is called a gradation or gradient. Curved surfaces do not have a distinct edge to separate the values of shading; therefore you must transition from a white highlight to gray shading with a gradual transition in tone.

With all shading, the key is to provide for transition between highlight and shaded surface so that the sketch clearly communicates the light source. These transitions, however, can be smooth, harsh, blended, or streaky depending on the intended visual impact or how harsh you intend the light source to be. Shadows cast by objects can also be smooth or harsh and serve to blend the object into the page or visually lift it from the page surface. We'll cover shadows in the following section.

Creating a value chart for pencils, pens, and markers will enable you to test how your solid and liquid mediums will perform on various papers. To create a value chart for pens and pencil, use hatching techniques to establish solid and open-filled sections. Changing graphite density (not diameter) and adjusting pressure will provide a broader range for pencils. For pens, you will want to change diameter of nylon-tip pens to achieve thin and thick strokes. When testing your markers, apply a fill in each frame of the chart; then after that has dried, go back again and try a second coat over half of the frame. The second coat shows the paper at full saturation with ink.

Value: Lightness or darkness of a color sample; a light or dark variation of a hue. White plus a pure hue gives a light value, or a tint. A pure hue plus black gives a dark value, or a shade. For example, a tint of red would be referred to as pink while a shade of red would be maroon.
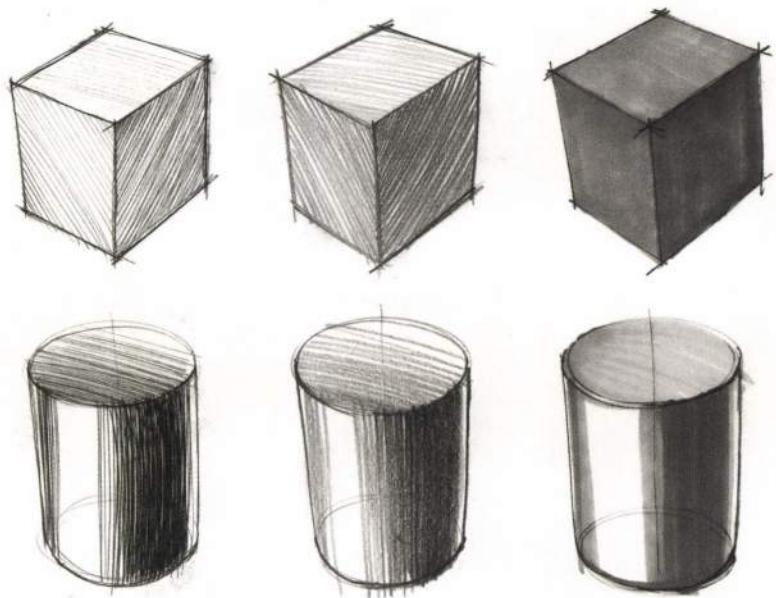
Primitive geometric forms drawn in pen, pencil, and marker

10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

1
2
3
4
5
6
7
8
9
10
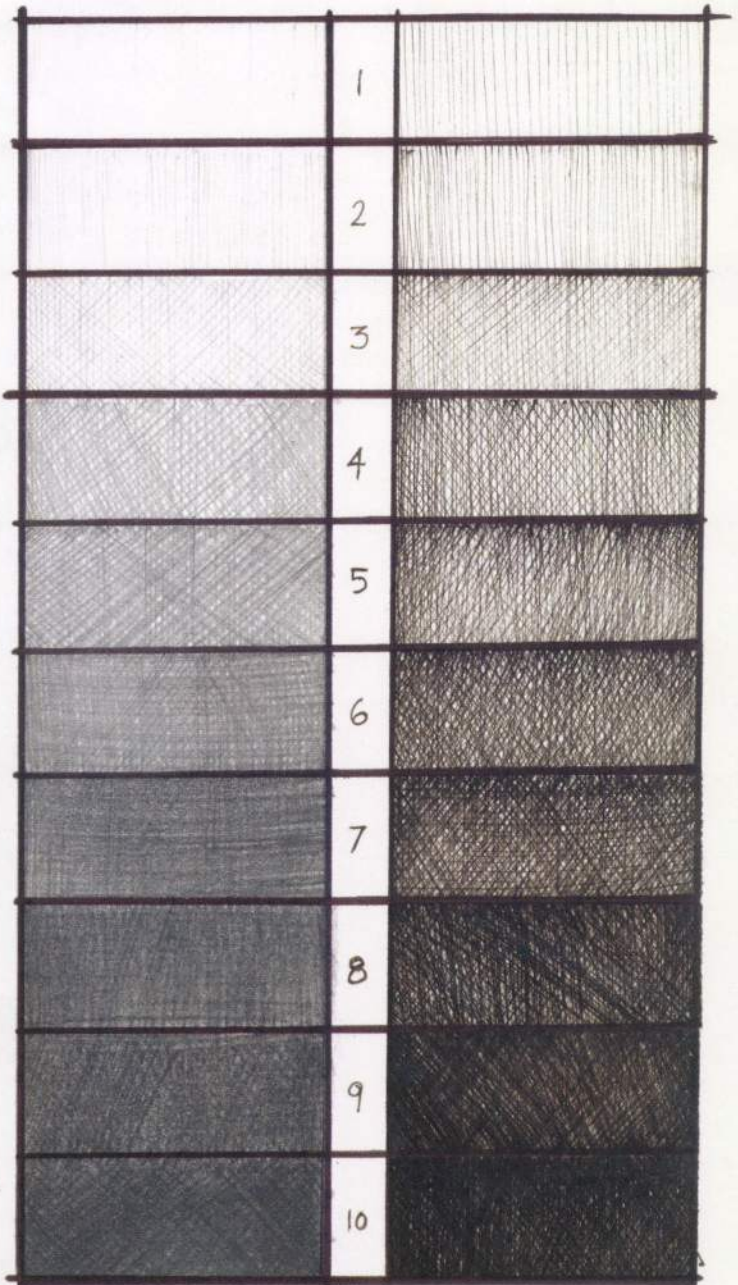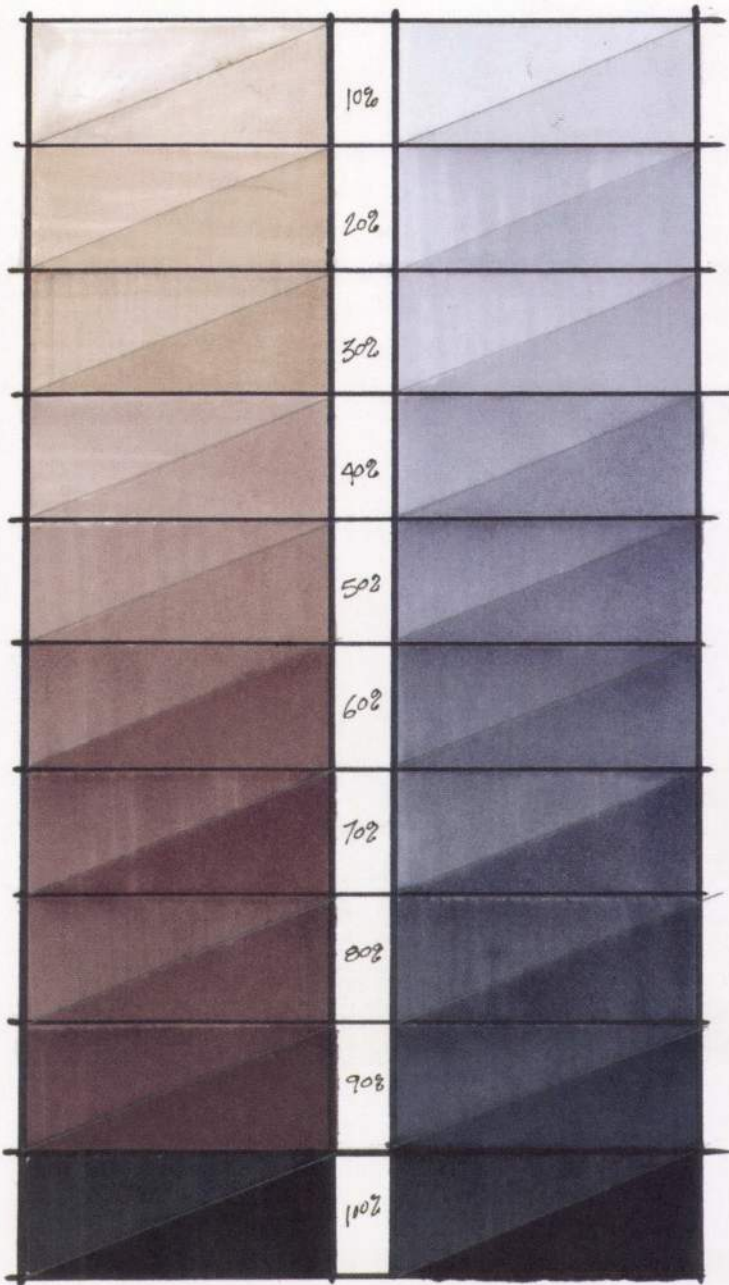
A value key is useful to better understand the performance of your markers, pens, and pencils. Using single- and double-hit (marking over an area more than once to add more tone) tests will show if a tool is capable of providing various tonal values.

vignettes

Vignette: A graphic element that sits between a subject and the background, providing a definite visual border.

A vignette provides a middle ground against which to view a concept sketch by differentiating it from the background. Vignettes can be washed, straight-lined, or patterned; however, they must serve as background elements, meaning they do not visually advance in front of the subject and dominate the sketch. Use tape to create a rectangular area that you want to color. Masking the areas that you do not want to color will enable you to work quickly and more expressively within the vignette area. Start and end your marker strokes on the tape to generate consistent tone. If you are new to marker-rendering, making a series of vignettes will help build proficiency.
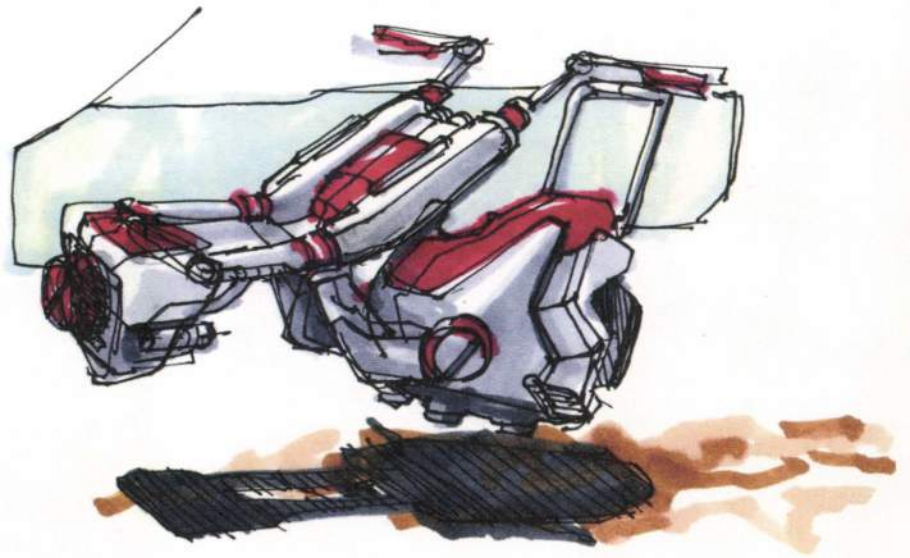
Vertical-line vignette

Accurate shadows provide reality and context to drawings. They also make a drawing look more dynamic, as the increased contrast helps to emphasize the form. Shadows that are mostly hidden behind the object form may not be read clearly as shadows and may appear as features; those that are too exaggerated may visually dominate the drawing, so you'll have to experiment a bit with your shadow placement, density, and scale to find the best way to enhance the communication.

shadows

Mail truck interior concept rendered using gray markers, chalk pastels, and black pencil. Note the use of shadows to create distinction within the form of the dashboard elements and seating.
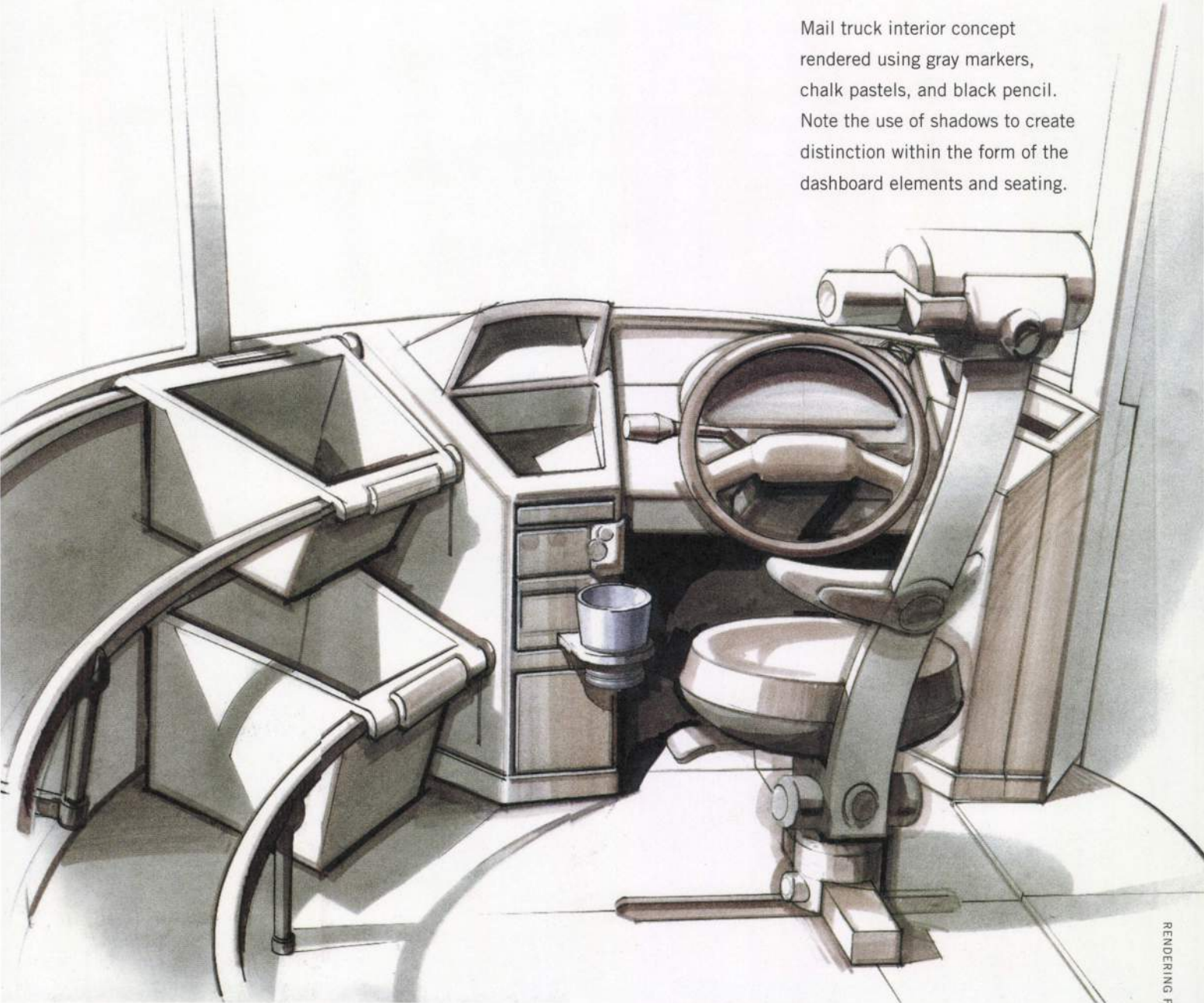
DEMONSTRATION

direction of shadows

Generally, shadows are rendered in black or dark gray and are in many instances used as vignettes to visually "lift" the object from the page (see page 227 about cast shadow/reflection as an occlusion depth cue). Following are diagrams of shadows cast by geometric primitives.

Shadows follow in the direction of light rays and follow the rules of perspective, so they will appear to diminish slightly as they are projected back into space. As a general rule, if the light source comes from the left (from the designer's point of view), the shadow will appear on the right side of the object, and vice versa. Envision a light source that is offset from the object and just above eye level—for example, over your left shoulder, projecting toward the object. This will enable the shadow to project back into space toward the right. A left-situated light and right-positioned shadow relationship is a common configuration for depicting handheld objects, buildings, and cars as the projection of the shadow toward the right invites an easier read (since we typically read left to right).

top view

side view

top view

side view

top view

side view

top view

side view

top view

side view
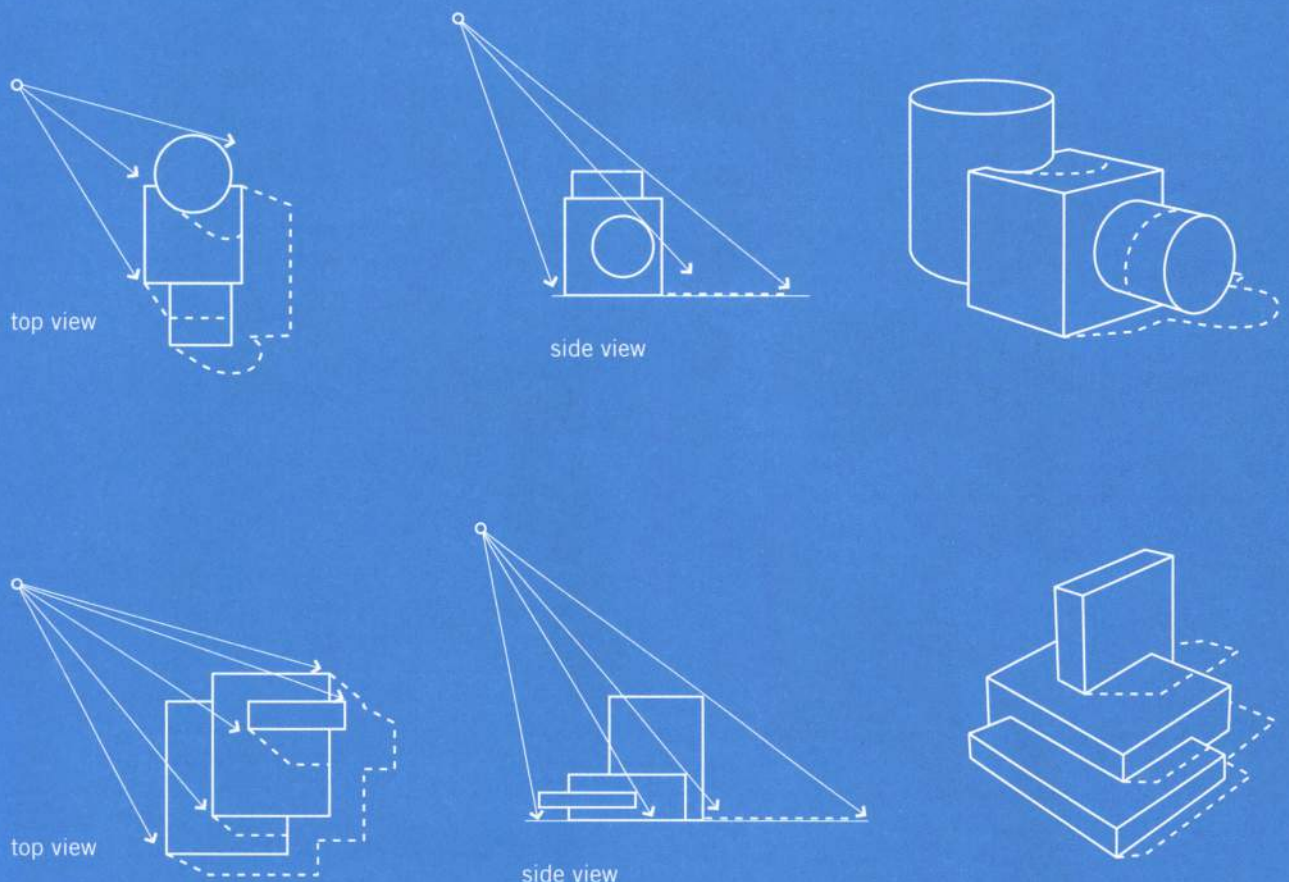
Complex forms cast complex shadows onto themselves as well as the ground plane. Shadows cast onto other objects can serve to add clarity and visual interest. A projected shadow can also serve as a vignette to provide a visual transition between the object and the page space.

As you wrap shadows over cylindrical and rectilinear forms, you'll discover that the shadow lines act as contour lines to enhance the readability of surfaces. Remember that when you project shadows onto other objects, their proximity to the light source and to the shadow-casting object will affect how much (or little) will catch the shadow.
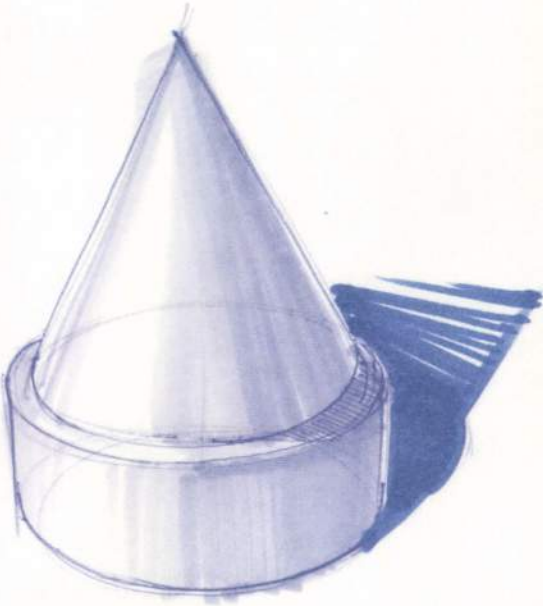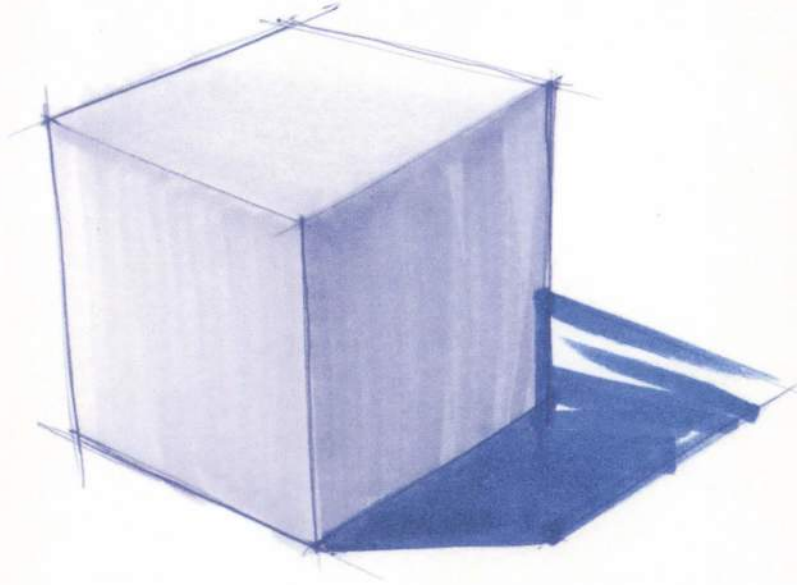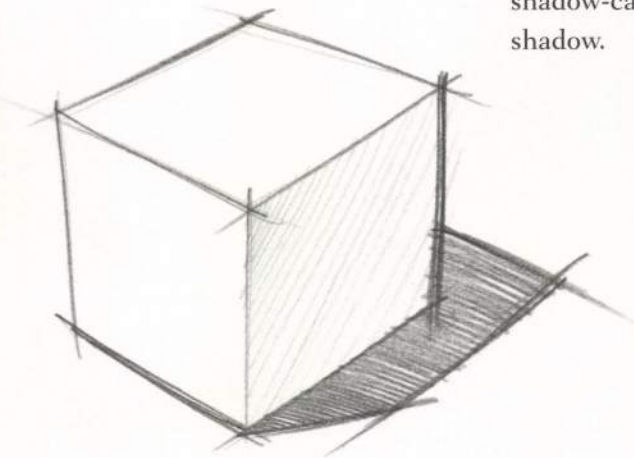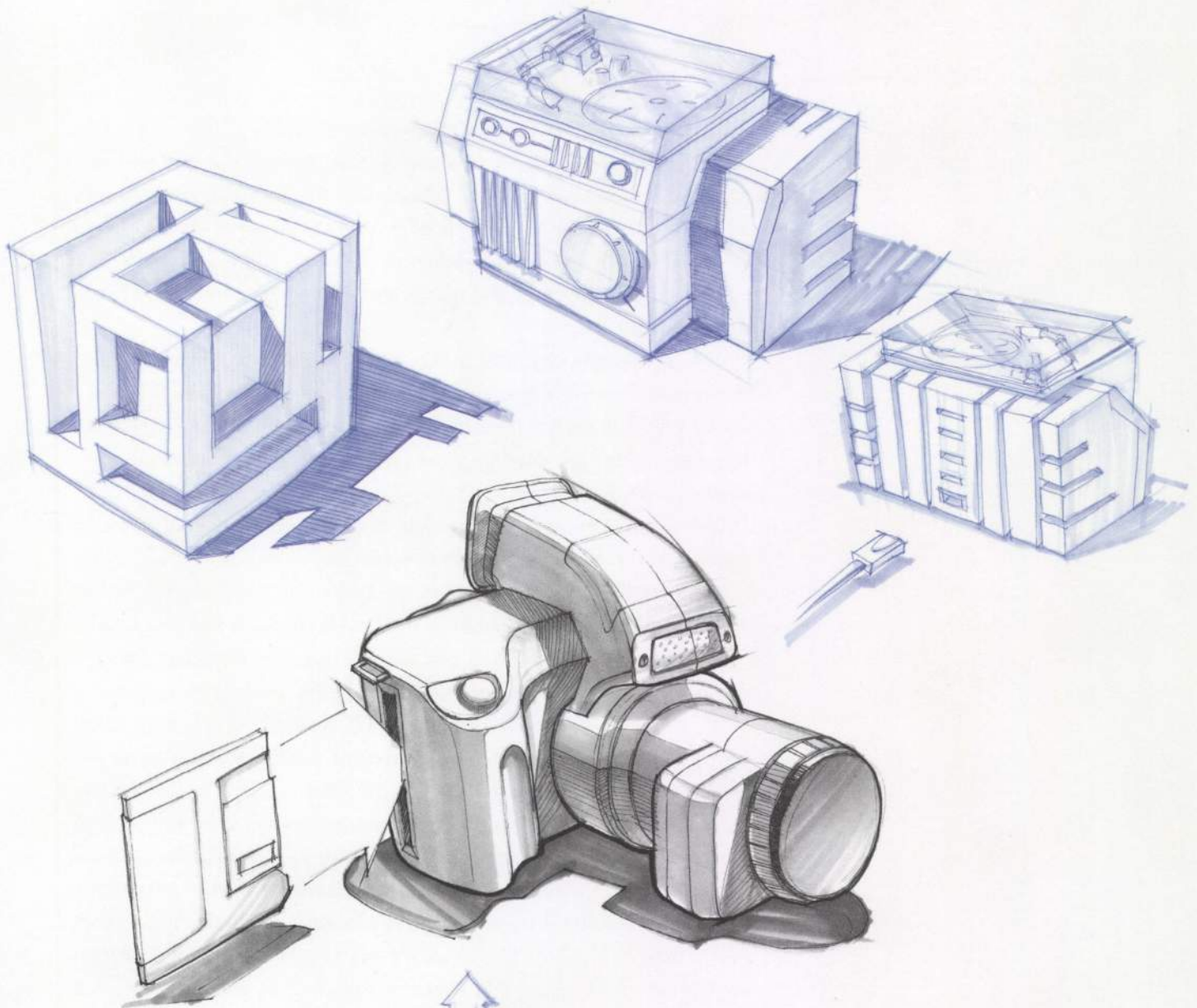
In these shading and shadow studies of three-dimensional objects, note how the shadows serve as vignettes to visually lift the forms from the perceived ground plane.
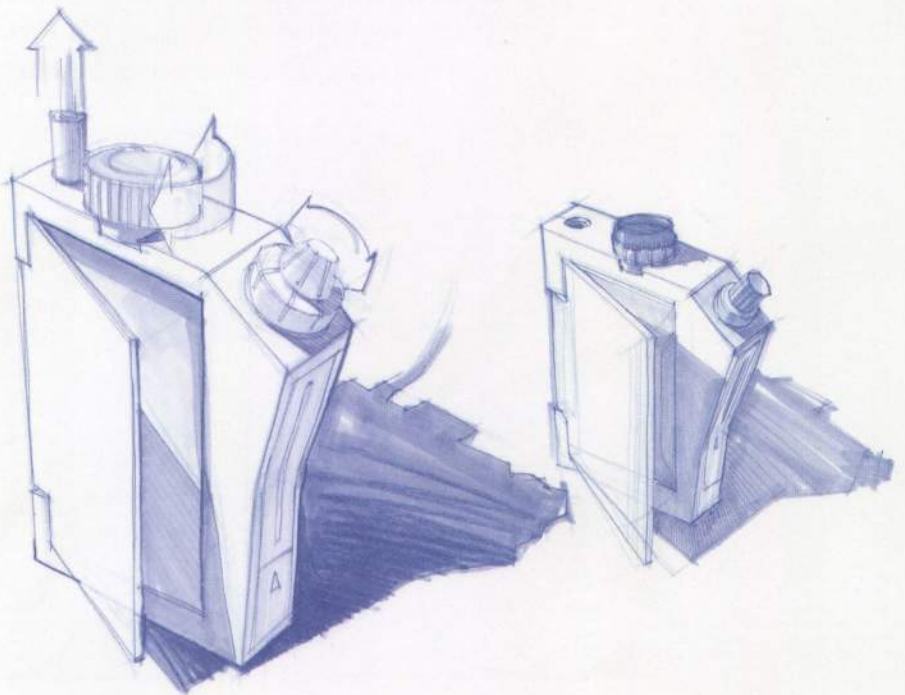
masking

Using frisket film or tape to mask areas of the drawing allows you to be generous with marker coverage and free with stroke patterns while protecting certain areas. Masks stop the ink from bleeding into unintended areas and generally help keep the drawing clean. Always start and end the path of a marker on the mask. Try not to let the ink pool along the edges of the mask, and use a paper towel to absorb the extra ink.

When creating vignettes and covering large areas, begin running the marker on the mask and continue across to end on the other mask. Overlap each stroke by 50 percent to create even coverage. Use a straightedge, ruler, or piece of illustration board to make each stroke consistent.

When masking watercolor, note that the medium is difficult to control. You have to work with the mistakes, especially when trying to get a gradual tone. This forces you to be quick and rough. Slowly applying or reworking watercolor washes often yields bad results.

Masking while rendering can be a tedious process that involves using many supplies and includes a lengthy setup and typically a hefty cleanup, but establishing a good work flow can save time. Using frisket film to mask areas for chalk pastel and marker application can improve the quality of your drawing and enable you to work quickly and more fluidly to improve your work flow. Frisket film typically is sticky enough to adhere to the paper, providing a good barrier between mediums, yet is repositionable, so you can use the same pieces multiple times. When rendering, we usually apply chalk pastel first to block in the shapes using the masking film and then apply markers for tonal adjustments, like shading and shadows, and finally use black pens or pencils for detail line work.
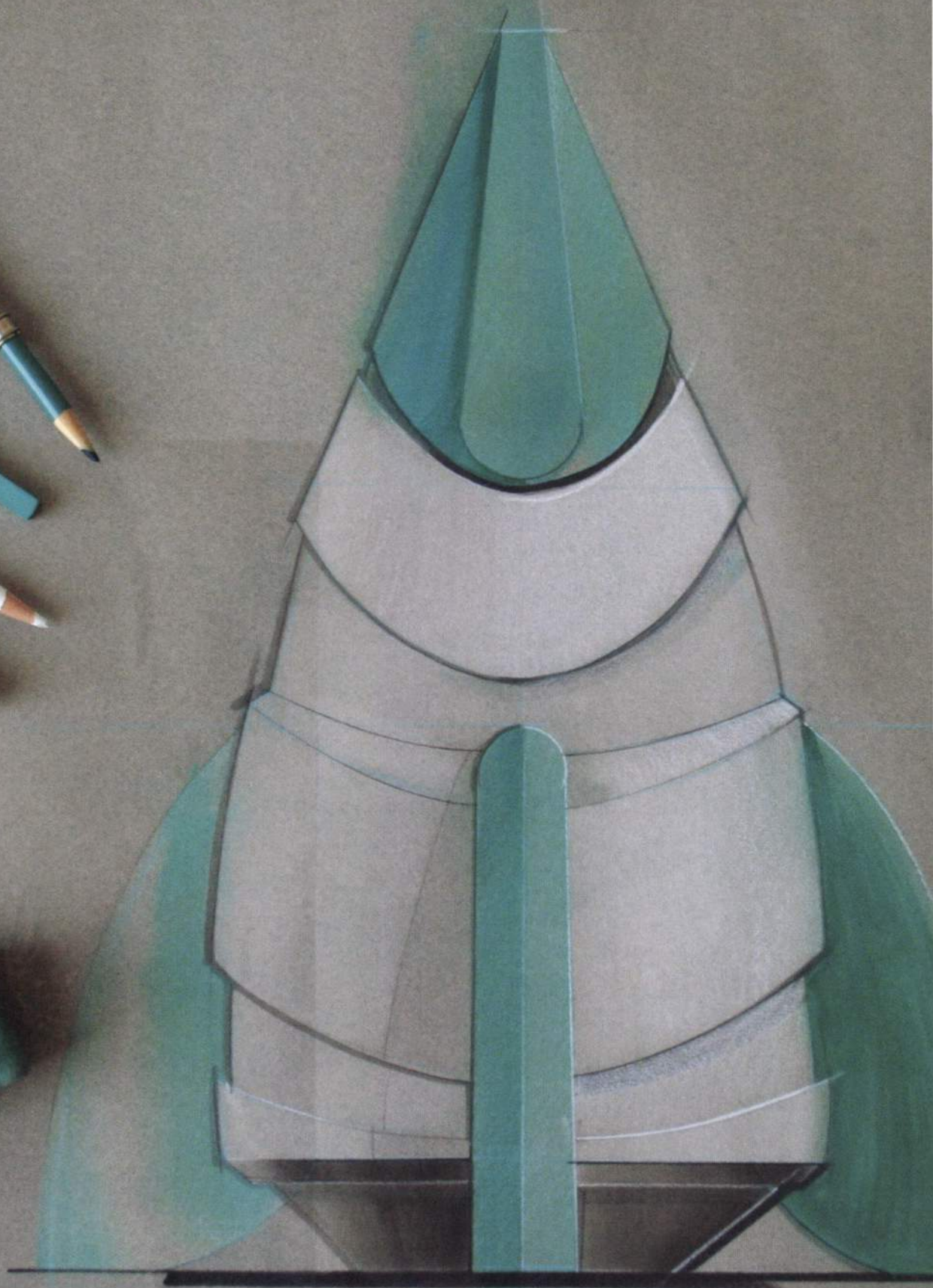
putting it all together

Drawings are created in service of ideas—crafted to express and embody your ideas in compelling ways. A good sketch provides information and prompts a response. The various themes in this section break down the complexity of drawing and sketching into component parts. You can practice each theme to build competency and depth of skills and understanding. How you employ your skills is up to you. Knowing how to draw cubes is good, but knowing how to draw cubic forms and work from orthographic to perspective views to explore design ideas is better. The subsequent sections of this book demonstrate methods for applying your understanding of drawing primitive geometries, figures, volumes, and elements to the areas of notational sketching, exploratory sketching and ideation, explanatory sketching, diagramming, and visual narratives. As a bridge to becoming a more competent sketcher, practice combining techniques across the various themes using a variety of mediums. Try making up exercises for yourself or daily tasks to draw at least one idea. Daily practice will build muscle memory and visual understanding.

Practicing perspective drawing with repetitious sketching of cylinders and cubes is boring and, well, repetitious. Combining these elements into complex forms by moving into, out from, and across the page space can yield some interesting compositions and lead to discovery. Without a prescriptive plan, try sketching a cubic form to set the perspective/viewing angle, and work from there to create a complex assembly. Since many of these geometric forms often look like robots, make up a fancy yet descriptive name for what this machine does or how it behaves. For instance, how about a quasi-hydraulic electrosymphonic transmogrimatron?
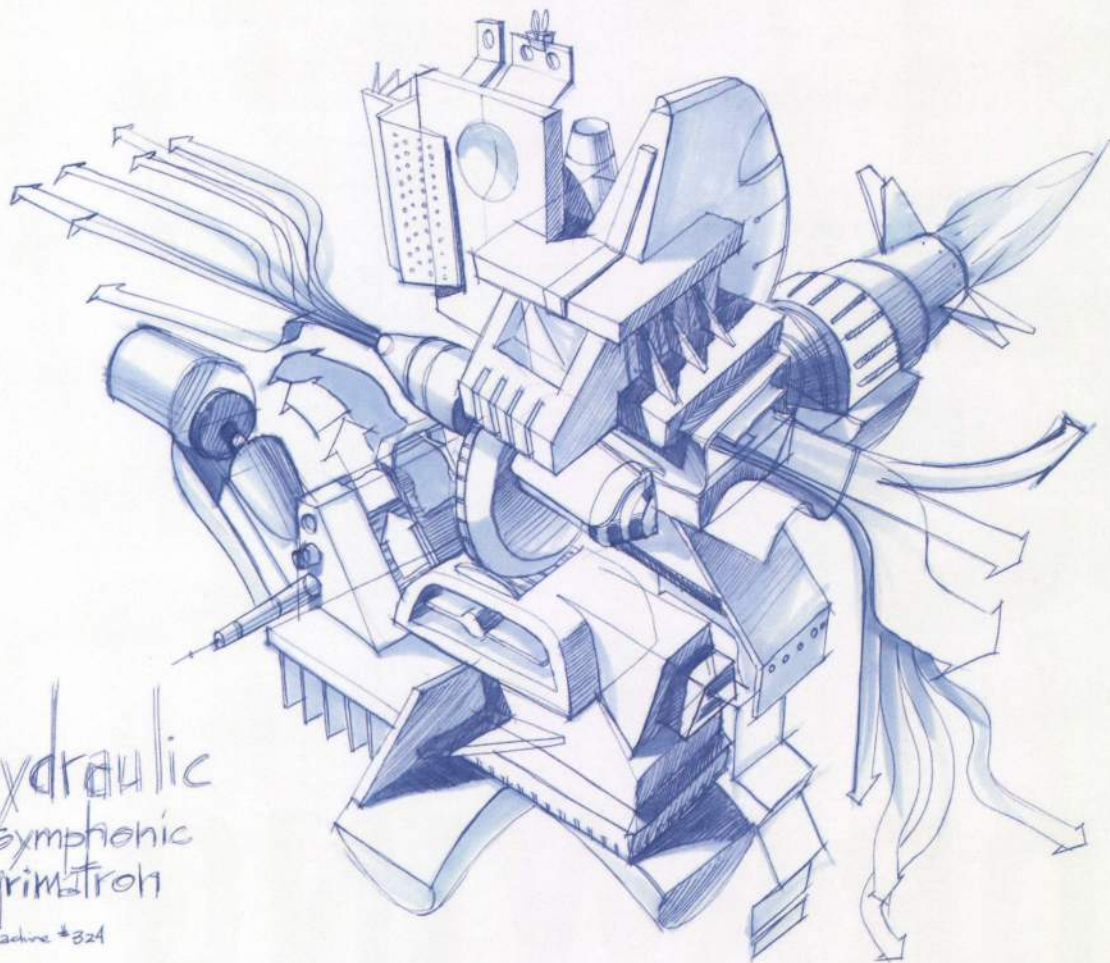
Quasihydraulic
electrosymphonic
transmogrimatron

Mostly improbable machine #324
20 min
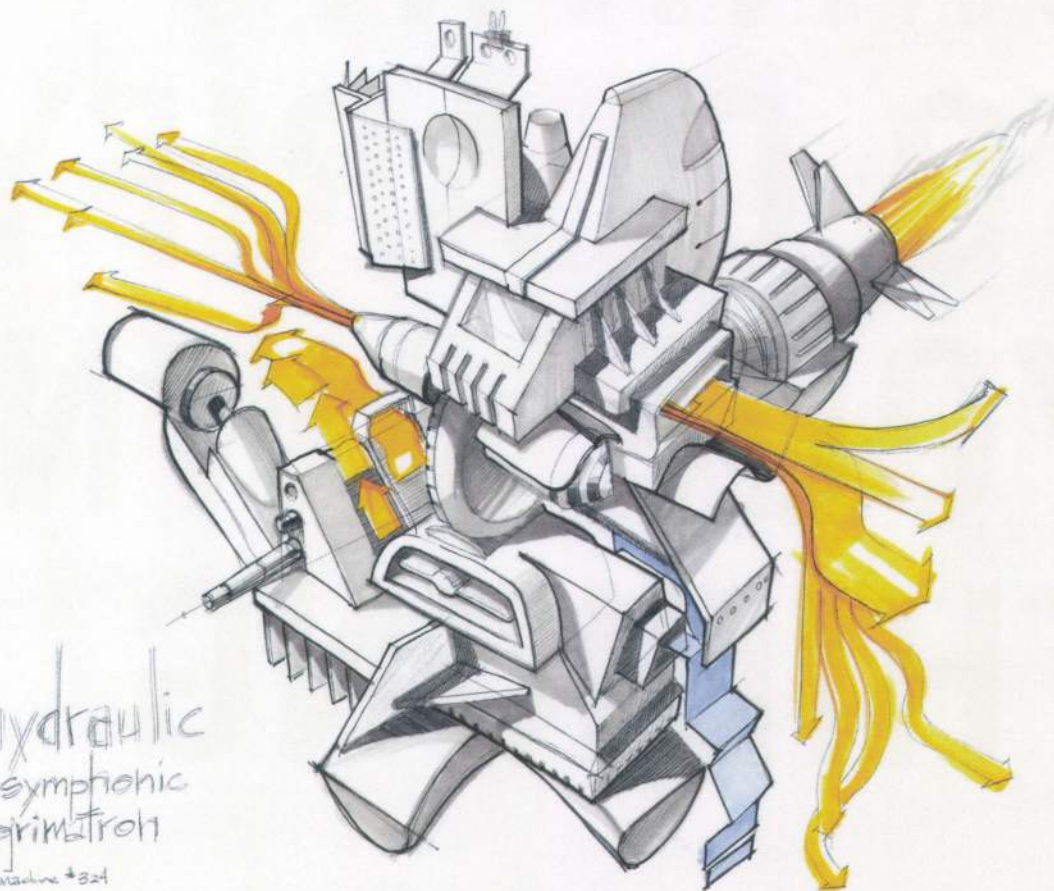
Quasihydraulic
electrosymphonic
transmogrimatron

Mostly improbable machine #324

3

DRAWING TO CLARIFY YOUR OWN THINKING

NOTATIONAL SKETCHING IN BOOKS, ON NAPKINS, ON SHEETS OF PAPER, or on the back of your hand brings text and image together in a personal yet contextual way to transform ideas into visual form and help the designer create meaning and order. The acts of recording and exploring ideas are inherently different in nature; however, as a designer, you must always explore further than what you can see with your eyes. The act of truly seeing is as mental as it is visual. Celebrated New York Yankee catcher and Hall of Famer Yogi Berra said, "Ninety percent of the game is half mental." Substitute *sketching* for game, and Yogi is right. Designers use sketching to record ideas, document what they observe, and project what they can't see (hidden from view or future state/existence). The acts of recording and exploring must happen together, recording what you know and what you don't know. It is a quick and effective means to engage your imagination and call upon all the other things you've seen or know that are relevant to the subject at hand.
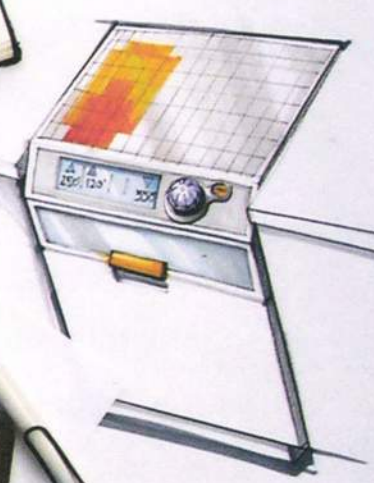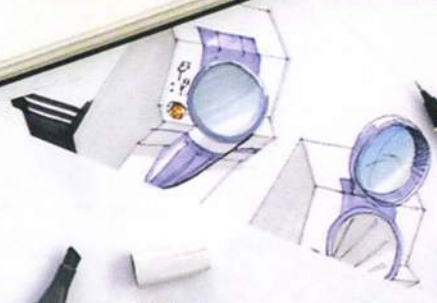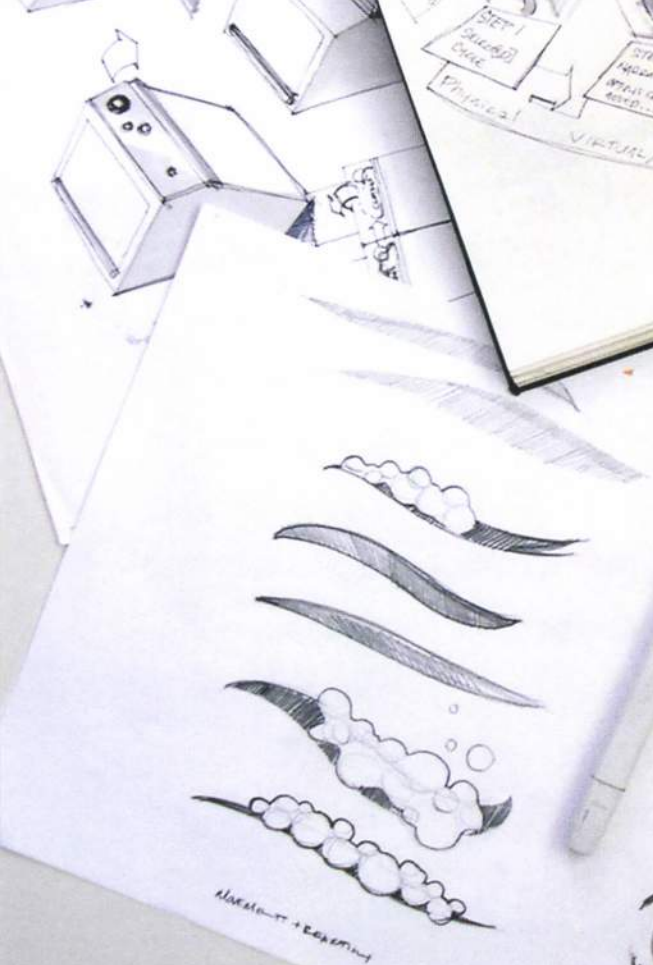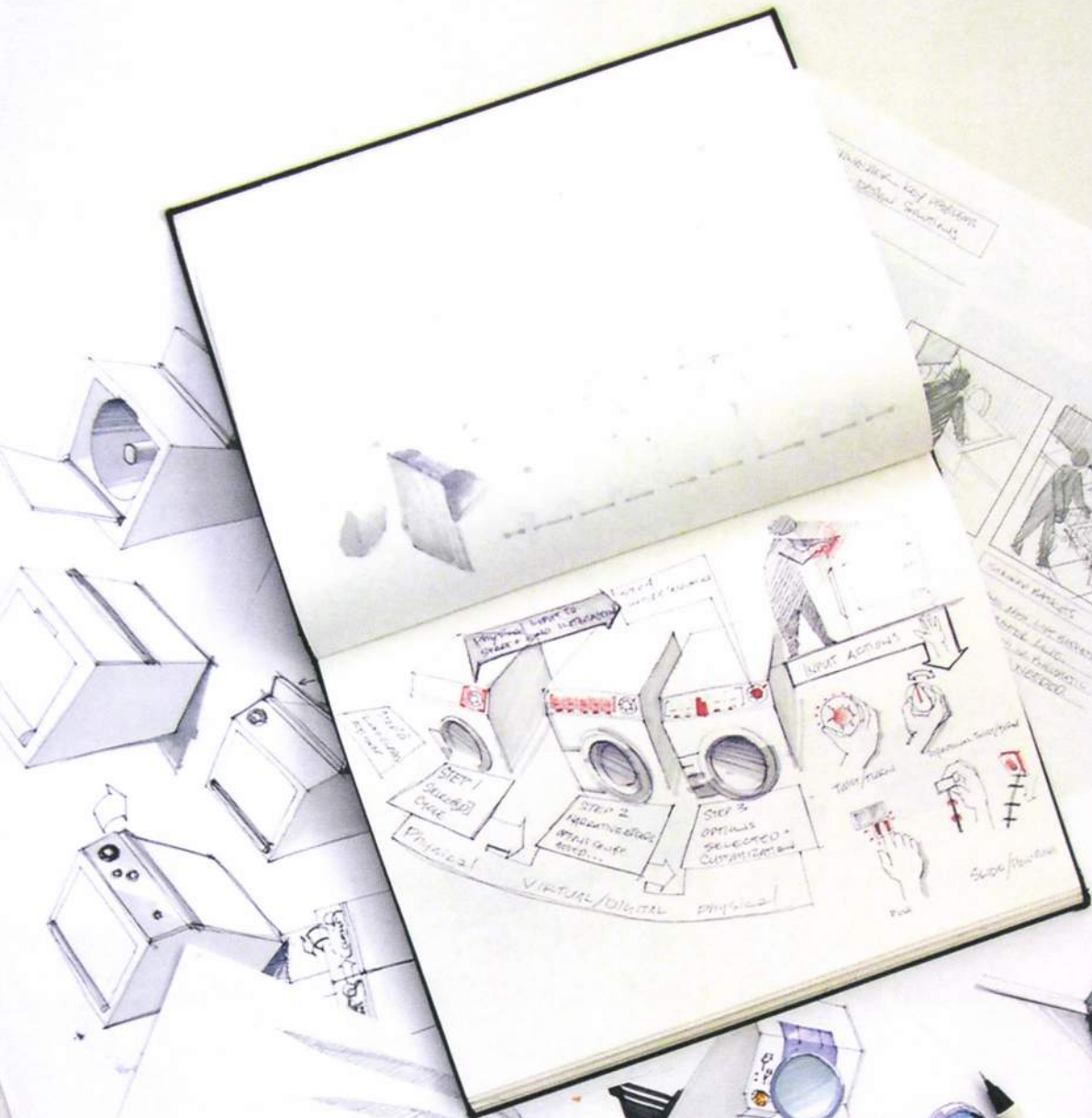
WHEN WE GIVE consideration to an idea, a written record of our thoughts can help us navigate its possibilities and see the paths of our investigation. This evolving record embodies the principle of what is called "visualization," or making thoughts more concrete through sketching. The primary audience when visualizing your ideas is yourself. You must first be able to communicate with yourself before you can effectively communicate your ideas to others. Through notational sketching, we make notes, doodles, and diagrams to capture important fragmentary thoughts for ourselves that we may use later, piecing together these fragments into constructed ideas.

Taking notes and making sketches would seem to be a basic, straightforward process. You observe something interesting in your environment, and you draw a visual copy of its form so that you can review it again later. This sounds simple but glosses over a fundamental aspect of the act of drawing. If we want to just record what we see, we might as well take photographs or video. Notational sketching, in contrast, engages us in a deeper mode of seeing and thinking. It awakens our brain.

Where notational sketching differs from making basic observations and recordings is that it helps us identify what is relevant and significant—and discard what is not. The act of notation is a way of seeing and thinking through the potential of an idea. It is an active process of synthesis and reduction that heightens our attention, resulting in closer observation and more engagement in a dialogue with the subject. It filters and helps us capture important features and issues related to the many dimensions of any design concept. Notational sketches of things we see and experience bring greater awareness of key forms, parts, and their relative organization. This in turn opens our eyes to see the following:

- Patterns or other underlying structures common to events, behaviors, or arrangements.

- Trace evidence of behavior, such as signs of wear from an activity.

- Evidence of failure, such as ad hoc additions or modifications that show gaps in communication or expected function.

- Opportunities for application of design concepts.

THE ACT OF NOTATION IS A WAY OF SEEING AND THINKING THROUGH THE POTENTIAL OF AN IDEA.

SEEING WITH NOTATIONAL SKETCHING

the sample of six

Researching a topic for design usually involves gathering artifacts, photos, samples, and other paraphernalia to help you identify issues and needs. Unfortunately, nobody will tell you just how much you need to collect. "Overfishing" is a common pitfall, when too much time and energy is spent gathering data and too little time is left to analyze and synthesize a practical solution. One way to avoid this trap is called *the sample of six*. Six sources of information (such as interviewees, books, maps, and the like) should provide enough information to identify a large majority of issues involved in a problem. In most cases, this should be sufficient information to make informed, intelligent decisions that lead to the next step, such as prototyping and testing.

INFORMATION-GATHERING IS A critical part of any design process in that it helps us form the basis for our decisions. Without accurate, detailed information, how can we expect to understand problems and discover the source for great ideas? Seeing with notational sketching involves using your sketchbook to record observations of what you view and experience—to make meaning for yourself. Finding inspiration starts with carefully observing people, spaces, and objects and, most important, seeing the interactive relationships (physical, communicative, emotional, and so on) that exist between them. Gathered information provides insight to recognize people's needs and inspires opportunities for great design.

Notational sketching's visual format provides an obvious advantage over text-only note-taking in that combining words and images together offers a richer vocabulary for expression and organization. This is important when we conceive and string together brief flashes of inspired thought. The ability to accurately express and organize is essential to the clear thinking needed for idea development and memory.

The level of complexity and detail used in notational sketches varies from person to person, and even subject to subject. Some sketches are no more than elaborate doodles that meander on the page in playful study. Others employ strict framework structures, such as matrices and grids, to organize with a clear analytical intent. Both ends of this spectrum are equally valid, depending on circumstance and need. Good notational sketching enhances the speed and depth of your thinking process.

Insights gained from notational sketching include not only "aha!" inspirational discoveries but also greater understanding of our own means of perception and thought. It helps us study problems and to gain a better understanding of where and what to look for when seeking inspiration.

By nature, notational sketching is an introspective technique, a way for you to actively reflect on your thoughts and observations. Some people question whether notational sketches should be included in presentations to clients since they demonstrate thoroughness in design practice. This does involve risk. It is easy to misinterpret the loose nature of notational sketches as disorganization. It is also possible to disrupt the thinking process with too much focus on presentation merits. If you choose to show notational sketches, do so with care and restraint. Otherwise you may find your client embracing an unintended design idea or direction.
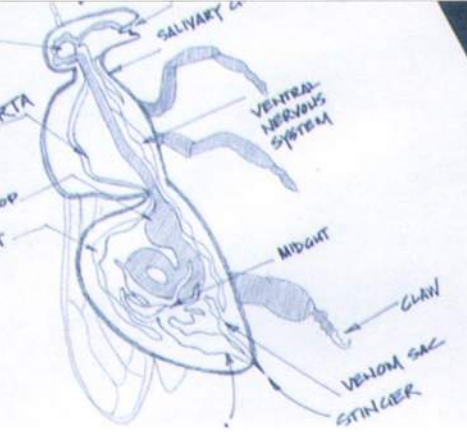
Bald-faced Hornet

SALIVARY G...

VENTRAL
NERVOUS
SYSTEM

MIDGUT

CLAW

VENOM SAC
STINGER

THE BA...
FOUND...
AND...
IN...

...sshopper
...a

1"

1 1/4"

CLAW

SPIRACLES

TRACHING...

TYMPANUM

OVIPOSITOR

TARSUS

FE...

TIBIA

HIND WING

FORE W...

ABDOMEN

PROTHORAX

HEAD

PALPS

COMPOUND EYE

SIMPLE EYE

ANTE...

...3 INCHES IN SIZE
...S ARE DISTINCT
...ORATION.
...CHANISMS:
...Y COLORED W... PATTERN
... FOUL-SMELLING & FOUL-TASTING
...TION FROM ITS THORAX
...F A LOUD HISSING SOUND
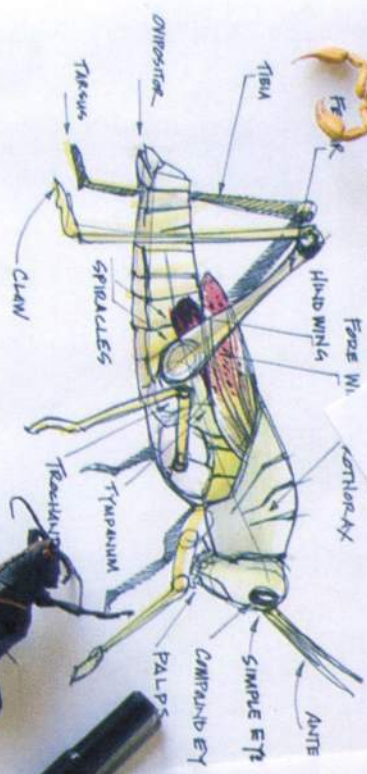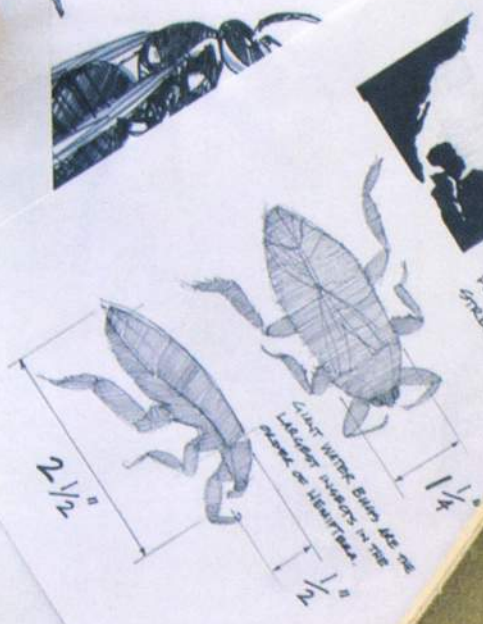
Giant Water Bug
Lethocerus americanus

OCCUR WORLD WIDE WITH
MANY SPECIES IN NORTH
AMERICA, SOUTH AMERICA,
NORTHERN AUSTRALIA, AND
EAST ASIA.
TYPICALLY INHABIT...
PONDS & FRESH...
STREAMS.

GIANT WATER BUGS ARE THE
LARGEST INSECTS IN THE
PROPER OR HEMIPTERA.

2 1/2"

1/4"

1/2"

...ed Hornet
...la maculata

1/4"

1/4"

Head / Thorax / Abdomen

ANTENNA

COMPOUND EYE

MANDIBLE

FORELEG

FEMUR

TARSUS

TIBIA

MIDDLE LEG

STERNUM

HINDLEG

HEAD

THORAX

TERGUM

ABDOMEN

HIND WING

FORE WING

STINGER

3/4"
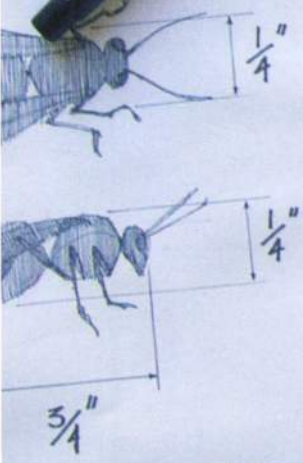
...BETWEEN 12 AND 15 MM...

THE SPIRIT OF SKETCHING

MATT ZYWICA is a professional industrial designer and adjunct instructor at Carnegie Mellon University who teaches courses in methodologies of visualization.

As a child, I grew up surrounded by the traditional watercolor paintings of my grandfather and the abstract prints of my uncle. Moving from the subtle liquid washes of a watercolor to the harshness of etched line was very interesting to me. My observations of those paintings are the foundation of my curiosity, and I eventually pursued an art major at the university level.

In my first semester as an industrial design student, I began to see the purpose in recording and communicating what I experienced. With a no. 2 pencil and sketchpad of fifteen-year-old vellum, I drew without concern or hesitation. While my craft and organization were extremely primitive, my naive approach contributed to an extremely free and enjoyable experience. I began considering drawing, photography, and model-making as ways to communicate. Problem-solving through material became more intentional. I began to consider a sketch as something that I could keep, organize, and reference to my benefit.

I took my first design-drawing course and, curiously, my first life-drawing course the same semester. While it was complicated to develop two drawing techniques that appeared to contradict each other, I tried to keep the experience of understanding range within technique. I embraced both extremes and worked on ways to apply character of description to purposes of understanding. I took courses in glassblowing and ceramics, and my visual and textural vocabulary strengthened while investigating complements and contrasts in description, such as hot and cold or hard and soft.

Developing and communicating form within product design became more natural in three dimensions when considering the way something might be used. My hand and mind were much more connected to what I was thinking, what I was designing, and what I was making. Through awareness of myself and my surroundings, and without overanalyzing my purpose and approaches, I allowed my sketching technique to take shape. Sketching doesn't have to be something limited within the experiences of your books or preconceived notions. It has different meanings for different people at different times.

The more you physically experience surroundings through sight, sound, touch, smell, and taste, the more sensitively your mind and hands will react.
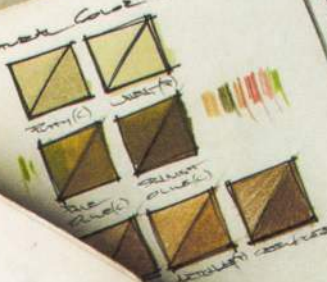
top 10 tips
for effective seeing

If you have trouble finding insight when making notational sketches, consider the following as you look at a subject:

1 SUMMARIZE THE HIGH-LEVEL PRINCIPLES, MAIN FEATURES, OR KEY MOMENTS OF ACTIVITY.

2 IDENTIFY THE IMPACT OF CONTEXT. HOW DO OTHER THINGS THAT SURROUND AN OBJECT OR INFORMATION HELP TO DEFINE ITS FORM AND CHARACTER?

3 CHANGE YOUR TOOL. PUT DOWN THE PEN AND PICK UP A SHARPIE OR CRAYON. THE DRAWING MEDIUM WILL IMPACT WHAT YOU ARE ABLE TO CAPTURE IN FIDELITY AND ACCURACY. SOMETIMES CHANGING YOUR TOOL FOR NOTATION CHANGES YOUR WAY OF SEEING BY FORCING YOU TO WORK MORE LOOSELY, ONLY CAPTURING THE BIG IDEAS.

4 IDENTIFY CAUSE AND EFFECT. HOW DO SOME THINGS RESULT FROM OR IMPACT OTHERS?

5 CONSIDER YOUR PERSPECTIVE. THERE ARE MANY WAYS TO LOOK AT A SUBJECT, SUCH AS TIME, LOCATION, PRIORITY. ARE YOU USING THE RIGHT ONE?

6 SHIFT YOUR SENSE. THINK ABOUT ALTERNATIVE SENSES THAT CONNECT PEOPLE TO OBJECTS AND ENVIRONMENTS (SIGHT, SMELL, TOUCH, TASTE, HEARING). DRAW EXPRESSIONS OF THESE.

7 DRAW FROM ANOTHER POINT OF VIEW. CONSIDER WHAT ANOTHER PERSON OR EVEN AN OBJECT, SUCH AS A CONTAINER, A PAIR OF HANDS, OR FEET WOULD EXPERIENCE AND DRAW FROM THAT PERSPECTIVE.

8 CREATE A SURVEY OF ARTIFACTS. VISUALLY DRAW AN INVENTORY OF ALL THE OBJECTS CARRIED, USED, OR OTHERWISE TOUCHED DURING INTERACTION.

9 DRAW WITH OTHERS. WORKING WITH A PARTNER MAY HELP YOU TO SEE THINGS FROM ANOTHER PERSPECTIVE.

10 DON'T STOP DRAWING. IF YOU FIND YOURSELF GAZING INTO SPACE OR STALLING OUT, DRAW SOMETHING—ANYTHING. DOODLING IN THE BORDERS OF YOUR PAGE KEEPS THE HAND, EYES, AND MIND ACTIVE.

If you draw something that you're looking at . . . you aren't really drawing it; you're drawing from a split-second "memory" of it.

MARK MENTZER is a professor of communication design at Carnegie Mellon University who teaches courses in drawing and visualization, notation, and color and communication.

I clearly remember the day in school when my art teacher said, "We draw to look, to see, to remember, to enjoy." I have since tried to live this mantra in my daily life. The meanings of these words have changed as I have applied them to different situations, but the activities these words convey remain largely intact.

LOOKING

We filter most of what we see through our brains without realizing what we are looking at. We're operating at survival level until something catches our eye, and if we have the time, we take notice. We delight in seeing something out of the norm. This implies a fabric of what we expect. Sometimes a thing or event separates itself from this fabric of quotidian existence and stands out.

SEEING

We may pick up what we notice, shine a light on it, and separate it from its context to see it differently. We have moved from noticing to taking note. You may also discover that it's not that unique and toss it aside. At any rate, you slow down and compare what you are looking at against things you have experienced.

REMEMBERING

If you draw something that you're looking at, what are you really drawing from? The amount of time between looking at something and recording it is minimal. You aren't really drawing it; you're drawing from a split-second "memory" of it. Try drawing what is in front of you, looking often and looking hard. Now turn away and try drawing from memory. Go to another spot in your environment and try drawing from memory again. With practice, you'll learn to understand what you need to remember and what is not so important to commit to memory.

ENJOYING

Most people enjoy learning. Learning by doing and making is enjoyable to a lot of us. At the heart of all learning is our enjoyment of the activity when we reach a higher level of understanding. Most people relish the idea of being able to demonstrate that understanding to others. The more we know, the more we can enjoy.

SEEING
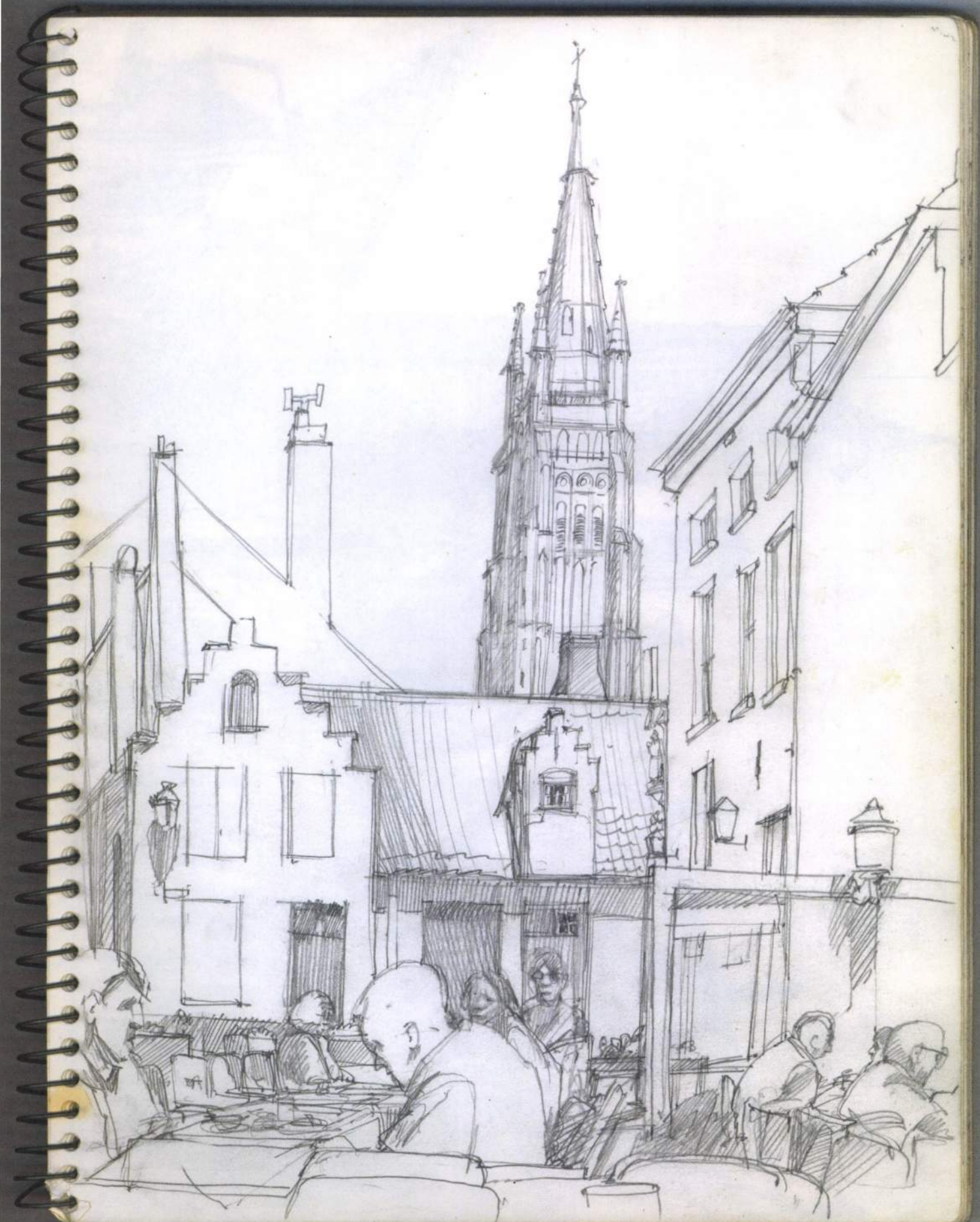
Q What is a good environment for sketching ideas and for practicing drawing?

A Cultural destinations such as museums, galleries, and botanical gardens are great places to go to practice your sketching and to brainstorm design concepts. They house collections of artifacts, tools, and images of ages past that spark imagination. It is also socially acceptable to sketch or draw in these reflective environments. Just be prepared for prying eyes of passers-by and the occasional question or comment.

A trip to a cultural place can help you find interesting objects to sketch and investigate through drawing their form, materials, and configuration. But you might also consider looking beyond the physical and interpret some of the information panels, historical information, graphics, and so on to build out a more complete story and situation for an object. You might even discreetly sketch other visitors as they view an object to capture how they interact with it in physical or emotional ways. Building a visual literacy and vocabulary will help you to sketch faster and more confidently.

JUNGLE GERANIUM IXORA COCCINEA INDIA

LEAF DETAIL

YOUNGER TONGUE FERN LEAVES.

-TONGUE FERN.

SANCHEZIA.

MORE DEVELOPED

FROG

SMOOTH GRAIN HARD/DENSE + CLEAR

MAPLE CONSTRUCTION HAND CARVED + PAINTED

FISHER HEAD W/ FROG IN MOUTH CONNECTS TO FIGURE

LOUNGING HUMAN FIGURE + SLUMBER? ≤ DEATH?

RAVEN HEAD W/ EXPOSED TONGUE "FISH ESSENCE"

HANDLE

TOP
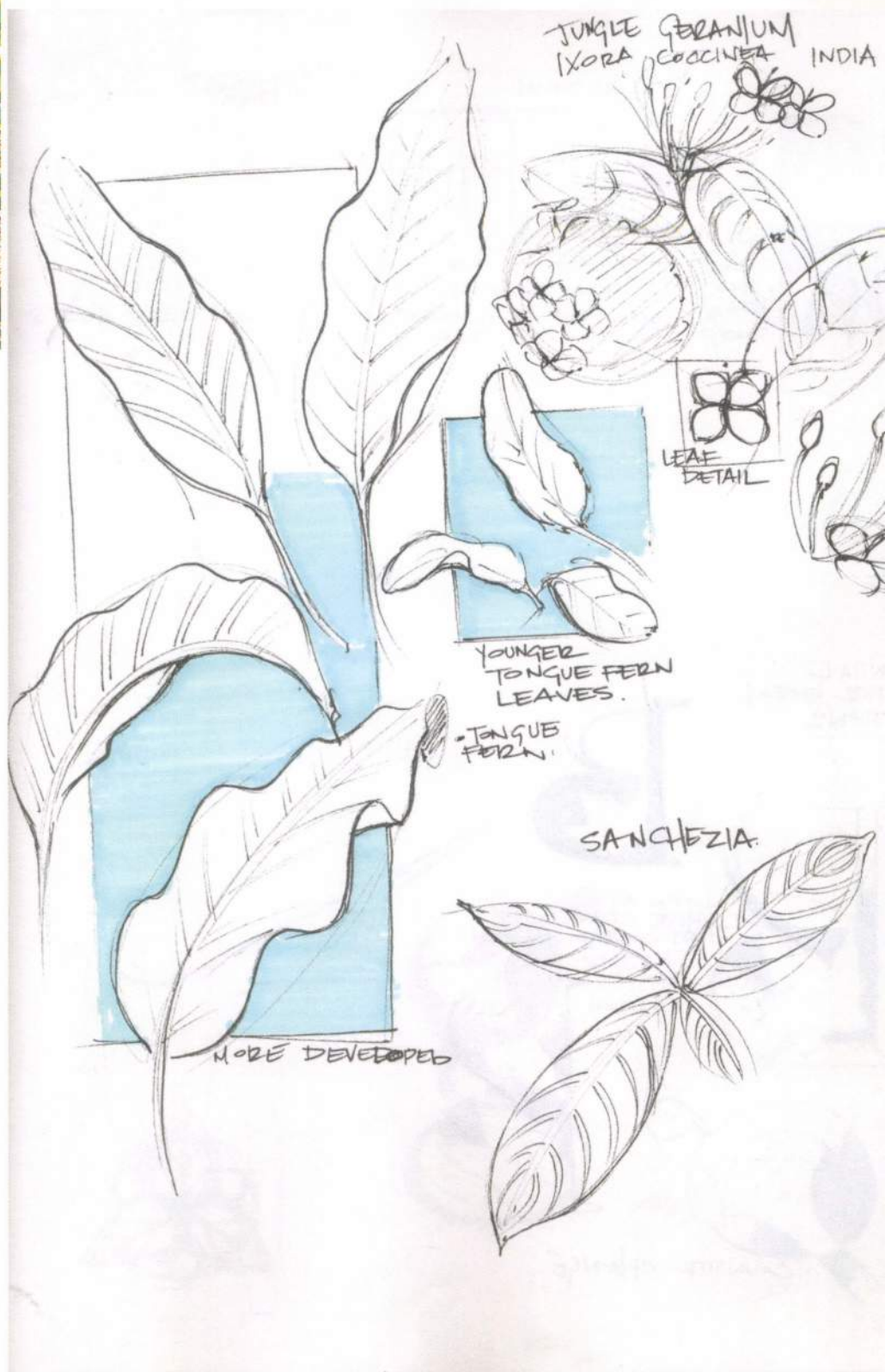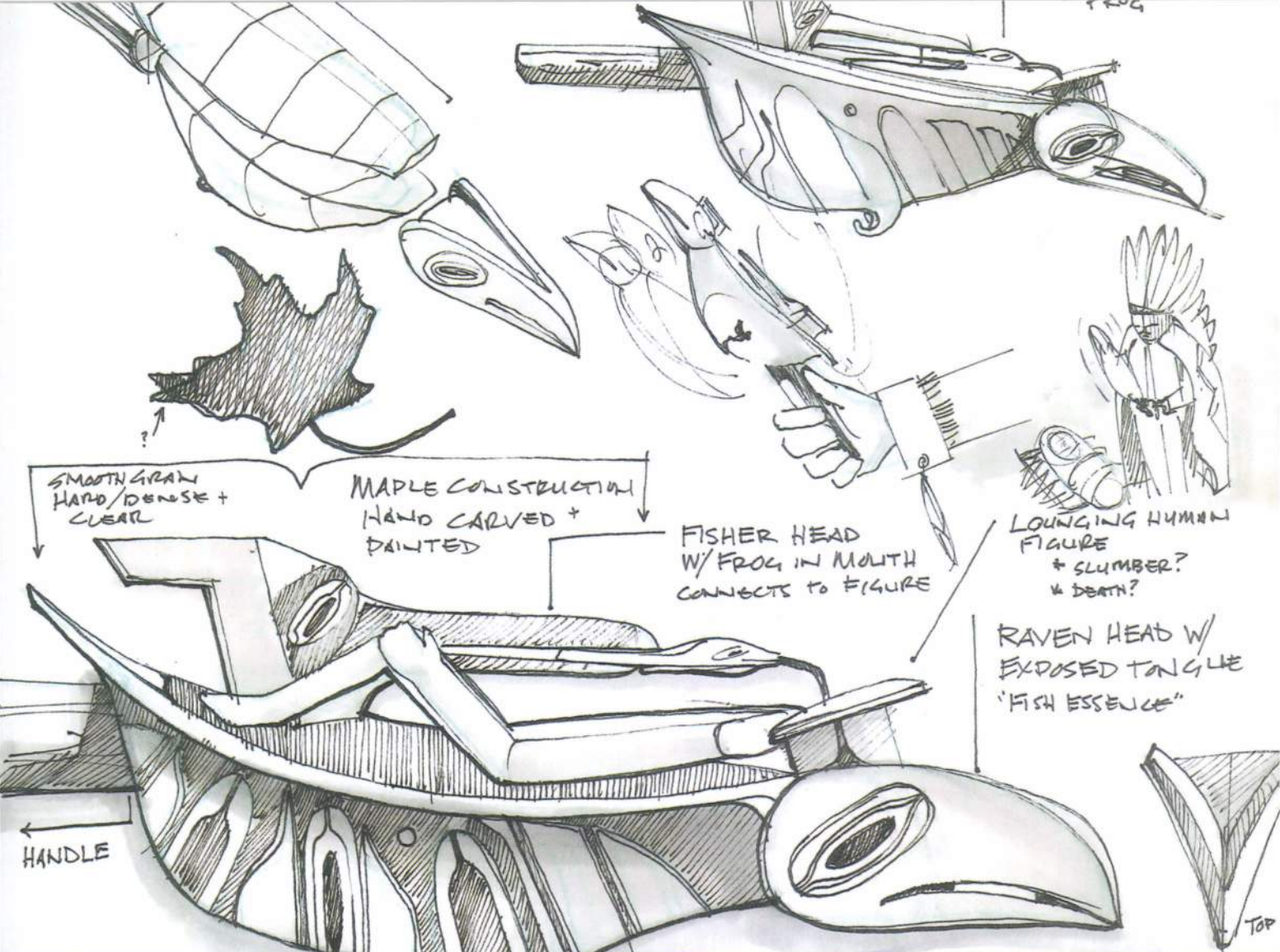
RAVEN RATTLE

HAIDA · pre 1897   CMNH #L.107.4
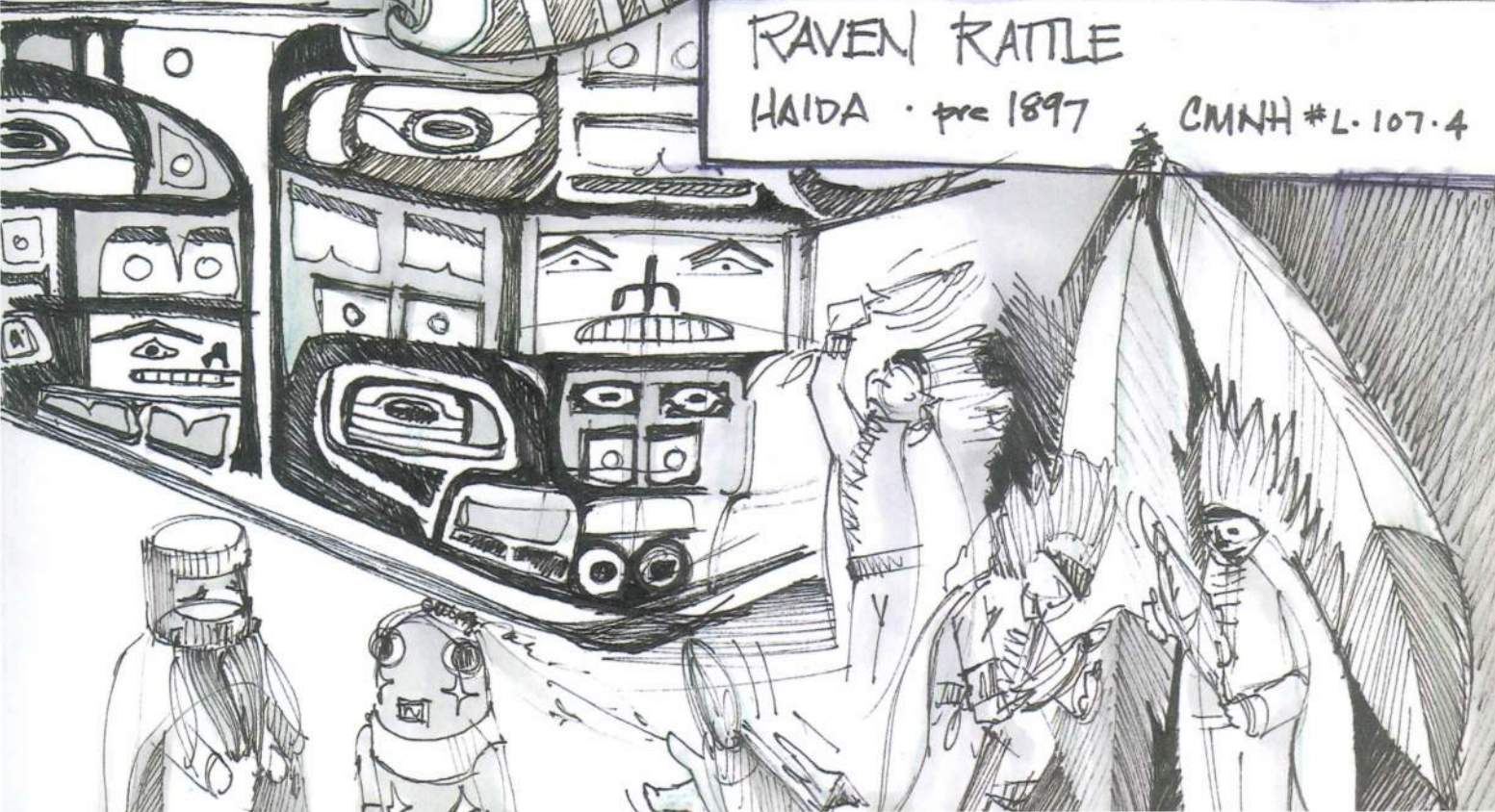
THINKING WITH NOTATIONAL SKETCHING

BESIDES HELPING YOU record information, notational sketching is a great "sandbox" for exploration, a tool to facilitate the working out of details and possibilities. The capacity to doodle and work out your thinking on paper can help you "see" challenges and solutions more clearly. Perhaps the most important aspect of notational sketching is that it creates a clearly documented trail of your thoughts. This can be incredibly valuable as you explore and develop your ideas.

Idea development is rarely a clear, linear process. Successful experimentation and invention often involves failure; for every successful idea, there are invariably alternate directions and possibilities discarded along the way. Being able to see this trail of alternates is important for continuity. When you get stuck, the ability to step back and review prior thinking and missteps is very helpful. Maybe the concept path you chose is incorrect and requires restarting at a prior point in development? Maybe there is an earlier, unnoticed omission that needs study before you continue forward? The documented trail of thought you create with notational sketching is a history that can yield invaluable insight into what you did, where the failure occurred, and what you need to do to continue forward.

Notational sketching can also have long-term value. Sketching over a lengthy period of time can build a library of ideas and idea fragments with tremendous residual value; think of this as building your own personal sketch library. Any idea, design concept, or method of structuring information that might not be the right solution for the task at hand can become an ideal source of inspiration for another. In design, the best ideas can come from the ashes of others, so having them on hand and in a place that is easily accessible can prove to be invaluable.

Notational sketching presents an opportunity to practice and experiment ways to describe something through drawing, without the self-consciousness caused by the necessity of appealing to or persuading an audience. Using your sketchbook frequently for personal, open-ended exploration will help improve your practice of design and become more comfortable at communicating your ideas to others.

Mirror①

Sliding door.

Alluminium
Body 누가시켰다.

Side table

Move like a car

Sliding Door.

Door open

Cabinet Container로 김장이 위에

Sliding Floor maybe.
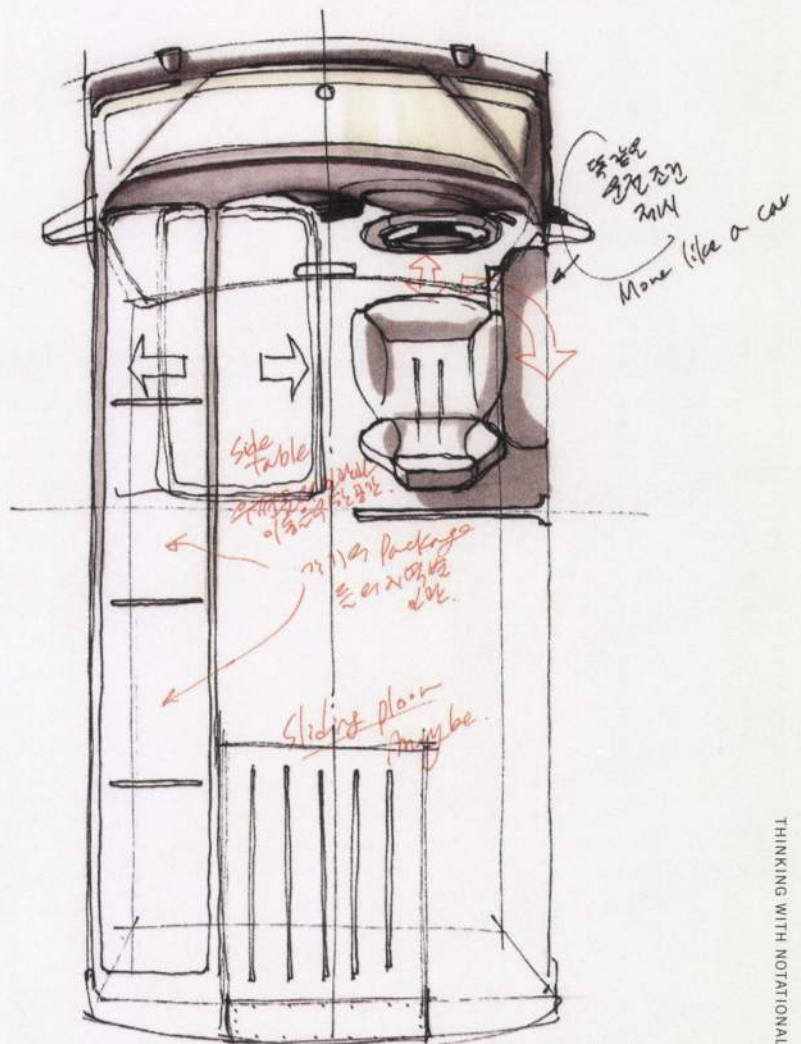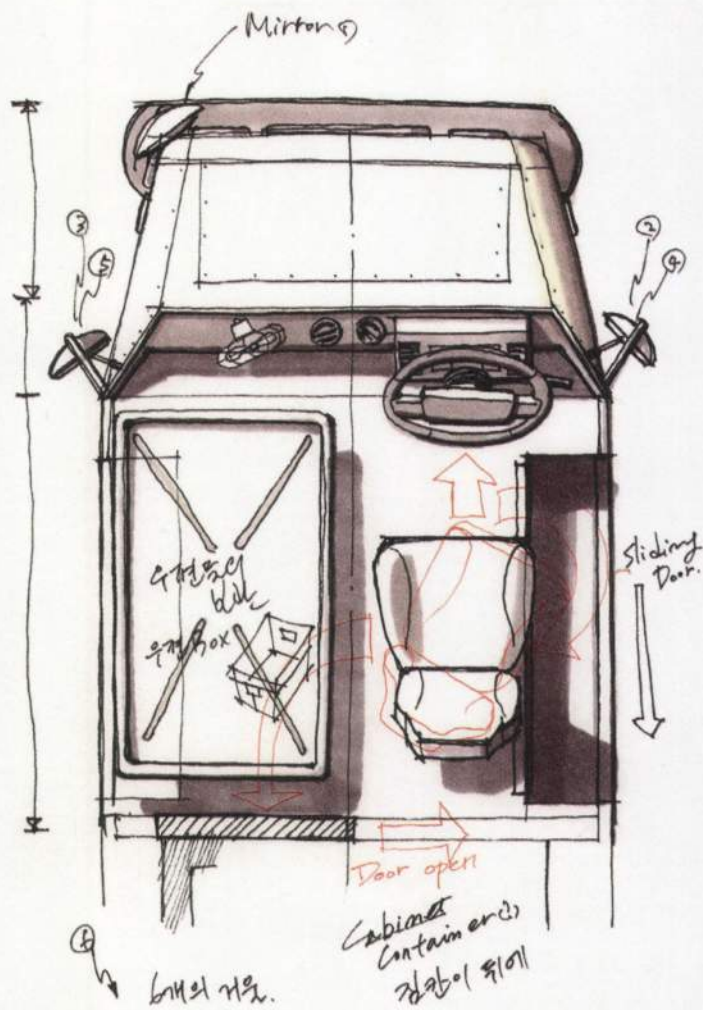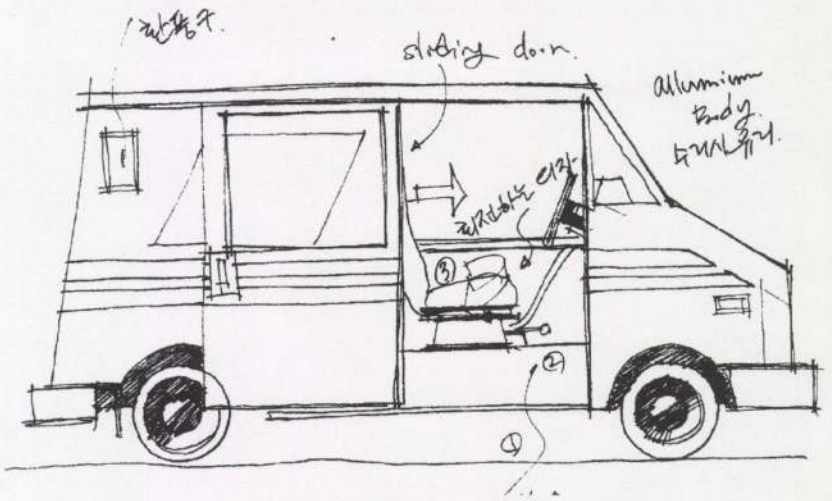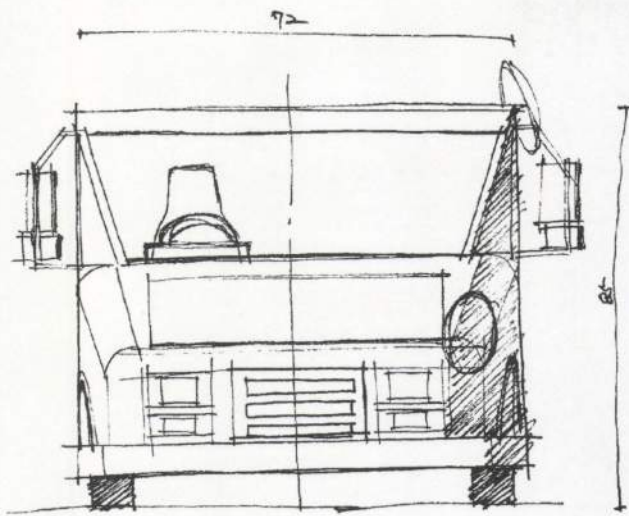
top 10 tips for effective thinking

If you find yourself having trouble using notational sketching to think through your ideas, consider:

1 FIND DIFFERENT WAYS TO EXPRESS THE SAME IDEA. DON'T ALWAYS ASSUME THAT THE FIRST WAY IS THE BEST AND ONLY WAY.

2 KEEP THE PENCIL MOVING. JUST LIKE WRITING, THE BEST SKETCHING OCCURS THROUGH A SMOOTH FLOW OF CONSCIOUSNESS.

3 TRY DIFFERENT MEDIUMS. YOUR DRAWING TOOL CAN AFFECT YOUR MEANS OF RECORDING THOUGHT AND, BY EXTENSION, INFLUENCE YOUR THINKING ITSELF. IF YOU ARE STUMPED, TRY SWITCHING FROM PENCIL TO CRAYON OR ANOTHER MEDIUM TO SEE IF IT HELPS RESTART YOUR BRAINSTORMING.

4 DRAW THINGS IN WAYS YOU HAVEN'T BEFORE. LOOK BACK THROUGH YOUR SKETCHBOOKS AND SEE IF THERE IS A COMMON THEME TO THE CONTENTS OR FORMS YOU DRAW. PERIODIC SWITCHING CAN HELP BREAK HABITS TO YIELD NEW INSIGHTS AND IMPROVE YOUR FLEXIBILITY IN DRAWING.

5 GET ANOTHER SET OF EYES ON YOUR WORK. IF YOU WORK ON A TEAM, PASS YOUR SKETCH TO SOMEONE ELSE AND ASK THEM TO CONTINUE DEVELOPMENT (NOT JUST CRITIQUE). ENCOURAGE THEM TO MARK UP YOUR SKETCHES AND OVERLAY THEIR OWN THOUGHTS.

6 SEEK INSPIRATION FROM OLD SOURCES. LOOK THROUGH PAST NOTATIONAL SKETCHES AND ABANDONED CONCEPTS FROM OTHER PROJECTS. IS SOMETHING THERE THAT YOU CAN USE FOR INSPIRATION? IT CAN EVEN BE HELPFUL TO GO BACK AND REWORK AN OLD DRAWING WITH A NEW PERSPECTIVE. YOUR SKETCHBOOKS SHOULD BE LIVING THINGS.

7 DRAW YOUR SUBJECT IN MULTIPLE STATES OF ACTION. THINK OF YOUR SKETCHING AS VISUAL STORIES. SHOW YOUR SUBJECT IN ITS PRIMARY STATE, DYNAMIC STATE IN MOVEMENT, AND FINAL STATE.

8 THINK LARGE. FOCUSING ON THE BIG PICTURE ENABLES YOU TO CONSIDER THE SUBJECT IN ITS ENTIRETY.

9 THINK SMALL. CONSIDER THE SMALLEST MICRO-LEVEL DETAILS. THIS COULD MEAN THE SCREWS IN A PART ASSEMBLY OR THE PIXEL DIMENSIONS OF A WIDGET. SOMETIMES FOCUSING ON EASILY DEFINABLE ASPECTS OF A SUBJECT OPENS THE WAY FOR MORE IDEAS.

10 TRY BOTH ABSTRACTIONS AND HIGHLY REPRESENTATIONAL DRAWING STYLES. SOMETIMES THE ACT OF SIMPLIFYING A SUBJECT INTO ITS BASIC COMPONENTS AND PIECES ENABLES YOU TO SEE SYSTEMS IN PATTERNS. CONVERSELY, REPRESENTING SOMETHING VERY TRUE TO LIFE CHALLENGES YOU TO CONSIDER HOW THE REALITIES OF THE PHYSICAL WORLD IMPACT THE SUBJECT.

Pen pops-out.

PEN
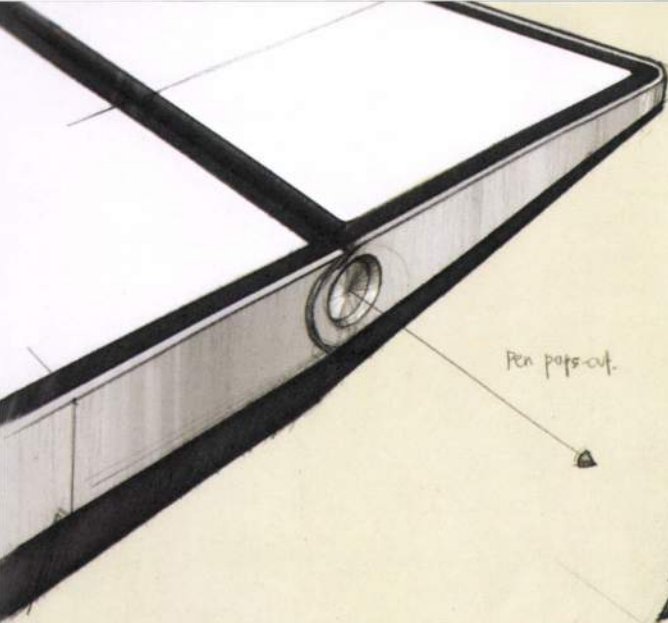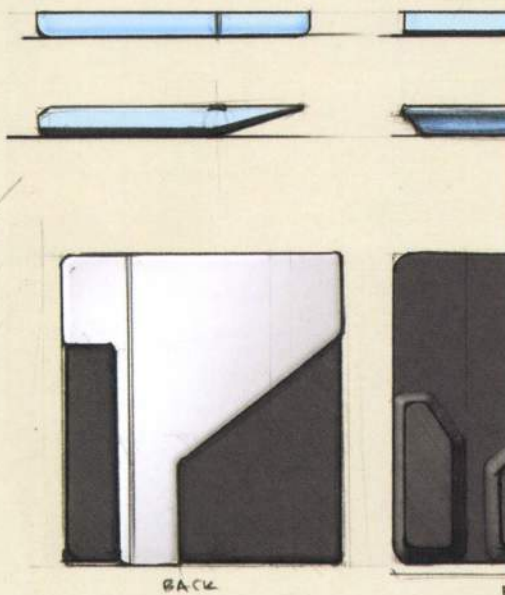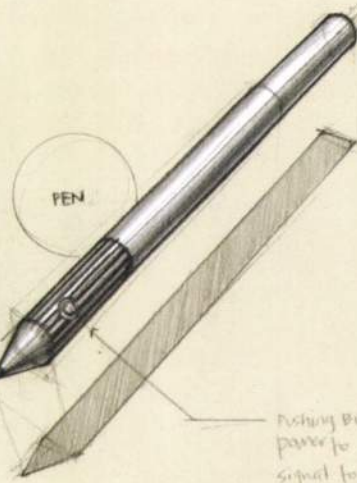
Pushing Button generates power to send wireless signal to Bibliofile

BACK

BIBLIOFILE

Pull up for skip

Skip pages with slider

- Looks "unbroken"
- Flipper
- Suggests how to use it
- Interplay screen + casing
- Flipper strength
- Grip
- Holding a screen
- Battery Indicator
- Charge only
- Skip pages → Combine!?
- Show where you are in book
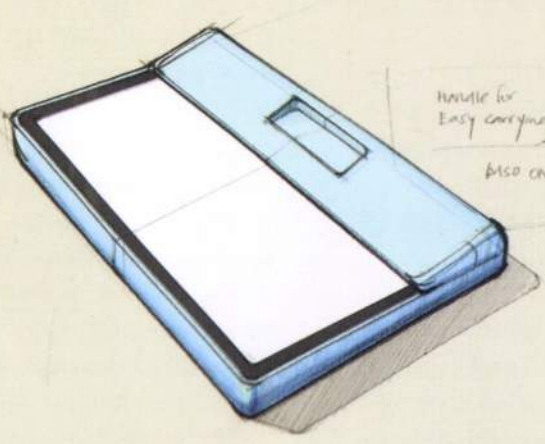
Handle for easy carrying

Also on/off

Aluminum

TPE

(z)

Slide forward to skip PAGES (TOUCHSCREEN)

Side screen indicators shows TITLE and progress
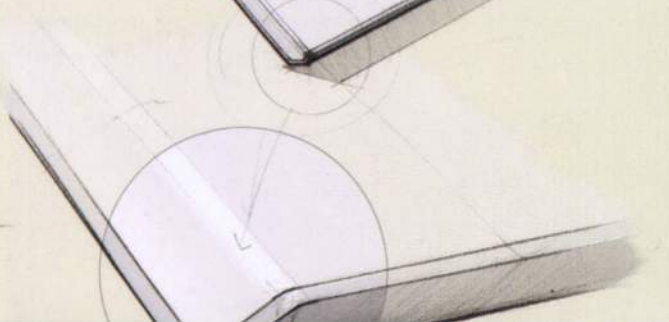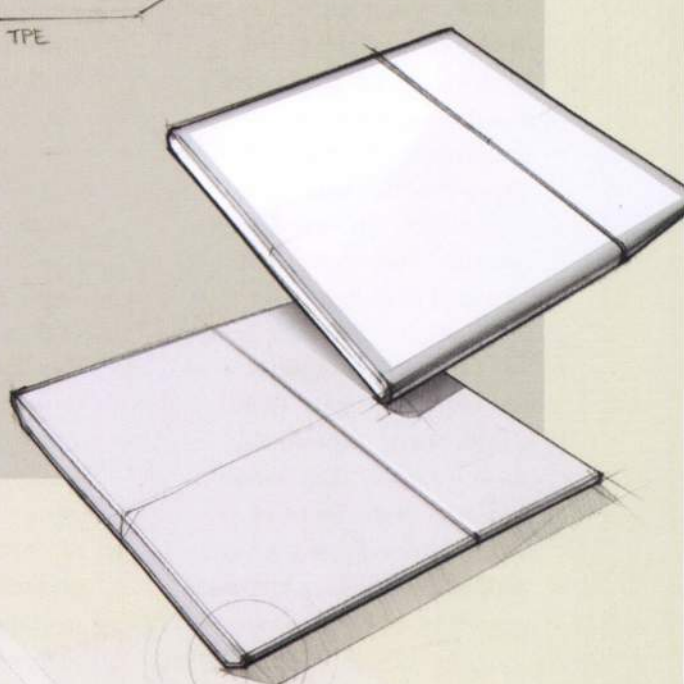
BEST PRACTICES FOR EFFECTIVE NOTATIONAL SKETCHES

AS YOU EXPLORE the use of notational sketching for recording and exploring ideas, there can be much to consider: What should I include? How do I express what I see? How should I organize my drawings? These are questions of content, style, and structure. Several considerations yield more effective notational sketches, regardless of drawing subject.

BE RICH IN CONTENT

Visually rich notational sketches that rely on a broad visual vocabulary tend to be better sources of inspiration in support of idea development. Mixing your words and images freely together provides a greater description that expressively supports your memory and thought. As you record with notational sketching, don't be afraid to incorporate photographs, clippings, scraps, and other found objects. If you find a key image that is significant or inspirational, paste it in your sketchbook and make it the focus of investigation. Draw over it, highlight portions, and expand upon it to make it useful.

START WITH THUMBNAIL DRAWINGS

Thumbnail drawings are simplified, scaled-down, and used to quickly consider the visual layout or structure of an idea's form. It often is not necessary to draw in full scale, especially during preliminary stages when considering a wide range of forms, layouts, and viewing angles. Where possible, begin idea studies with a series of thumbnails approximately 1 to 3 inches in height. This time-saving technique provides a quick way to visually look at a wide range of possibilities and narrow the field to a handful of viable options. During preliminary stages, it is not necessary to draw in full scale in order to consider a range of forms, layouts, and viewing angles.

FRAME THE BASICS BEFORE WORKING ON THE DETAILS

Build up your sketches progressively, moving from macro to micro detail. Start with simple silhouettes and wireframes for objects and compositions to establish basic proportions and an order of major visual elements. Then, fill in pieces and parts that involve detail. Approaching your notational sketches in this manner not only helps you with distorted objects and "squished for space" page layouts but is also a good hedge to protect against unreadable drawings should you run out of time to complete their development.
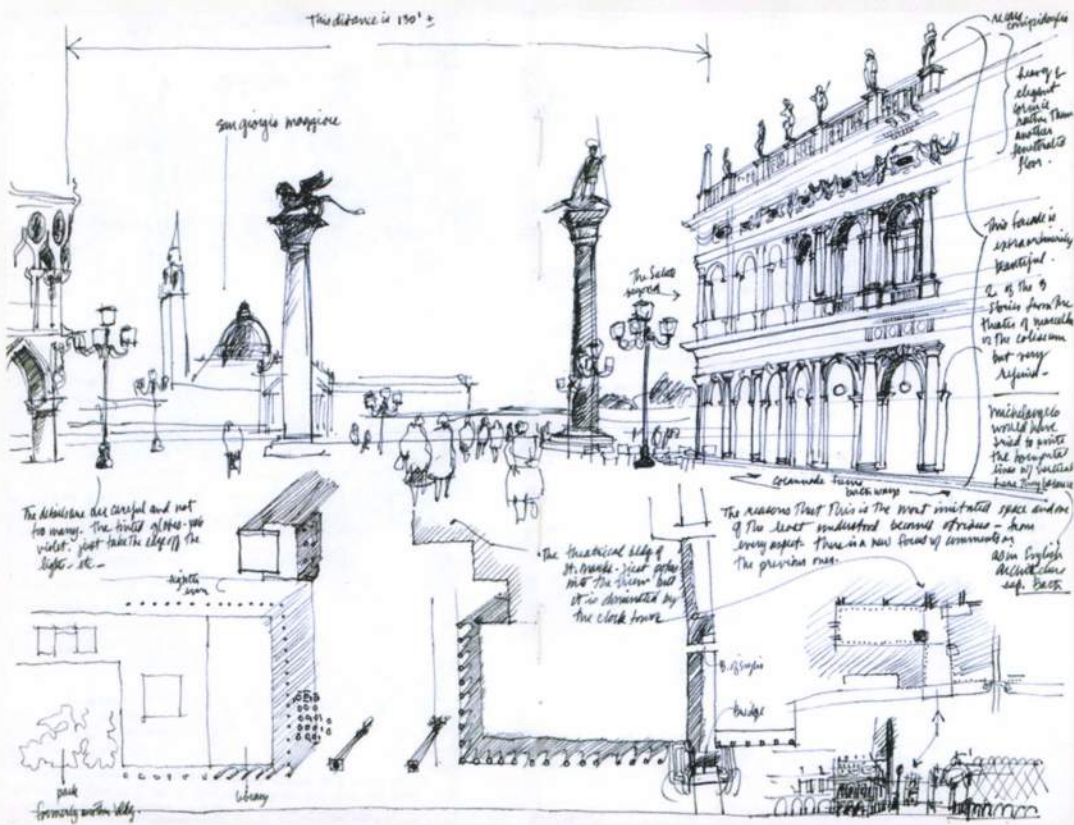
LOOK FOR OPPORTUNITIES TO CONDENSE CONTENT

Notational sketches do not need to be masterpieces of detail. When recording your observations and using notational sketching to think through ideas, seek to efficiently capture the basic nature of things, be it a scene, environment, activity, moment, or mood. Incorporating too much detail can disrupt your thinking process and distract from the essential points. Consider what really needs to be shown and what can be omitted. For less important areas and information, use a vague representation, such as an outline or wireframe, to block in approximate details and forms.

EMPLOY GRAPHIC SHORTHAND NOTATIONS

Part of notational sketching is finding a balance between photo-realistic and symbolic form. Icons and pictograms are examples of representational shorthand notations you can incorporate into notational sketches to save time and page space while enriching the clarity and readability of your notes. A simplified graphic note can help quickly express a basic concept, such as transit or payment. This is particularly helpful when diagramming relationships and activities involved in ideas.

DON'T FORGET TO INCLUDE THE FINAL RESULT IN YOUR SKETCHBOOK

A sketchbook can serve as a storybook of an idea becoming reality, but only if you show the beginning, middle, and end. Once an idea takes form as a produced project or product, print images of the final idea or product and paste them into the sketchbook to show a full sequence of your design process. This creates a useful artifact not only for yourself but also for peers and teammates with whom you share your sketchbook.
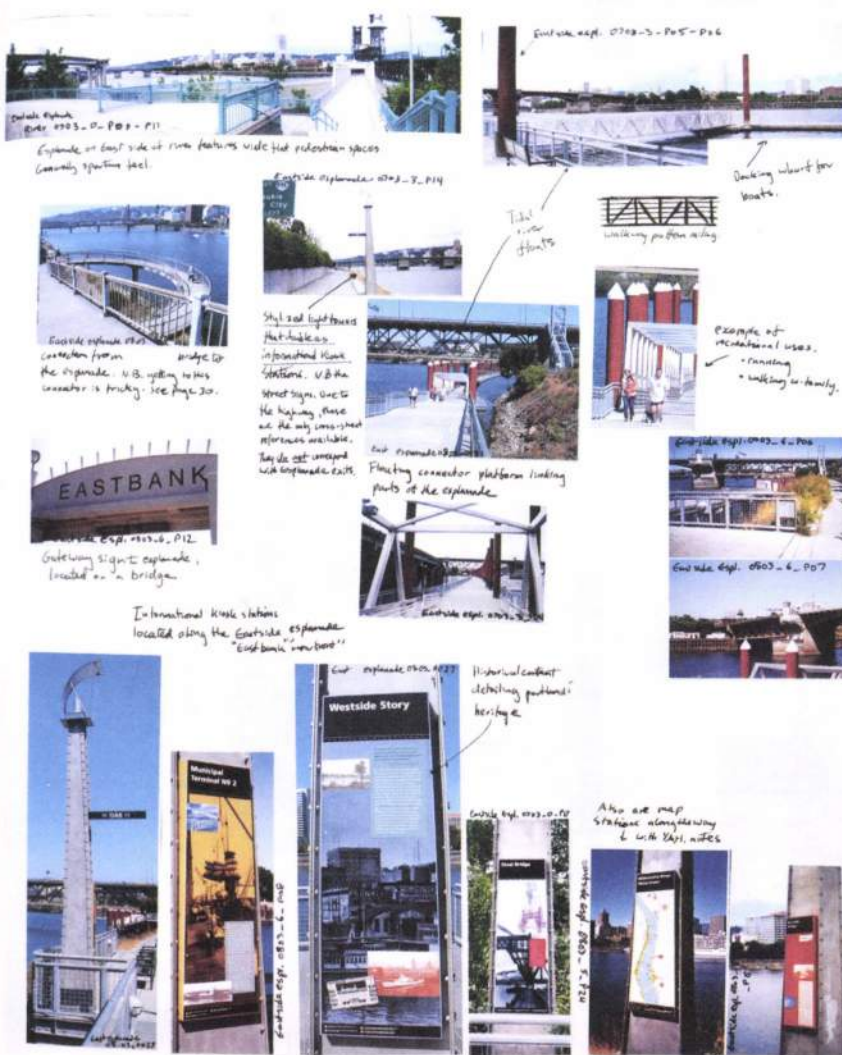
Q What is a good way to incorporate photographs in my sketchbooks?

A Including photographs and other images is a great way to enrich your sketches and enhance your record of thinking. If you have already tried this, you probably have found that making photos stick to your pages can be challenging or messy. A solution is to print or photocopy your photos on large sheets of adhesive-backed label stock. Cut out the photos, and stick them in your sketchbook. You can then annotate them with callouts.

tips for using icons & pictograms

- Keep icons and pictograms graphically simple using basic shapes or silhouettes. Too much detail defeats the purpose of shorthand.
- Reinforce the meaning of complex subjects by pairing your keywords with your graphics.
- Watch for ambiguous forms in shorthand notations that invite misinterpretation.
- Avoid completely abstract (nonrepresentational) signs for coded meaning in your notational drawings, such as stars, diamonds, or blocks. The meaning of these can be hard to remember when you return to a drawing later. Worse, their meaning may be unknown to others if you need to share your notes.

KEEP YOUR MISTAKES, DON'T ERASE THEM

As tempting as it may be to edit your sketchbook, don't abandon or remove an exploratory sketch if it doesn't look great initially. Keep working on it until it takes shape. Use the page with a failed drawing to try alternatives or redraw the same subject using a different view angle, medium, or technique. Sandboxes are full of mounds from past failed creations. A sketchbook should not be pristine art but rather a working canvas that clearly shows active thought.

DOCUMENT YOUR DOCUMENTATION

Since a prime reason for notational sketching is to build a record for future reference, include features such as drawing titles, dates, project names, source names, and even page numbers along with your sketches. A brief moment spent doing this consistently is considerable time saved later on. If your drawings or pages aren't identifiable and easy to find, it can be frustrating to have to rummage back and forth within a sketchbook (or multiple sketchbooks!) to find them again at a later date.

Right page — hospital icon grid (labels)

Surgery

Intensive Care Unit

Emergency entrance

Ambulance entrance

Cardiology

Diabetes

Immunization

Infectious diseases

Oncology

Pediatrics

Pharmacy

Radiology

Mammography

Ob/gyn center

Ob/gyn clinic

Laboratory

...Therapy

Outpatient Services

Care staff area

Waiting room

Left page — notebook notes

.../ Food bar. ~~Restaurant~~ Cabin

"Food/dining area" 5
"Restaurant ahead" 4
"restaurant/snack bar" 4
"restaurant" 5
"towel/utensil" 5
"Food" 5
"Restaurant" 5

Although books indicate this to be clearer, side by side option less open for misinterpretation. Notice ranking marks for both.

"Food/Dining Area" 5
"restaurant" 5
"restaurant" 5
"Food/Dining" 5
"restaurant" 5

"food" 5 "restaurant" 5
"Foodservice/restaurant" 5

Crossing knife & fork /or spoon makes an X that can confuse.

So....

"Food/dining area" 4
"Cheap restaurant" 3
"restaurant/snack bar" 4
"Food service" 5
"snack bar" 4
"Food" 5
"restaurant" 5

not enough

Information / tourist office

"information" 4 / "info" 5

"i" "information" 4
"important notice" 3
"information booth" 3

Problems understanding the "i" sometimes mistaken as "important". However this is partly a cultural issue. More widely recognised in Europe.

Best scores even with language differences

★ For people with language barriers a word is easier to look up or i.e. post than a letter or a question mark symbol. due to language root commonalities

"information" 4
"no clue" 0
"..." 5
"information booth" 4
"information" 5

notational
sketch style

Nearly all the best practices for notational sketch style relate to speed. Good notational sketches should be quick, especially when used to record observations in order to keep pace with your thinking.

KEEP IT LOOSE

Loose notational sketching is an activity in which the flow of drawing should feel effortless. If you find yourself too conscious of your sketch's accuracy and appearance, relax and speed things up. This may seem counterintuitive, but the key to loose sketching is actually to keep it relatively fast. Drawing too slowly transforms the activity into a conscious act. This produces cramped drawings and a disjointed flow of thought. Capturing ideas quickly ensures a loose quality that keeps your mind's attention on the idea. Think of the act of handwriting: imagine what it would be like if you consciously focused on the drawing of each individual letter; it would take forever and disrupt your ability to think clearly. The same applies to drawing. It should be quick and fluid.
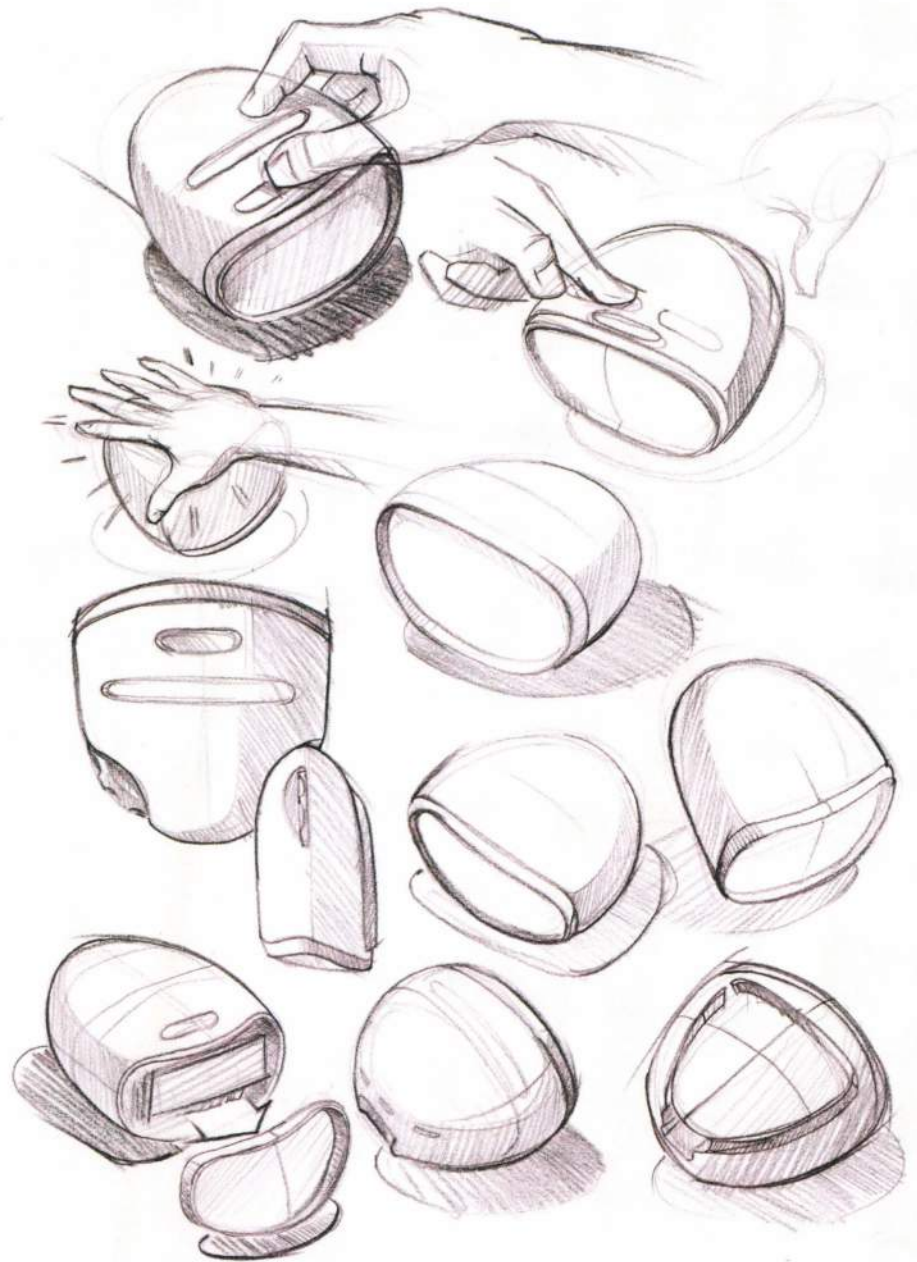
KEEP IT ROUGHLY ROUGH

Where keeping it loose is about a level of self-consciousness, rough is about detail. "Roughly rough" involves working in a manner that shuns meticulous (unnecessary) detail and favors getting your ideas down on paper quickly. Note that rough does not mean sloppy or inaccurate. Always strive for correctness of form and good line work.

MESSY IS OKAY

Notational sketches can be messy affairs, particularly if you are exploring a range of possibilities. For beginning drawers, this can be especially concerning, as you might be obsessed with precision and getting your sketches "right"; however, notational sketches should involve a certain degree of mess—but not be so messy that clarity is compromised. They are, after all, the first rough drafts of personal thought created to describe an observation or idea. Embrace the occasional wonky cube, hairy drawing, or erring wavy line; they are minor blemishes in the scope of a much larger process. But strive to always improve your craft with good form, descriptive line weight, and organization.

* details
· swinging motion
· gears
· smooth
· reflective surface.
· handles
· grips
· main screws
· cold ? temperature
· bulky!

swinging motion

main screw holding main two pieces together.

a slight change in surface, angle shift!

Contour of surface shifts
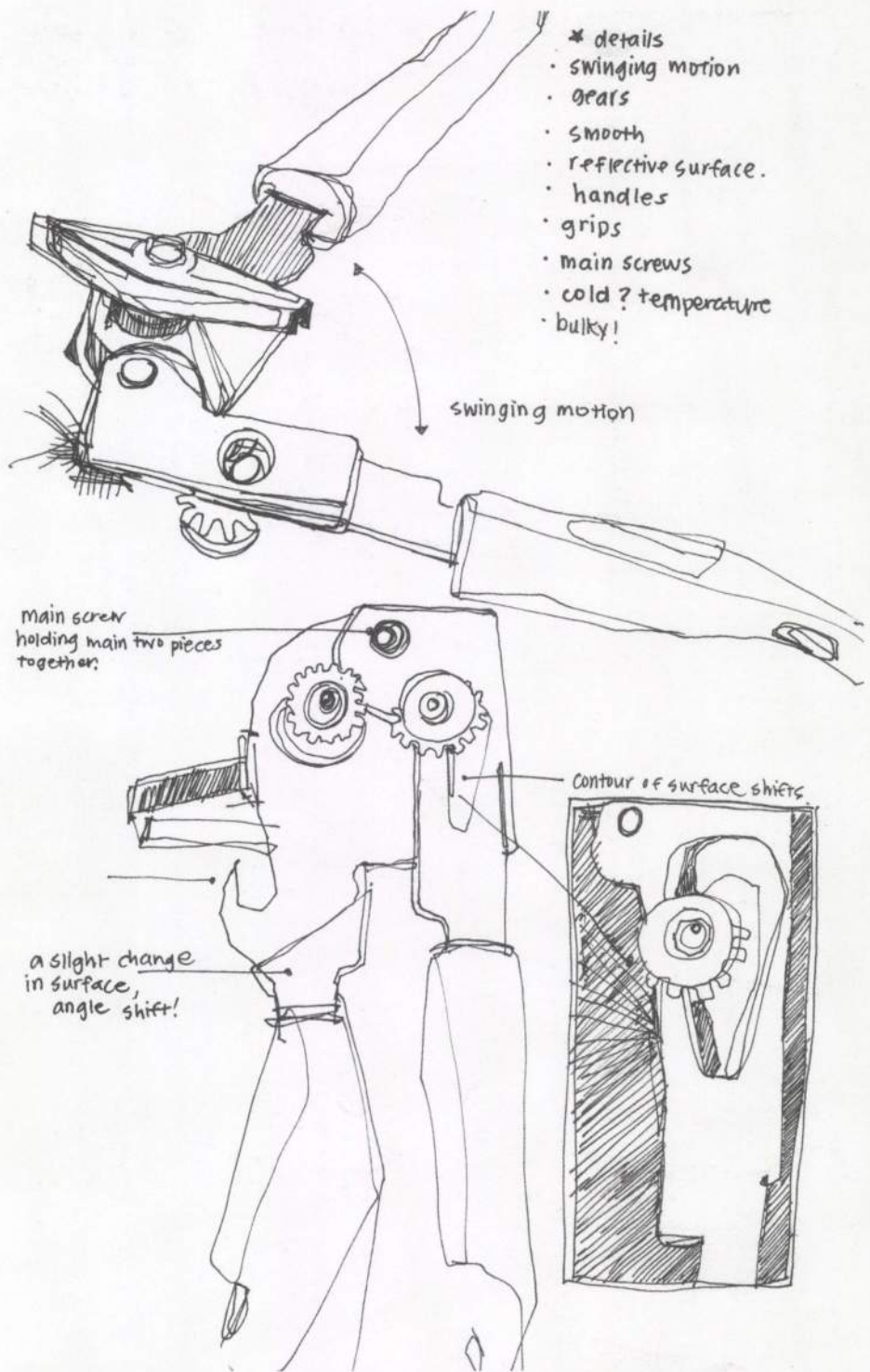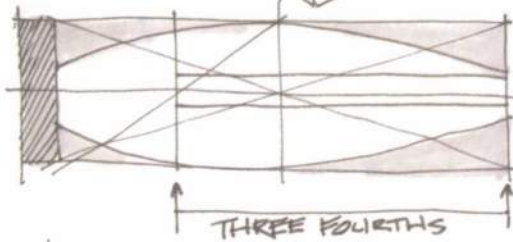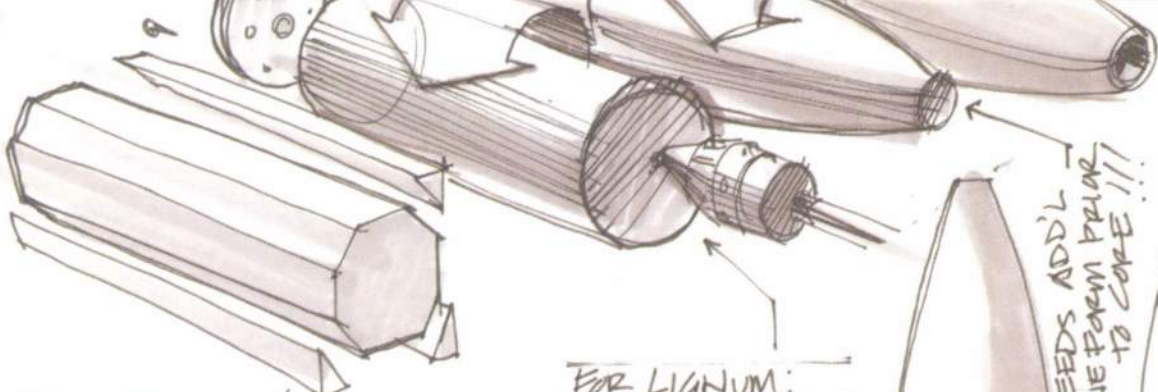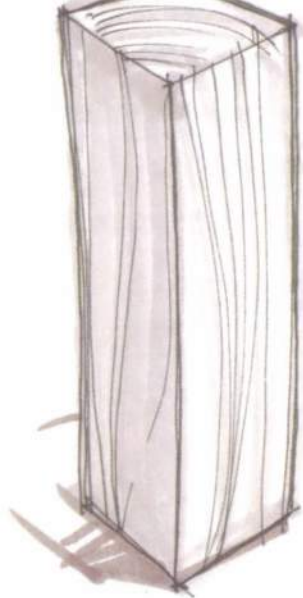
FOR LIGNUM:
LEAVE 2 MONTHS IN TURNED
SOLID FORM
TO STABILIZE

$1\frac{3}{8}$

THREE FOURTHS

LIGNUM NEEDS ADD'L
MONTH IN CONE FORM PRIOR
TO CORE !!!

REMEMBER
to FORM TO
BOTTOM
TOO!
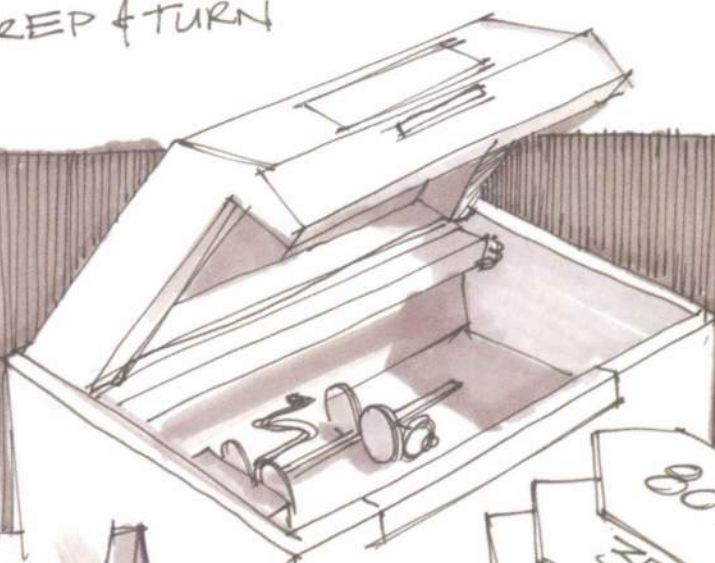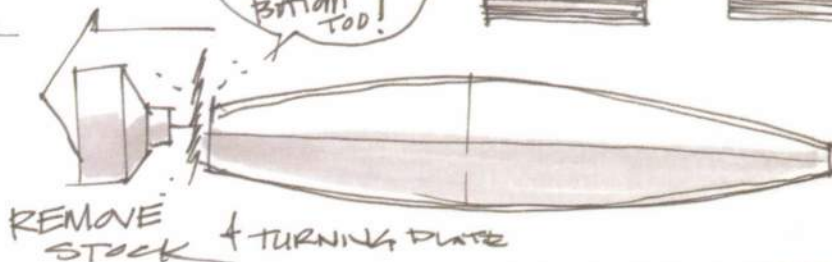
FIVE EIGHTHS

PHASE
ONE:
PREP & TURN

REMOVE
STOCK & TURNING PLATE

gend 36EXT

80 POWER
35 SPEED
5000 FREQ

CORE 1

CORE 2

CORE 3

BIT #1

BIT #2

BIT #2 W/EXTENSION

SEALED BEARINGS

ADJUSTMENT

STEADY REST CORE MECH.

THINK CONICAL!

TAPER TOWARDS TOP FOR CONE EFFECT

CONE WRAP

INTERLOCK OF PATTERN

BEHLEN

164
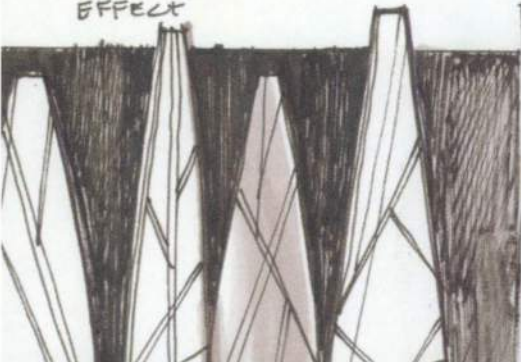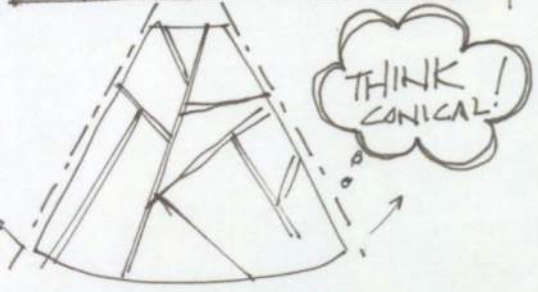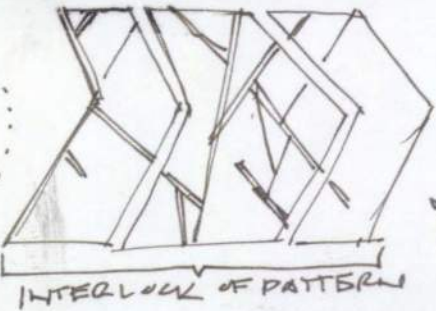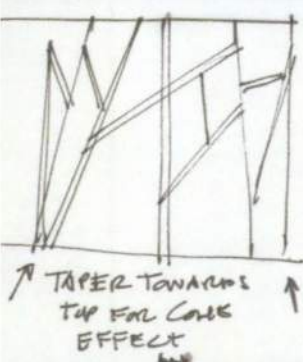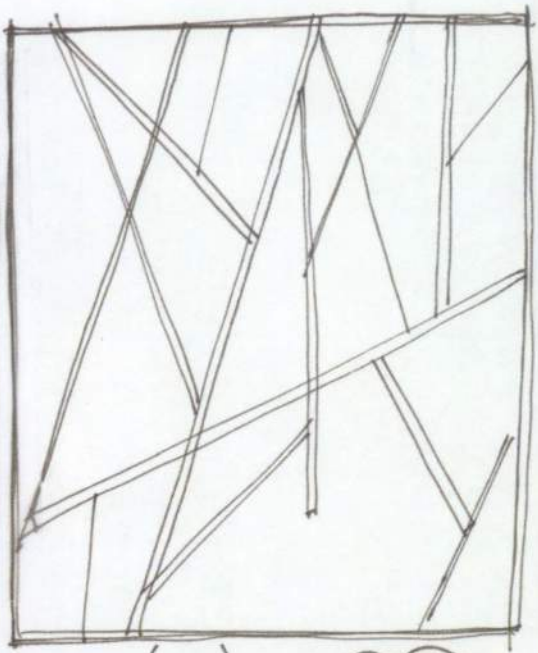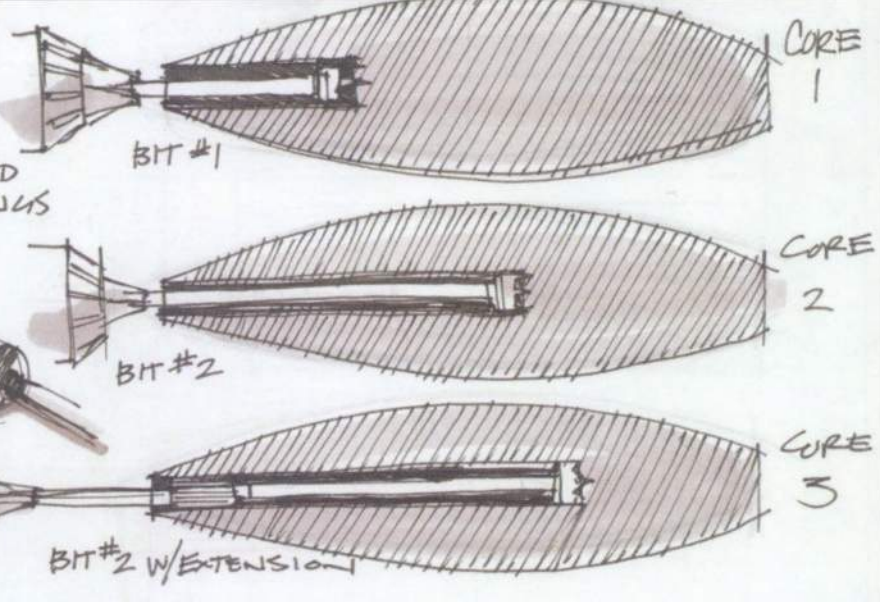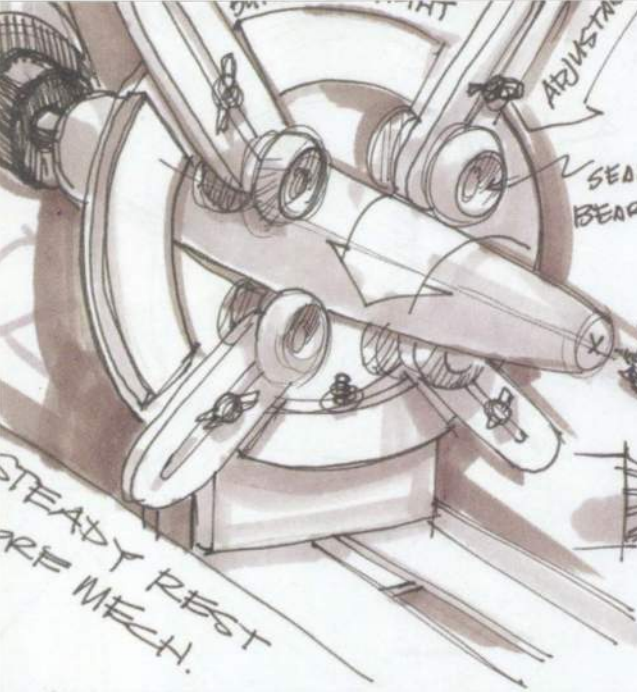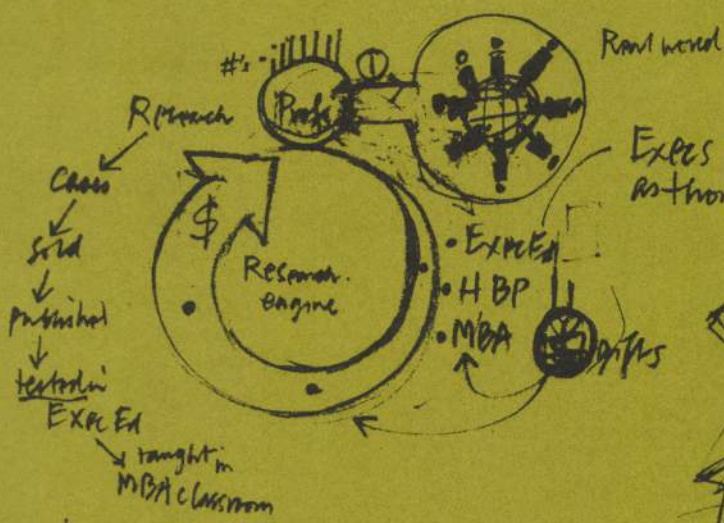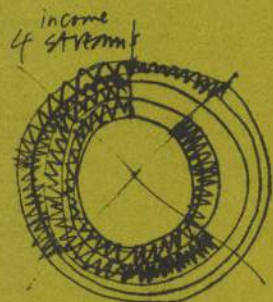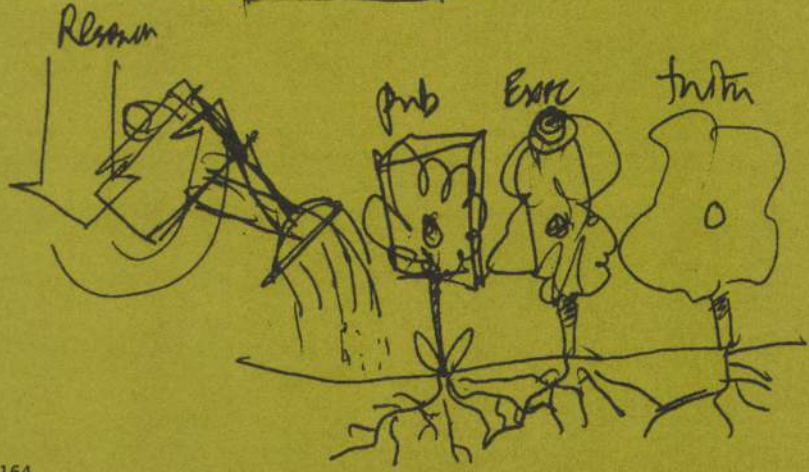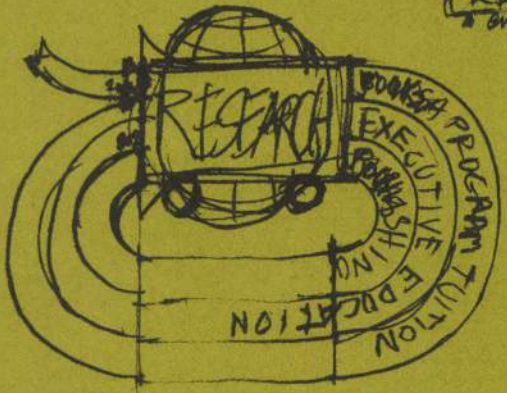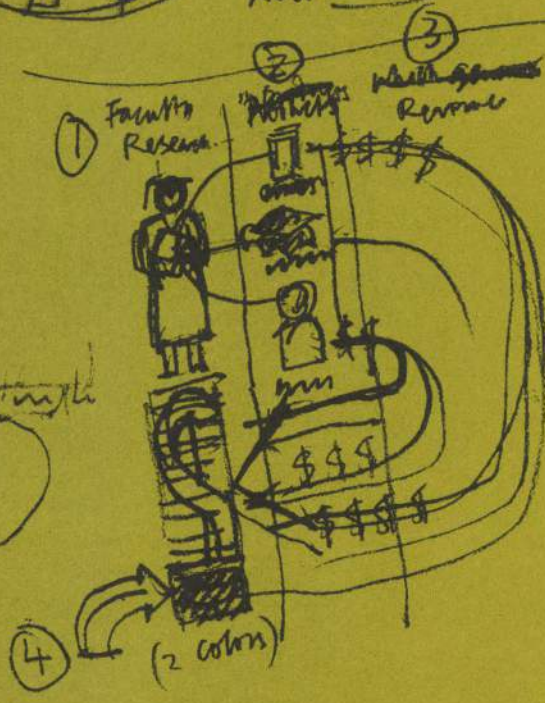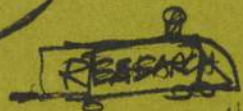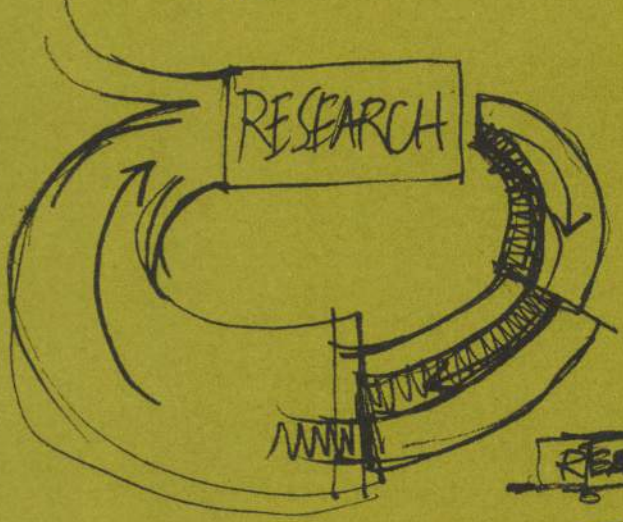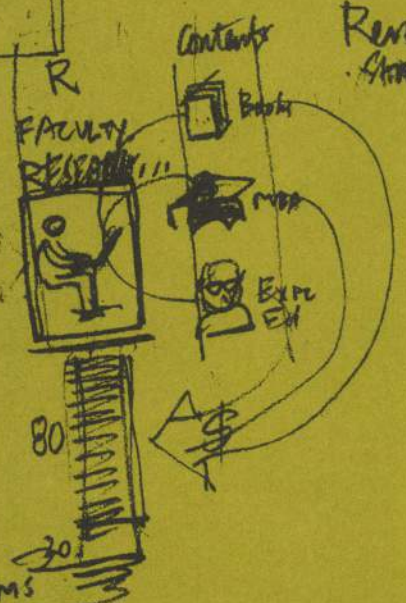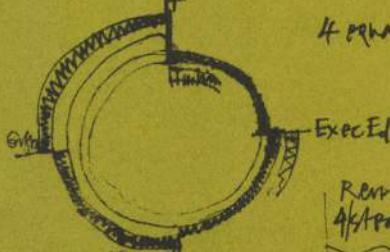
SKETCHBOOKS

NIGEL HOLMES was the information graphics director of *Time* magazine from 1980 to 1994. Now, his company Explanation Graphics clarifies complex information for health, science, and news organizations.

I'm on the 11:33 a.m. train to New York for a business lunch. Frankly, I'm more excited about the train ride than the lunch.

I don't know why the train works so well as an idea facilitator; perhaps it's the fact that I can eliminate distractions: the phone, the ping of a new e-mail, or the fridge. Actually, I think the movement of the train promotes new thoughts. The gentle jiggling wiggles my pencil as I draw, leading to many of the drawings being shaky; they can't be considered as anything other than very rough roughs. But I can concentrate on the idea behind the drawing, not what it looks like.

I carry just a few drawing tools with me: a pencil with an eraser, a pencil sharpener, and a red or blue pen. My notebooks are homemade. I use the colored pens as I do in many of my diagrams and charts—as an explanatory second color, on top of the pencil drawing.

I'm deep into the elements of a chart I'm working on. How best to show the information about an Ivy League college's business cycle in a way that isn't just a table of numbers?

I'll try many different versions. Some are completed quickly, just to try out different ideas. Others are abandoned. It's the equivalent of the old movie cliché of an author who types one line then rips the paper out of the typewriter and crumples it up. Except that I don't throw anything away: there may be the germ of an idea in there that I don't see at the time or don't need for this particular job. My sketchbooks are filled with false starts.
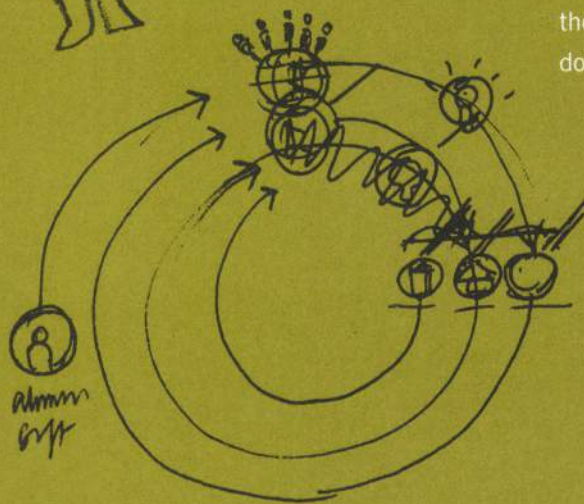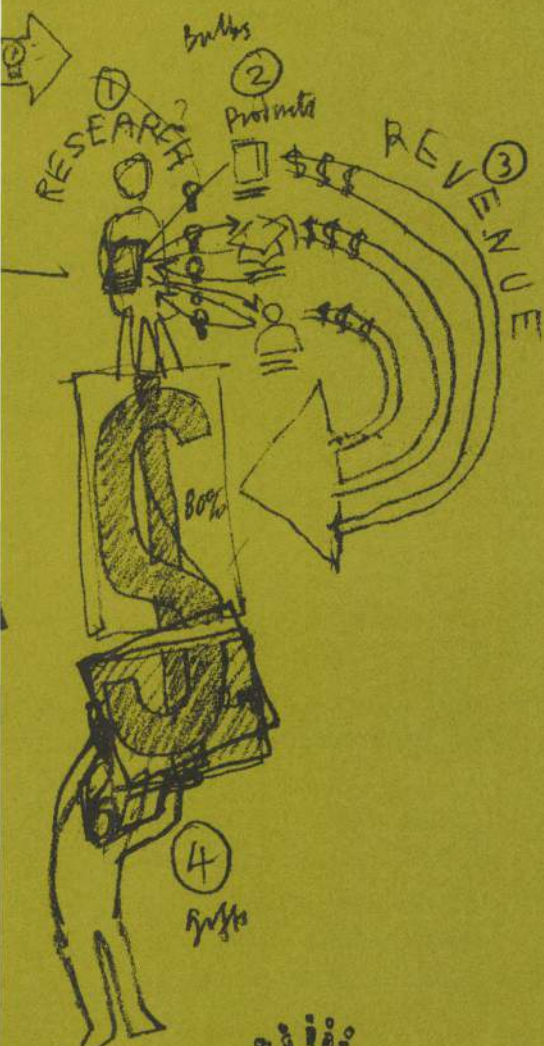
notational sketch structure

Simple structures such as grids, matrices, columns, and lists can be useful tools for your notational sketches, especially for recording an inventory or exploring through an iterative sequence of variations to an idea's form. Structure in composition establishes an ordered hierarchy that supports accessible reading. Section 4 gets into more detail on the use of structure as part of its focus on explaining ideas to yourself and to others.

Keep pages simple and open. From an early age we are taught to start at the top of a page and fill it completely with whatever we are writing. It is better to throw this concept out when making notational sketches. Each sketchbook page should contain one complete idea or theme as its focus. While you should aspire to fill your pages, try not to cram different, multiple ideas into a single tight space or it will be difficult to review your work. Leave some white space for visual breathing room and the potential to add further comment at a later date.

Use layout structures for iteration. Applying a structure such as a grid, matrix, or continuum to a page layout is useful for iterative exploration where the goal is to formally consider a range of possibilities. The content of these structures can either be a random assortment of options to a single idea or an evolutionary range. In most industrial-design sketching, the primary subject is rendered in progressively increasing level of fidelity from top left to bottom right. Complexity and rigidness to these structures is dependent upon your needs; sometimes a simple horizontal line with a title for the page is enough of a structure to build around.

Strive for organized chaos. Unless you are using structure as a tool for iterative exploration, don't overplan the pages of your book with structure or it will turn drawing into too conscious an act. Keeping the visual development of your pages organic is important for preserving the level of "play" that supports an active—and enjoyable—thinking process.

top 10 characteristics of good sketching behavior

Inspiration for ideas can happen anywhere at any time. Being able to capture ideas quickly as they occur may mean the difference between remembering and forgetting. This is perhaps why the pocket sketchbook is regarded as such a good format for notational and exploratory sketching. If you are looking for a good sketchbook, choose one that is small, is lightweight for travel, and can withstand a fair amount of use. Some people even make their sketchbooks by drawing on letter-size paper and binding them later.

1 NEVER OUT OF SIGHT

YOUR SKETCHBOOK IS YOUR COMPANION WHO TRAVELS WITH YOU EVERYWHERE; YOU NEVER KNOW WHEN YOU'LL HAVE THE NEXT BEST IDEA. IF FOR SOME REASON YOU FORGET YOUR SKETCHBOOK AND HAVE A NEED TO DRAW, LOOK FOR NAPKINS AND LOOSE PAPER THAT YOU CAN TAPE INTO YOUR SKETCHBOOK.

2 FOCUS ON THE IMPORTANT

EACH PAGE SHOULD CONTAIN A COMPLETE IDEA OR THEME. THIS HELPS TO FOCUS YOUR SKETCHING ACTIVITIES AND PROVIDES BETTER ACCESS WHEN REVIEWING YOUR BOOKS AT A LATER DATE.

3 4 ITERATIVE SKETCHING

ONE DRAWING WILL NEVER TELL THE COMPLETE STORY; TRY MULTIPLE VIEWS, OR EXPLORE THE SUBJECT FROM A VARIETY OF VANTAGE POINTS OR FROM MULTIPLE ANGLES.

ROUGHLY ROUGH

METICULOUSLY MASSAGING THE SURFACE OF THE PAPER WITH A PENCIL IS NOT THE GOAL OF DESIGN DRAWING. WORKING IN A "ROUGH" MANNER WILL HELP YOU TO GET IDEAS DOWN QUICKLY. ROUGH, HOWEVER, DOES NOT MEAN CARELESS, SLOPPY, OR INACCURATE SKETCHES— RATHER, LOOSE, EXPRESSIVE SKETCHING THAT MAINTAINS CORRECTNESS OF FORM.

5 FILLING THE PAGE

DON'T ABANDON SKETCHES IF THEY DON'T LOOK GREAT INITIALLY. KEEP WORKING ON THEM UNTIL THEY TAKE SHAPE. USE THE PAGE TO TRY ALTERNATIVES AND TO REDRAW THE SAME SUBJECT IN DIFFERENT MEDIUMS OR BY USING DIFFERENT TECHNIQUES.

6 WORDS AND IMAGES

THINK OF YOUR SKETCHBOOK AS A JOURNAL OR A SCRAPBOOK THAT INCORPORATES NOTATION, NARRATION, PHOTOGRAPHS, AND FOUND ELEMENTS TO SUPPLEMENT AND ENHANCE YOUR SKETCHING.

7 CUTTING AND PASTING

YOUR SKETCHBOOKS WILL CONTAIN THE SEEDS OF GREAT IDEAS THAT TURN INTO REAL PRODUCTS AND SYSTEMS. ONCE THE PROJECT TAKES FORM, PRINT OUT SOME SAMPLES AND TAPE THEM INTO THE SKETCHBOOK SO THAT THE BEGINNING AND END OF THE DESIGN PROCESS ARE REPRESENTED.

8 ARCHIVE AND REVISIT PERIODICALLY

SHELVING AND ARCHIVING YOUR SKETCH-BOOKS IN AN ACCESSIBLE WAY WILL ENABLE YOU TO PERIODICALLY REVISIT OLD IDEAS AND SPARK YOUR IMAGINATION FOR NEW AND FUTURE ONES.

10 ENGAGE OTHERS

WHENEVER YOU HAVE A CHANCE TO SIT DOWN WITH SOMEONE ELSE AND SKETCH OUT SOME IDEAS, TAKE ADVANTAGE; IT WILL BE ENLIGHTENING AND FUN.

9 SHARING

ALTHOUGH SKETCHBOOKS ARE FOR PERSONAL AND PRIVATE USE, THE OCCASIONAL PUBLIC DISCLOSURE TO FRIENDS AND COLLEAGUES MAY YIELD A POSITIVE EFFECT AND GET YOU MORE COMFORTABLE SHARING YOUR IDEAS.

putting it all together

In this section, we have described simple techniques for getting the most out of your visual notes. We view notational sketching as a highly personal and informative process that helps you to better understand your ideas—with better understanding comes better explanation, where you share your ideas with others. As you draw for yourself, to understand your own ideas, consider if someone else can make sense of them. Although you may be working quickly to capture ideas, remember that good craft and organization has as much to do with building understanding as does the content in each sketch.

When we are sketching to record and explore our ideas, we usually find that our mind works faster than our hands—that we have too many ideas to capture. Rather than trying to capture everything all at once, be selective and trust that through drawing you will capture enough to seed further thinking. We often describe the flood of ideas as a raging river carrying all sorts of trees, tires, objects, and animals downstream. It is impossible to pull all of these things from the river, but it may be possible to pull a key selection of them. Notational sketching provides the opportunity to make this selection meaningful and make parallels between ideas. You may also find that capturing fewer ideas allows for greater depth in their development and deeper connections that bring opportunities.

WHILE YOU SHOULD ASPIRE TO FILL YOUR PAGES, TRY NOT TO CRAM DIFFERENT, MULTIPLE IDEAS INTO A SINGLE TIGHT SPACE OR IT WILL MAKE IT DIFFICULT TO REVIEW YOUR WORK.
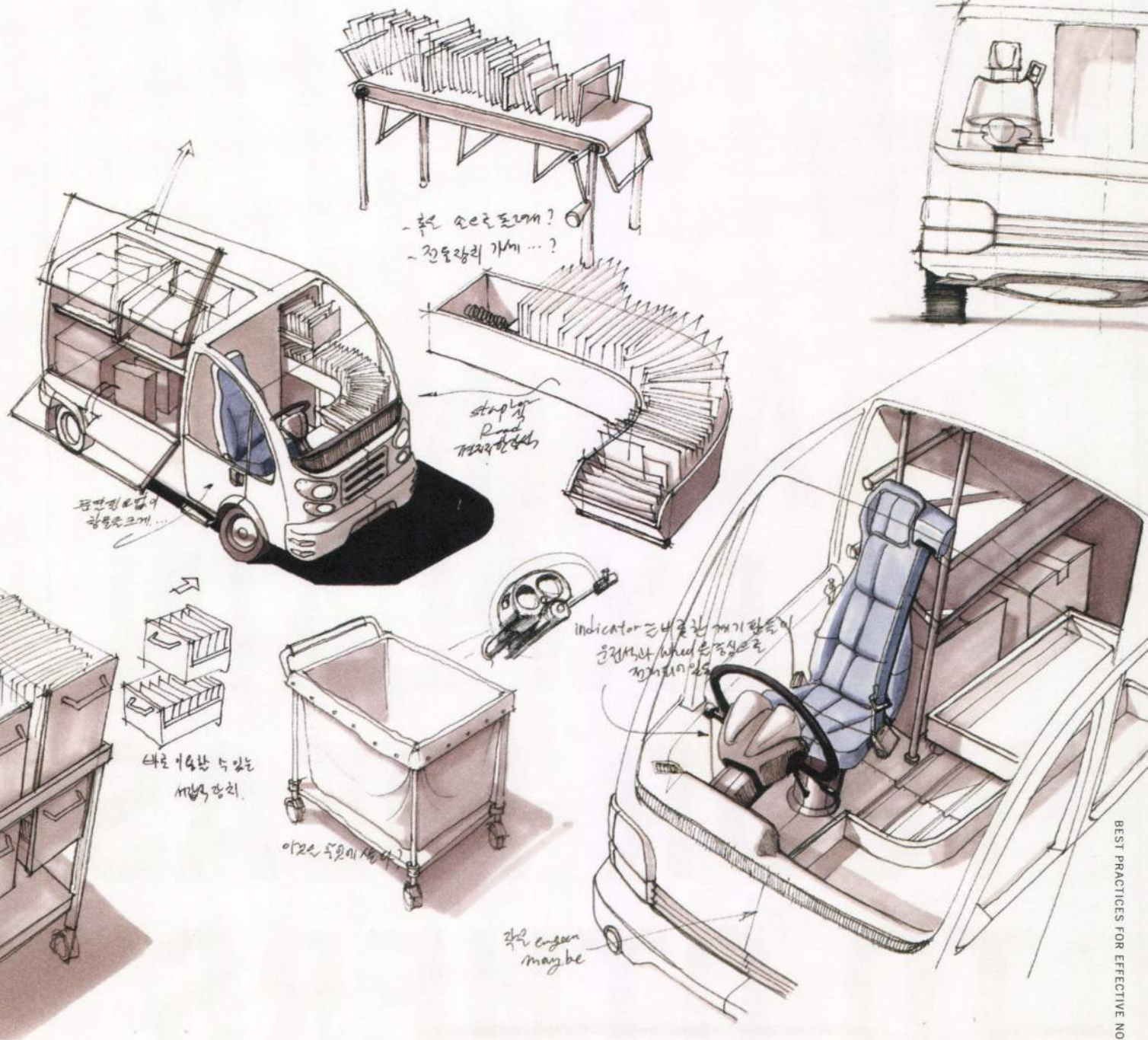
- 혹은 손으로 돌려서?
- 전동정리 가게 …?

strip 넣어 Rood
펼쳐진 한입니

indicator 로 써줄림 꺼기 팔속의
운전자와 wheel 은 중심으로
꺼거리의 없슴

단면만 이렇어
완충으로 크게 …

내로 거6한 수 있는
새납정리.

이건 도움이 생겨?

작은 engine
maybe

4

DRAWING TO EXPLAIN YOUR IDEAS TO OTHERS

IN THIS SECTION, WE LOOK AT USING EXPLANATORY SKETCHING TO organize and present your ideas. Whether it is a network diagram drawn on a meeting white board or a presentation sketch of a product idea, these visual explanations involve "sense making": communicating an idea—be it object, activity, or information—in an accessible way that permits an audience to understand its nature and significance. This section describes ways to enhance the clarity and compelling nature of your drawn explanations.

When we explain ideas, we enter a realm where the appearance and organization of a drawing becomes important. To be effective communications, explanatory sketches need to clearly show the character (shape, form, features, and so on), patterns, and contextual relationships (reasons, causes, interactions) that define a subject. In other words, organization is an important expression of your point of view. By nature of choice, your presentation's form highlights certain qualities while obscuring others. Getting people to see and agree with your point of view requires thought about how your sketch's content, structure, and layout can be crafted to support understanding and persuasion. An approach to explanatory sketching should include three key steps: planning, developing a graphic structure, and composing a visual layout.

Carefully consider your objectives and approach behind your explanatory sketch. You should be aware of how structures within a sketch and their characteristics help communicate your ideas.

PLANNING YOUR EXPLANATORY SKETCH

THE IMMEDIATE DESIRE with any explanatory sketch is to start drawing and "figure it out" as you go along. Spontaneous sketching may yield interesting possibilities while exploring ideas, but it produces unreliable results for visual explanation. Taking the extra moment to think and plan promotes more efficient drawing and produces more effective, articulate sketches—something any audience will appreciate.

PLANNING

DEVELOPING A GRAPHIC

CONTENT

AUDIENCE

MESSAGING
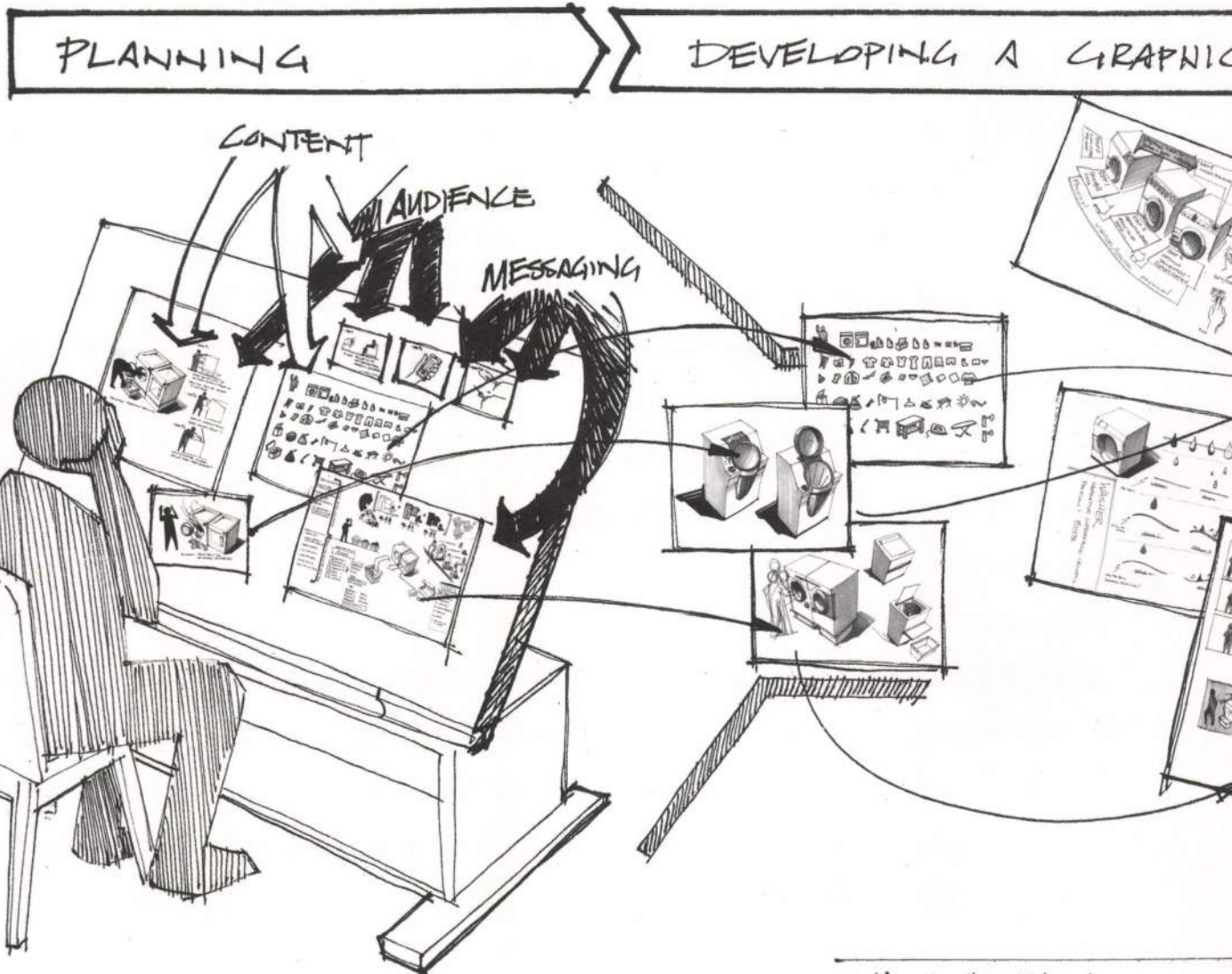
WHAT AM I TRYING TO COMMUNICATE?

WHAT ARE THE VARIOUS PIECES/PARTS, ASPECTS + DIMENSIONS?

HOW MIGHT I PRESENT THIS FOR OTHERS TO UNDERSTAND?

STRUCTURE > COMPOSING A VISUAL LAYOUT

Dynamic Movement
(INTERACTION/REACTION)
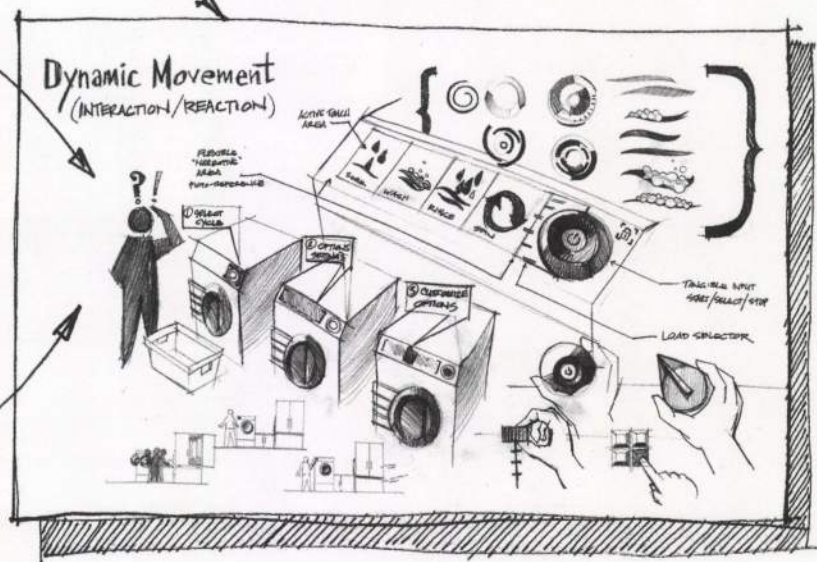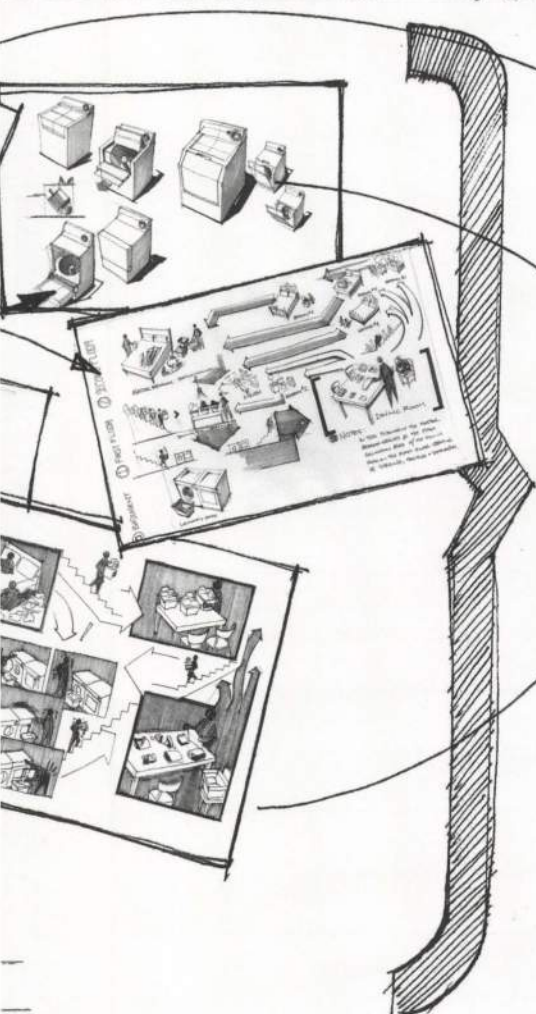
WHAT IS THE BEST WAY TO SHOW THIS?

WILL THE AUDIENCE GET IT?

inventory what you know
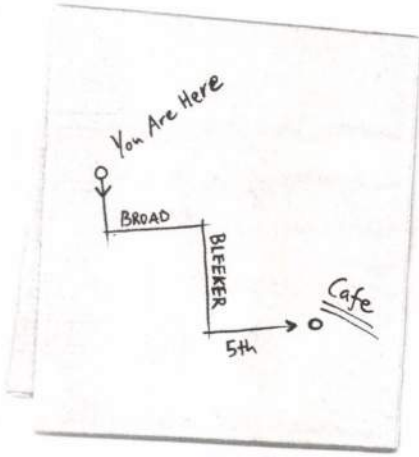
Start with a text checklist inventory of what you know. Methods of information gathering, such as the "5W's and H" (who, what, where, when, why, and how) are simple and practical means to build a list of possible information you can use to describe objects, people, situations, or idea concepts.

Once you have an inventory of potential information to include in your explanation, next consider complexity. Simple, visual explanations are easy to create when the information and graphic structure are obvious. For example, to visually explain "Where is the café?" we draw a map showing geography and position. Further information adds detail to increase context and relevance, such as a "you are here" marker and a directional route line of how to get there.

PERSPECTIVE		DESCRIPTION
Who		Characters, entities, organizations
What		Activities, objects, quantities
Where		Geography, relative position, hierarchy
When		Time frame, sequence
How		Connection, method/mode
Why		Objective, motivation

In contrast to such a simple visual explanation, most of our ideas often involve complex, multiple aspects we wish to explain and not just describe. But time is an issue when it comes to presentations. An inventory of information offers little guidance for building clarity and persuasion when we are dependent upon audience attention span and understanding. Great visual explanations of ideas for products, services, or beliefs involve compact, organized arguments that show relevance and value. To build an effective, efficient explanatory sketch we need to look at information through three core elements for idea communication: content, audience, and message. Understanding these elements and their interrelationship offers insight into developing clear, accessible visual explanations that persuade audiences.
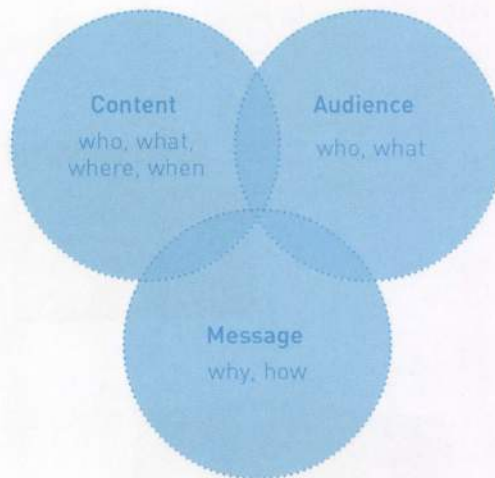
UNDERSTAND YOUR CONTENT

Your content is a collection of facts, figures, data, or information associated with your idea. Understanding content involves having a strong grasp of not only this collection and the relationships between its parts but also how external relationships define the content's perceived shape, character, and role through context. This should be a basic, not exhaustive, process. Recognize your content relationships enough to digest down to the essentials, editing out irrelevant or redundant information while also filling any potential gaps that may exist.

Observation and notation are effective ways to gather an understanding of your content and gain insight into what it is and what it is not. Start with a summary review of your recorded notes, exploratory sketches, and other sources of information. Putting all content in view using a table, wall, or pinup board to spread out inventory and sort your material can help you identify commonalities, associations, underlying patterns, anomalies, and holes.

Content
who, what, where, when

Audience
who, what

Message
why, how

LACK
OF
SINAGE

Structure

Flow ⭐⭐

No
Map

Lack of
Organization

ENTRANCE
LOCATION

NEEDS
IDENTIFER
OUTSIDE /
INSIDE 1st
SET IF DOORS

too Much
all at once

Bad flow
f traffic

Museum
Exit →

Directing Flow
of visitors

Hard to
fine Museum
w/out help

CLUTTERED

not well
organized

FLOW
THROUGH

DIFF. GALLERY
SPACES

NO
MAPS!

IMG_1870.JPG

NO
SEQUENCE

IMG_1840.JPG

UNKNOWN
FLOW

THIS WAY
TO THE Museum

IMG_2158

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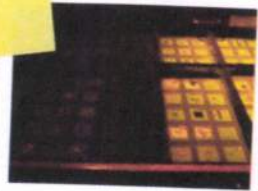
KNOW YOUR AUDIENCE

Your viewers are defined by their abilities, preferences, and experiences. Knowing your audience is about recognizing what conditions may affect viewing and comprehension of your explanatory sketch. Your audience has physical needs (for example, vision, reading comprehension, capacity) and cognitive states (frustrations, interests, opinions, a body of prior experiences, and so on). Taking time to know your audience and consider its needs might seem an impossible task given that explanatory sketching can be fast-paced. We can't fully know and predict people's behavior; we can, however, anticipate the likely overall condition of our audience and its probable needs.

At a minimum, take a moment before sketching your explanatory sketch to define who your audience is and what they typically need and want. Your audience's condition and interests should help drive your explanation's style and argument.

Audience needs considerations:

- Experience and cultural opinions, such as prior knowledge, preconceptions, or biases

- Cognitive ability, such as reading level and ability to process information

- Physical ability, such as visual acuity and sight line with respect to age

- Emotional state

- Pain points
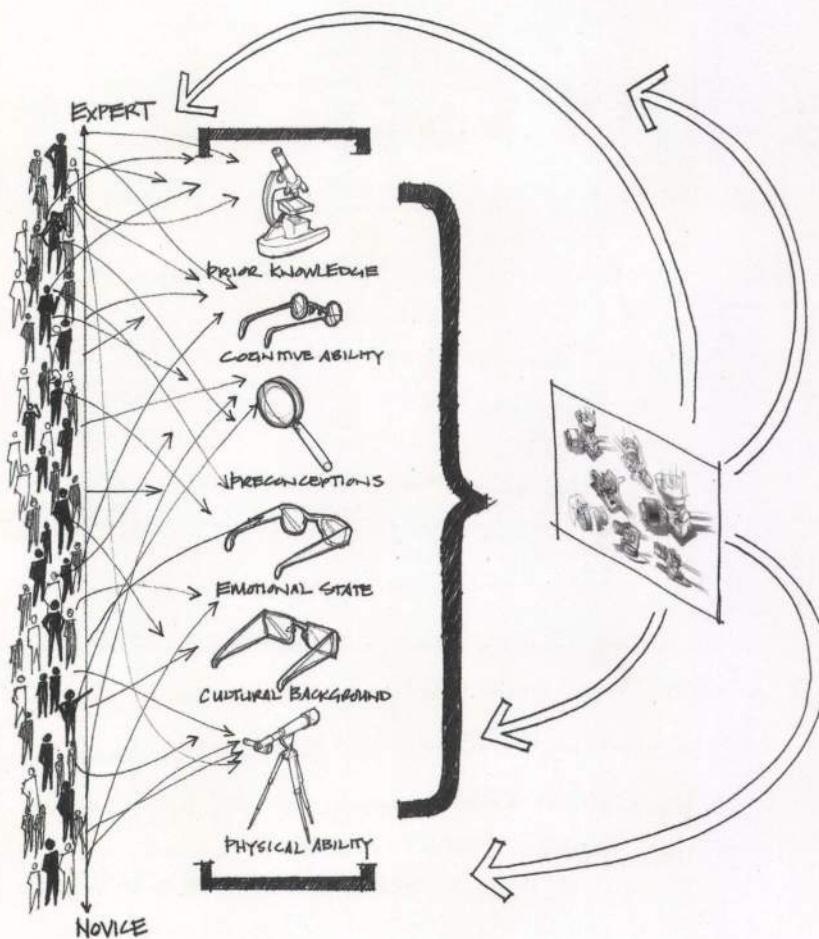
AUDIENCE + LENSES = INTERPRETATION

pain points

A pain point is a source of physical, emotional, or spiritual discomfort for people. For example, bending over to pick something up or pressing a stiff button with difficulty can be considered a physical pain point. Walking through a narrow or dark passage can be an emotional pain point. Identifying these pain points is a way to recognize opportunities for improving the interaction and experience of things. In the context of visually explaining ideas using explanatory sketches, showing pain points is a means to communicate a clear understanding of important audience needs.

FIND YOUR MESSAGE

Chances are you already know generally what you want to say, but have you taken the time to define it well? To be effective, your explanation needs to express your idea with a clear, well-defined message that specifically frames how you want someone to see an idea. Finding your message is about confirming and prioritizing simple objectives for your explanation (for example, reduce energy use, prevent forest fires, show car efficiency). It often helps to jot down a simple message statement before sketching your explanation. Like a company mission statement, an explanation message statement can help clarify your communication objectives and priorities (even before you consider how they relate to your audience's needs and interests). Message statements can be a written sentence or paragraph, doodle, or bulleted list that captures the reasoning for why/how you plan to explain your idea. This is an important precursor to creating an effective argument.

Data
Energy loss/use in a car

61%
19%
7%
5%
5%
3%
Accessories, friction etc.
0 10 20 30 40 50 60 70 80
(Boring)

So little energy makes it to the wheels!
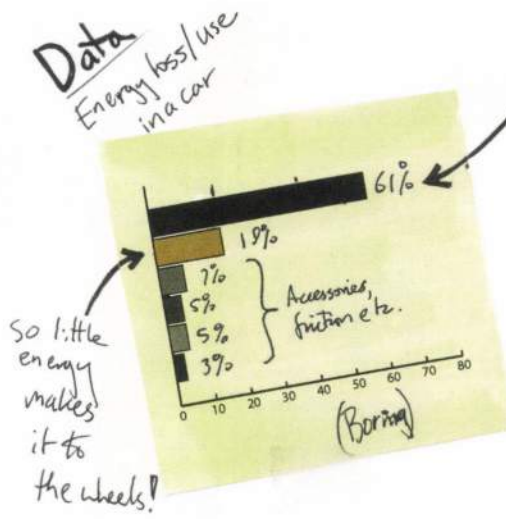
Engine thermal loss   X 3
So much energy lost as Heat
Over 3 times as much that makes it to the wheels.

The real question is what be done with all that heat?
What engines use heat as an energy source?
Furnaces, locomotives, Boilers, hmm.

Other @1x
gas in
3X Waste
1X Movement
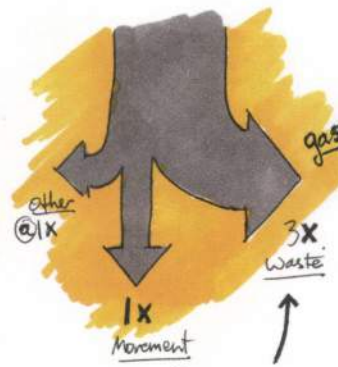
Visual Comparison of these amounts are key.
But how do you make it interesting to look at?

Energy out!

This gets too technical and complicated to look at
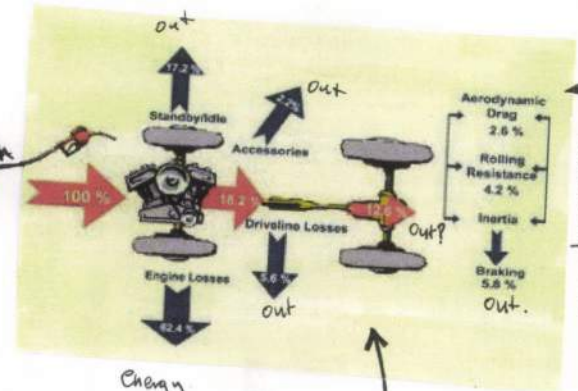
trouble with this graphic is that you don't get a sense of the relative size

SHOW IN A CAR WHERE THE ENERGY FROM FUEL GOES IN A WAY THAT HIGHLIGHTS:

1.) RELATIVE AMOUNTS OF ENERGY (VISUALLY REPRESENT)
2.) HOW MUCH ENERGY IS LOST AS HEAT (A LOT - 61%)
3.) HOW MUCH ENERGY ACTUALLY MAKES IT TO THE WHEELS (A LITTLE - 19%)

Of the energy put in a car with fuel...

5% **Power Steering, Water Pump, Alternator**

61% **ENGINE THERMAL LOSS**

3% **Combustion Inefficiency**

7% **Pumping, Friction**

5% **Drivetrain, Transmission**
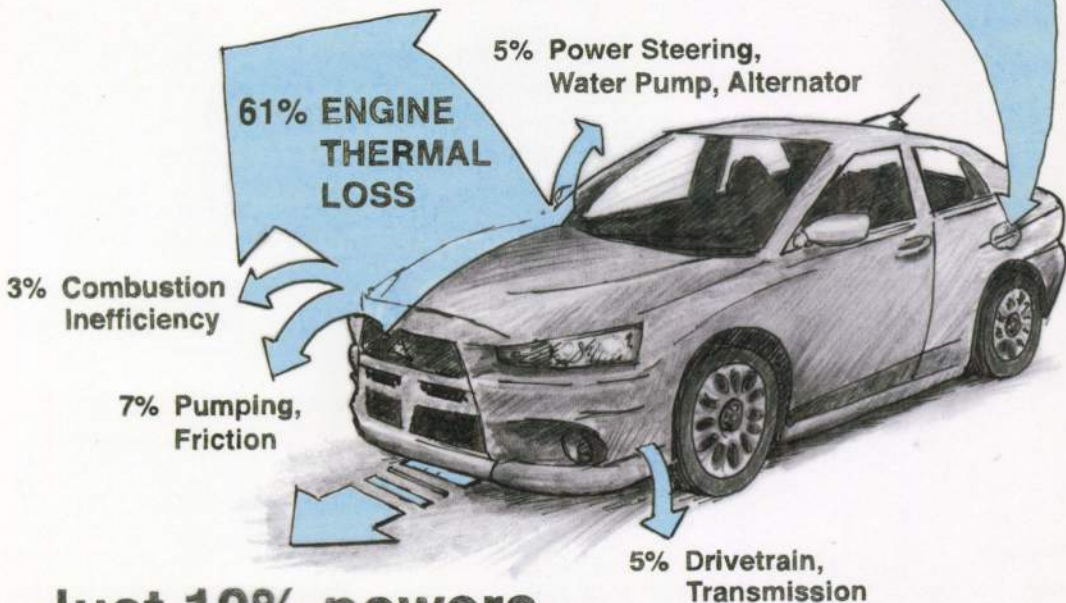
...Just 19% powers the wheels and makes the car move

Which makes us think... With all that heat, maybe cars should be steam powered?

Good explanations also pose questions. Keep in mind that your explanatory sketch's message can be a prompt for inquiry. Explanations that reveal unanswered curiosities of fact are especially engaging. An explanatory sketch can serve as a platform for conversation. Don't be afraid to call attention to loose ends and issues that can spark further investigation.

Once you understand your content, audience, and message individually, consider their relationship (i.e., message–audience, content–message, content–audience). These relationships provide insight to their mutual influence, such as how the type of audience affects your choice of message. Supporting interaction between the three core elements of idea communication augments the clarity, accessibility, and persuasion in your explanatory sketch.

Greek philosopher Aristotle proposed that a presentation's argument is most persuasive when it includes a balanced mix of three appeals: logos (logical), ethos (ethical), and pathos (emotional).

Accessibility.
Navigation

Content   Audience

Focus,
Accuracy   Message   Value,
Persuasion
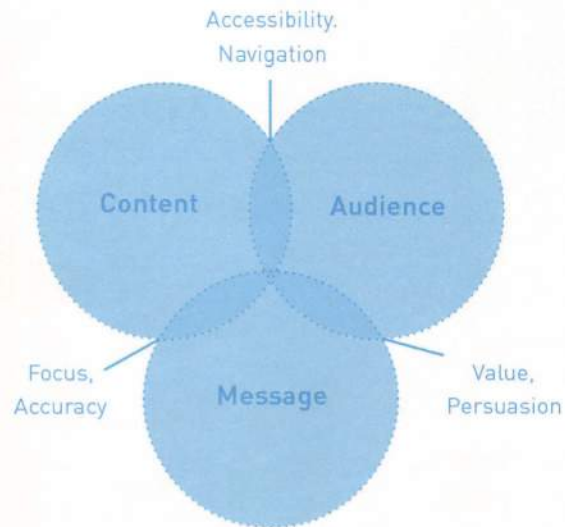
MESSAGE–AUDIENCE

The message–audience relationship is key for promoting your ideas through explanation—it is the primary source for argument. What parts of your message does the audience perceive as relevant and significant? Persuasive argument includes a comprehensive mix of:

- Logical appeal by means of clear statements of facts that are seen as objective truth. Persuasiveness comes from a rational demonstration of subject knowledge.

- Ethical appeal by means of qualities that elicit trustworthiness, such as a sense of character authority with respect to topic or a relation between source and audience. Persuasiveness comes from a demonstration of relevant credentials and/or personal familiarity (i.e., the speaker can be identified with).

- Emotional appeal by means of aesthetic qualities that elicit an emotional reaction based on prior experience

and preference. Emotional relevance often resonates empathy and compassion for universal human needs and shared values, such as quality of life.

Forging these three argument appeals as part of a message–audience relationship involves connecting your message objectives to your audience's needs and interests. This can help guide an explanation's development, ensuring that the sketch's argument is compelling and audience-centric.

Showing elements that qualify expertise and authority is a way of drawing ethical appeal.
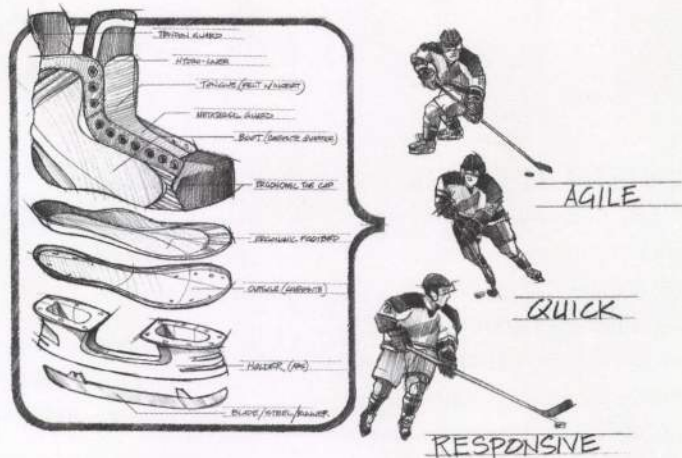
Showing important factual detail such as an object's form and its relationship of parts is a way of drawing logical appeal.

AGILE

QUICK

RESPONSIVE
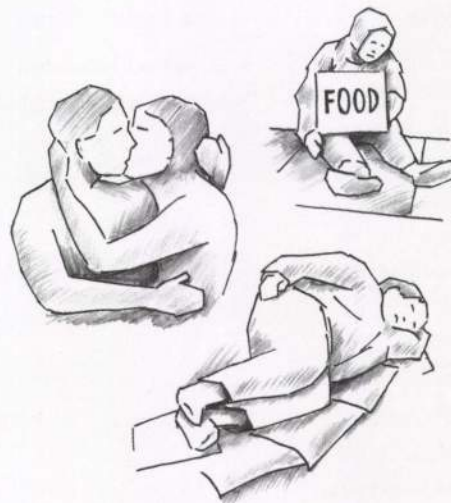
Showing human connection to universal needs and values, often through a contextual story, is a way of drawing emotional appeal.

FOOD
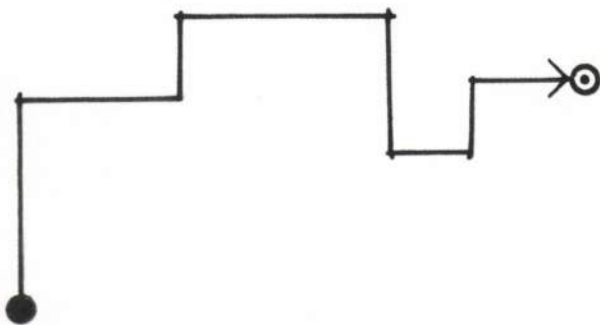
CONTENT—MESSAGE

The content—message relationship involves focus and accuracy. How clear is your message's point of view about the content? Does your content adequately support your message? Your message directs attention to show the content's significance. At the same time, content serves as a message's descriptive evidence. Establishing a strong content—message connection involves finding links between your message and relevant, supporting content, and then using content order as a lens to focus audience attention toward a specific point of view.

There are two types of content you can link to a message. Effective explanatory sketches include a mix of direct content and contextual content.

1. Direct Content

Direct content to communicate the message itself. For example, drawing:

- A route line on a map to show a preferred path through an environment

- Buttons, edges, surfaces, and physical features to describe an object's shape and its interaction points

- A bar within a bar chart to show a specific quantity

2. Contextual Content

Contextual content to provide the relative frame of reference needed to see direct content's significance and meaning. For example, drawing:

- A visual landmark, "you are here" marker, or distance scale on a map for orientation and measurement context of a route line path

- The human figure, hands, the surrounding environment, and other objects (especially related to a system) to show an object's relative scale and use

- Other bars within a chart to reveal the relative magnitude of a highlighted quantity bar
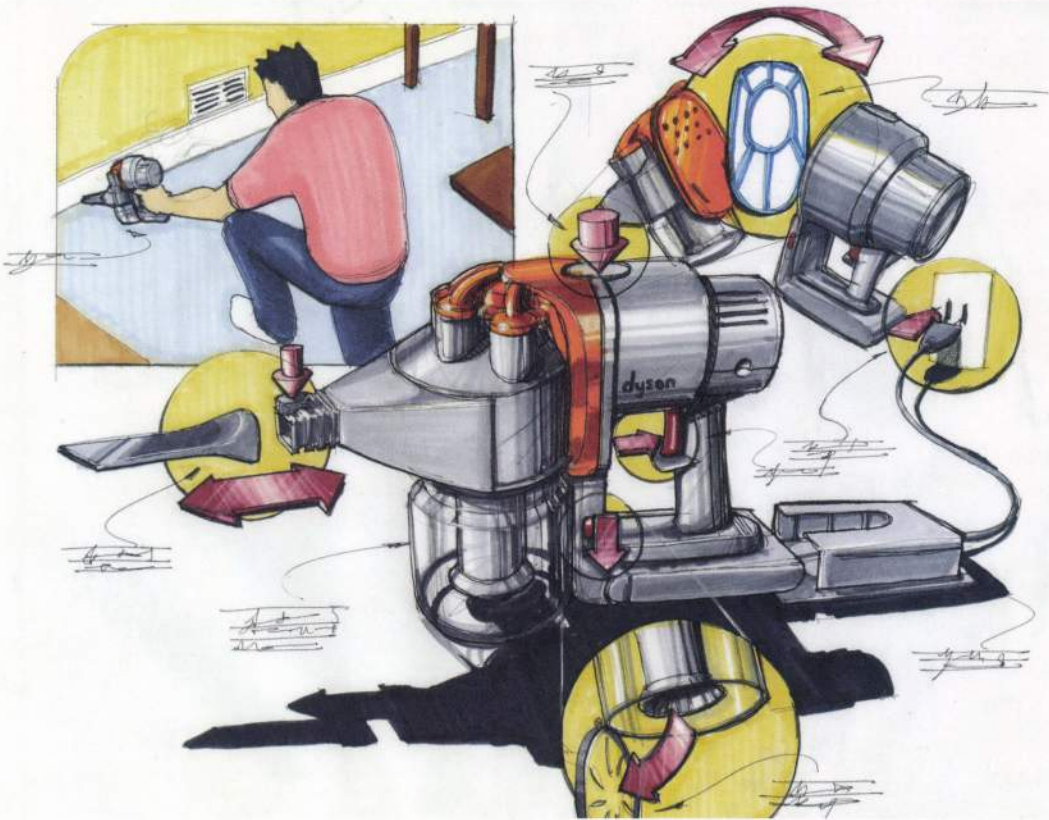
Finding the appropriate balance of direct and contextual content depends upon an explanatory sketch's intended use. Urgent presentations, such as emergencies, warrant an almost exclusive presentation of direct content with minimal accompanying contextual content to reduce reading time. Presentations involving complex or controversial ideas may require a higher degree of contextual content to support understanding of form and significance. As you consider direct and contextual content, ask yourself:

- Is it easy to distinguish between direct vs. contextual content and therefore see the focus of your explanatory sketch?

- Does the amount of contextual content adequately frame and not overwhelm direct content?

- Does the content adequately address the characters, causes, situation, and environment that involve and interact with the subject of your explanatory sketch?

- Does the mix or direct and contextual content adequately support your message?

Showing an object in use blends direct and contextual content.

Ordering Content

Your choice of content order (by time, location, and so on) in an explanatory sketch is a message in itself. Order highlights a desired perspective of content. For example, if we choose to order by time, we focus attention on cause-effect sequence relationships. If we choose to order by location, we focus attention on relative position and distribution. Chosen order guides your audience toward the significance you see in the content, strengthening the content–message relationship. Methods of order can be applied alone or layered together depending on need and specificity of the explanation.

Circle
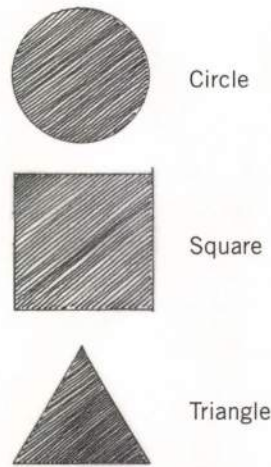
Square

Triangle

Ordering by letters and numbers (alphanumeric sequence, such as the first letter of the words *circle*, *square*, *triangle*) in a sketch focuses attention on words and nomenclature, often in linear fashion (for example, a phone book). Ways to visually show alphanumeric order include lists and indices.

Ordering by location in a sketch focuses attention on relative position, distance, and distribution. Location is useful when explaining the function and shape describing networks and objects.
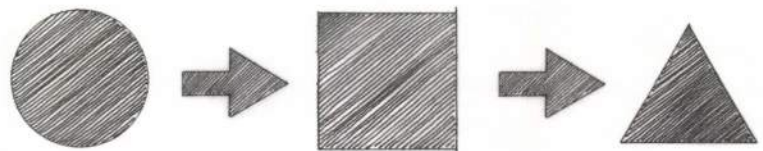
Ordering by time in a sketch focuses attention on changes in state and evolution, including cause-and-effect sequence relationships. There are inherent expectations of linearity and scale involved with time. Ways to visually show time include time lines, storyboards, flowcharts, and action scenarios.
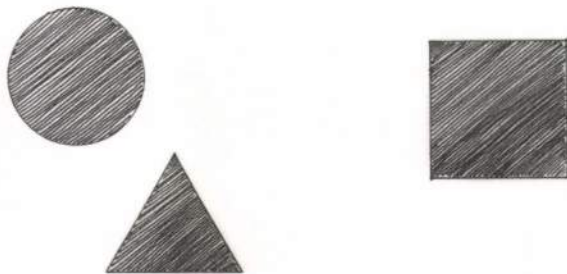
Ordering by category in a sketch focuses attention on objective or subjective variables, such as size, color, shape, and emotion. It is especially useful for showing group associations. Ways to visually show category include graphic coding (color hue, value, shape, size, orientation, and so on) and position.
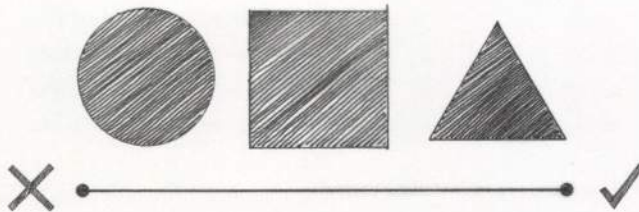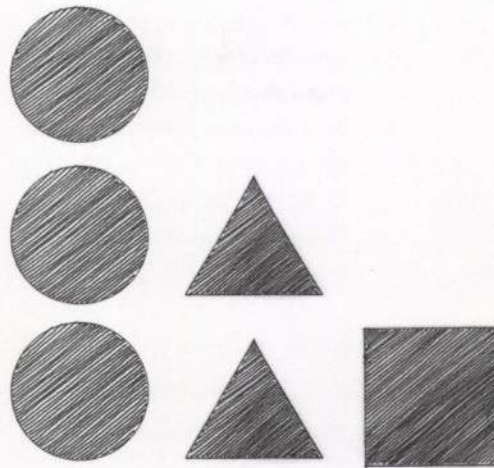
Ordering by continuum/ hierarchy in a sketch focuses attention on scalar relationships (i.e., ranking). Ways to visually show hierarchy in sketching include changes in size, hue, value, and position within a sketch composition. Showing continuum on sketches in an impartial way usually involves horizontal organization to minimize bias.

The five types of content here comprise what is called the LATCH method for organizing information is only briefly described in this book. For a more in-depth explanation about this method and other ways to order and classify information, you should refer to *Information Anxiety 2* by Richard Saul Wurman.

CONTENT–AUDIENCE

The content–audience relationship involves accessibility and navigation. Can your audience easily access the content in your explanatory sketch? Does your choice in content correspond with your audience's knowledge and abilities?

To be understood, your explanatory sketch content has to be conceptually accessible. Establishing a strong content–audience connection involves anticipating how the audience will interact with your content. In the context of planning your explanatory sketch, this means recognizing how an audience's abilities, actions, interest, and knowledge will affect reading and recognition. Ask whether your explanatory sketch content will be:

• Dependent upon the audience's experience and prior knowledge for understanding and meaning. This includes issues such as bias impact, word choice (acronyms, industry terminology, metaphors), and graphic coding types (symbols, icons, and pictograms).

• Considerate of the audience's reading and processing ability, environment, and situation of use (affecting word choice, coding, size, contrast, viewing angle and position, color choice).

• Digestible and navigable in conceptual scale and structure (sentence and graphic complexity; language in respect to age, culture, and disability).

• Absent of confusing redundancies or similarities (visual, conceptual, phonetic, and so on).

If you think your audience may have trouble seeing and understanding your idea content, then consider your choice in content, or take steps to make it more accessible; try streamlining, dividing (with pauses, divisions, breaks), or transforming it through metaphor, or framing comparisons to facilitate comprehension. "Bite-sized" content is friendlier to attention span and working memory. Divisions in your content provide important pauses for your audience to cognitively catch its breath and see meaningful order (a meal is divided into courses with appetizers and dessert, geography is divided and organized by continents); however, too much division can appear fragmented. A good guide to follow is a rule of five to eight: for clarity, divide into and present no more than five to eight separate elements at a time. This applies to groups, codings, bulleted items in a list, and so on.

SALES   CFO CEO   LEGAL   JANITOR INTERN   R+D   IT

The Cloud

Has a dark side...

...without a connection
you can't access your data.

...it makes it easier for
someone to steal your data.

Tips for Using Metaphors: Metaphors are useful to assist memory and express unknown and unseen things using known entities, but they can be tricky. Choose metaphors with care. If you decide to rely on a metaphor, aim for a known basis of comparison that involves:

1. a common everyday thing.
2. a simple, direct comparative match that doesn't add confusion.

If a metaphor requires detailed explanation or selective presentation (i.e., pay attention to this part only), then seek an alternate way to express the original idea.

CHOOSING A GRAPHIC STRUCTURE

AFTER CONSIDERING THE content, audience, and message involved in your explanatory sketch, consider what graphic structures you will use to communicate your idea. A graphic structure is a visual form that provides an architecture for organization, such as a map, diagram, or storyboard. As expressions of content order, graphic structures help explain an object or process by focusing on a desired perception of an idea. This makes graphic structure important to consider as you start sketching. Your choice in structure will play a role in your explanatory sketch's argument and clarity.

SCHEDULE & PL...
requirements, av...
Ensure seamless...

RESOURCES: Optimise human and infrastructure resource allocation to reduce costs and ensure safety compliance.

ORDERS: Increase efficiency in the handling of freight orders.

TICKETING: Streamline ticketing to support a seamless travel experience.

START/PREPARATION: Coordinate train schedule... crew, infrastructure and stationary activities.

PERFORMANCE MANAGEMENT: Analyze post-run data to continually improve transport planning and service levels.

REPORTING: Expedite the submission and analysis of journey reports for statutory, internal and contractor reporting.

etables based on customer
es and cost projections.
transport modes.

PLANNING

POST-EXECUTION

OPERATIONS CENTER

EXECUTION

CLAIMS MANAGEMENT: Complete claims management, from first notice of loss to final disposition, including a flexible risk management information system.

INCIDENT MANAGEMENT: Preventive and corrective. Manage maintenance ahead of incidents. Respond to incidents promptly. Provide timely passenger information.

ACCOUNTING: Pay contractors, administer passenger and incident-related claims and fines.

DISPATCHING: Analyse schedules, select routes, manage stop times and connections, calculate train run forecasts, manage conflicts, respond to changes and incidents with reforecasting, provide instructions for the trains and networks.

METRO

OPERATIONS CENTER

RUN: Monitor train locations, station and onboard security, and manage ticketing and onboard services.

ARRIVAL: Improve on-time arrival and provide an innovative information management system for optimising interconnections.

TURN AROUND: Execute activities to rapidly turn around the service. Manage post-run maintenance, cleaning and safety checks.

graphic structure qualities and considerations

Between maps, diagrams, storyboards, time lines, charts, wireframes, renderings, and many others, there is a daunting array of graphic structures from which to choose. The visual variety of these options makes comparison of graphic structures difficult. To best understand and evaluate graphic structures, we need to look at how their qualities dictate their role and effect in an explanatory sketch.

With graphic structures, two principal qualities to consider are abstraction and formality. Abstraction involves the degree of accuracy and distortion in its representation of a subject. Formality involves the degree of explicit character and structure in a subject's appearance. Each graphic structure involves different levels of abstraction and formality in its presentation. A diagram is more abstract than a map. An isometric diagram is more formal than a wireframe.

Since levels of abstraction and formality are scalable, the distinction between some structures can blur (such as a map vs. a diagram). It is therefore important to look at graphic structures with some flexibility to their definition. Leaving room for adjustment (map or object drawn with diagrammatic qualities) allows us to follow an unspoken rule of thumb that should guide development of any explanatory sketch: For efficiency with respect to your time spent sketching and the audience's attention span, be as representational as necessary but no more. Be as formal as necessary but no more.

LOW ABSTRACTION ——————————— HIGH ABSTRACTION

FORMAL ——————————— INFORMAL

1

negative space is IMPORTANT!

U

Adrian Frutiger

Realist Sans Serif

Helvetica
Gill Sans
Univers

Geometric Modernist Sans Serif:

Kabel
Avant Garde

← Futura

Univers

Alternate Occupations

Usages

Greek	Didone	Slab Serif	Sans Serif	Transitional	Garalde	Venetian Old Style
Minion	Bodoni	Lucida	Univers	Baskerville	Garamond	Berkely
Lithos	Century Schl	Officina	Helvetica	Bookman	Weiss	Centaur
		Melior	Kabel	Caslon	Sabon	
			Verdana	Mrs. Eaves		
			Gill Sans	Times		
			Avant Garde			
			Futura			

thumbnail your graphic structure possibilities

To consider graphic structure options efficiently, it helps to create quick thumbnail sketches. Taking a moment to visually see your option in rough form is a way to quickly evaluate structures without much effort.

2

Univers

Adrian Frutiger 1957

Switzerland
Europe

Realist Sans Serif

Helvetica
Univers
Gill Sans

Geometric Modernist Sans Serif

Kabel
Avant Garde
Futura

Univers Lt Std
ABCDEFGHI
JKLMNOPQ
RSTUVWXYZ
abcdefghijk
lmnopqrstuv
wxyz...
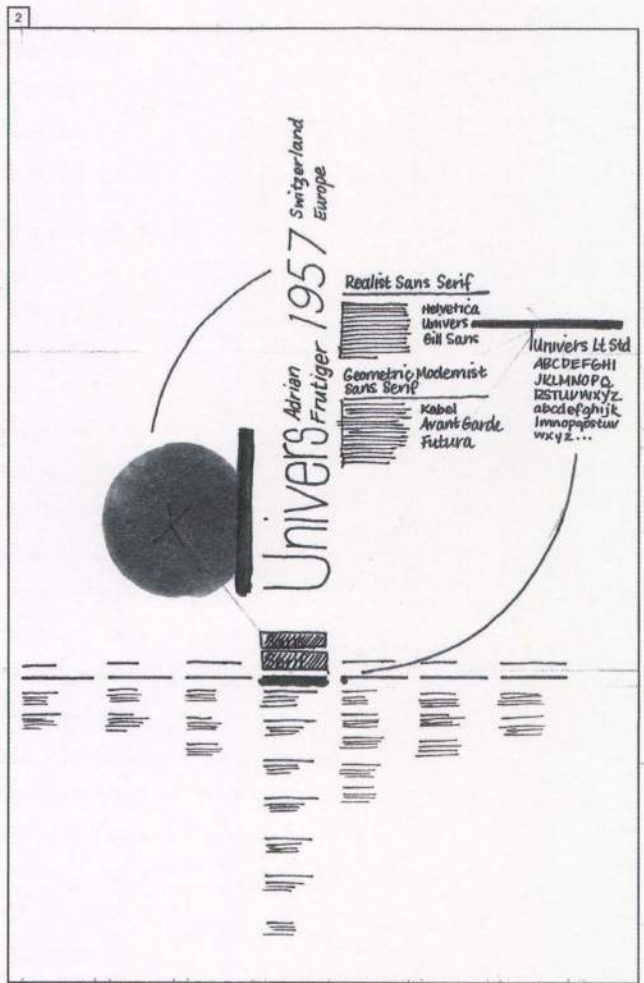
sketches, schemas, proxies, models

When we look at abstraction and formality together, we see four effective roles that graphic structures can play in an explanatory sketch. These roles are sketch, schema, proxy, and model.

- **Sketches** are informal yet representational forms that produce suggestive, evocative drawings through their rough, selective reveal. They include wireframes, doodles, and ideation sketches in which there is less expectation about completeness and precision.

- **Schemas** are informal, abstracted forms that eschew detail for a simplified, summary view that draws attention to conceptual relationships. They include conceptual frameworks, mind maps, and storyboards in which a loose overview assists memory (see A Few Types of Common Graphic Structures on page 204).

- **Proxies** are formal yet abstract representations used as a substitute presentation to show design aspects such as composition and sequence. They include stylized, highly structured presentations, such as orthographic views, information architecture site maps, and blueprints in which consistency supports instructional reading.

- **Models** are formal, representational forms that faithfully describe an idea in a literal, factual manner. They include highly descriptive and precise renderings, mock-ups, and concept models in which the expectation is for accuracy and detail.

Considering the role a graphic structure plays in your explanatory sketch will help you choose a structure that responds to content–audience–message considerations, discussed on pages 182–188. It can also help us see how we can shift the qualities of a structure to better support an explanation. For example, is a high degree of focus and accuracy needed to support the explanatory sketch's content–message relationship? The need for added focus may move you toward lower abstraction and less formality (a sketch role). A need for added accuracy may move you toward lower abstraction and greater formality (graphic structure in a model role). If audience engagement and persuasion is of primary concern to support a message–audience relationship, you may shift toward lower abstraction and less formality to be evocative (a sketch role). A need for more persuasion may move you toward lower abstraction for clearer logical appeal and

less formality for emotional appeal (sketch role) or lower abstraction and more formality for ethical appeal (model roles). Is conceptual accessibility and navigation particularly important for supporting a content–audience relationship? A need for greater accessibility and ease of navigation may move you toward higher abstraction and more formality to methodically direct attention (a proxy role).

Keep in mind that while role recommendations such as these are great ways to respond to needs you identify while planning your sketch, they are not absolute formulas. Also, it is possible to include multiple graphic structures in your layout if needed. What roles offer is a big-picture perspective of function.

[INFORMAL]

SKETCH

SCHEMA

· IDEATION
· WIREFRAMES
· DOODLES

· CONCEPTUAL FRAMEWORKS
· MINDMAPS
· STORYBOARDS

LOW ABSTRACTION

HIGH ABSTRACTION

MODEL

PROXY

· RENDERINGS
· MOCK-UPS
· CONCEPTUAL MODELS

· ORTHOGRAPHICS
· SITE MAPS
· BLUEPRINTS

[FORMAL]
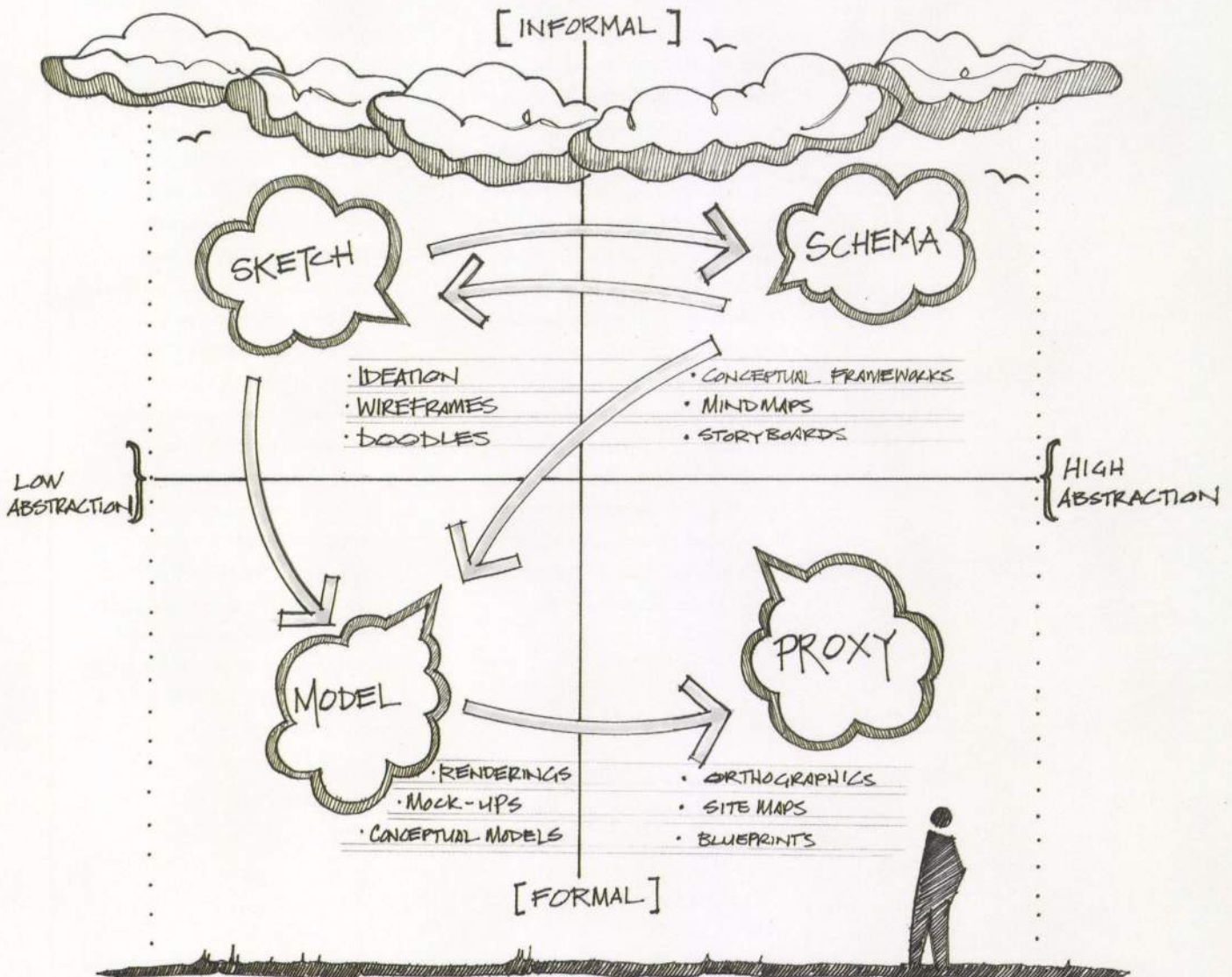
abstraction

If we look in more detail at abstraction as an adjustable quality of graphic structure, we see it involves fidelity—the degree of accuracy in description. The importance of abstraction as a useful tool for explanatory sketching is clearest when comparing maps and diagrams. The degree of abstraction affects how audiences perceive an explanatory sketch's content and message.

MAPS

The graphic structure of a map comes with an expectation of accuracy. Audiences view maps as accurate, representational accounts of environments, objects, and information. Unless contradicted by what is seen or known, a map's associations with the physical world (features, interactions, distributions, and relationships) cause them to be relied upon as fact. As maps and object renderings demonstrate, we can use less abstraction to persuade through a logical appeal in argument, relying on detail as evidence of our credible knowledge. The more literal and concrete we are in detail and structure, the greater the audience's assumption and belief in accuracy will be.

DIAGRAMS

Diagrams are functionally not very different from maps. They describe interactions, distributions, and relationships, but their artificial style and level of detail suggests reductive, symbolic representation. Diagrams come with an audience expectation of efficiency with a directed, distilled view. As diagrams demonstrate, we can employ abstraction to focus attention for clarity and memorability. Flexibility to deviate from reality and use of a stylized visual vocabulary provides freedom to present ideas and physical forms in revealing yet nonrepresentational ways. A diagram, mind map, or blueprint presents information in an artificial way to describe essential relationships in a simplified fashion. An exploded diagram of an object provides insight through a constructively distorted view that is not normally possible.
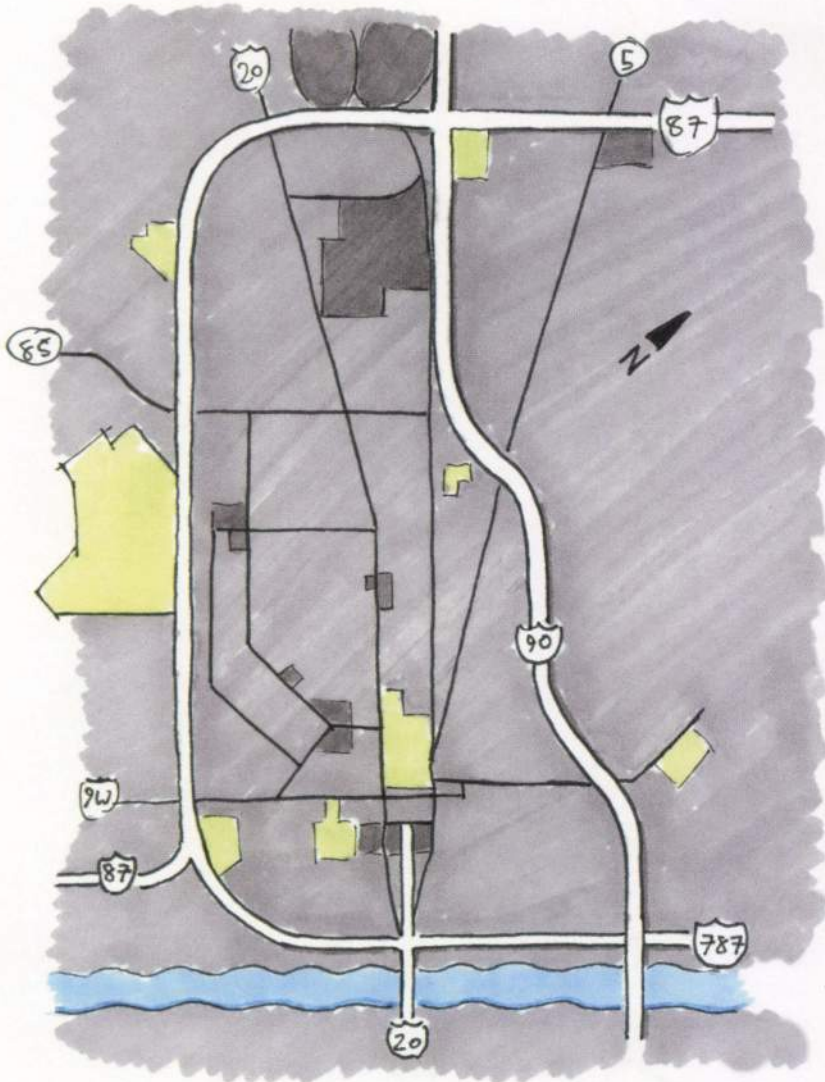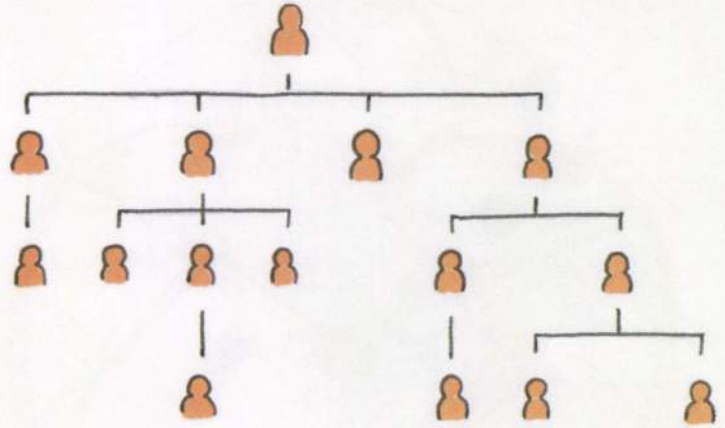
DIAGRAMMATIC MAPS

Hybrid "diagrammatic maps" best demonstrate a "middle ground" of partial abstraction to enhance visual clarity and memorability. Limited distortion is the mapmaker's true friend. Simplified curves, lines, and other features can be modified to memorably reveal appealing geometric patterns. Streamlined shapes and route lines can facilitate the audience's ability to read and understand.
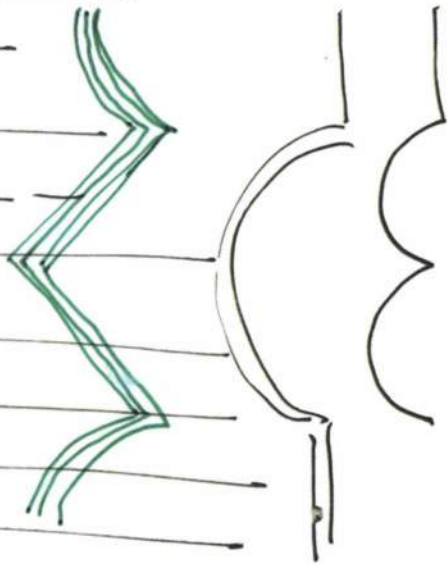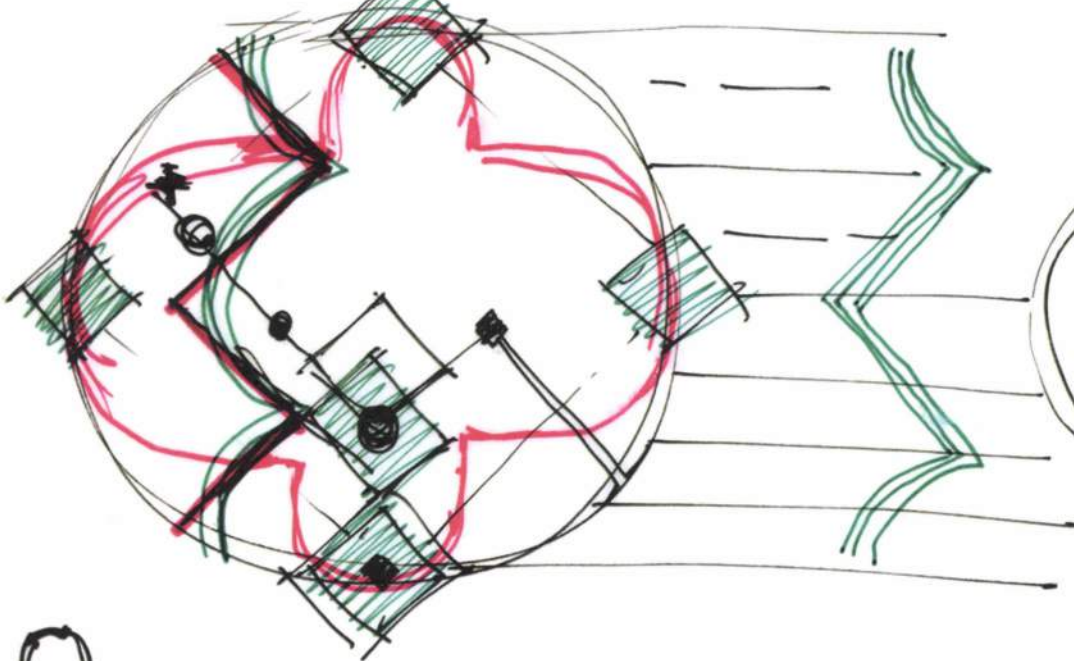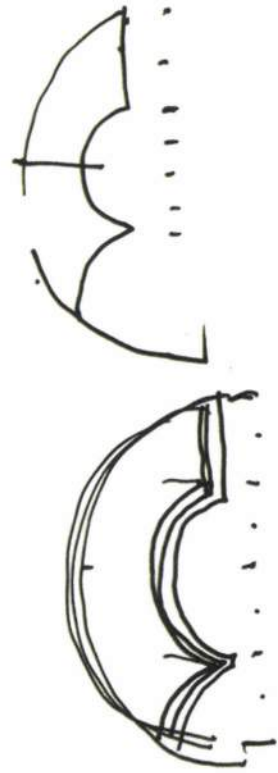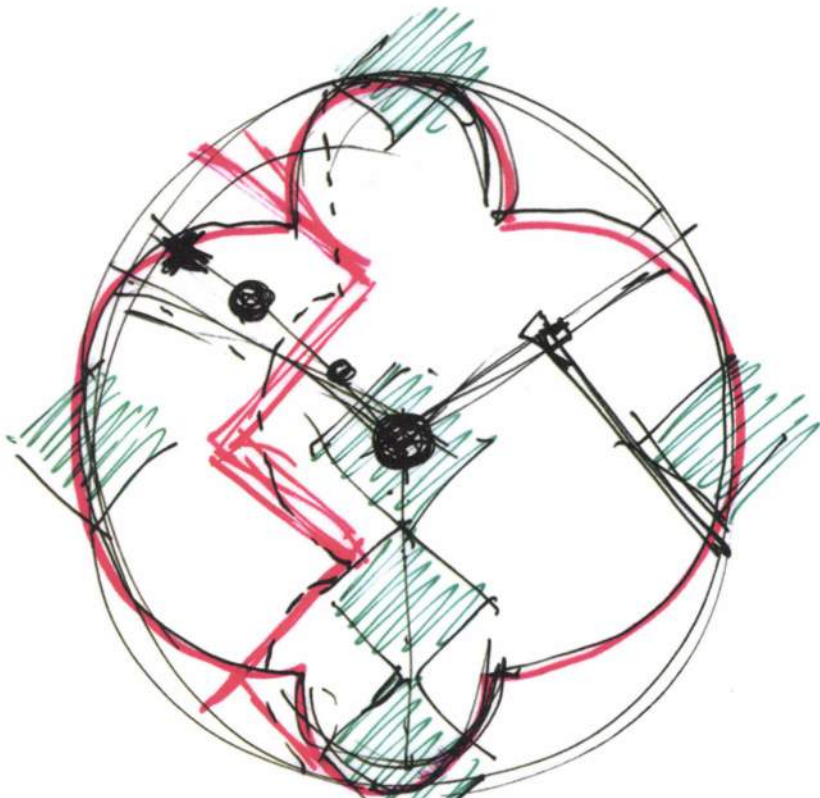
If $O = 8''$, divide into 8 parts @ $1''$

$1.414''$

$1''$

or $6px/6px/8.4852px$

DIAGRAMMATIC MAPS

JOEL KATZ is an information designer and principal of Joel Katz Design Associates in Philadelphia, Pennsylvania, and the author of *Designing Information: Human Factors and Common Sense in Information Design.*

I have been designing diagrammatic maps for a long time—they all begin with an analysis of information and determining the context of its use. There is no right kind of map, only a right map for the needs of the user, his movement experience, and the context in which the map will be used. There are maps for finding one's way and for information; there are maps for walking, bicycling, driving, and using a rapid-transit network. Each experience that requires a map offers different possibilities and imposes unique constrains, not the least of which is the limit of human memory.

I've been attracted to the idea of cities as circles from the time I viewed a relief of the first Parisian settlement, a church on an island in the middle of a river, all surrounded by a circular wall.

So I wondered, what would happen if I synthesized the realities of present-day cities and what I've come to think of as the city *concept*? As a diagrammatic cartographer and information designer, could I tease out new geometric iconographies from cities that have evolved over hundreds or thousands of years? The circle seemed a logical starting point; no shape has a center quite like a circle.

These sketches and the designs on the dishes pictured here grew out of a personal project called "Urban Icons," where I created circular maps of cities. The design process for the urban icons maps was an integrated one, beginning with looking at both antique and contemporary maps, and then sketching thumbnails with marker on paper. While keeping in mind that the final artwork would be executed on the computer, I knew that if I went to the computer too soon the results would be stiff, wooden, and unresolved. Like Rome itself, there are infinite possibilities and relationships. Regardless of the clarity of the finished icon, the sketching process was and remains a joy.

Most ancient cities evolved near water or with water running through them, for the obvious reasons of movement, trade, and protection. Rome is no exception, although its center is not on the river but on a centrally located hill; its river divides the city into two unequal segments, and the Aurelian wall surrounds the city in a shape vaguely resembling a four-leafed clover, with its ancient gates at almost regular intervals.

Formality is an adjustable quality of graphic structure involving the degree of explicitness in presentation, often visible through a structured style. Doodles, mind maps, and wireframes include informal qualities that suggest an outline or overview of a conceptual idea that, as a whole, is more significant than its details. This makes informal structures evocative but forgiving. Audiences see informality as a sign of evolving development, with room for interpretation and adjustment. In contrast to this, formal graphic structures are highly specific expressions. The formal qualities of a blueprint, orthographic model, or rendering suggest a concrete view supported by precise detail. Formal structures are often used to assert factual truth. Audiences view formality as a sign of a decisive, complete description.

The added time that is involved in developing formal qualities in an explanatory sketch limits its usefulness. Most explanatory situations favor quick, informal sketch expressions of ideas; however, formality is of practical value where we need an explicitly structured style for visual consistency, facilitated navigation, and a sense of knowledgeable expertise. The use of specialized projections of graphic structures is a good example where applied formality enhances an explanatory sketch's accessibility and perception.

The complex form of a hockey glove can be depicted through orthographic drawings. When aligned and oriented together, you can see how each perpendicular viewpoint provides enough information to understand the form as a volumetric object.
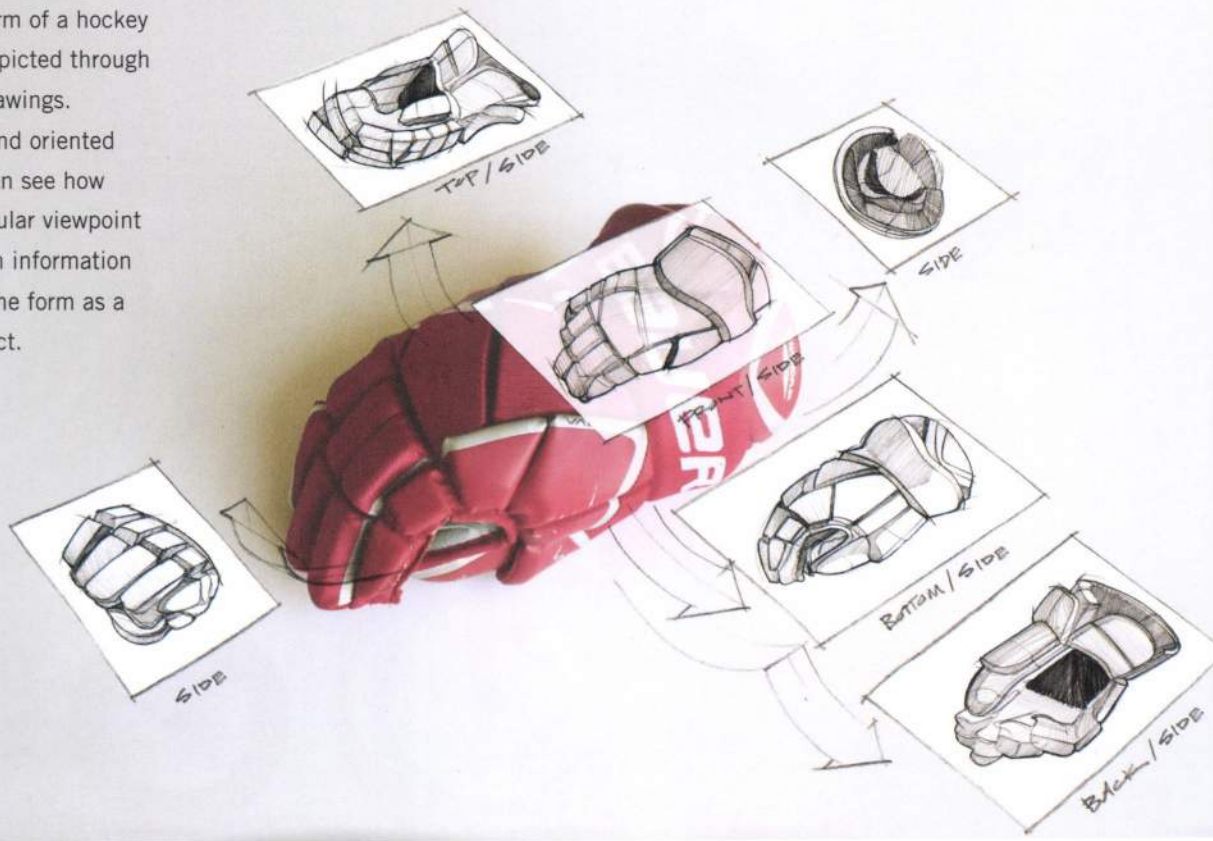
ORTHOGRAPHIC PROJECTIONS

Orthographic projections are formal views that show objects or environments in a flattened two-dimensional format, usually from the top (plan view) and front and side views (elevation views). The main purpose of orthographic projection is accessibility. Architectural plans and blueprints use orthographic projections to provide consistent proportions that facilitate measurement of individual parts (micro view) and enable a better appreciation of relative size. Orthographic projections are simple and quick to construct; however, if audience understanding of a whole object or environment is important, then the projections need to be accompanied by a three-dimensional rendering for added reference.
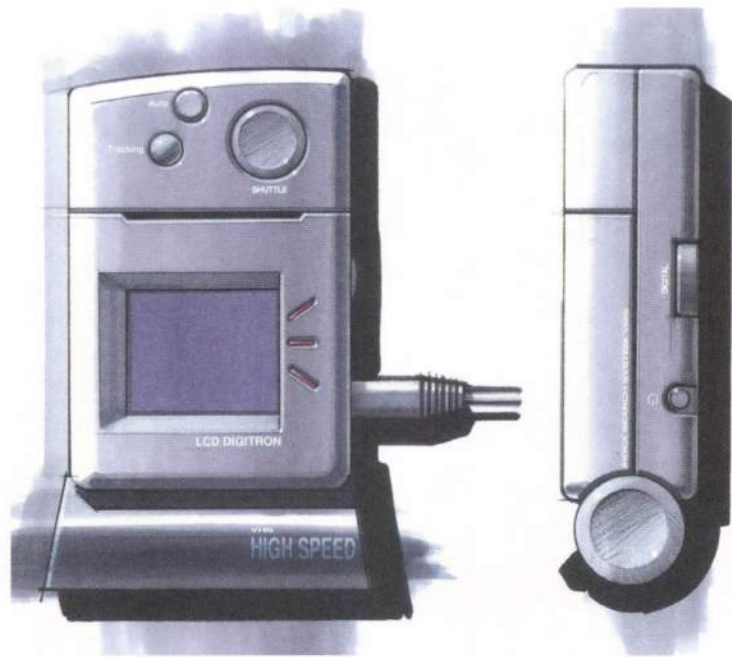
Stylized Projections (orthographic, isometric, axonometric): A means to show objects or environments in a constructed three-dimensional view as seen from a real or imagined vantage point. A close connection to our own experience of sight in the real world makes the use of projections effective for communicating visual relationships and bringing a sense of realism to an idea.

ISOMETRIC AND AXONOMETRIC PROJECTIONS

Isometric and axonometric projections are hybrids of perspective (three-dimensional) and orthographic (two-dimensional) views. They show objects or environments in three dimension using parallel lines that do not converge at a vanishing point and therefore omit foreshortening. Isometric projections involve base angles in 30-degree increments, while axonometric projections involve 45-degree increments. As an applied-use formality, isometric and axonometric projections systematically distort to combine the realism of a perspective view with the quicker drawing and facilitated measurement of orthographics. The result is a stylized, modular presentation that explicitly describes features and components.

MODIFYING PROJECTIONS

Combining formality with abstraction in an explanatory sketch projection allows us to provide clarity with views that are either difficult or impossible to see under normal viewing circumstances. Doing so helps direct attention.
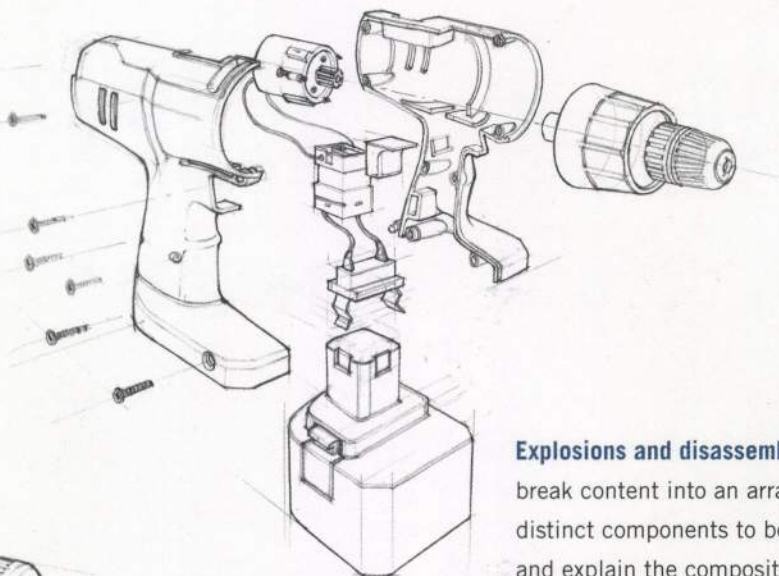
Explosions and disassemblies break content into an array of distinct components to better parse and explain the composition.
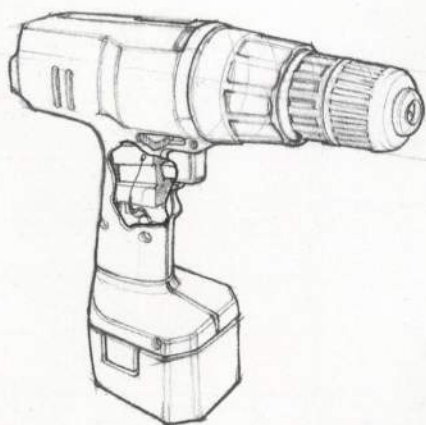
Cutaways and sections remove or divide a portion of content to reveal layer relationships and underlying hidden parts.
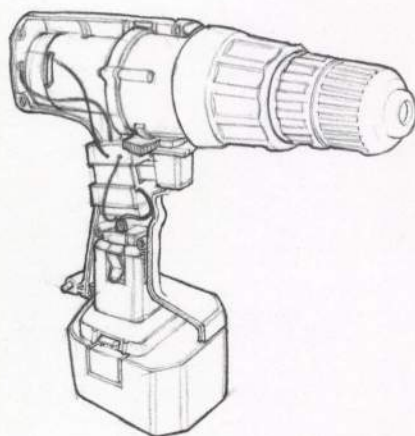
Subtractions remove a large key component of content in its entirety to highlight obscured content and structure.

Inversions show the negative form around an object to emphasize the overall shape of the object itself. This highlights cavities, angles, curves, and other object features that define character and composition.

a few types of common graphic structures

There are a lot of graphic structures we can use in an explanatory sketch. The following is a small overview of some common types and their use. Discussing graphic structures by name is complicated by the presence of multiple names and "hybrid" forms. A *fishbone diagram* is also known as a *cause-and-effect diagram* or an *Ishikawa diagram*. A *flow map* is a map with an overlay of diagrammatic arrows. A *timeline* is a form of an abstracted diagram, although you could also say that it "maps time." Classifying graphic structures is difficult and subjective.

For some common graphic structures, there is also an issue of relevancy for explanatory sketching. Graphic structures, such as graphs and bar charts, have limited use in the context of explaining ideas, given the time required to draw complex data and the inherent conflict between hand-drawing's personal, imprecise qualities and the desire to represent quantitative (numerical) data with precision.
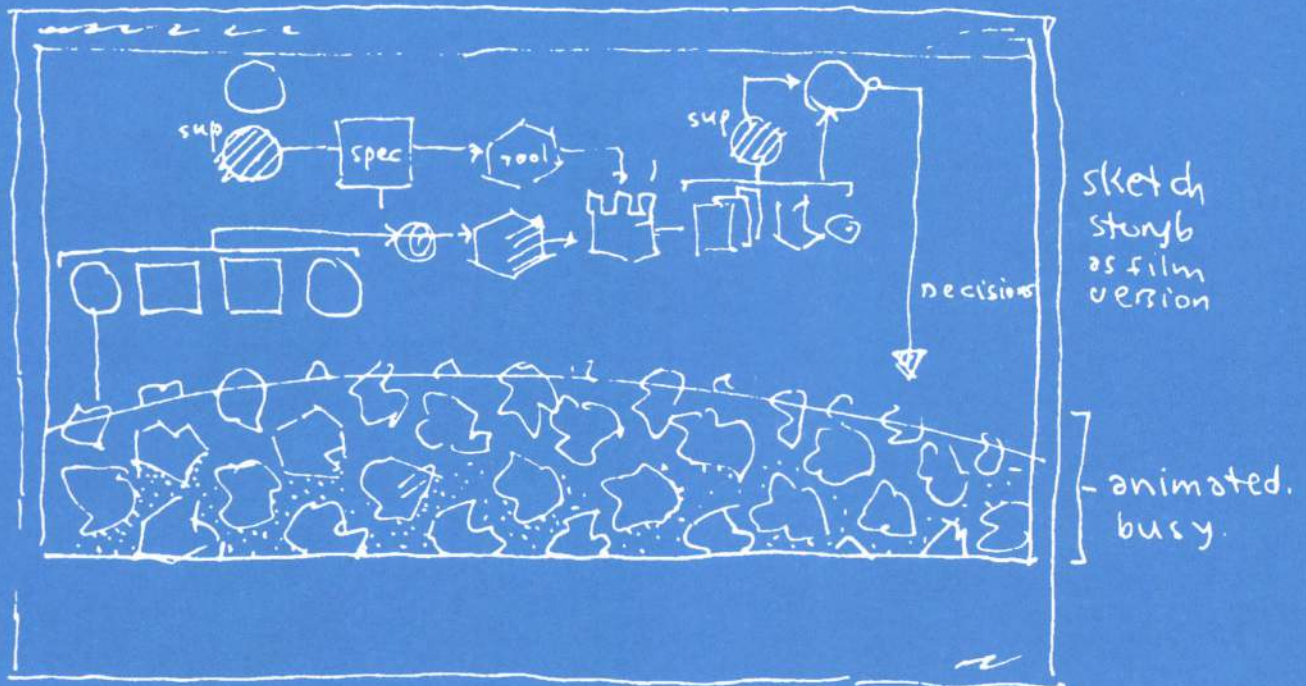
RENDERING

Representational (low-abstraction) and formal graphic structure commonly used to communicate the form of objects and environments. Renderings involve drawing tone, color, and shadow to show information about surface and volume.
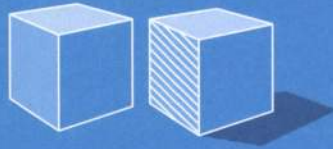
MOCK-UP

Representational and formal graphic structure used to communicate idea form for studying issues of feasibility and function (often through testing). Mock-ups can come in both three-dimensional and two-dimensional layout forms.
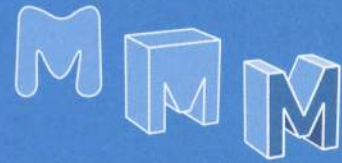
IDEATION DRAWING

Informal but representational graphic structure used for idea investigation and communicating an idea's development. A good ideation drawing can be useful in both the exploratory and explanatory phases of the design process.

MAP

Representational graphic structure of a conceptual or physical environment used to communicate relative spatial relationships and distributions. Maps are highly trusted forms of visual communication.

DIAGRAM

Abstract graphic structure used to communicate a schematic of conceptual relationships in an idea. Diagrams benefit from being perceived as focused distillations of ideas that afford a quick read.
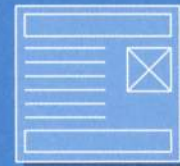
WIREFRAME

Informal, representational graphic structure used to communicate a general (draft) outline of an idea object and layout in detail. Often skeletal in form, wireframes help ensure focus on more objective features and function without the distraction of aspects of subjective color, tone, and the like.

DOODLE

Informal and often abstract graphic structure used for quick exploration or communication of an idea's basics. For explanatory purposes, a doodle offers speed over polished refinement.

ISOMETRIC

Formal but abstract graphic structure that uses a consistent, styled structure for instructional clarity to communicate an idea. An isometric structure's modularity simplifies construction.
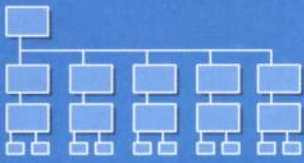
SITE MAP

Abstract but formal graphic structure used to communicate overall architecture of an idea system for reference in outline form. Site maps are beneficial because they provide context for how parts relate to a whole structure.
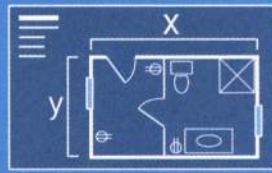
ORTHOGRAPHIC

Formal instructional graphic structure that is systematically drawn to provide a reference during construction/fabrication. Orthographics, commonly seen as blueprints and engineering drawings, are drawn to reference scale depicting the top, bottom, and sides of an object or the plan and elevation of a space.

CONCEPTUAL MODEL/MAP

Formal, representational graphic structure used to communicate the overall "big picture" organization. A conceptual model involves a representation that helps to explain the form of something else, sometimes through metaphor.
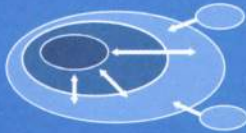
CONCEPTUAL FRAMEWORK

Informal, abstract graphic structure used to communicate an idea in outline form, particularly of functional systems. A conceptual framework often involves describing a process or methodology for use.
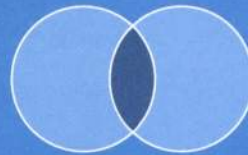
VENN DIAGRAM

Abstract graphic structure used to communicate the commonality between two or more topics or information sets.

TIME LINE

Abstract graphic structure used to communicate a sequence of events or actions over time. The linear nature of a time line makes simplicity its greatest strength for communication.

STORYBOARD

Formal graphic structure sequence that uses a visual series to communicate change or related action/events (for example, cause and effect).
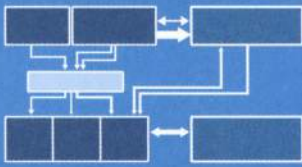
ROUTE/FLOW MAP OR DIAGRAM

Abstract graphic structure used to communicate the relative scale and movement of things (forces, substances, people) through an environment or system.
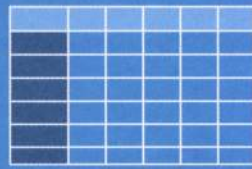
TABLE

Abstract but formal graphic structure used to organize and communicate data for comparison.
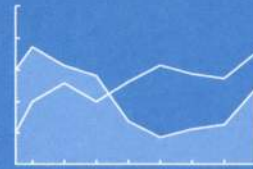
GRAPH

Abstract but formal graphic structure used to organize and communicate data through distribution. Graphs are often used to show a relationship between two or more means of ordering, such as by time and location.
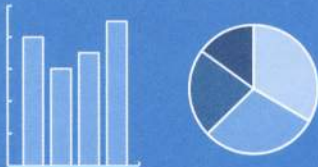
BAR/COLUMN AND PIE CHARTS

Abstract but formal graphic structures used to communicate comparative magnitude through difference in length or area.

MIND MAP

Abstract and informal graphic structure that uses an organic branching structure to investigate concepts and communicate their relationship through organization. Mind maps provide a useful tool for analytical thinking, especially for groups, but their often-undifferentiated appearance and loose, organic organization can make later reading difficult.

FISHBONE DIAGRAM

Abstract graphic structure used to communicate the cause-and-effect summary of factors behind a conclusion. Major branches on a fishbone diagram show a topic on which additional attached branches provide further detail.

scale and simplicity of graphic structures

Besides abstraction and formality, graphic structures involve other adjustable qualities that are worth consideration. Two of them are simplicity and scale.

Simplicity would seem a straightforward quality for explanatory sketch success. The common notion is that simpler is better; to reduce clutter and show ideas in a clear, efficient manner, simplify your graphic structures by removing unnecessary detail and ornament. While simplification reduces distracting visual noise, it introduces a paradox. Simplicity can lack interest. Graphic structures in explanatory sketches need to be simple for understanding but also have visual richness and complexity to be engaging. We inherently search for pattern and meaning in what we see; we are attracted and engaged by complexity's ability to stimulate thought. Graphic structures are therefore a balancing act, employing simplicity and complexity in concert—or as Albert Einstein said, "Everything should be made as simple as possible, but not simpler."

Scale's importance in graphic structure involves the impact of vantage point, how the scope of view frames relationships within an explanatory sketch with context. Do you show an object at a distance, or do you show a close-up view that affords space for only a few detail features? Your choice in scale should consider both its informational and psychological effects. A macro-scale view in graphic structure calls attention to "the whole of details," particularly overall shape and larger patterns among associated parts and features. Distance emphasizes formality and objectivity. In contrast, a micro-scale view calls attention to the relationships of specific features. Closeness is subjective in what it chooses to show and tends to create an intimate presentation that is at times comparatively informal.

When choosing scale for graphic structures with your explanatory sketch's layout, consider:

- The effect of scale on comparisons within a graphic structure and on the mood of an explanatory sketch.

- How variety in scale when showing multiple graphic structures affects attention and hierarchy (see Depth Cues on pages 224–229).

- How unusual vantage points heighten interest.

straight
tube chimney

Can you do
this truss?

overhang

Lower plht.
+9'-0"

slope change
@ overhang

Resolve
railing

Fixed Wdw.

Pull the deck
back 5'-0"

Metal awning
@ all windows

Columns
1'-0" sq.
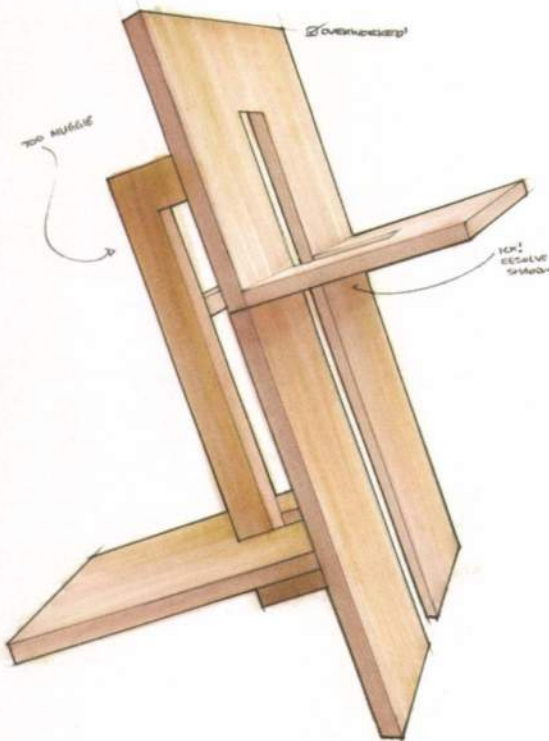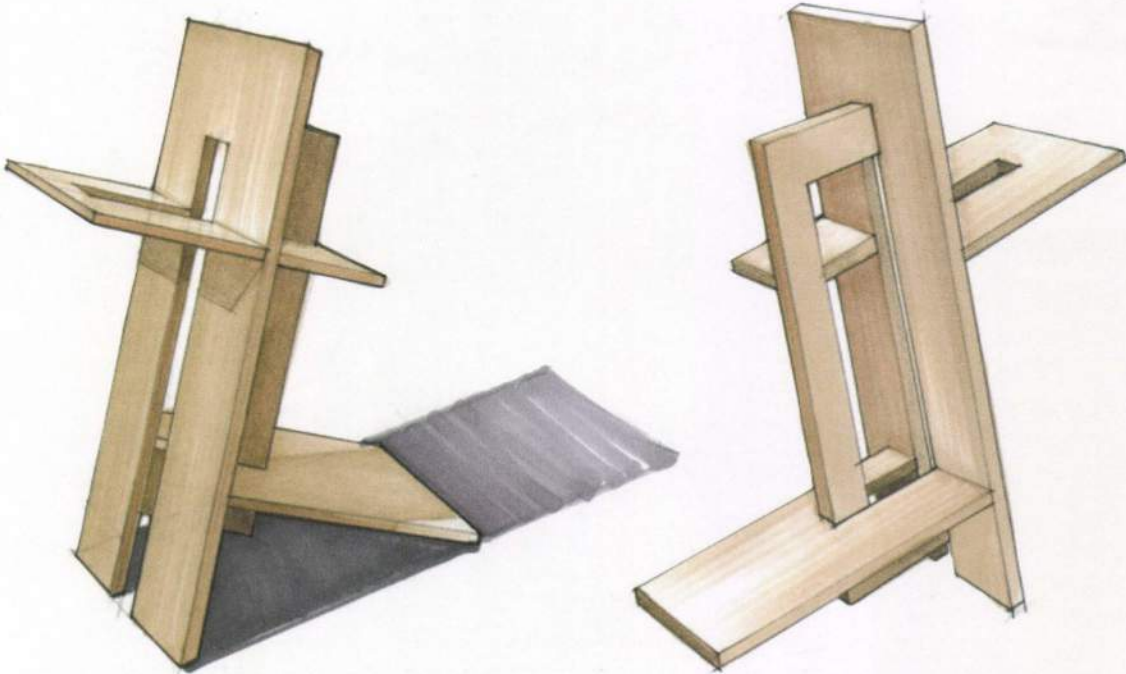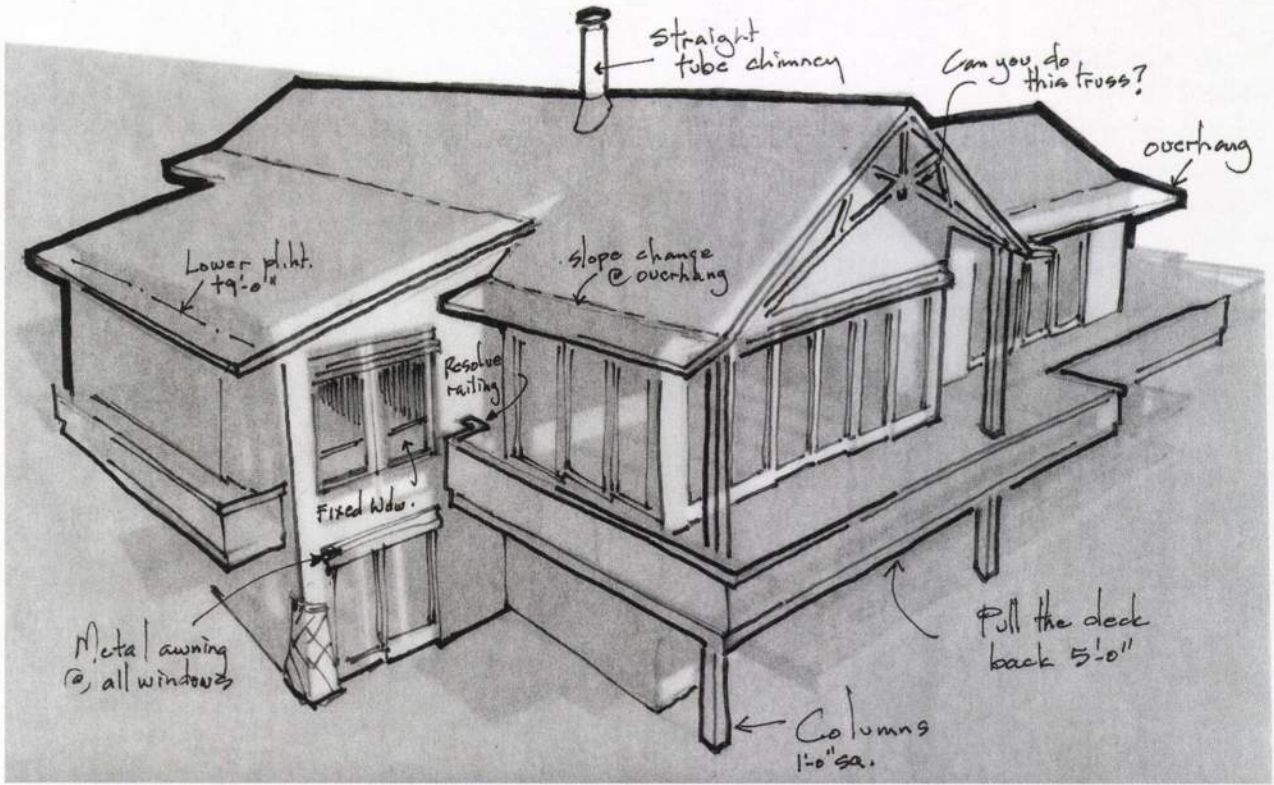
TRUST IN GRAPHIC STRUCTURES

A discussion of graphic structures in explanatory sketches is incomplete without mentioning audience trust. Visual presentations of objects and information are seen as "real," and so attract a surprisingly high level of automatic trust. Your audience's tendency to trust graphic structures is what affords some stretching and distortion for reasons of clarity. For example, most maps can—and should—be stretched to facilitate reading or highlight important information; however, automatic trust of graphic structures brings risk and a high cost if they appear "broken." Trust is lost if what is seen does not reflect reality because of a major omission or distortion that appears accidental. The result is expansive. If the accuracy of a single feature in a graphic structure is proven false, then the audience will question the truth (accuracy) of everything else associated with it. The more representational and formal the graphic structure, the more this is an issue.

perils of assumption

An audience's assumptions based on what they see (and don't see) are noteworthy. There is a consequence of what you choose to include in your explanatory sketch. Hazard communication is one such area. Identifying a specific area in an environment or object feature as hazardous will cause a trusting audience to assume other spaces and features are comparatively safer (even if they are not).

National Rail Timetable Map 2012

National Rail

INVERNESS
ABERDEEN
EAST COAST ROUTE
PERTH
DUNDEE
STIRLING
GLASGOW
EDINBURGH
NEWCASTLE
YORK
HULL
LEEDS
DONCASTER
Peterborough
LONDON

INVERNESS

ABERDEEN

PERTH

DUNDEE

STIRLING

GLASGOW

EDINBURGH

NEW CASTLE

YORK

LEEDS

HULL

DONCASTER

PETER BOROUGH

LONDON
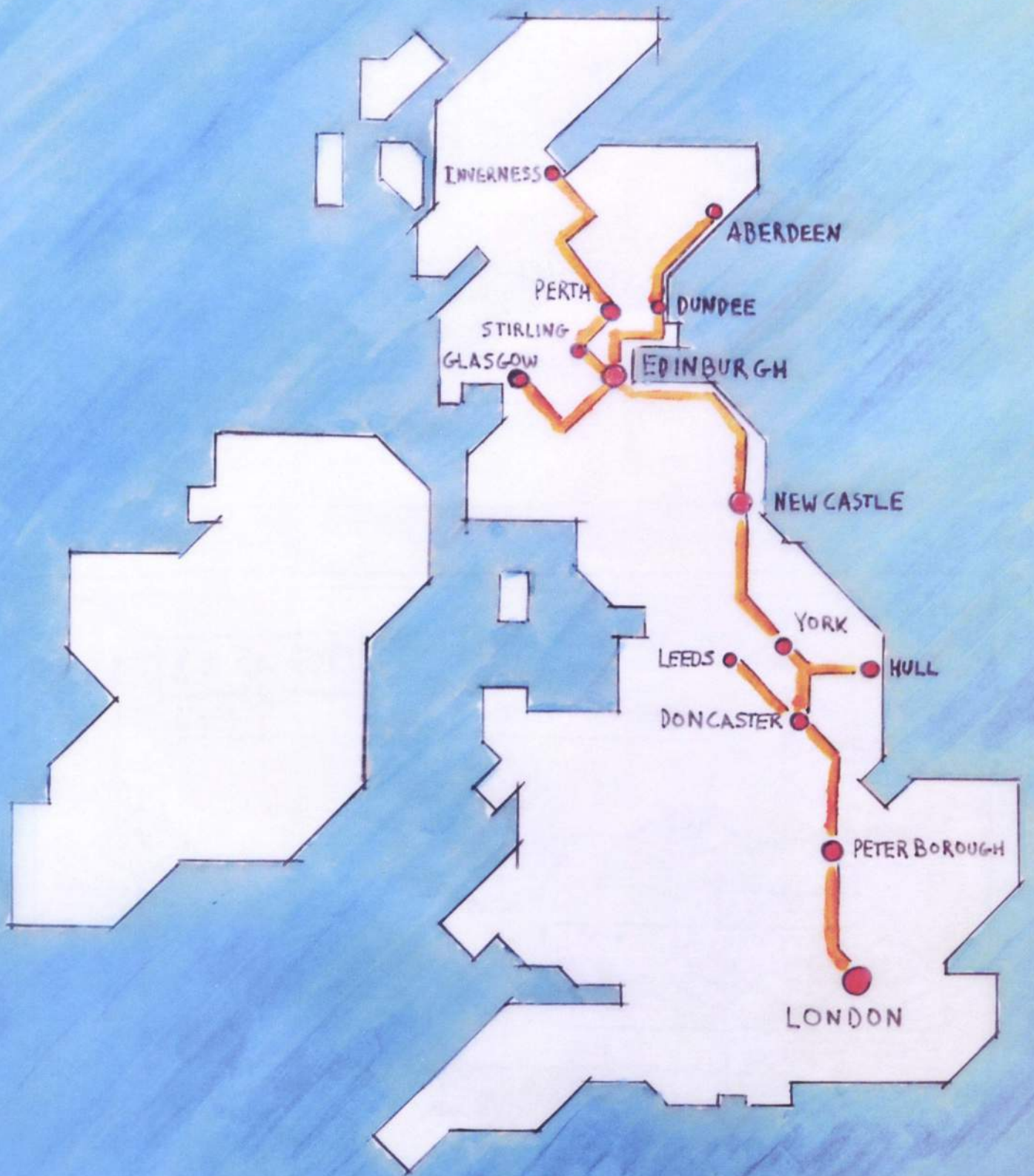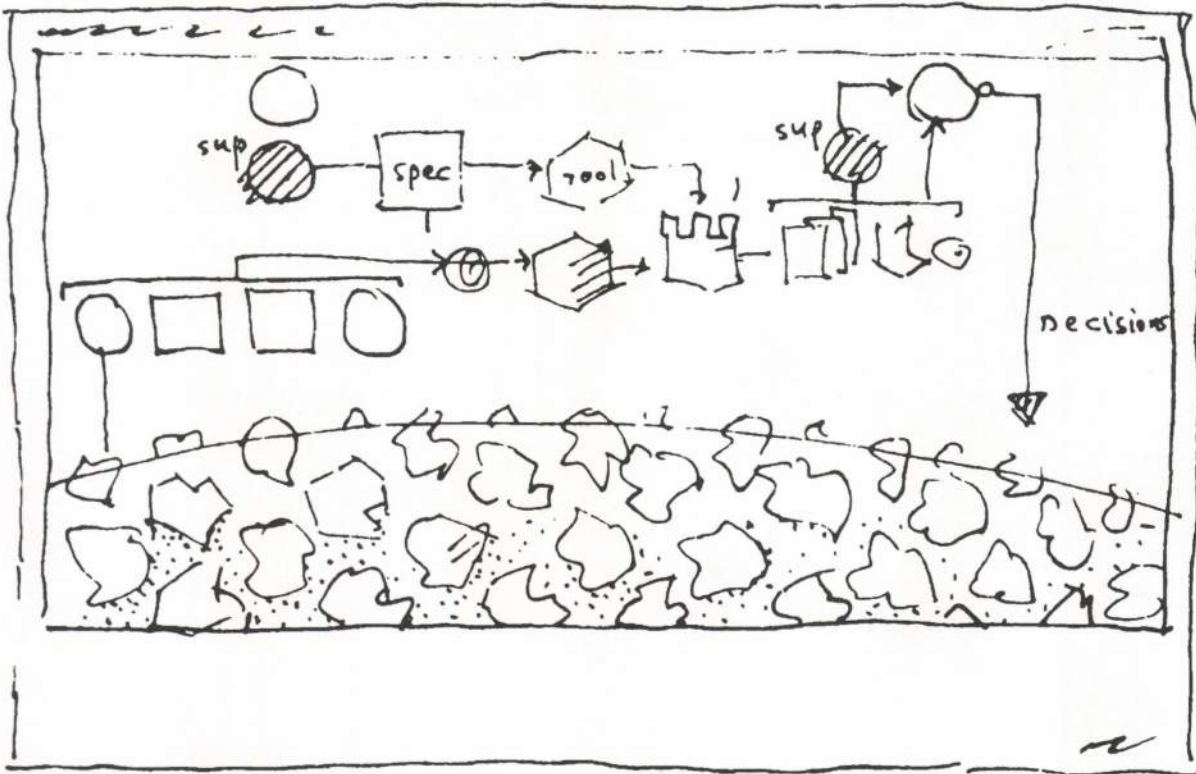
sketch
storyb
as film
version

— animat
busy.

what

pos RDs Home featr

← ☐☐☐
New
Prod.
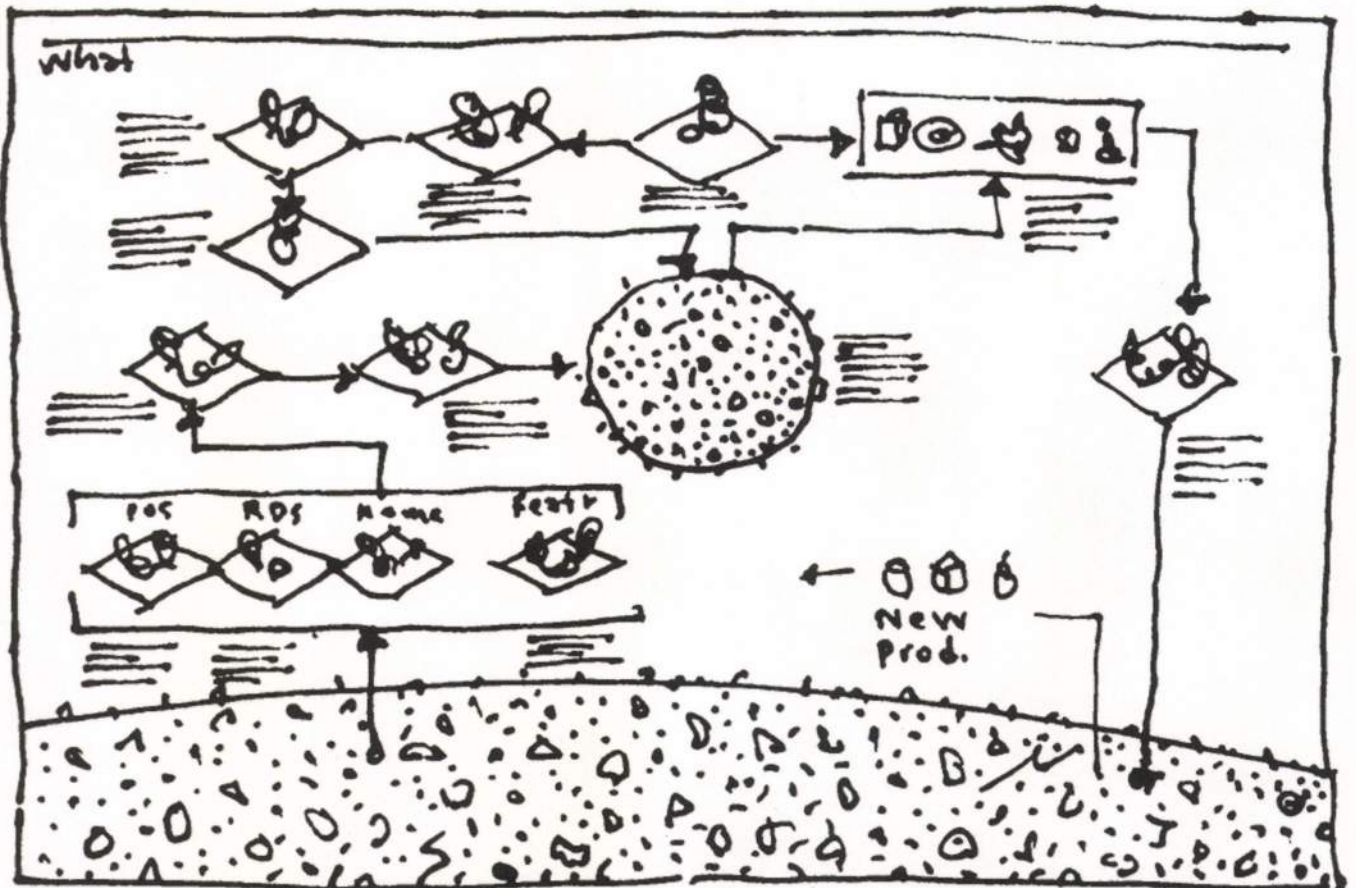
Vignettes above market (horizontal)

AFTER PLANNING YOUR idea's explanation and choosing one or more graphic structures through which you will communicate it, the next step is to compose a visual layout—how a composition of graphics, text, and spaces fits together in your sketch.

Layout is an opportunity to establish tone with a visual reading sequence. A good sketch layout draws the reader in and directs attention to what is necessary for understanding and action. With explanatory sketches, this involves four major considerations: form for defining space and tone, association for relationships that structure and order, hierarchy for direction in navigation, flow for movement that supports reading sequence.

Putting these considerations together, composing visual layout for explanation involves drawing an expressive form containing a hierarchy of associated structures that provide a reading flow to see your idea. Structures and a related reading path establish a visual narrative sequence that supports processing and understanding. The result should be clear, concise, and progressive.

As you develop an explanatory sketch layout, it is helpful to initially move in drawing scale from macro to micro, starting by outlining major elements and finishing with detail. Doing so avoids unexpected distortions of layout that result from being "lost in space" when drawing on large poster sheets and white boards. Starting to define a sketch at macro scale also steers away from organic drawing that can produce loose, ambiguous compositions that are hard to read.

start layout with small thumbnail studies

An impulse with layout is to jump into the final, full-scale sketch itself. At times this is necessary, but it is frequently better to start with simple, small thumbnail-size sketches to quickly test different layout possibilities. Doing so will help avoid:

- Running out of room.
- Accidental distortion in scale of drawn objects and graphic structures.
- Working inefficiently on a "dead-end" layout.
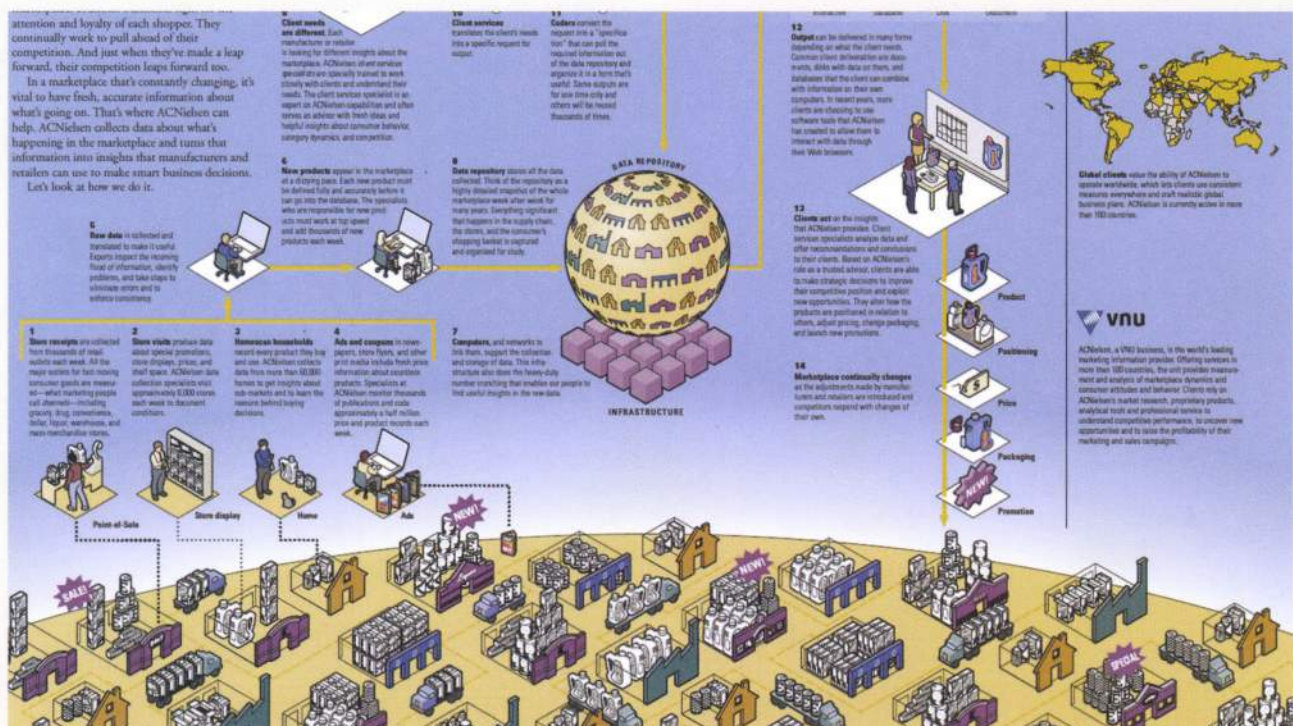
form

Form involves how layout space is defined by shape and composition. In this respect, form has a communicative effect at all scale levels of layout and helps establish presentation tone. When your audience first reads a layout, especially at a distance, overall shape in form is one of the first things noticed. This makes form a good consideration to start with, as it will roughly outline how the surrounding drawing space will interact with your sketch composition.

Several qualities of form—such as shape, orientation, scale, and balance—help establish the underlying tone and expression of an explanatory sketch. This starts with qualities of the drawing area and its relationship to your sketch composition. Horizontal (landscape) orientation conveys an informal, peaceful tone, while a vertical (portrait) orientation is more formal and active. Increased space bordering your sketch provides a separation from the physical environment that conveys the importance of the subject, drawing the reader in both physically and mentally.

Within a layout, the shape of overall composition and the contours of objects are expressive. By influencing the paths our eyes follow when we look at structure and layout, shape can augment concepts behind ideas; lines suggest progressive and finite movement, circular shapes suggest renewal, and the points in bullets bring stationary attention.

Scale is expressive. Close-up views from visual cropping bring a personal and interactive energy for engagement, showing greater detail and drawing the reader in. Faraway overviews bring a formality with a viewing distance that suggests contemplation and objectivity. Achieving balance in your composition's form by creating qualities such as symmetry reinforces a sense of solidity and harmony. Imbalance (tension) through qualities such as asymmetry brings dynamic interest and activity.
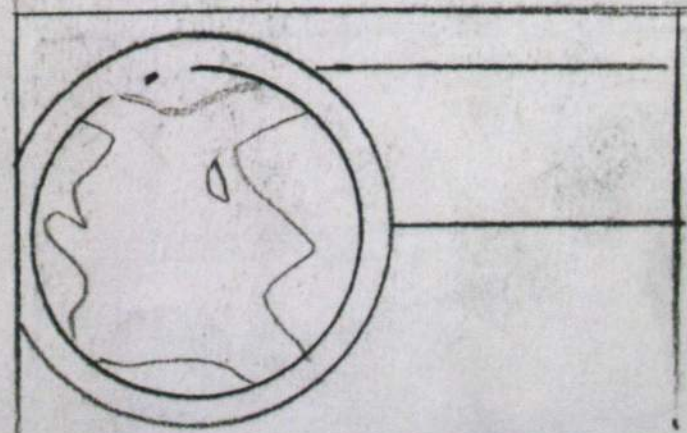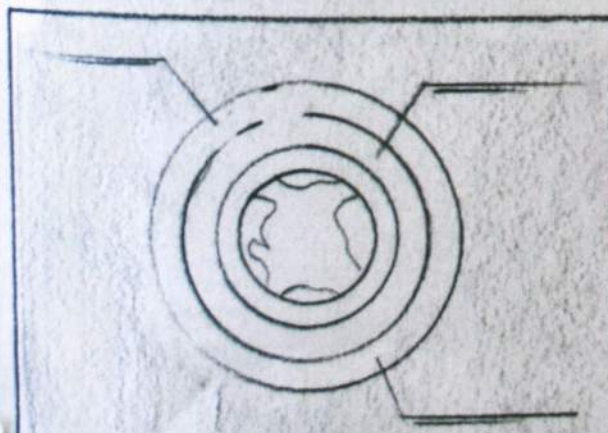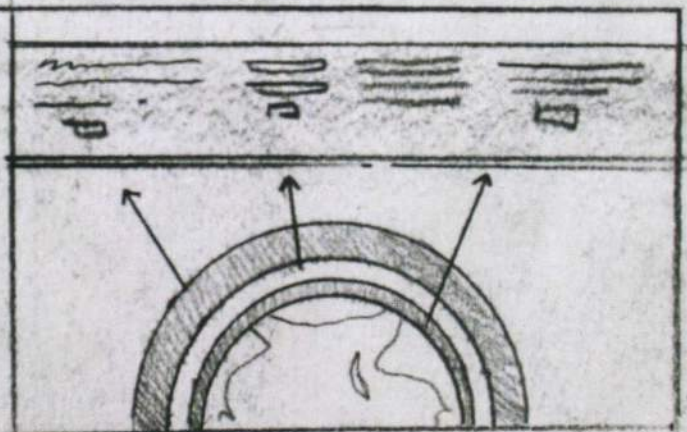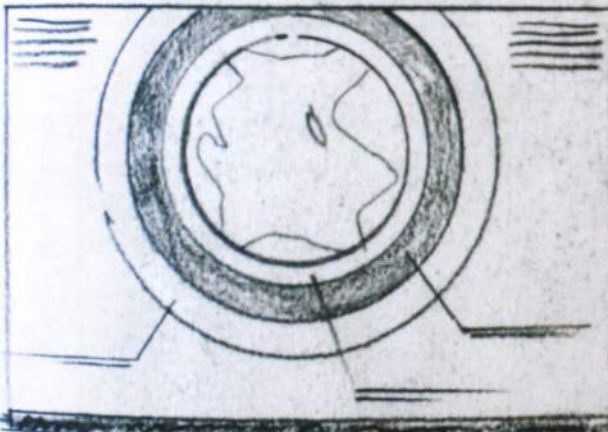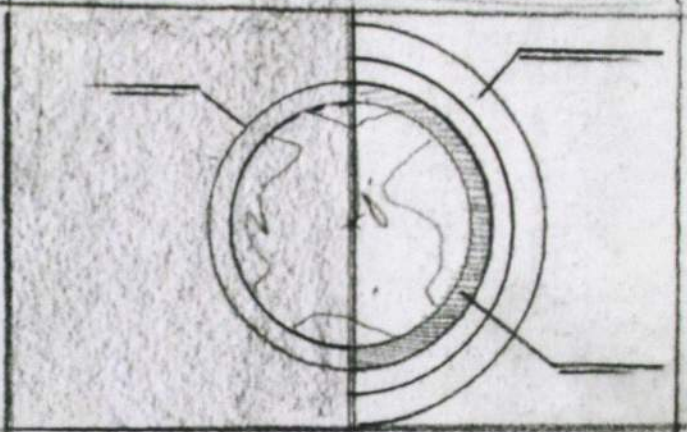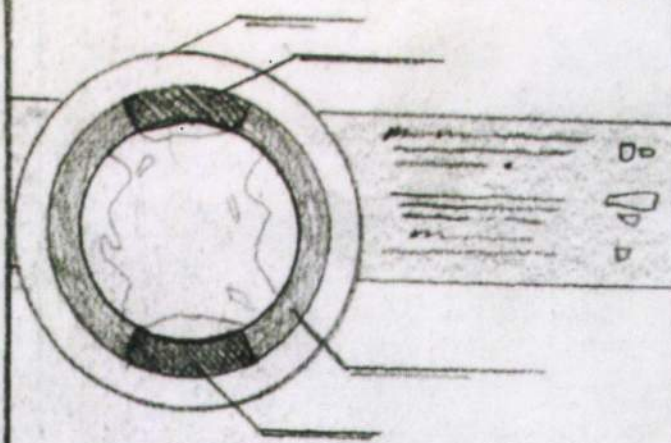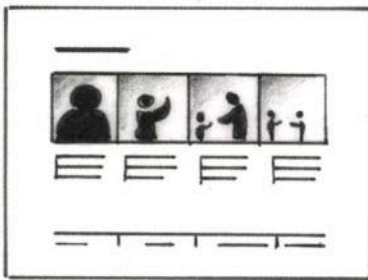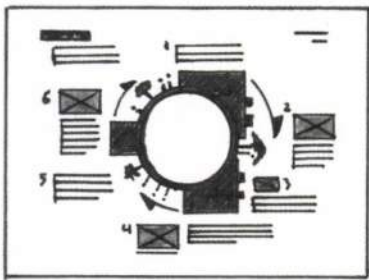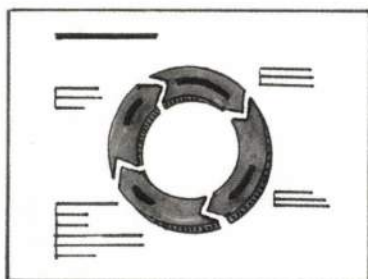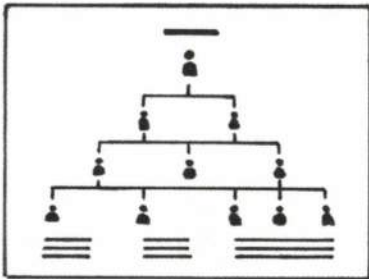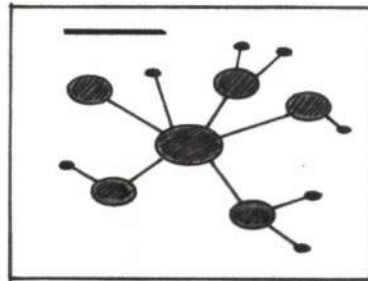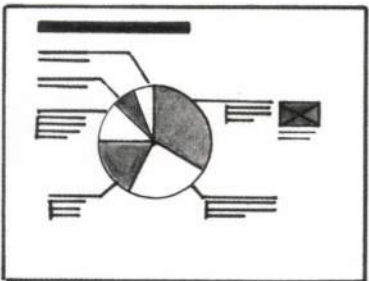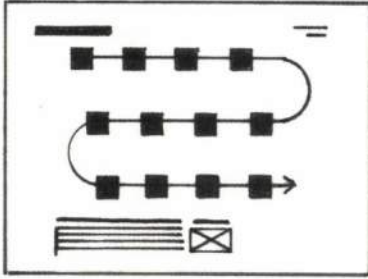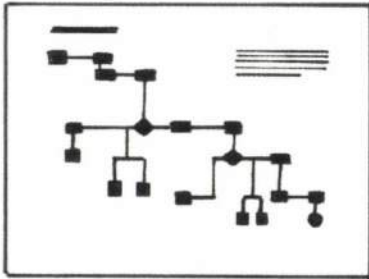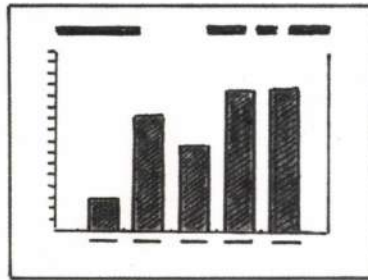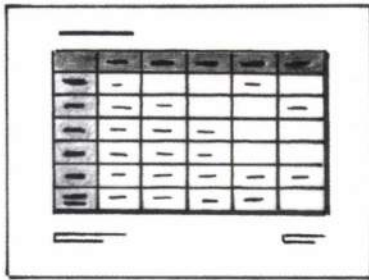
SHAPES AND THEIR VISUAL CONNOTATION

Shapes communicate at all scale levels of layout.

Point: Focus, attention

Line: Finite duration, movement

Spiral: Growth evolution/ devolution (depending on direction), change

Circle, Oval: Renewal, cycles, completeness, endlessness

Triangle: Activity, change, movement

Square, Rectangle: Stability, solidity, endurance

Polygons: Culturally coded meaning, although polygons with a resemblance to circles can have a similar connotation

Stars: Radiance (dispersion), energy

Hearts (and other sign shapes): Culturally coded meaning

negative space as water

Think of negative "white" space as water, not air, around your sketch composition. It is not truly empty. Negative space has its own mass in layout and therefore acts as a visual counterpoint for compositional balance. Failing to preserve the open water of negative space results in crowding and clutter.
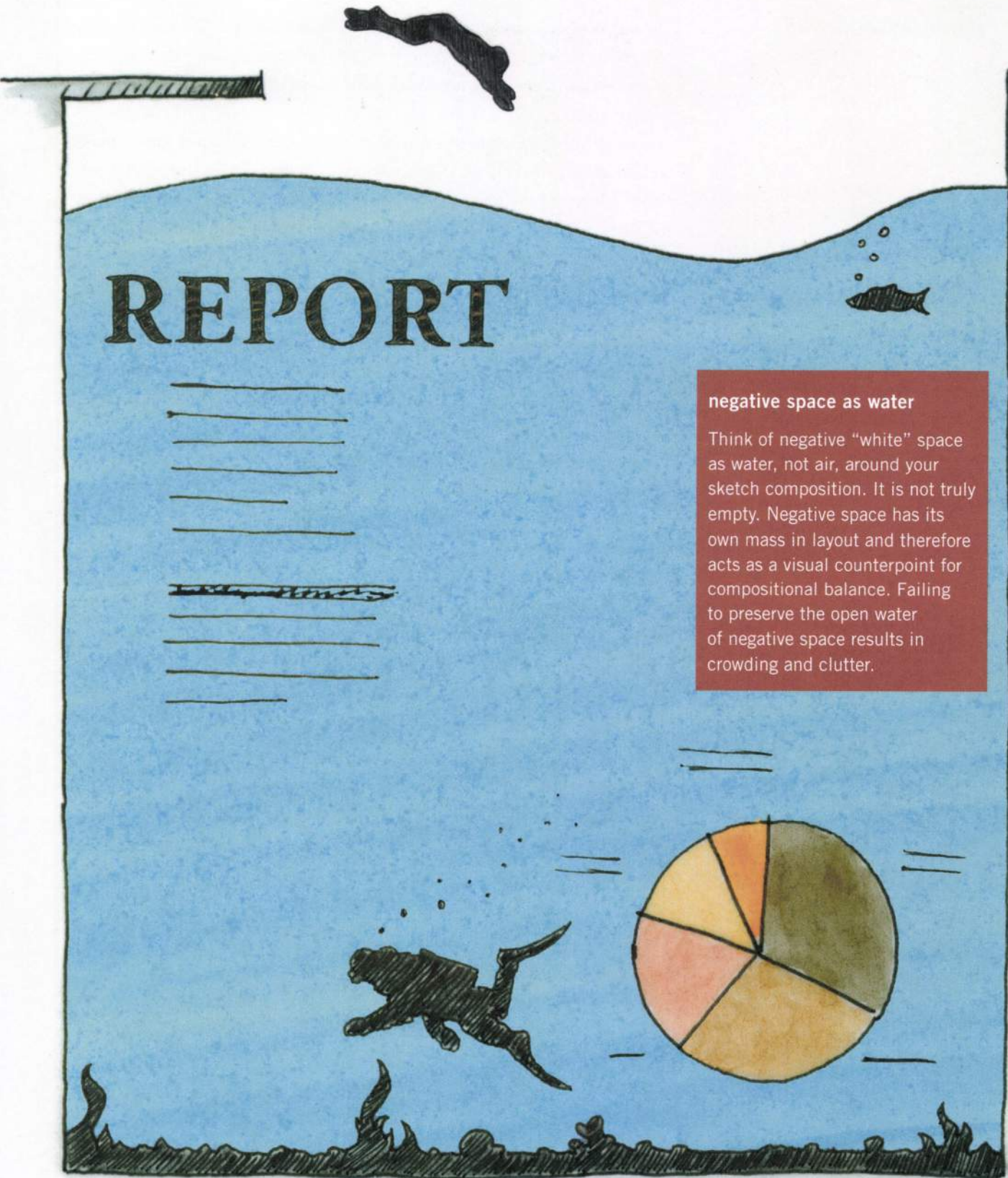
visual associations

Visual association within layout is fundamental to recognizing meaning through structure and order. Communicating the conceptual relationships behind ideas with explanatory sketches depends upon making connections visible and understood. To fully understand your idea in explanation, the reader must see how parts interrelate at every scale of presentation to form a cohesive structure, from elements to objects and the layout itself. Visual associations of lines, shapes, and words fit together to form identifiable objects, sentences, and sequences that operate together as an ordered visual framework to aid understanding. Whether desired or not, your audience automatically infers meaning from any organization it perceives within your layout. Planned visual relationships are therefore important for clarity and focus in order to avoid arbitrary or ambiguous associations that may lead to unintended interpretation of your idea, its significance and meaning.

Visual perception knowledge of how we process our everyday physical environment can inform our drawing of a sketch layout's artificial environment. Gestalt psychology principles of perceptual organization provide an easy, basic way to understand how visual qualities produce an associative effect. Principles of similarity, proximity, symmetry, closure, continuity, and common fate work individually or together in additive fashion as the reader's mind seeks to understand what it sees by simplifying visual elements and objects into recognizable pattern structures. Functional confusion and increased reading effort occurs when intended associations conflict with these principles.

Supply Chain

Virtual Supply Chain

i2 Solutions

i2 Agile Business Core

i2 Design Studio

Integration Layers

To ERP Systems

Other Platforms (.NET, Netweaver, WebSphere, etc.)

Links to
- Suppliers
- Customers
- Distributors
- Carriers
- Partners
- Contract Manufacturers

To Legacy Systems
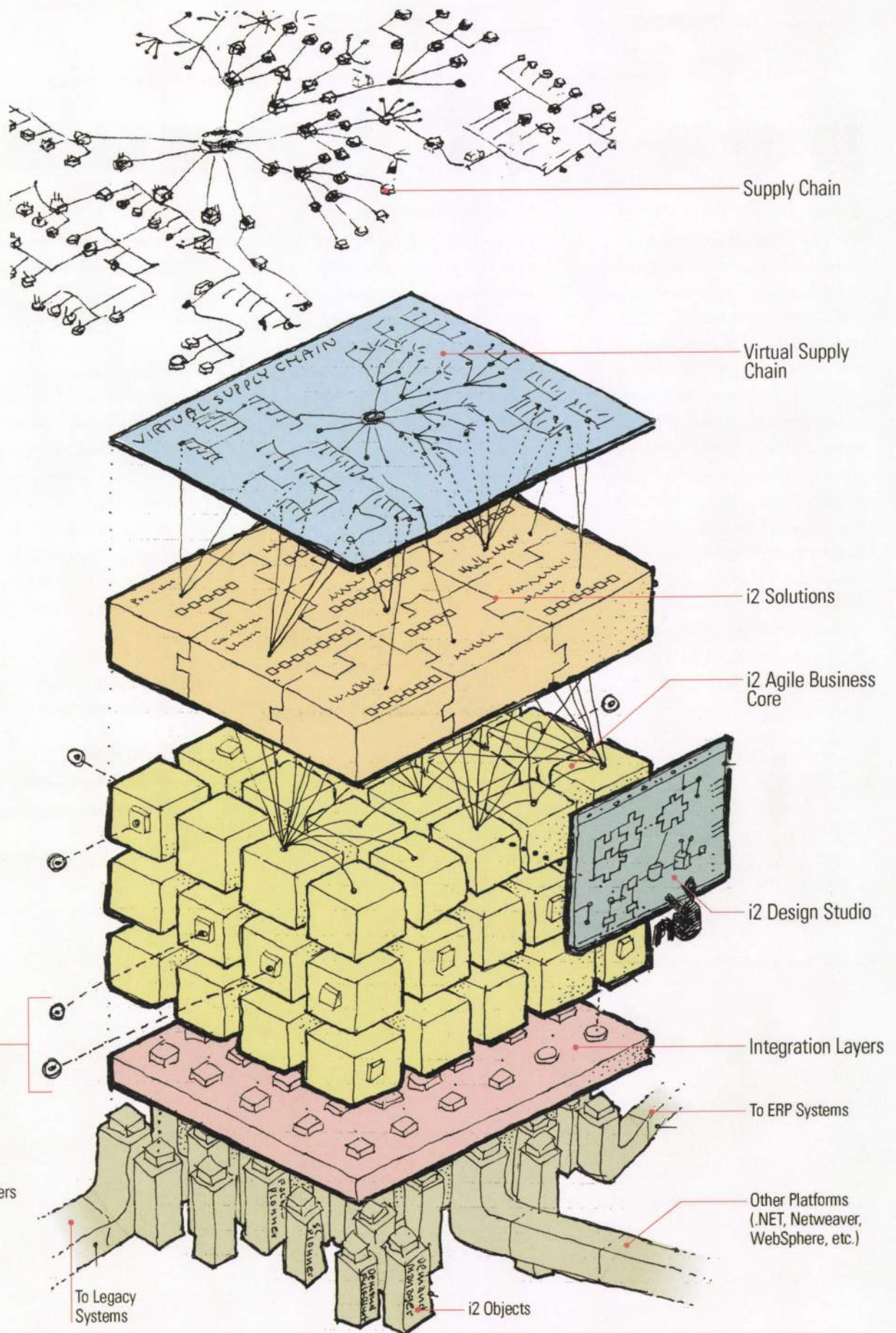
i2 Objects

SIMILARITY PRINCIPLE

We associate elements and objects of similar visual nature (in shape, size, color hue, value, alignment, orientation, texture, and so on), no matter how intermixed in space. Degree of similarity within an associated group and difference to items outside this group influence the clarity and depth of association. Coding of drawing information keys is an example where similarity (and difference) is important for clarity. It often helps to reinforce the difference of individual keys using more than one visual characteristic, such as color plus shape.

SYMMETRY PRINCIPLE

We associate elements and objects with a symmetrical arrangement aligned around a focal central point (hub). Proximity affects the clarity and depth of symmetry's association. Symmetry's framing quality is a particularly eye-catching means to heighten a reader's attention. Parentheses and brackets are examples of symmetry focusing attention on the content between the two graphic punctuation forms.

"Quotes"

Salmon (Alaskan Sockeye)

PROXIMITY PRINCIPLE

We group elements and objects of close visual proximity into pairs or clusters. Figure-ground relationships (the relationship of objects to their surrounding background) are important for proximity, since the degree of distance in between elements and objects communicates the depth of association. Items with comparatively less space between them are seen as having a stronger relationship bond. Labeling is an example in which proximity is important for clarity.

CONTINUITY PRINCIPLE

We associate elements and objects according to a perceived visual pattern, such as a line, favoring the smoothest direction that best corresponds to overall form. Flow diagrams and route maps rely on continuity for navigation, often rounding the corners of lines to help make them easier to trace and follow.

CLOSURE PRINCIPLE

We associate elements and objects according to perceived geometric or semantic relationships, reflecting our need to overcome interference or incompleteness. This association partly depends upon our prior understanding and experience. Closure is what allows us to omit or obscure detail in sketches through layering and simplification without sacrificing their understanding. The mind is able to fill in the gaps of what is partially obscured and still see the intended object. The ability to see and still recognize a cigarette in a no-smoking symbol is a good example of closure.

COMMON FATE PRINCIPLE

We associate elements and objects with a common direction of movement, either observed or perceived. In explanatory sketches containing a sequential series, such as a storyboard, we experience common fate by associating objects that "move" in common fashion across each frame within the series. In the illustrations below, head and body are associated by common direction of movement on the escalator.
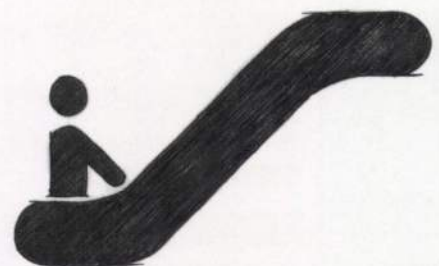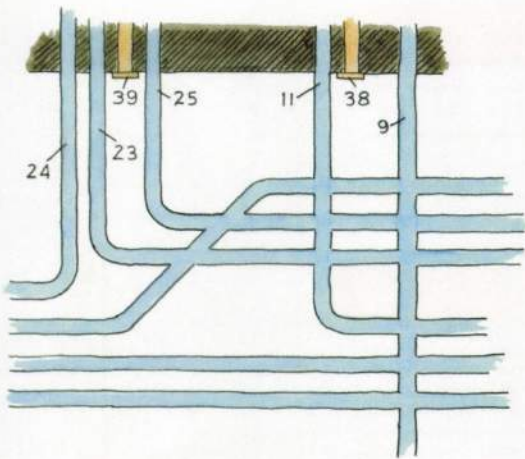
Section head
option B.

$\frac{1}{3}$ $\frac{2}{3}$ $\frac{3}{3}$ option

Login?

Logo
(head
latest)

Frame
break.

§5 Horz NAV

Lead Article
w. link.

Main
text.

step by
step
tips

Preview
Illust.

DIY
Videos

TBD
Space

Special
offers/
newsletters

Monthly
Personality
Feature
or
Ask the
Expert.

Addit.
Article
options
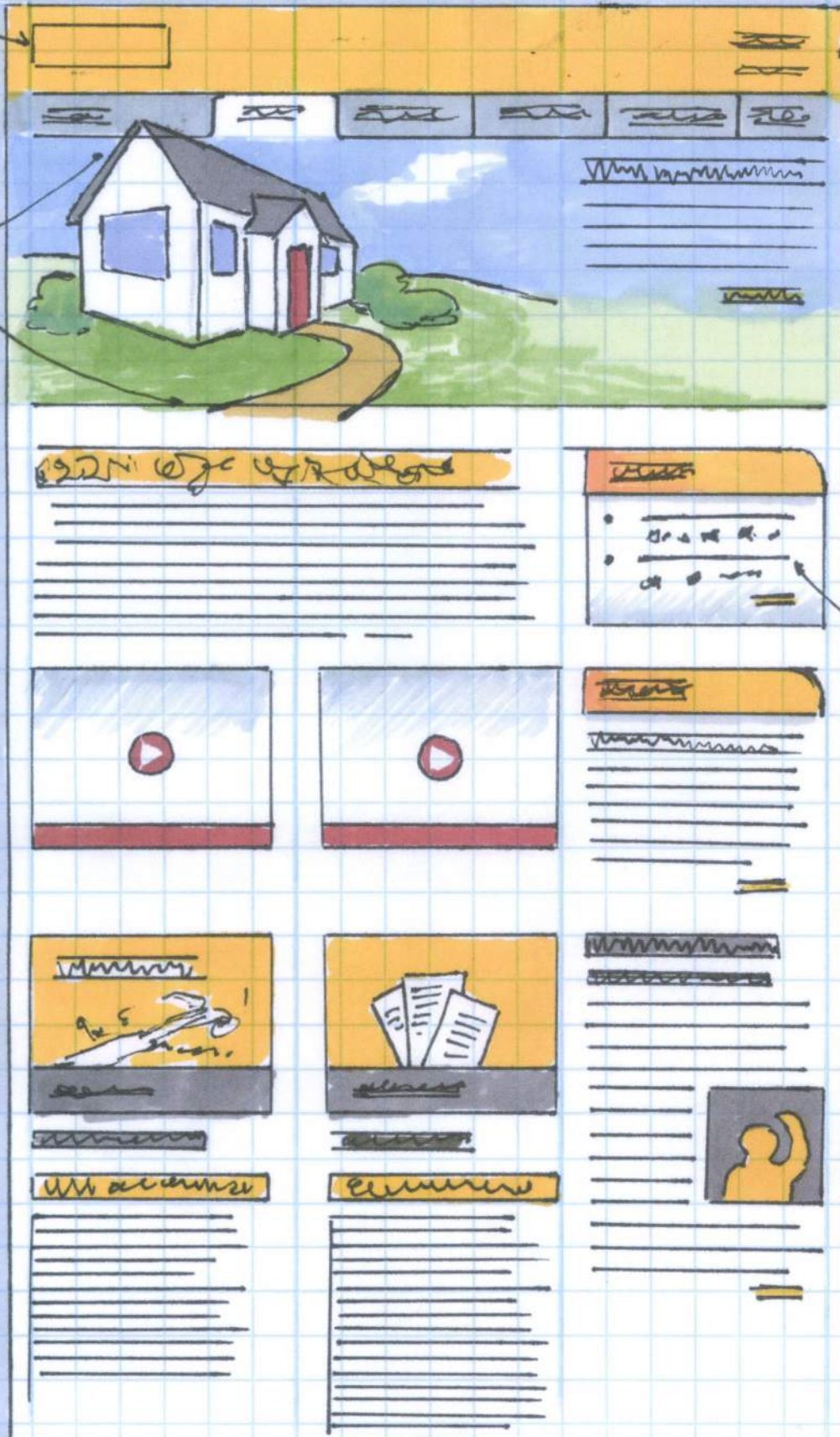
Without a clear structure from visual associations, layout can be chaotic and confusing. Layout structure should be immediately visible in pattern and extent. If missing content or visual qualities lead to ambiguous interpretation, then the structure warrants further consideration or visual reinforcement. Structure should include adequate separation to clearly see its parts, such as features, columns, modules, or blocks. Too little separation can compromise the reading of hierarchy. Too much separation can weaken perceived connection. As an additional rule of thumb, proportions in the figure-ground relationship of objects and negative space involved in separation should avoid a 1:1 ratio to prevent perceptual confusion.

Grids are an example of layout structure used to divide space as an organizational aid. Their presence is an application of visual association that creates meaningful cohesiveness to layout. Grids come in many forms, with cells that vary in size to reflect layout needs; however, grid use should be kept as simple as possible to not overplan an explanatory sketch.
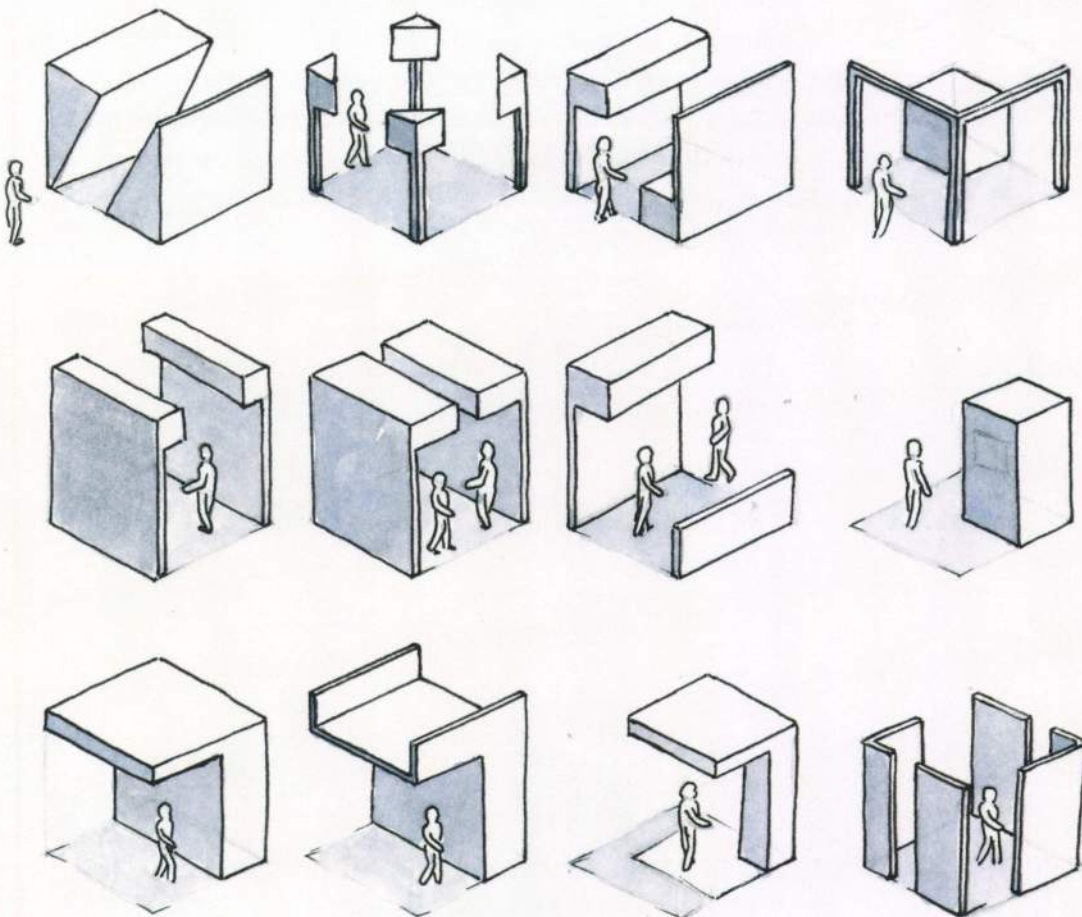
depth cues

Q **Why does depth attract our attention?**

A Navigating physical environments during activities such as walking requires prioritizing our attention to avoid immediate obstacles. Therefore our preferred attention hierarchy of our environment is near to far. Moving objects perceived to be approaching tend to further dominate attention. An explanation for this is that depth attracts our attention because of its functional link to potential threat assessment. This may also explain the use of rapidly approaching three-dimensional objects as a thrilling gimmick in many bad movies.

Hierarchy within layout is fundamental to direction for navigation. Unfolding an idea in an explanatory sketch depends on directing attention toward a clear visual sequence. Not only does visual hierarchy aid in reading flow but it adds visual contrast for drama, interest, and stronger engagement.

For explanatory sketch layouts, we can turn to visual perception knowledge of "depth cues" to understand how the mind perceives hierarchy from visual contrast in what we see. Depth is deeply tied to interest level. Our sense of depth prioritizes attention of our environment, with objects perceived closer to the viewer receiving greater initial attention. In explanatory sketches, we can use visual depth cues and contrast within layout to establish a visual hierarchy and emphasize direction in reading sequences. On a macro scale, contrast through depth cues can visually highlight a starting point and sequence. For example, changes in rendering fidelity (detail) of drawn objects in layout from low to high indicate evolution toward a concrete final idea. On a micro scale, contrast through depth cues can help separate visual foreground and background elements to help identify groups of associated items. Directing attention in these ways allows us to reinforce explanation timing and order. Depth cues tend to work together in additive fashion; we rarely see depth cues individually in our environment, because they tend to operate in concert. Most depth cues fall into three categories: perspective, occlusion, and focus cues.

QUICK REFERENCE
COLOR SHOWS TIME
REMAINING TO
DRIVER'S ARRIVAL

DRIVER'S LOCATION.

RIDER — DRIVER
LOCATION DESTINATION

RIDER MODE.

I'M @ ONE SPOT.

I'M ON THE MOVE
TRACK MY LOCATION

CURRENT TIME

NOW 2:15
DRIVER ARRIVAL
12:36
MIN REMAINING
VIEW MY ARRIVAL
VIEW MAP
ALERT DRIVER

NOW 2:19
MY LOCATION
MEETING POINT.
DRIVER LOCATION
DRIVER ARRIVAL
MY ARRIVAL

NOW 9:57
DRIVER'S LOCATION
ARRIVAL TIME
20:45
MIN REMAINING

20:45 MIN

1:59 MIN/GO

10 MIN REMAINING

TO ELIMINATE THE NEED
TO CONTINUALLY LOOK AT DEVICE
TIME CAN BE TRACKED BY VISIBLE
CHANGE IN COLOR/INTENSITY OF
COLOR [BACKLIGHT] — ALLOWS RIDER
TO MULTI — TASK WHILE WAITING.

PERSPECTIVE DEPTH CUES

We perceive hierarchy through contrast in the relative size, height, and position of objects within the context of an environment or sketch layout's space. Perspective cues include size/texture gradient and linear perspective.

SIZE/TEXTURE GRADIENT

Objects of the same size appear proportionally smaller the farther away they are from the viewer. This proportional contrast exists in both the overall size of objects and similar features on their surfaces, such as textured bumps or buttons. In explanatory sketches, size gradient brings a reading hierarchy that draws attention to larger objects over smaller accompanying objects. Texture gradient brings hierarchy by providing repetitive surface information that indicates the position and depth of planes and their edges. To establish visual hierarchy, vary the scale of drawn objects and their surface features within your layout.

News Bureau Reports:
Truth in Advertising

LINEAR PERSPECTIVE (RELATIVE POSITION)

Parallel patterns of objects or object features appear to converge toward a single point on a horizon line. This is due to reduction in visual scale that perceptually causes objects and object features to appear closer together at farther distances. Contrast in the position of objects relative to one another and the horizon is therefore associated with depth. In explanatory sketches, this helps to move our eyes along a visual series or line. To establish visual hierarchy, vary the scale and spacing of objects accordingly to harness linear perspective's ability to communicate a flow in direction.

Horizon line: An inferred or explicit divide where ground meets sky in a scene. In the context of sketching, there is an inherent expectation that a horizon line exists. Unless shown or suggested by the presentation angle of objects, the assumed position for this line is approximately at or slightly below the middle of the overall drawing area.

OCCLUSION DEPTH CUES

We perceive hierarchy through contrast from object occlusions, such as overlap. Simplification from Gestalt principles of continuity and closure establishes strong binary sequences that stratify what we see yet offer little information about the degree of depth. Occlusion-based depth cues include overlap/interposition and cast shadow.

OVERLAP/INTERPOSITION

When the Gestalt principles of closure and continuity extend the contour of a partially obscured object into the space occupied by another object, our mind perceives the partially obscured object as comparatively farther back in space. Contrast in the visibility of objects is therefore associated with depth, helping to establish a cascade of depth-associated layers to a scene. In explanatory sketches, layering facilitates comparison through direct overlay with the most important information in foreground. Contrast in the visual characteristics (shape, hue, value, and so on) of each object layer reinforces the sense of depth. Visual similarity weakens it.
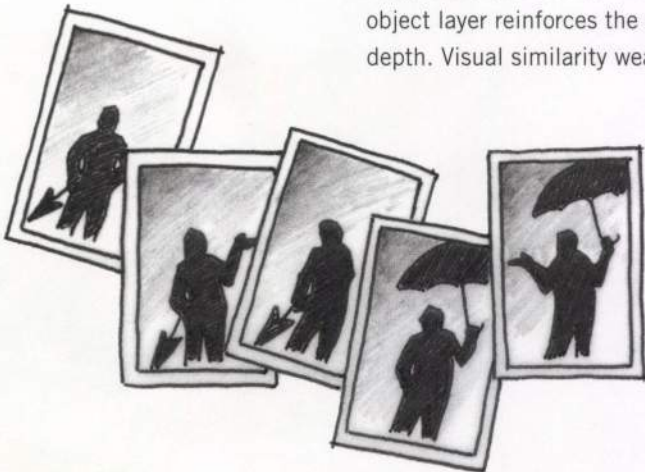
CAST SHADOW/REFLECTION

Objects accompanied by a corresponding silhouette on a surface appear closer to the viewer, relative to this surface. Gestalt principles of proximity, similarity, and symmetry influence the degree of depth. Contrast in the corresponding position of shadow or reflection is therefore associated with depth. In explanatory sketches, cast shadow helps separate drawn objects and information from their surrounding background and provides a sense of volume to three-dimensional objects. To establish visual hierarchy, use differences in shadow or reflection to establish layers in composition.

FOCUS DEPTH CUES

We perceive hierarchy through contrast in visual density. Biomechanics of the eye and environmental conditions affect the clarity of what we see, from which our mind infers depth information. Focus-based cues include relative focus, relative intensity, and atmospheric perspective.

RELATIVE FOCUS

Objects with comparatively less sharpness in contour and features appear farther back in space. This is due to constraints in the eye's lens and fovea that limit optical focus to a specific area at a single focal length (distance). As a result, peripheral objects and objects at other lengths appear blurred. Contrast in the sharpness of objects therefore communicates depth.

As the phrase "focus of attention" would suggest, relative focus is connected to attention because of the conscious action it requires. In explanatory sketches, relative focus explains how increased sharpness in detail attracts greater attention. To establish visual hierarchy, include sharper detail on objects of primary importance while degrading the detail on secondary objects.

The Fovea: A small, central area in the eye with a significant concentration of sensory cells to detect small details. We use this area to detect edges and feature information. In reading letters on this page, the fovea is engaged to see individual words and letters, while the surrounding paragraph appears blurred because it falls outside this sensory area.
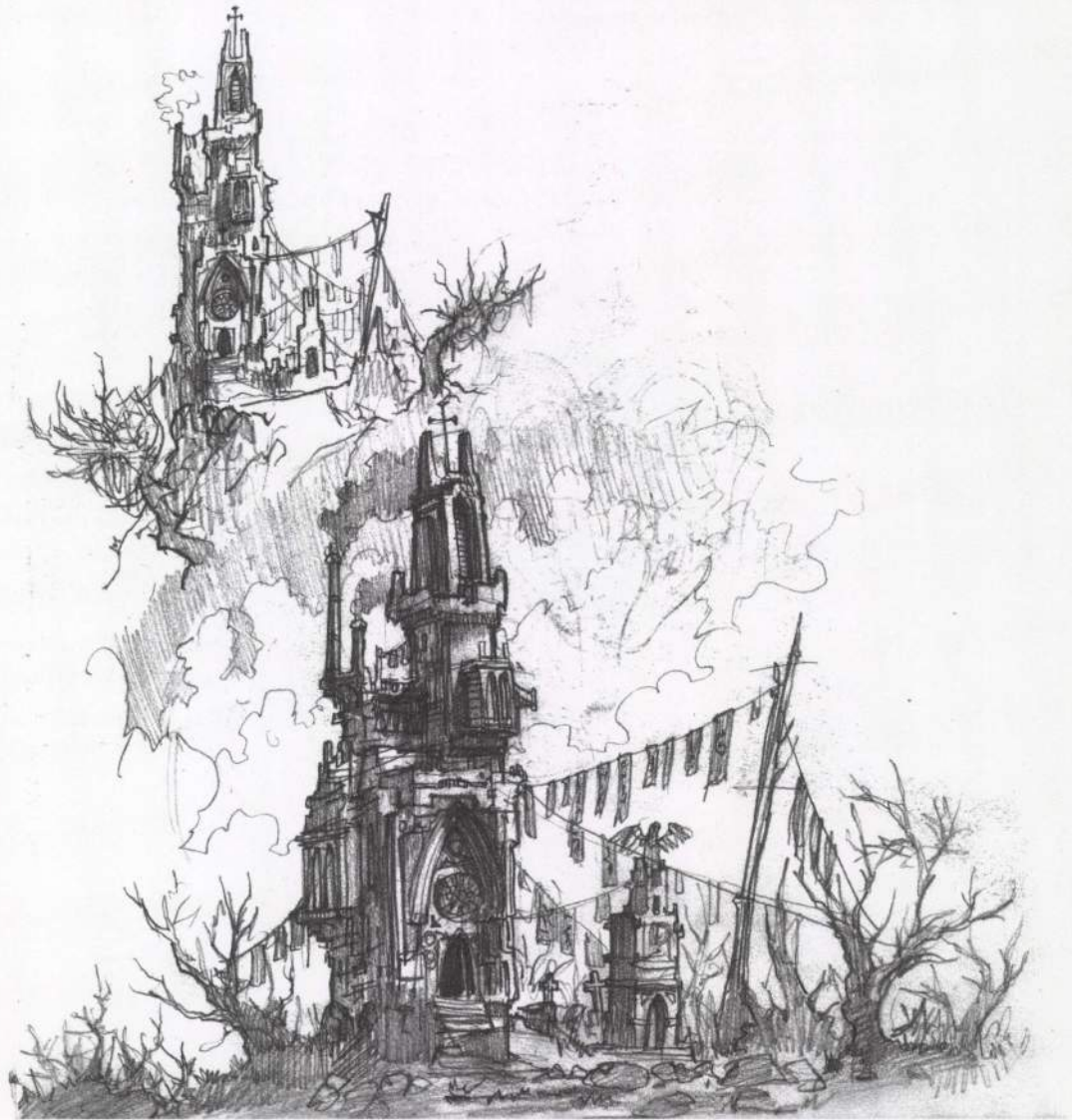
RELATIVE INTENSITY/ ATMOSPHERIC PERSPECTIVE

Objects with comparatively less intensity in value and/or chroma (color strength) appear farther back in space. This is due to both environmental and biomechanical factors. Environmental factors involve interference due to atmosphere quality (for example, haze and smoke) and illumination. Atmosphere quality involves haze from particulate matter suspended in the air, such as water and dust. These dull the contrast value and chroma of distant objects.

Illumination involves proximity to a light source. In bright conditions, overexposure reduces the contrast value and chroma of objects closer to the ambient light source, making them appear farther away. In dark conditions, objects closer to a light source are more intensely illuminated and perceived closer to the light source's position. Biomechanical factors relate to the arrangement of our eyes' sensory cells that limit color vision to the main line of sight and not the

periphery. In explanatory sketches, relative intensity explains how strong values and colors attract attention. To establish visual hierarchy in layout, use higher values and chroma to highlight and separate key information from a background involving a more muted palette. This is particularly useful to separate important information such as overlaid annotations from their referred objects and background elements.

flow

Flow is the difference between good and great explanation. In explanatory sketch layout, flow is the quality that directs the reader's eye along an intended path. When this path is clear in its shape, structure, connection, and direction, then visual movement in reading facilitates the audience's cognitive movement through an idea explanation. Flow ensures that the unfolding process in an explanatory sketch is both clear and engaging.

Ensuring visual flow in your explanatory sketch layout involves using form, association, and hierarchy in combination to define a clear visual path that supports reading. A good reading path involves three major elements—landmarks, waypoints, and waylines—and should always include characteristics or instances of all three. Thinking about flow in spatial terms helps to see layout as an environment that requires visual aids for navigation.

Making Tea

Waypoint

Wayline

Landmark

Waypoint
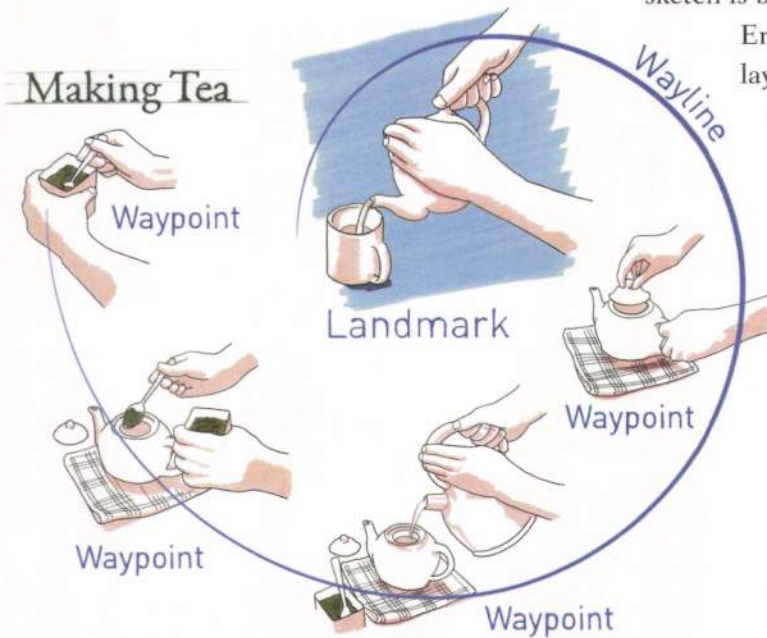
Waypoint

Waypoint

LANDMARKS

Layout landmarks are visible entry points within an explanatory sketch layout that act to orient the reader. They include a major contrasting image, text title, graphic, or other dominant visual object within layout space. As one of the first things noticed during reading, landmarks provide an anchor and a starting entry point that help prevent an uncertain, confusing read. Placing a landmark in your explanatory sketch layout should involve thinking about its impact on priorities in your explanation and layout shape:

- What is the first thing you want the audience to notice about your idea explanation? Is your landmark a visual expression of the idea itself (a graphic structure such as an object or system diagram) or another element such as text that introduces the perspective required to understand your message?

- How will your landmark's presence and position affect the overall shape and structure of a layout and reading flow? For example, if the landmark is a

central object, will the reading flow circle around it? Does the position take into account audience considerations, such as cultural reading directions (clockwise, top-to-bottom, left-to-right reading of Western cultures)?

- How will your landmark contrast with its surroundings for visual hierarchy? Will it be clearly primary but balanced against other visual elements to avoid dominating your layout and disrupting flow?

Signage presented in series sequence
(Illustrating an event)

Signs presented during an activity take on a variety of different roles (dependent on temporal context of the participant's actions). It is in this way they can be seen as prompts or activators to events (decision points along the sequence of an activity (or discussion as such).

Identifier
Cancellation
Point

Preparatory
Qualifying
Notification

Cautionary
Interruption
Point

Action
Activation
Notification

Cautionary
'in effect'
Notification

Preparatory
Notification

Preparatory
Action
Notification

Terminal
Action
Notification

Terminal
Point

NO SINGLES PLEASE

LIFT CLOSED

WEAR TICKET VISIBLE TO LIFT ATTENDANT

STOP GATE

STAY IN TRACK

PREPARE TO UNLOAD

CHECK FOR LOOSE CLOTHING AND EQUIPMENT

UNLOAD HERE

Whether they are effective or not is a function of perceived value + relevance.

A GOOD READING PATH INVOLVES THREE MAJOR ELEMENTS — LANDMARKS, WAYPOINTS, AND WAYLINES — AND SHOULD ALWAYS INCLUDE CHARACTERISTICS OR INSTANCES OF ALL THREE.

WAYPOINTS

Waypoints are small but distinct graphics and text in explanatory sketch layouts that act to orient the reader and introduce detail information. As lesser visual landmarks, waypoints often identify transitional events or key moments within explanation. For example, a paragraph title serves as a waypoint to indicate the start of a new section or topic. Building waypoints within layouts should involve thinking about the divisions they help identify:

- **Clarity in content:** As a transitional event in a reading sequence, a waypoint should help to orient the reader with its information. Within a waypoint's content, the transitional change and an idea-related message should stand out. Visual or semantic ambiguity within waypoints results in confusion that disrupts reading flow.

- **Clarity from surroundings:** Waypoints should be distinct steps, both visually and cognitively. Their boundaries and visual form should easily separate them from their surroundings, including other waypoints.
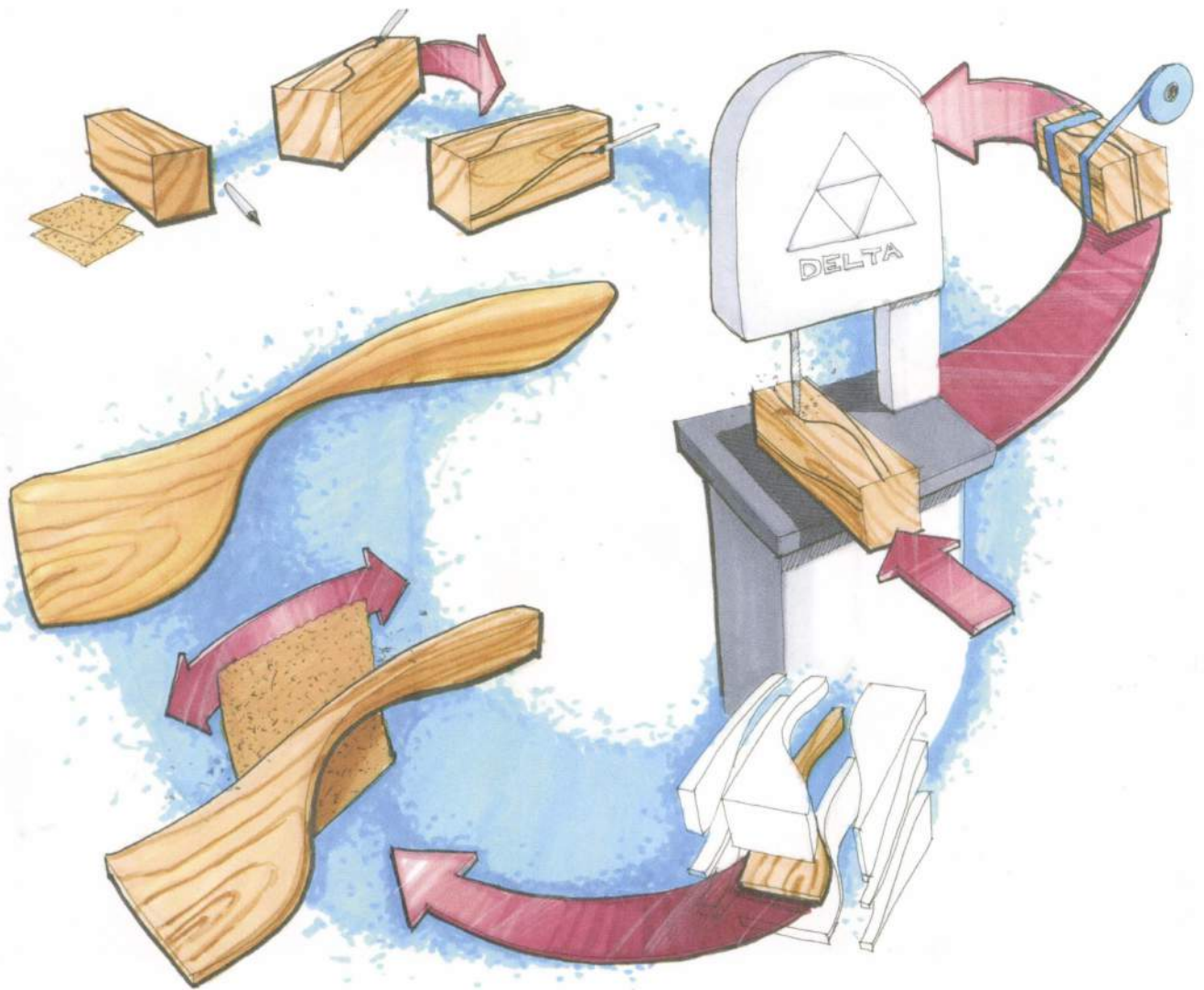
WAYLINES

Waylines are a series of objects in explanatory sketch layouts that together, implicitly or explicitly, identify a reading path through layout space. Their linear nature creates a strong flow. Implicit waylines involve landmarks, waypoints, and visual objects indirectly associated through their spatial relationship or common content. Explicit waylines use notational elements such as visible lines, arrows, dots, or text to depict a path of activity and connection. Organizing your explanation around a wayline's path brings several considerations:

- **Implicitness/explicitness:** If you identify a wayline's path implicitly, then consistency becomes important. Standardized increments, shared qualities, or repeated elements are necessary for seeing a common pattern for connection. If you identify a wayline explicitly, notational clarity becomes important. Draw visible wayline elements with different line weights or distinct color to ensure visibility. Avoid long waylines or branching out into more than five lines to ensure legibility.

- **Shape:** A wayline's shape is often tied to the effect of overall layout shape. Most readers prefer to follow smooth, simple waylines such as straight lines, curves, circles, or serpentine shapes. Angular or abrupt changes to a wayline's overall direction disrupt flow.
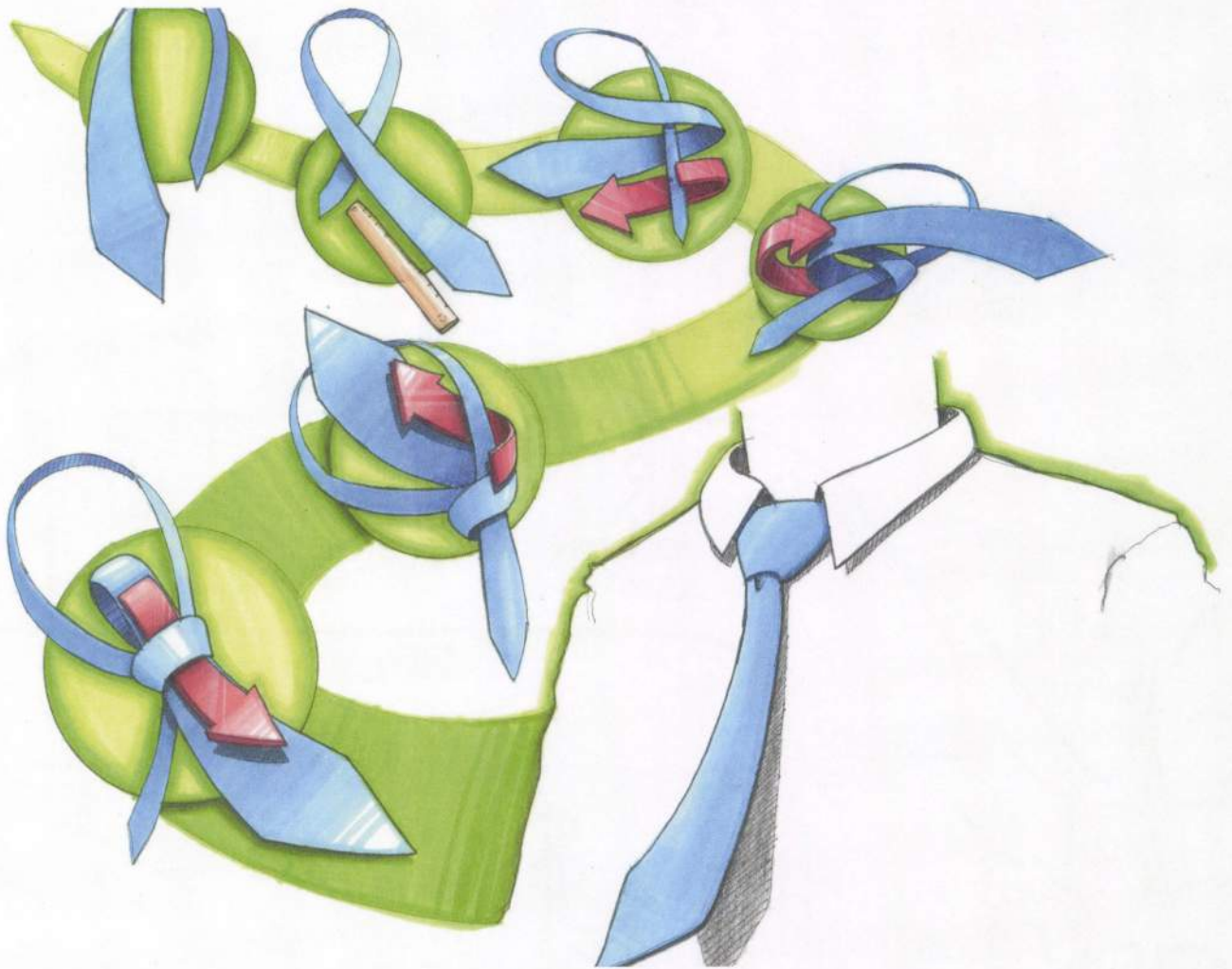
- **Spacing:** A wayline's visual rhythm (pattern) of its components reinforces flow with continuity and pacing. Ensure a strong visual connection, particularly for visual evolutions such as methods of construction, operation sequences, or biological morphs. Too much separating "space" disrupts flow.

- **Sequence:** Waypoint sequences within waylines should clearly show a reading progression. Two or more waypoints together need to communicate a direction along a wayline. On a local level, look to see whether this direction is clear, considering your audience's knowledge, and abilities.

- **Cultural preferences:** Keep in mind your viewers' cultural reading directions, such as top left to bottom right. Adhering to common reading patterns brings familiarity. Breaking convention adds interest but can cause confusion.

1850
1er REVOLUTION INDUSTRIELLE

1880
$

1914 1939 1970   2001 2008 201
1er & 2ème 1950 1979   MA
GUERRES   OIL   9/11   VITE
MONDIALES   PEAK

PER CAPITA

FINANCIAL CRISIS
2006 PRODUCTION OIL PEAK.

ARTs
AUTONOMOUS
AUTONOMIE

FORCE DES SYMBOLES
2ieme REVOLUTION INDUSTRIELLE
1969 AUTOROUTES BANLIEUES

CULTURE

ON DÉCRÈTE LE
DROIT AU BONHEUR

ART
INFLUENCE

A WALK ON THE MOON!

INDUSTRIE

ESPACE

IRRATIONNEL

Foi

1789

JUSTICE MORALE
POLITIQUE $

POLITIQUE
SCIENCES HUMAINES

RAISON

CONSOMMATION
FRAUDE

DROIT AU POUVOIR
EU. ITALIE
FRANCE CANADA

RATIONNEL

REVOLUTIONS

SCIENCE
OBJECTIVE KNOWLEDGE

3 REVOLUTIONS SIMULTANÉES
1 MONDIALISATION
2 INFORMATIQUE
3 BIOTECHNOLOGIES

SCIENCE TECHNIQUE

HOLISTIQUE
→

○

SF
GAÏA NATURE
TERRE

ADÉ 2010
© L'Unité Créative Inc. 2010
The Creative Unit Inc. 2010

$
ARGENT
MONEY.
CAPITALISME
CAPITALISM POWER

2020 ?

3ıèm RÉVOLUTION
INDUSTRIELLE.
(J. RIFKIN)

PORTE VERS)
LA SPIRITUALIÉ

ARTS + POLITICS + SCIENCES
APS

ART COMME
ÉQUILIBRE DES
VIVANT

ARTS
APPLIQUÉS.

ÊTRES VIVANTS

BUSEMENT
TIQUE

SPIRITUALITÉ
TEMPS
RESPIRATION
MÉDITATION

MIE

ES

ÊTRES PERFORMANTS   30°

45°

AÚÉÉ
2010.

TENTES
ESIR DES
MERVEILLES
CHNOLOGIQUE

- WEB
- GREEN
  ENERGIES

- COMMUNICATION
  REVOLUTION
- NEW ENERGY REGIME.

RECHAUFFEMENT
CLIMATIQUE.

POLLUTION
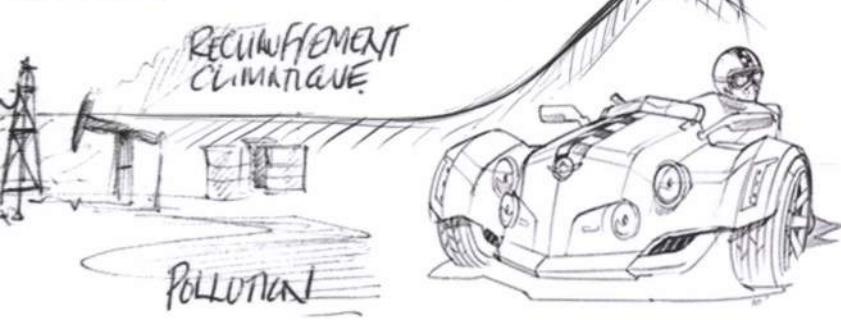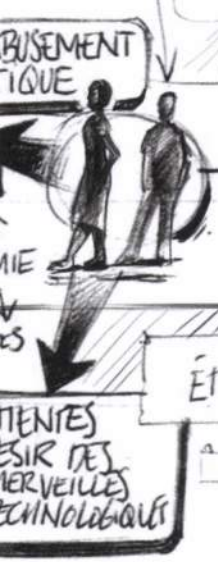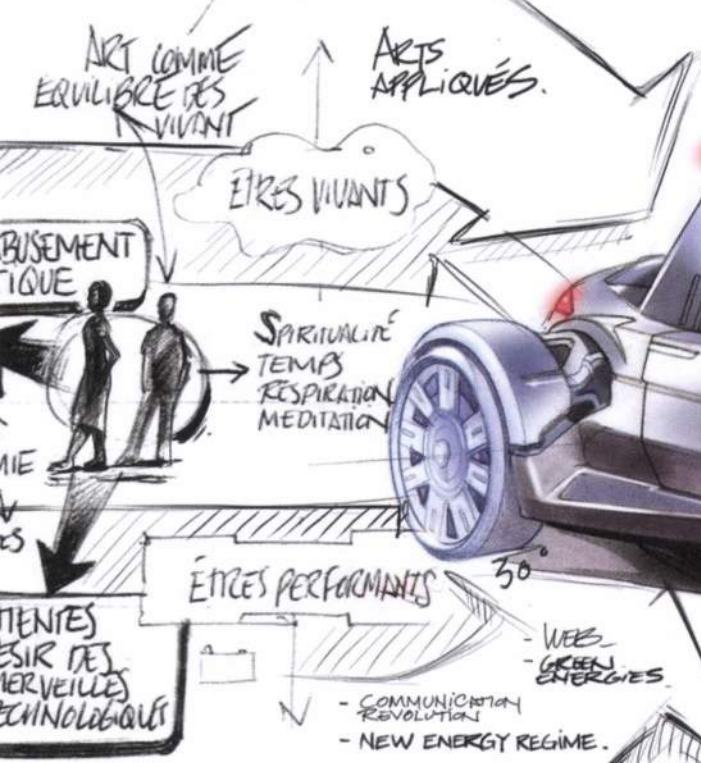
DETAIL FEATURES OF AN EFFECTIVE EXPLANATORY SKETCH

GRAPHIC DETAILS SUCH as line style, text, and color offer opportunities to augment sketch expression and function. This chapter addresses some of these details and provides advice in the context of explanatory sketches.
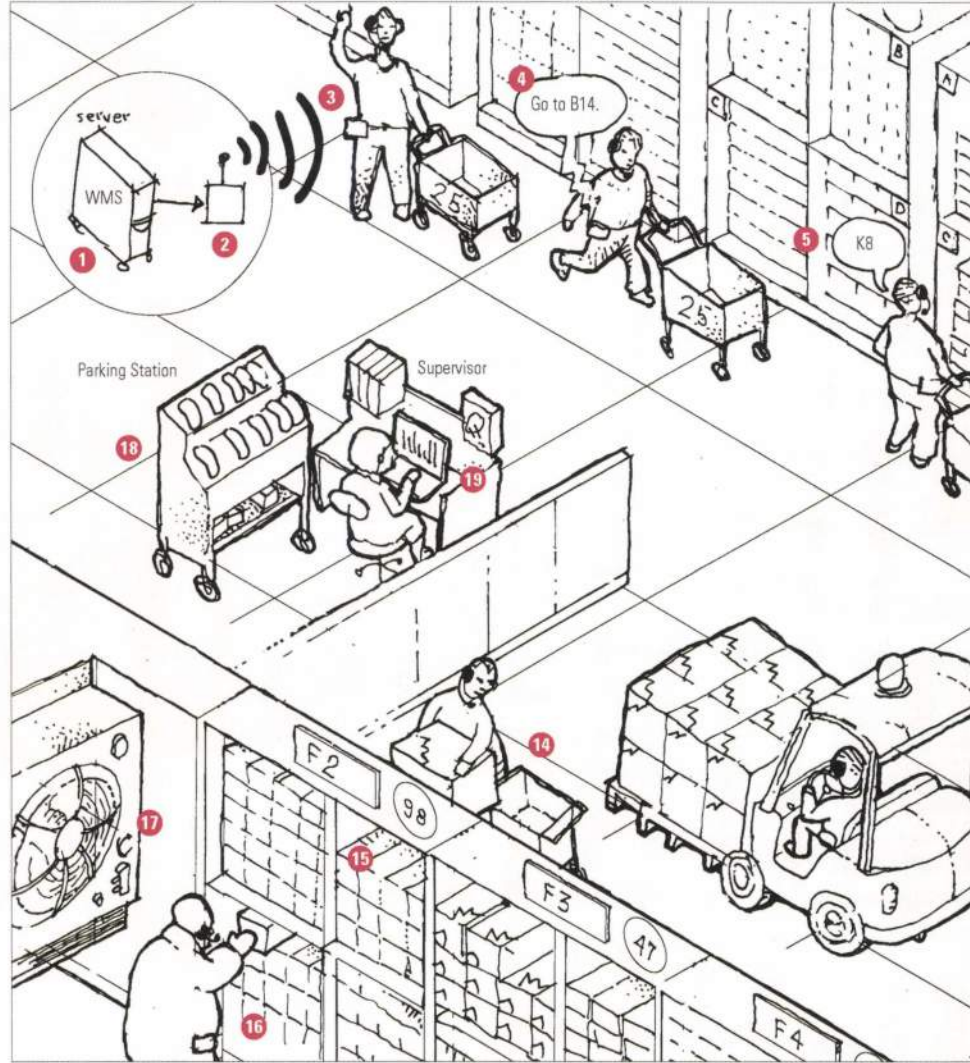
In explanatory sketches, drawn lines have many functional uses. They can define form, partition as a dividing element, and function as a physical link or border. Drawn lines are also emotive marks and can help establish a visual tone in their drawn character, such as calmness or urgency. For purposes of clarity, it helps to consider how line qualities affect function and perception.

Results
- Training time is reduced.
- Accuracy of picks improves.
- Productivity goes increases.
- Operation costs decrease.
- Return on investment can be achieved in as little as 00 months.
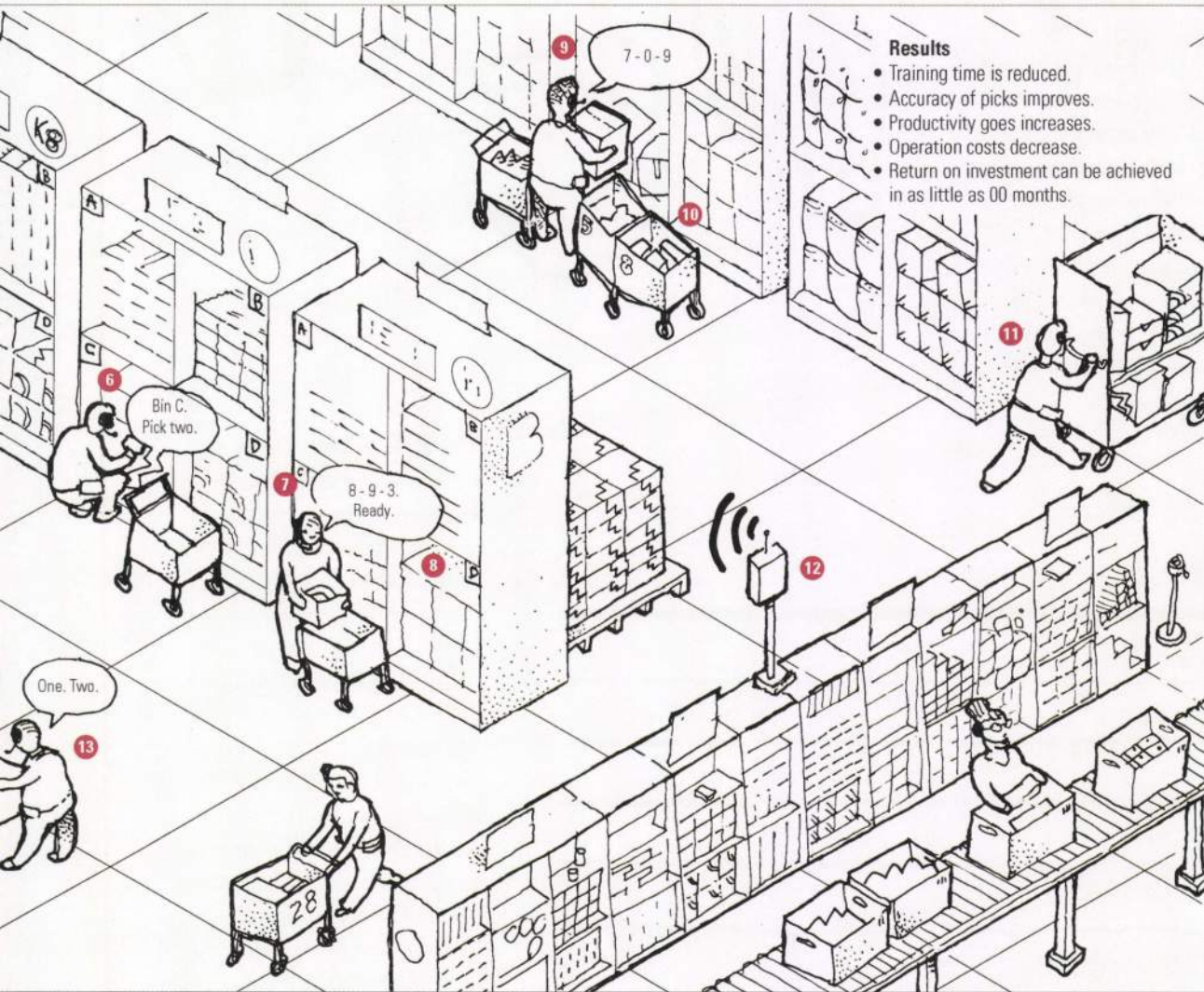
LINE WEIGHT

Drawing line thickness speaks of emphasis. In function, varying the line weights in an explanatory sketch helps direct attention by highlighting features and objects, thereby supporting association and visual hierarchy. In perception, line weight is a sign of mood and intent, as evidenced by the physical pressure used to make a mark. It is in part for this reason that we associate bolder, heavier lines with emphasis through a visual intensity. Thicker lines are characteristic of fast, simple, bold gestures, whereas thin lines are more delicate, contemplative, and supportive of detail.
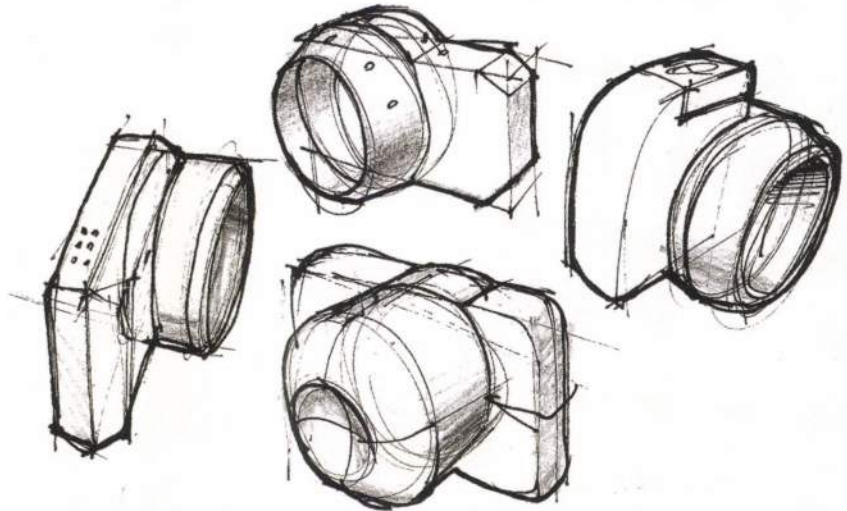
Object line

Dimension line

Hidden feature line

Center line

Section line

Section line

6:1 ratio

1:1 ratio

1:1 ratio

LINE STYLE

The style of your lines—in color, shape, and form—conveys meaning. Some of this is inherent: we use dashed lines to indicate obscured features because of the partly hidden nature of the line itself. Other line styles depend on convention: engineering has established line styles to communicate divisions, sections, axes, etc. Longer dashes are peaceful, particularly with a high ratio of dash to space. In contrast, shorter dashes project a higher degree of energy. Dashed lines with a 1:1 ratio between dash and space are particularly active because of the seeming vibration created by their equal, ambiguous figure–ground relationship.

LINE COMPOSITION

In some explanatory sketches, such as route maps, a drawn line is the primary element of visual explanation. In others it serves as an associating element, such as a leader line to link descriptive text to a drawn object or feature. For explanation purposes, associating line composition should be easy to trace with the eye. In simple layouts (top), organic drawn lines are recommended. In complex layouts (bottom), it is best to simplify and group line paths. This can involve color-coding, dashing, and standardized orientations (0/45/90 degrees) to avoid a confusing spaghetti mess.
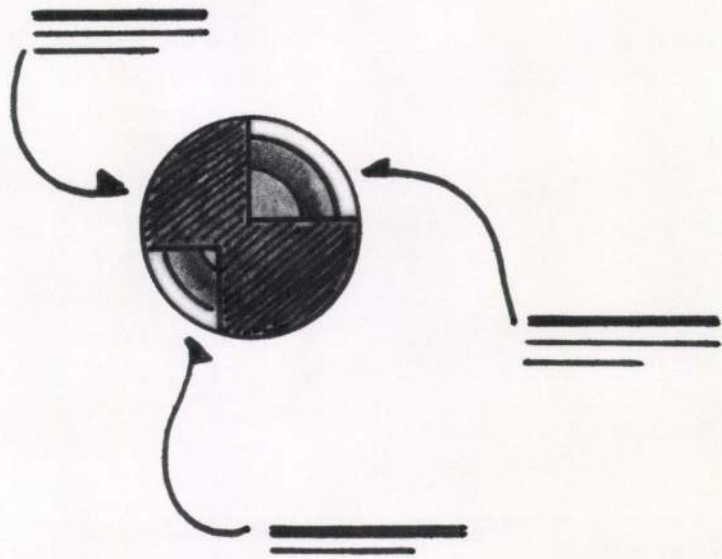
Simple line composition
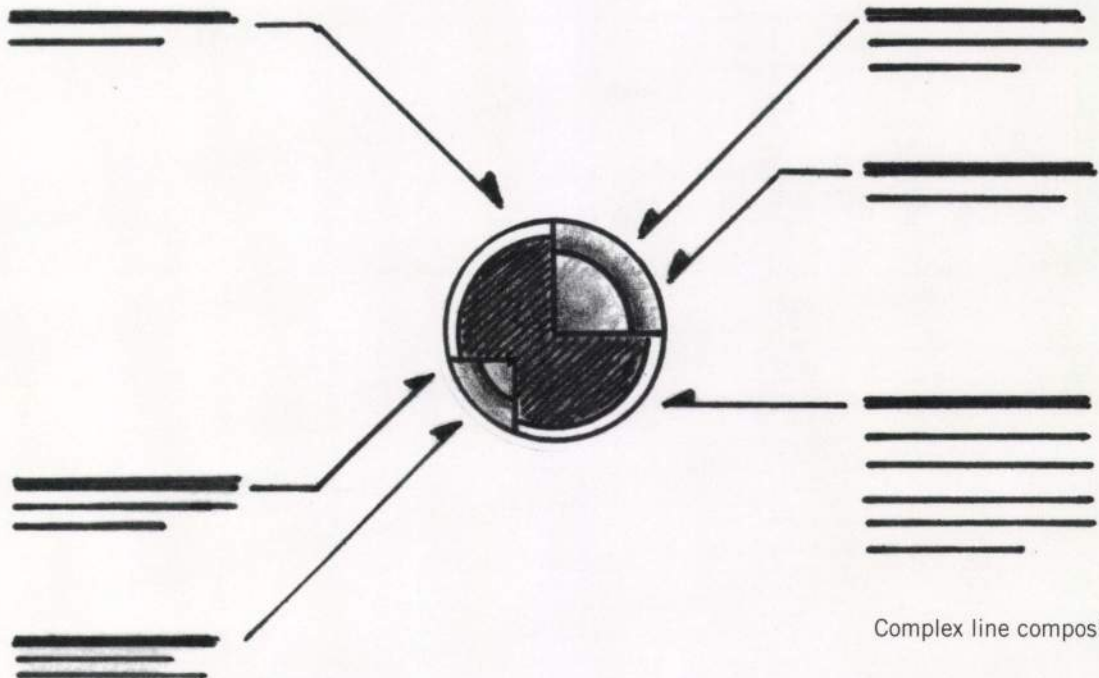
Complex line composition

title blocks and drawing frames

In explanatory sketches it is often helpful to include a framing element such as a box and title block to formalize a presentation. A good title block not only provides a visual boundary to make a drawing more formal and official but is also a valuable organizational reference. When collaborating with others or working on an idea over a long period, it can be frustrating to remember the origin and chronology of a collection of loose sketches without information such as basic dates and version numbers.

Some helpful things to include in title blocks are:

- Drawing title
- Drawing date
- Version or iteration
- Names (client, company, or designer)
- Additional comments
- Considerations
- Next steps for development
- Notes
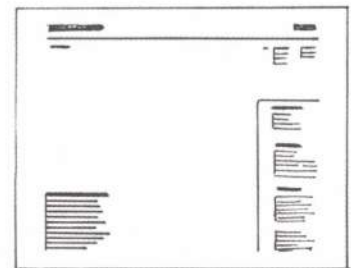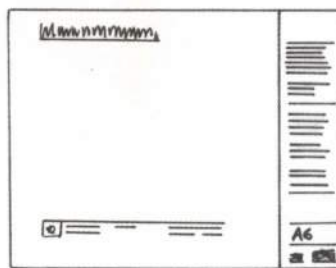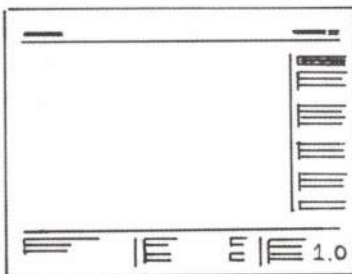
DYNAMIC INTERACTION
INTERFACE DEVELOPMENT PROGRAM
LAUNDRY PAIR / WASHER PLATFORM
SKETCH #1 OF 2   15 FEB
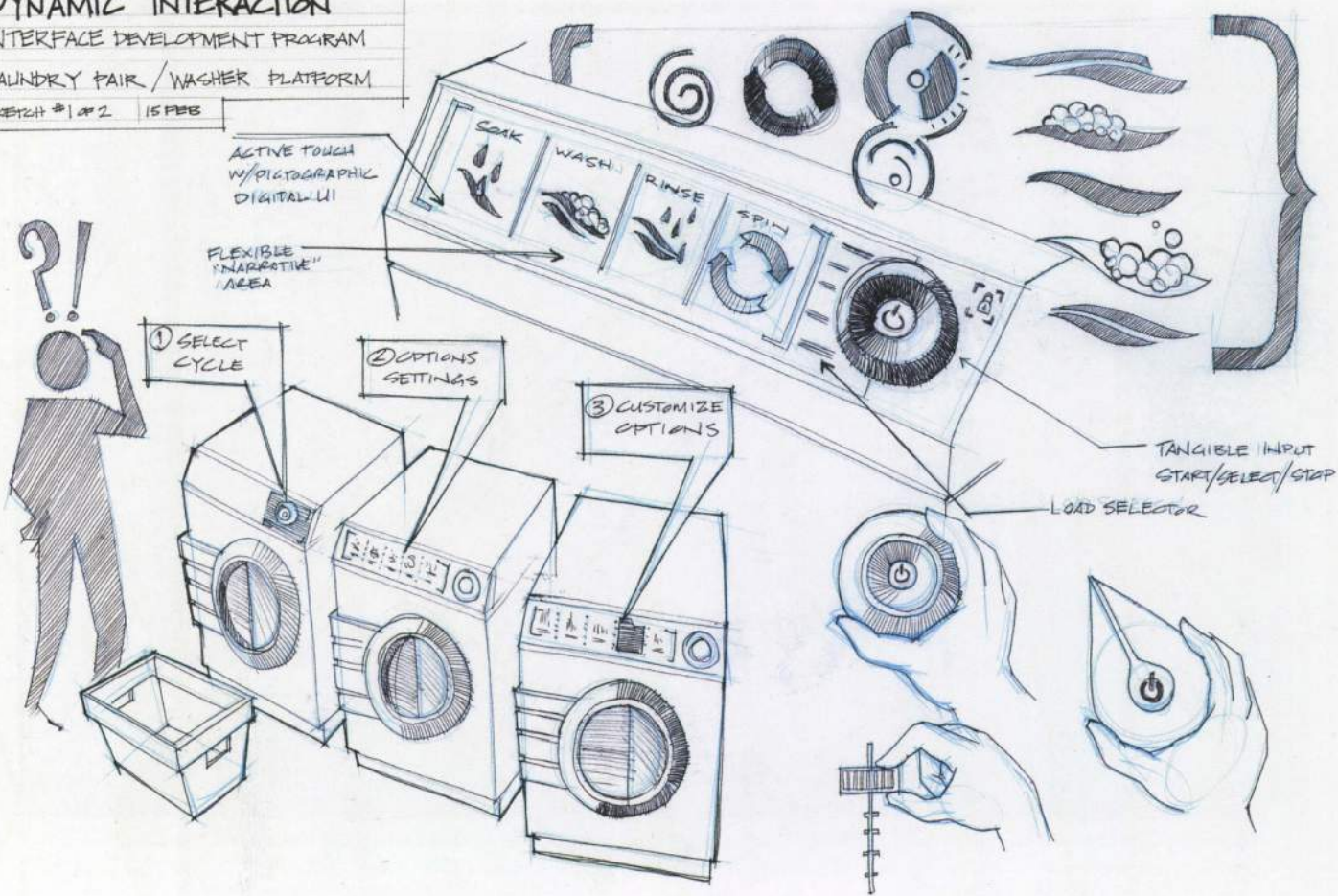
ACTIVE TOUCH
W/ PICTOGRAPHIC
DIGITAL UI

FLEXIBLE
"NARRATIVE"
AREA

SOAK   WASH   RINSE   SPIN

① SELECT CYCLE

② OPTIONS SETTINGS

③ CUSTOMIZE OPTIONS

TANGIBLE INPUT
START/SELECT/STOP

LOAD SELECTOR

A GOOD TITLE BLOCK NOT ONLY PROVIDES A VISUAL
BOUNDARY TO MAKE A DRAWING MORE FORMAL AND
OFFICIAL BUT IS ALSO A VALUABLE ORGANIZATIONAL
REFERENCE.

Labels within the drawing: PARK ST., BRIGIT ST., PED WAY, 1A, 1B, 2, 3, 4, 5, 6, 7, 8, 9
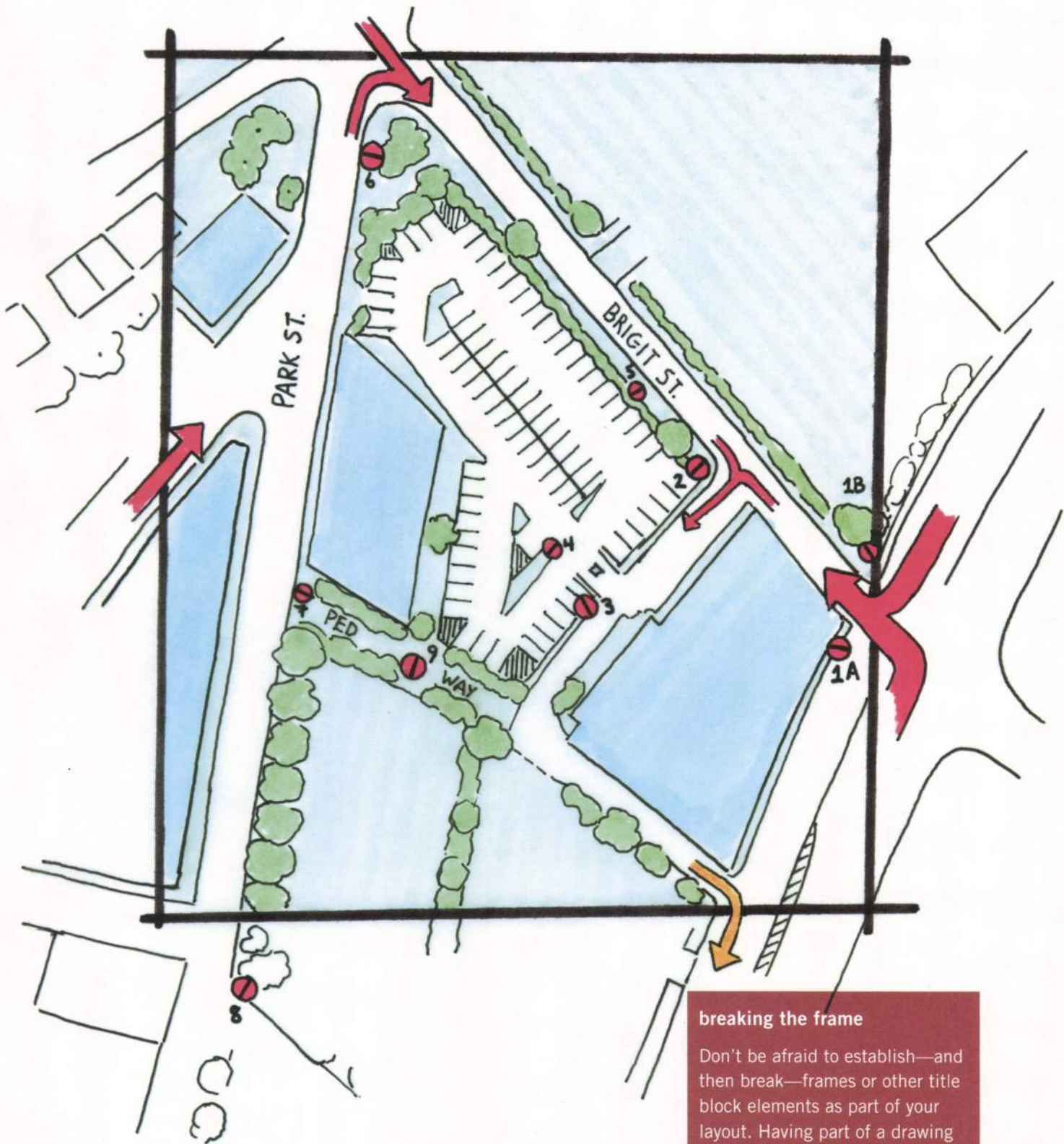
VIGNETTES

As explained on page 126, vignettes are a form of frame used within a sketch that enables you to bound together a group of visual elements in a composition and link it to other similarly shown groupings to suggest a larger relationship.

Storyboard templates and comic books are a prime example of their use in support of explanations that involve a timed sequence. Vignettes associate with one another through shared qualities such as size, shape, and alignment.

In explanatory sketches, vignettes help to reinforce visual presence and association. The next section in this book about narratives provides more information about their application.

EGG

HE EATS THE EGG FOR NUTRIENTS

EGGS ARE OFTEN LAID ON LEAVES IN AN ADHESIVE GLUE-SUBSTANCE

CATERPILLAR

ADULT

ADULT BUTTERS LAY EGGS ON LEAVES

PUPA

THE COLOR OF THE BUTTERFLY BECOMES FAINTLY VISIBLE.

PUPA CASE SPLITS
BUTTERFLY STRUGGLES OUT

BUTTERFLY EXCRETES WASTE ACCUMULATED DURING METAMORPHOSIS

BLOOD IS PUMPED THROUGH WINGS TO INFLATE THEM
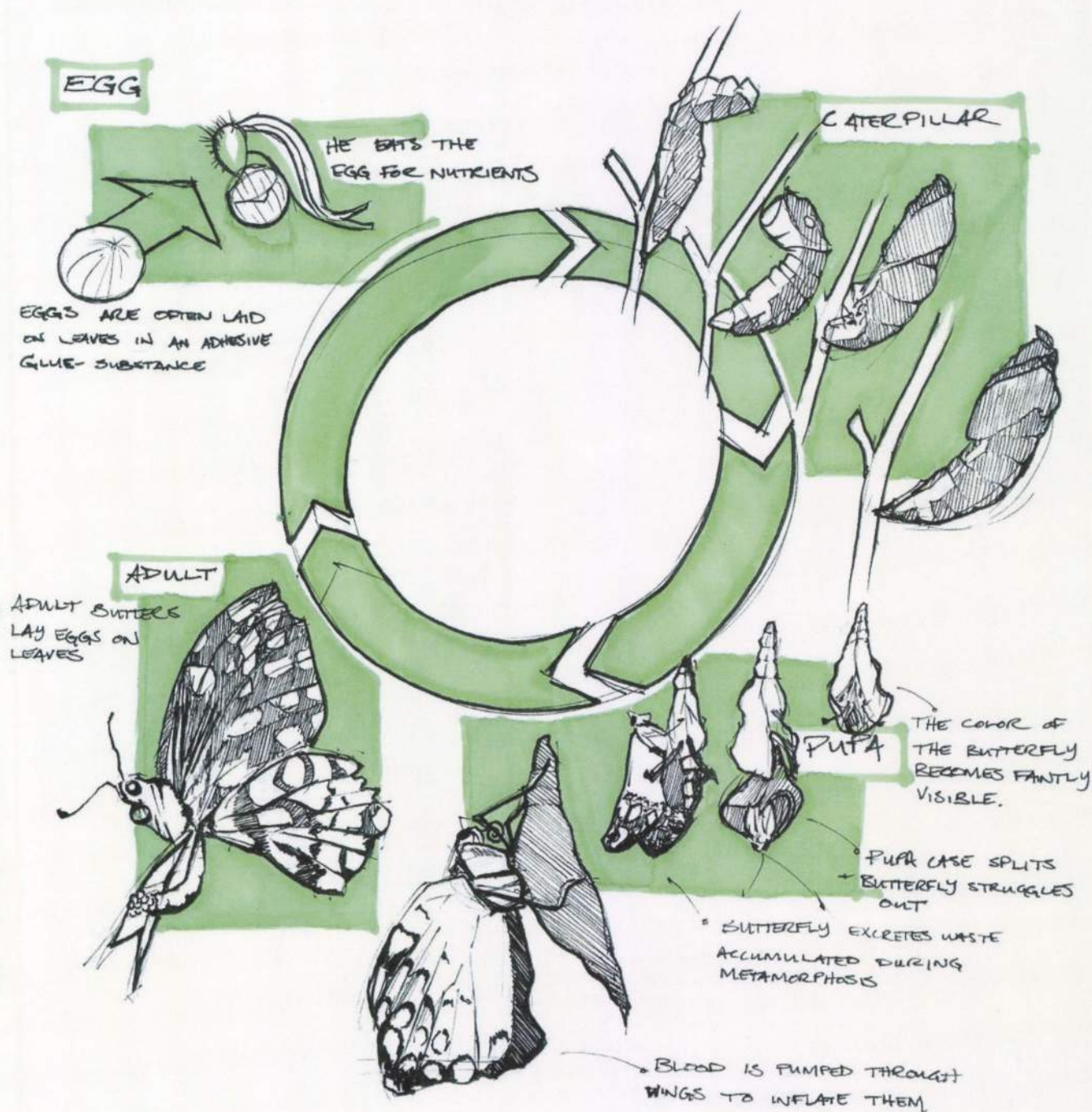
Explanatory sketches include titles, captions, labels, and short descriptive statements to provide contextual information that highlights a point of view. Text also is an opportunity to establish tone with its content and appearance. Explanatory sketch text needs to be visible, legible, and easy to understand. This is a matter of both visual form and content. As you include text in layout, consider the reading relationship and sequence between text and graphics. What do you want your audience to pay attention to first? Is there a desired sequence? How will text and graphics reinforce each other? The following advice about text will help you achieve legibility and expression in your explanatory sketch's text.

BugWorks
Centerpiece Concept

• BUILD A BUG & HANG ON THE STRUCTURE.

• PHOTOS FROM BALCONY ABOVE.

• LIFT TRUCK INSTALLATION. WHO DOES THIS?
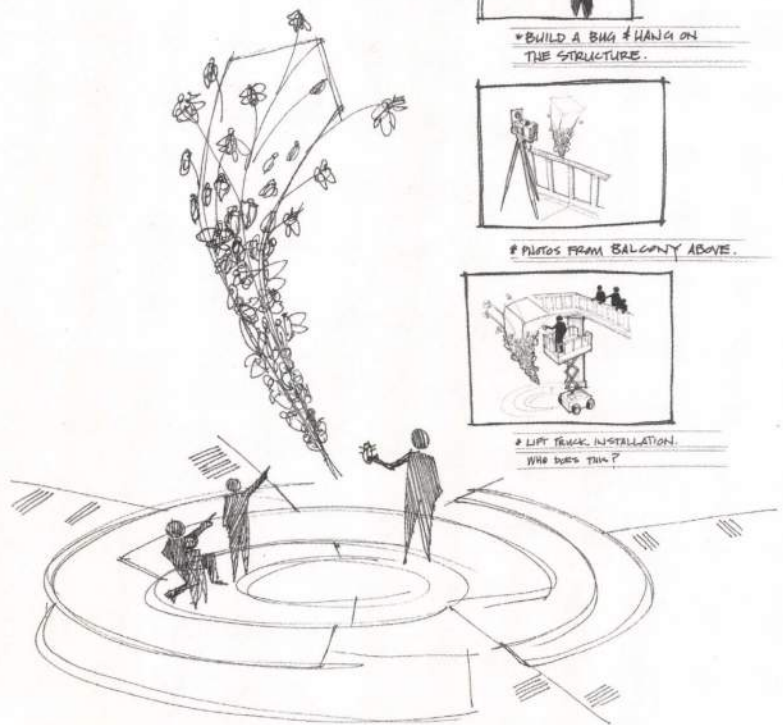
THE EXPERIMENTAL GALLERY WILL HAVE A LARGE BUG-THEMED CENTERPIECE THAT CORRESPONDS WITH A GRAPHIC TIMELINE BELOW.

THIS SERVES AS AN ORIENTATION POINT AS WELL AS A FOCAL POINT FOR THE EXHIBIT SPACE.

STYLE

Text style is expressive in character with subtleties in its shape, color, angles, and so on. We can use these qualities to create presentation tone with a visual voice. For example, thick, bold letters in red visually shout, while gray, thin letters comparatively whisper in restraint. Text style affords broad opportunity for expression but requires care. Ornate text using drop shadows, silhouette lines, and three-dimensional effects can grab initial attention, but will rapidly decrease legibility and distract from subsequent reading of the remaining layout. As general principles:

- Consider how typographic style and flourishes can augment your point of view by reinforcing a desired tone.

- Use typographic ornamentation sparingly to avoid overwhelming your drawing.

- Hand-drawn text in explanatory sketches should be simple and less prominent to the objects and other graphic structures it accompanies. Audiences expect explanatory sketches to be visually driven and concise. When text competes with graphics for visual prominence in a layout, a conflict results because the reader's eye will want to favor the graphics first.

- Unless seeking a structural feeling and look with all capital letters, favor a combination of upper- and lowercase letters for easier reading.

SPACING, SCALE, AND CONTRAST

The scale and space—both around and between letters, words, and lines of text—are also expressive.

- Greater space helps establish a calmer tone.

- Vary the scale of titles, subheads, and other text for hierarchy and flow in your layout. Consider type size in respect to desired attention in sequences (larger first, then smaller).

- Uppercase letters in titles and other major text should be approximately 1 inch (2½ centimeters) in height for every 5 feet (1½ meters) of intended viewing distance.

- Text should clearly contrast from its surrounding area. Unusual drawing surfaces and colors, or poorly lit presentation environments, may require emphasizing contrast through color choice, larger text, and/or greater spacing.

PLACEMENT

How and where you place your text in layout can affect its reading and association. Text length, orientation, and alignment are all factors to consider.

- Avoid positioning text too close to graphic structures, especially above drawn objects—a location where text can feel cramped and heavy.

- Draw a topline or baseline (better) as a guide for drawing text.

- Group text and graphic annotations to avoid clutter and preserve white space.

- Keep line lengths and paragraph widths short.

CONTENT AND COMPOSITION

Audience understanding of your text depends on content and composition. Can an audience comprehend its meaning? Is it easy to read? Reading text out loud is a good test. If it does not flow naturally aloud, then it is likely hard to read.

- Aim for direct language that considers audience knowledge.

- Avoid odd visual breaks in sentences, particularly with multiline text.

- Vary sentence length for interest.

- Limit bullet lists to a maximum of five to eight items.
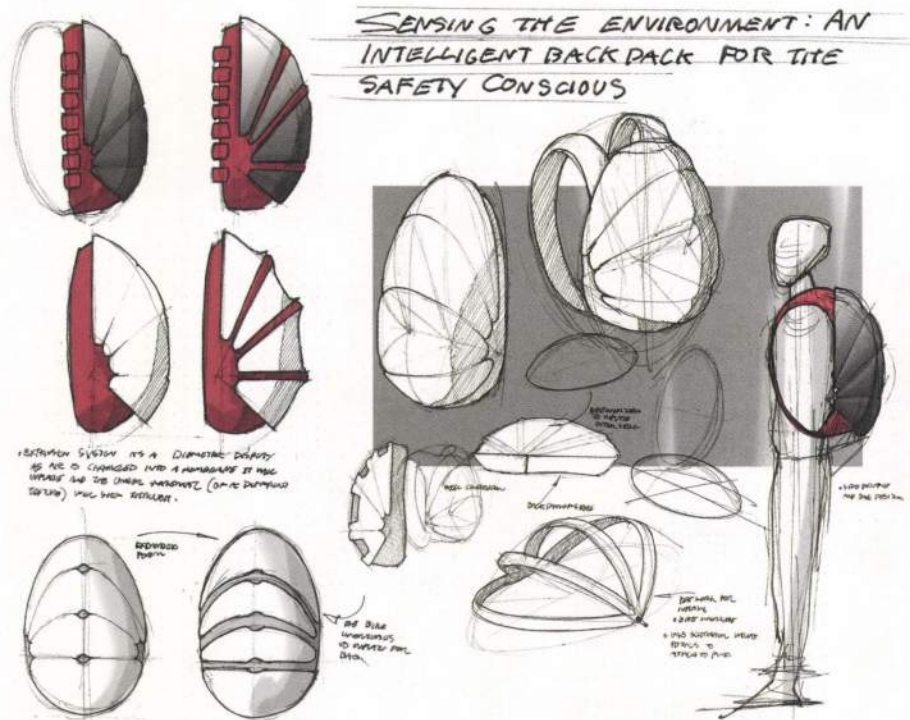
- Number sequences clearly.

TITLES

Drawing titles provide an opportunity for a large, expressive statement that engages audiences and helps make your explanation desirable to read. Decisions about titles depend on their need for prominence in a layout. Does a title need to be read first to frame the explanation with context? Style, spacing, scale, contrast, and position are ways to heighten title attention. Title content is also particularly important. Rather than a descriptive title that simply says "How Coffee Processing Works" or "Bike Helmet Concept 1," seek to use evocative and personally engaging language. Use titles such as "Roasting for Success: The Miracle of Coffee Production" and "Can a Smart Bike Helmet Save Your Life?" Evocative titles pose questions and make expressive statements that open the door to interest and curiosity in your visual explanation.

ANNOTATIONS, CALLOUTS, AND LABELS

Text annotations, such as callouts and labels, identify and describe parts and features. This text should involve simple terms and concise, common language for ease of reading and less distraction from your drawn objects and other graphic structures. If you are not sure about what you want to say, write it out and then cut the length in half by removing unnecessary words, particularly prepositional phrases, adjectives, and adverbs. Look to reduce adjective and adverb clauses (for example,

"This idea which is innovative for transportation" becomes "This innovative transportation idea"). Short statements are more authoritative than longer, emotive paragraphs.

Just as with leader lines, alignment is particularly important with labels. When labeling your explanatory sketch, group and organize your labels in a consistent alignment and with appropriate space from your sketch. This avoids clutter and helps to separate your labels from the rest of the drawing.

BUILDINGS - INTERIOR DIRECTORY

TABLE HEIGHT OPTION, ELLIPSE SHAPE

40

BLDG NO.

DIRECTIONAL

TOUCHSCREEN

MAP

OR FREESTDG IN LOBBY OF EACH BUILDING SMALL TOUCHSCREEN, SLEEK, ELECTRONIC

CONSIDER AUTOMATIC DIAL TELEPHONE
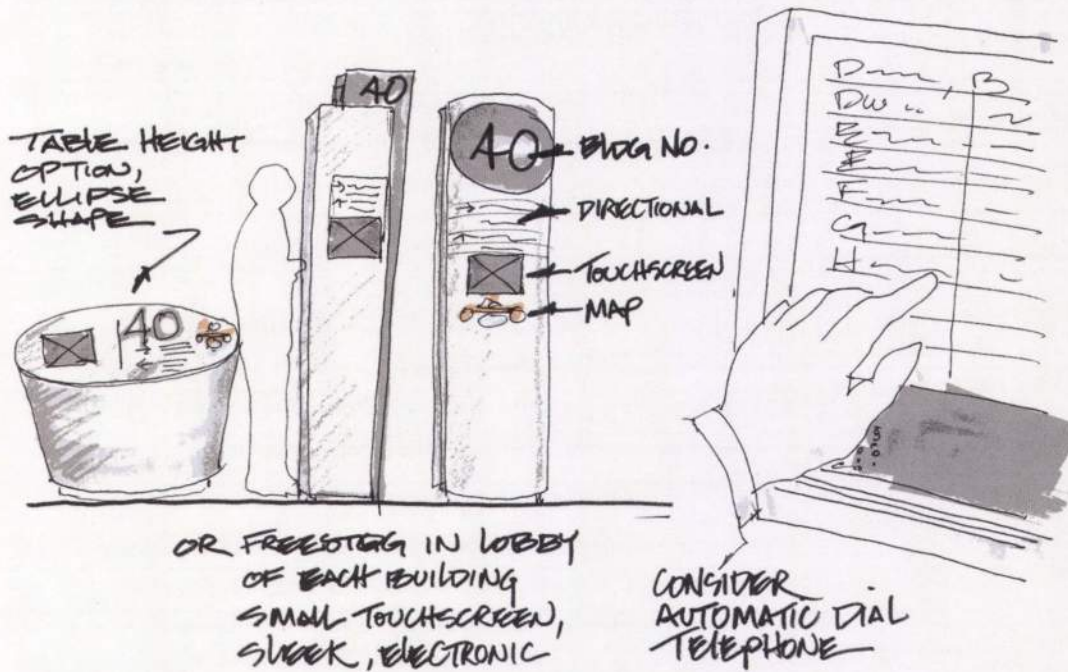
Color use is a difficult detail feature of explanatory sketches. It can elicit an unpredictable, strong reaction because of personal taste and deep cultural association. The benefit to color is in its appeal and function. Used well it not only adds life to a sketch but also strongly directs attention, helps associate important information, and can provide a scale for measurement.

For clarity of explanation, always use color sparingly. Overuse of color dilutes emphasis with a rainbow that is as distracting as it is undistinguished. Simple, limited applications of color are invariably stronger in graphic effect and appeal. Enhancing your explanatory sketch depends on understanding some basic principles:

- In drawing, there are three basic applications of color:

  1. Color as a ground element to set a drawing apart from its page and add atmosphere.
  2. Color as a figure element to add dimension and presence to drawn objects and graphic structures.
  3. Color as a detail element to emphasize components or features of objects and graphic structures.

color: associating important information with color appeal
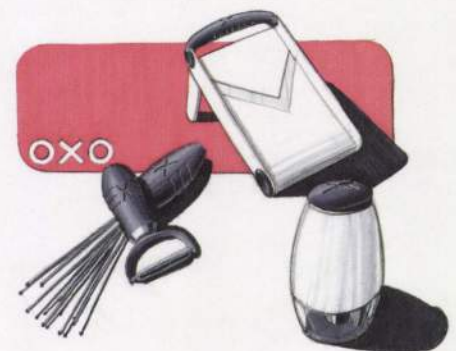
- When color is used in a graphic code, a scale, or serves to differentiate information or objects in an explanatory sketch, anticipate the possibility of color deficiencies in eyesight, particularly with red/green color blindness. Color hue should not be the sole means of differentiation. Other variables such as shape and value should help differentiate objects and accommodate impaired audiences.

- To enhance the clarity of a drawing and support visual hierarchy, background elements should favor "ground" colors for rendering most shapes and defining major areas. Ground colors are usually low intensity and light values, such as warm and cool grays, and pastels, that preserve the visibility of hand-drawn lines in a sketch, thereby maintaining that sense of a sketch as a conceptual draft.

- Important and highly directional elements should sparingly involve a "spot" (highlight) color that is comparatively intense in hue relative to the overall drawing. Spot-color usage is best to bring particular attention to annotation labels and detail features such as annotations, small buttons, lights, and dials that might otherwise be overlooked. Minimal applications are cleaner and increase attention to highlights.

- Bold, dominating colors indicate a higher degree of rendering fidelity (accuracy) to a drawing.

- Avoid pairing colors of similar value to avoid a vibrating effect.
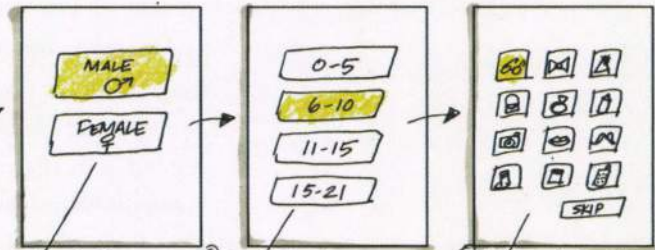
Architectural floor plan
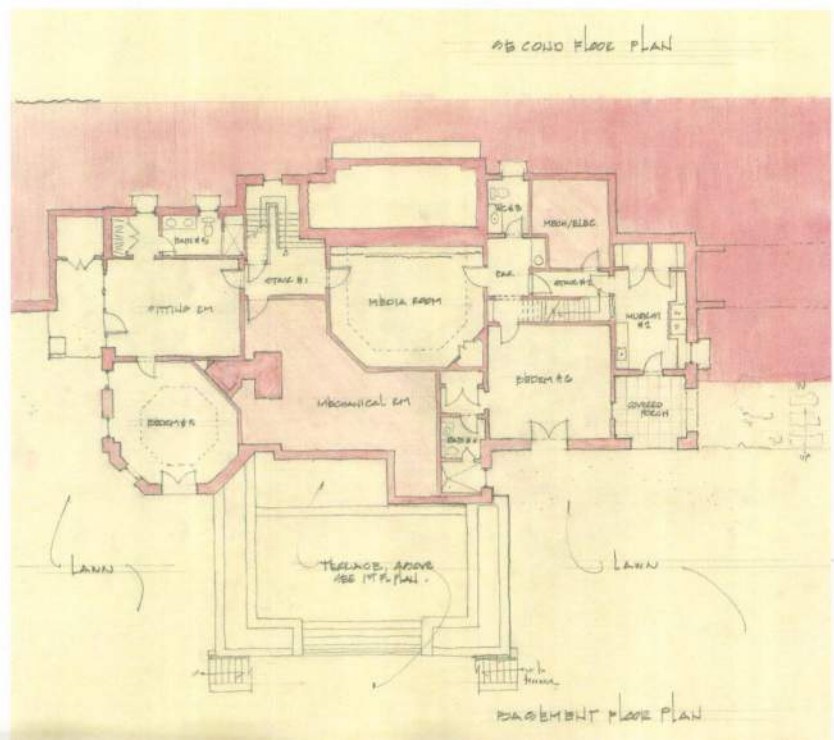
Visitor observation Tool:
- ipad app
- optimizes for multiple entries
- Predefined visitor characteristics allow for speedy entry.
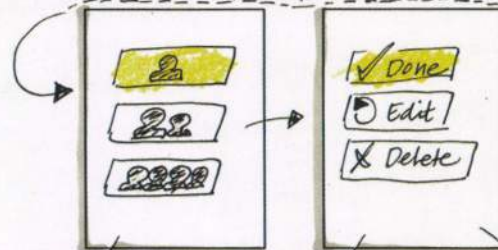- All functions are single tap access.

Creating a visitor card:
- 5 step process.
- like a field notebook
- canned/predefined attributes
- Expedite entries

MALE ♂
FEMALE ♀

① Gender selection

0-5
6-10
11-15
15-21

② Predefined age ranges

SKIP

③ Avatar characteristics

← Chronological Archive Session

9:31
10:01
9:45

Facilitates & Allows for multi-observation

Visitor Card:
- Individual Observations
- timestamped
- Avatar for ID.

Alt:
- Grouped Observations
- Double tap to access individual data.

✓ Done
⑤ Edit
✗ Delete

④ Visiting style

⑤ Confirm/Exit

At this stage, visitor card appears on the screen and timestamped.

User interface study

Erasmuslijn
geen zone info
Oost
Calandlijn

Calandlijn
in rijtuig
Erasmuslijn
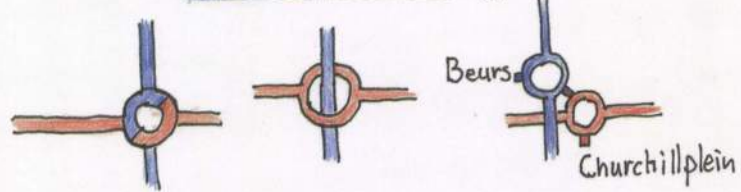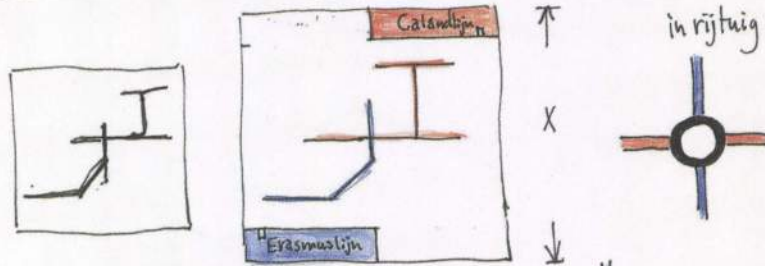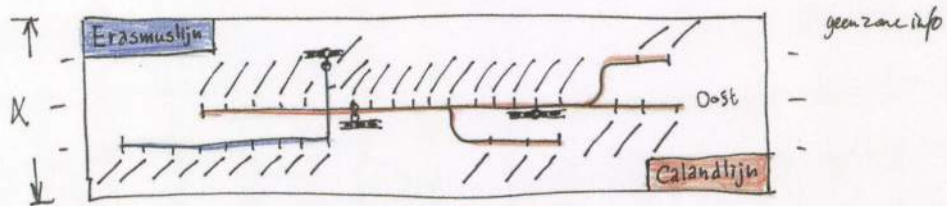
Transit route map study

Beurs
Churchillplein

249

Explanatory sketches depend on a collection of features for orienting information. This includes objects and figures shown for comparative size, scales for measurement, compasses, information keys, and "You are here" markers. Such familiar features are essential context for recognizing meaning and significance. A tool is hard to appreciate in size without the context of a hand holding it. A map has little use for navigation unless we see its context relevant to our position and where we want to go. Orienting features provide a link that creates a personal connection between reader and idea by answering common questions such as "How do I hold this to make it work?" and "Are we really that far away?" Here are a few principles for orienting features:
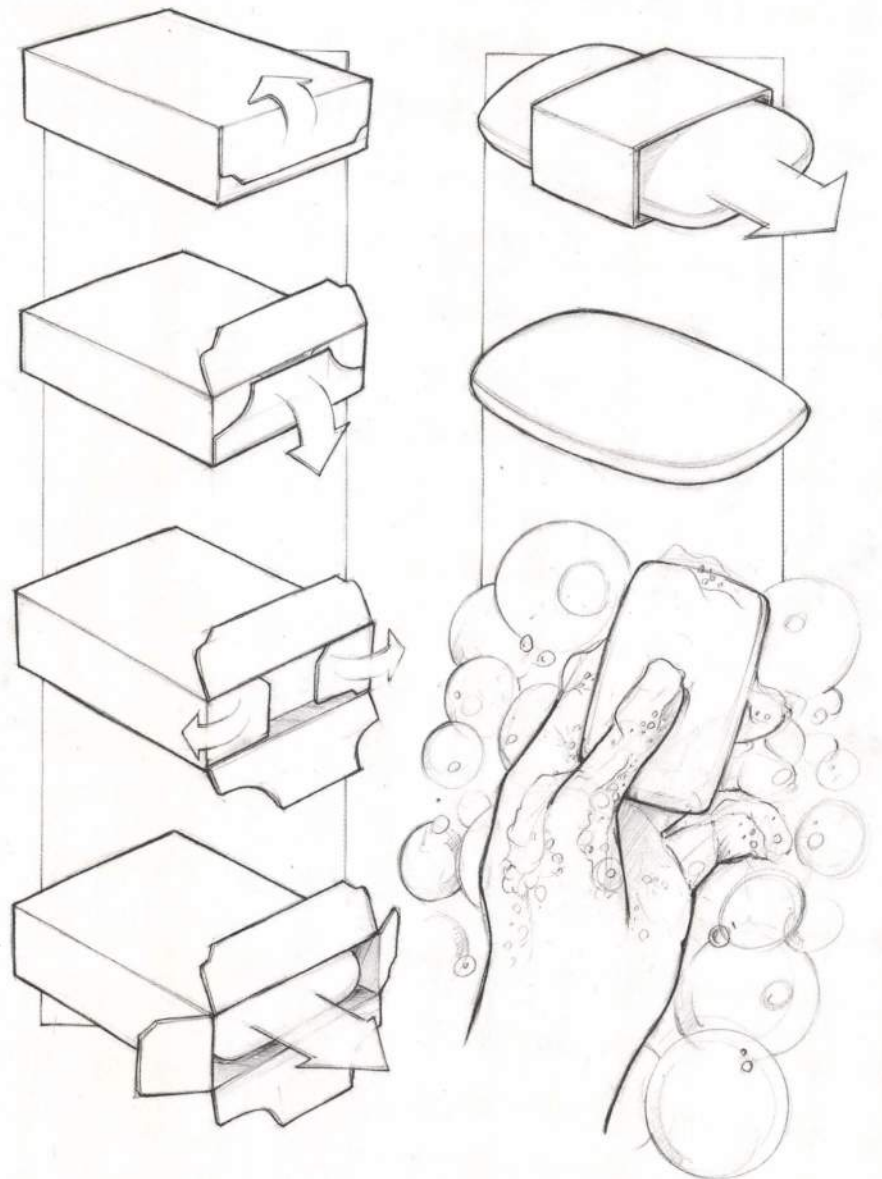
With the exception of "You are here" and other origin/start markers in maps, most orienting features should be secondary in visual hierarchy to objects or graphic structures. For example, in an industrial design sketch, a hand shown holding a tool for human scale should be less detailed in rendering than the tool that is the subject of explanation.

For comparative scale, a familiar reference is important when showing unfamiliar objects in your explanatory sketch. Provide your audiences with a stable, everyday object that they are familiar with, such as a coin. Visual references that are uncommon, not immediately visible, or drastically variable/ambiguous in size are problematic. A height comparison to the Empire State Building in New York is hard to appreciate by someone who has not seen it. Screwdrivers and trees are poor objects for comparative scale since their dimensions vary widely.

For a strong connection between an orienting feature and its related object or graphic structure, keep the space between them small, or emphasize their association with a visible connection such as a leader line.

You Are Here

15 min

Data set 1
Data set 2

* Source: 12/13 Report

1 2 3 4 5 6 miles

COMMON ORIENTING FEATURES

The following are orienting features frequently used to provide context:

- Objects for comparative scale, such as the human figure, a hand, pencils, coins, and cars

- Scale marker

- Information key/legend showing meaning of colors and symbols used

- Grid lines (to assist in measurement)

- "You are here" marker

- Physical landmark

- North arrow (also called a compass rose) that indicates cardinal direction

- Clock or other indication of current or elapsed time

- Rule lines that provide spatial context to recognize scale changes and the depth relationships of objects (for scale)
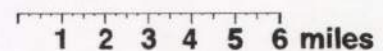
- Source or credit line

signs and symbols

Explanatory sketches frequently rely upon signs and symbols such as pictograms. Such coded associations and symbolic representations provide a quick, compact way to convey concepts such as stop, on/off, airport departures, and baggage claim. Sign and symbol effectiveness depends on your audience's ability to recognize and understand their meaning. This requires forms that correspond to cultural exposure and topic familiarity. A largely universal object such as a bus provides a recognizable symbol to represent public transportation. Invisible phenomena, such as wind, or culturally specific phenomena, such as rodeos, can be difficult to visually symbolize and depend upon cultural experience for recognition. Here are some general principles for sign and symbol development and use in explanatory sketches:

Templates from UX Stencils
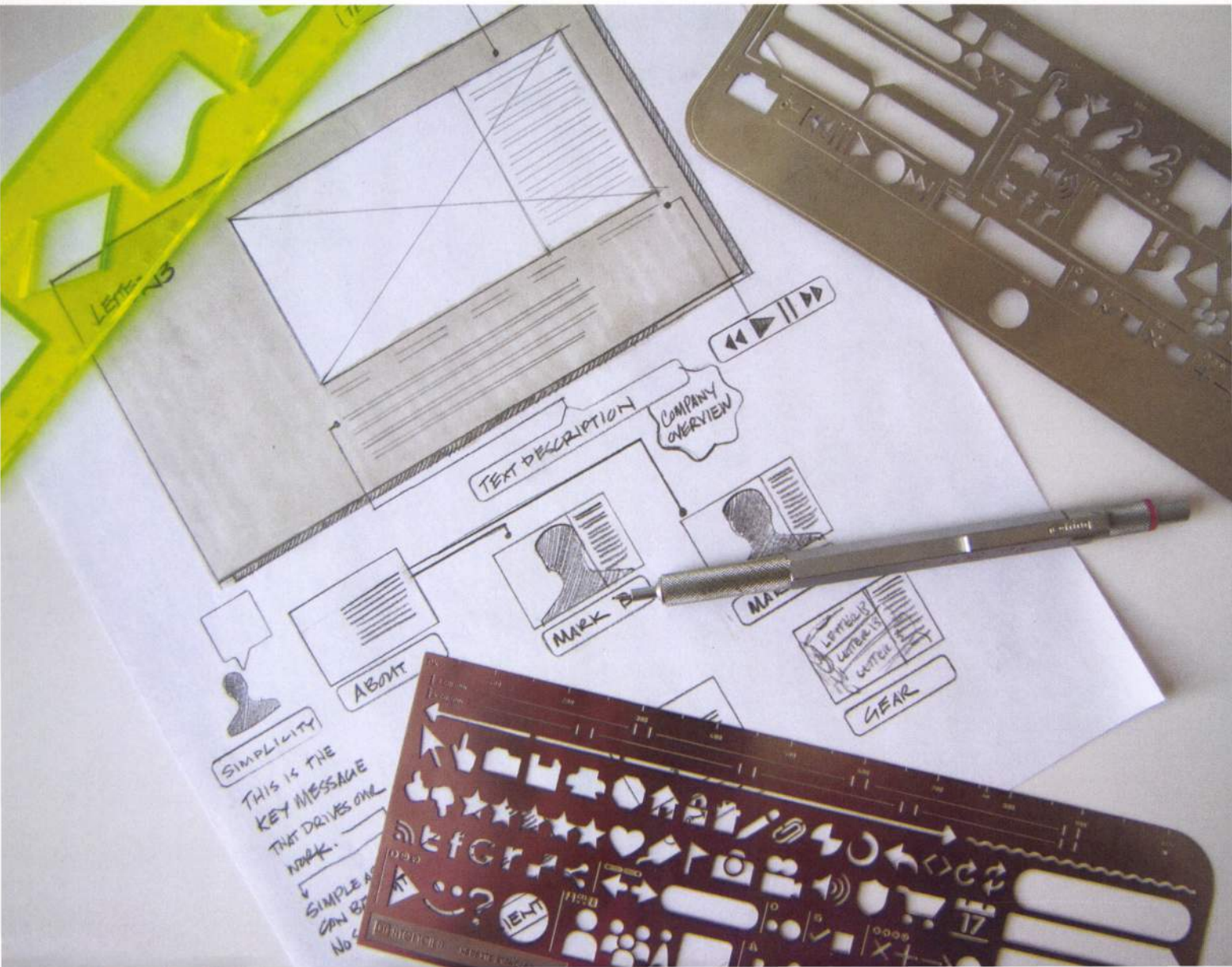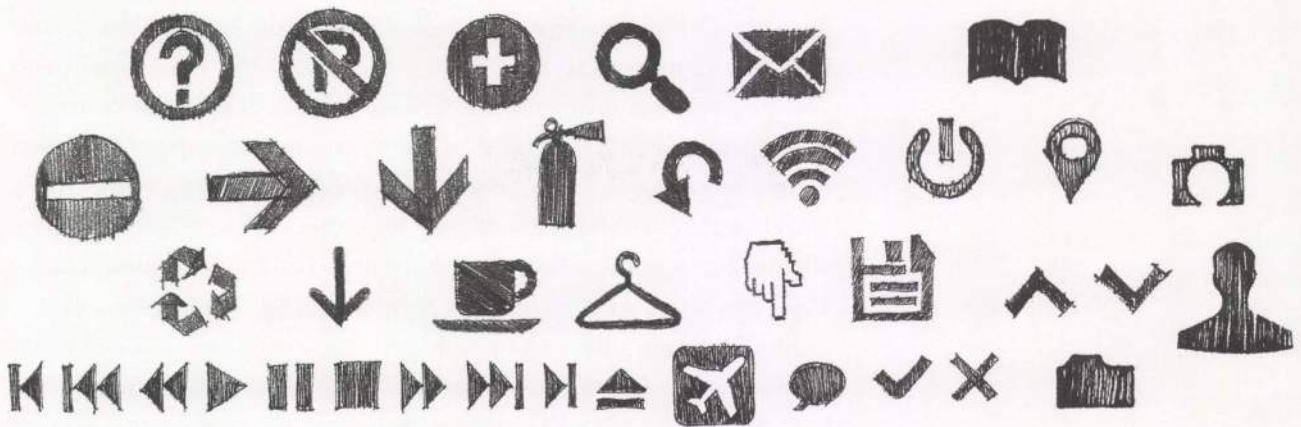
SIGNS

These are basic visual forms with a coded association to ideas (for example, a check mark, an arrow, or a star used to identify a location).

- To avoid confusion and unintended association (grouping), visually differentiate signs as much as possible. Use at least two methods of coding (for example, shape, hue, value).

- Unless a sign is pervasive in the audience's environment, don't assume it is readily understood. A sign's dependency on convention and environmental context can make recognition and understanding largely depend upon cultural experience (industry, society, region).

- Accompany signs with text to reinforce meaning, particularly in initial introduction or through an information key for reference.

SYMBOLS

These are pictograms and other graphics that are visually simplified representations of objects and actions.

- Where possible, favor use of popular, "known" symbols to save time and ensure familiarity, such as an airplane to identify an airport, a trash can to identify file deletion, and so on.

- Consider abstraction level, scale, and simplicity. This is a balancing act; elaborately drawn symbols contain unnecessary detail and may be harder to quickly recognize at a distance, while overabstracted symbols risk misreading.

- Consider alternative viewing angles if you are having trouble drawing a representative symbol.

- For aesthetics and ease-of-reading, make symbols graphically consistent in style. This involves recurring internal shapes, stroke weights, and so on. A mash-up of significantly different symbols is less cohesive and authoritative.

putting it all together

Explaining your ideas in a clear, persuasive fashion requires thought about craft and how your visuals relate to your audience. This is perhaps why a great explanatory sketch requires some planning and thought. Compared to notational sketches, a little more polish and voice is required for explanation. Your informal sketch or more formal drawing needs to stand out and communicate faithfully and clearly what you want to say. It is a fundamental necessity that a visual explanation be both visually engaging and as efficient as possible in presentation. Audiences have little patience for visual confusion. Designers with great ideas have a limited chance of success if their sketch can't be understood. Success, therefore, depends upon understanding the nature of your communication (content, audience, message) and the means to realize it through the visual structure and layout. This is what it takes to make a great explanatory sketch.
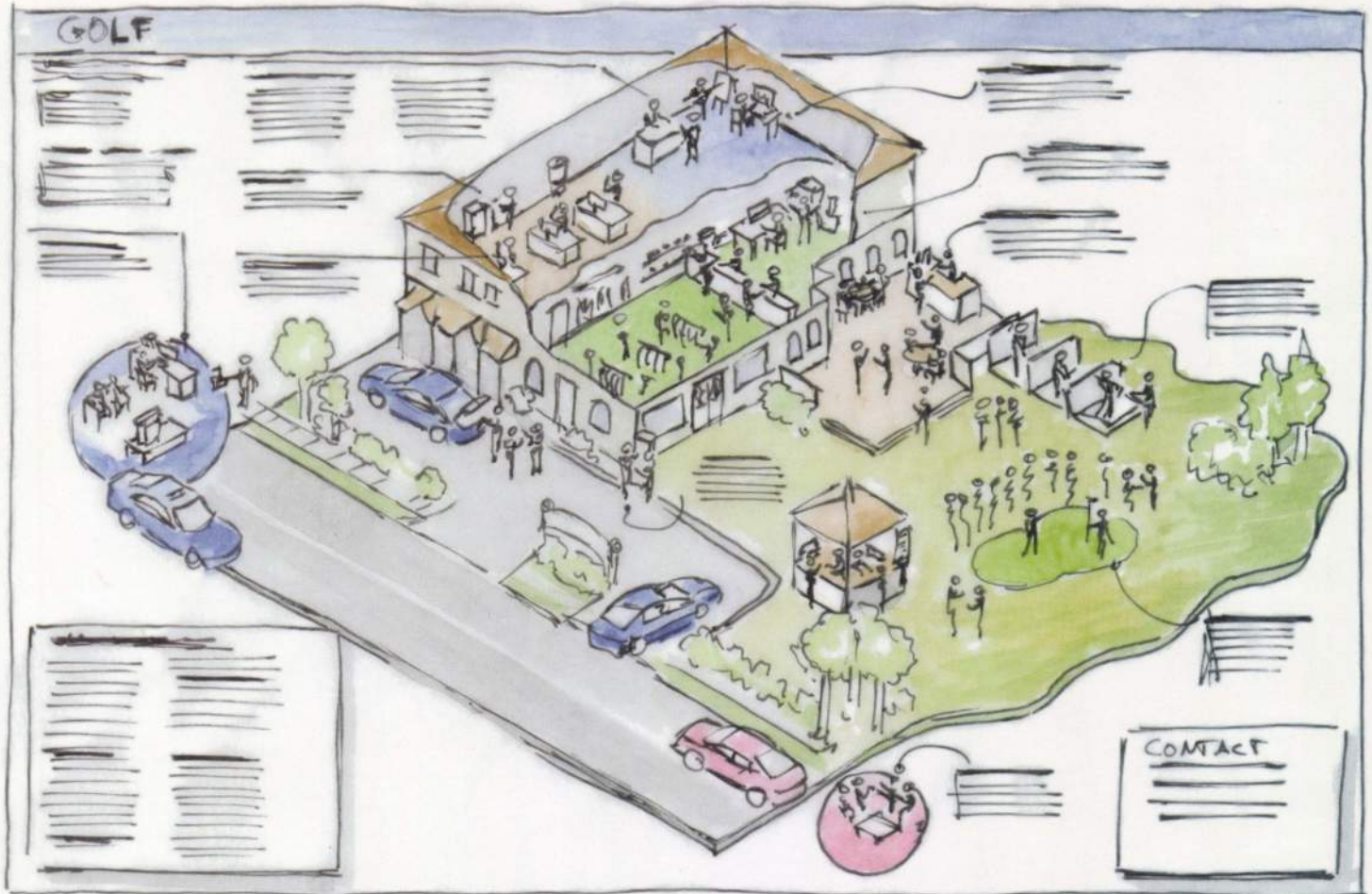
innovations   GOLF

Customer-Centric Business Solutions for Golf Club Management
Our Golf program manages all aspects of your golf business in one integrated system - from check-in and starter functions, tee sheet management.

Golf - We Change the Game

Attract and retain customers
Our comprehensive CRM system enables you to track customer data so you can market more effectively and ensure you attract and retain members & guests.

Comprehensive administration tools with real time reporting & analysis
We provide you with the flexibility and control to set-up & administer the way that's right for your company. Powerful back office tools and web-based multi-dimensional reporting provide you with real time view, report and analysis of revenues and sales and customer data.

Extend business with the web
Our Microsoft .NET architecture enables members & guests to schedule tee-times, update personal information, buy merchandise, and more.

Extend your sales
Sell more tee-times through other third party channels with our Distribution Services, a single point of integration for all your sales channels.

Inventory Management
Never run out of inventory again. We enable you to track your inventory in real-time, so you have up to the minute information on what you have, what you need, and when you need it.

Intuitive, easy-to-use point-of-sale
Sell everything from a sleeve of balls and hats to golf clubs and more with our comprehensive point-of-sale solution.

The 19th hole
Our Food & Beverage system for concession, casual and fine dining establishments can meet all your business needs.

Manage lessons and activities
Easily schedule lessons and other activities with our comprehensive Activity Management Solution. Create custom itineraries for your member's day at your course, ensuring a memorable experience.

Offer quicker access to services
With our curbside handheld tools and self-service terminals, golfers can check-in, reserve tee-time or lessons. Faster.

Track tee-times & course availability
Our Tee-Sheet solution enables you to book tee-times easily, check course availability at one or more courses, and ensure your golfers stay on track with starter function tools.

Extend the 19th hole to the green
Your wait staff can go mobile with our wireless Food & Beverage solutions. Enhance the golfer's experience by enabling members and guests to order drinks, snacks and more from the green.

Build member & guest loyalty
Create custom loyalty programs that will ensure your members continue to patronize your courses and your resort for years to come.

WELCOME

Golf Features

Tee Sheet
Tee Time Management
Flexible Slot Management
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No-Show Auto-Charge
Front 9/Back 9
Tournament Scheduling

Customer Relationship Management
Customer History Tracking
Player Activity Tracking
Tee Sheet Transaction History
Guest Demographic Profiling
Member ID's
Mailing/e-Mail Lists
Loyalty Programs

Activity Management
Activity Plan Management
Activity Inventory Control
Resource Management
Activity Search
Guest Scheduling
Access Control

Retail & Inventory
Touch-Screen Ready
Bar Code Scanning
Powerful Reporting
Robust Inventory System
Easy Product Setup
Intuitive User Interface
Instant Customer Recognition
Gift Receipt
Returns Management

Food & Beverage
Menu Designer Tool
Touch Screen Interface
Swipe-Card Security
Flexible Reporting
Station Menu Management
Station Location Printing
Modifiers
Concessions and Fine Dining

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         Stanford, AZ 81620

WORKSHOP: TEAM DRAWING

STRATEGIES FOR COLLABORATIVE DESIGN

DESIGNING HAPPENS BEST with a collaborative process that provides conversation and critical discussion on a topic. Bouncing ideas off of one another allows you to test ideas before they are fully resolved. Designers who can visualize their ideas in a compelling manner have a distinct advantage over those who cannot. Since sketches provide common reference points for team members and allow everyone to "see" the same thing, designers who draw tend to influence discussion and project direction. The following points represent some best practices for brainstorming sessions.

SUSPEND JUDGMENT

In brainstorming sessions, your goal is to get out as many ideas as possible to begin to define the problem space. Ruling out ideas too early may curtail the creative process or steer the discussion down the wrong path. Suspending judgment will enable your team to put many ideas forward for consideration.

DISCUSS ONE IDEA AT A TIME

Inundations of half-baked ideas fracture brainstorming sessions. When working in teams, staying on task and keeping ideas on target can, at times, be a challenge. Keeping ideas focused and on target, and allowing them to germinate in your mind as you sketch, may allow you to think through more clearly and to rule out certain aspects.

GENERATE TONS OF SKETCHES

Working quickly to record lots of ideas will capture your stream of consciousness, but as stated previously, working too quickly may be detrimental. With rough sketches, you can always go back and add further detail or refine and redraw as needed.

ENCOURAGE LATERAL THINKING

Just because one idea may seem a bit wacky doesn't mean it may not have value. Far-out, blue-sky ideas may reveal new opportunities and get everyone excited. Design is about new and appropriate solutions; repeating what is already out there may not be taking full advantage of the design process.

BUILD ON THE IDEAS OF OTHERS

Ownership of ideas can be dangerous as people become defensive and protective. Encouraging the sharing of ideas allows team members to collectively build upon individual ideas and push them further.

This collaborative sketch was done during a workshop at design firm Adaptive Path in San Francisco.

COLLABORATIVE DRAWING STRATEGIES enhance brainstorming teamwork and the distillation of ideas, getting to the heart of issues in a direct manner. Working with others has great benefits for either rapidly generating a wide range of ideas or for exploring a few concepts in depth. Generating, sharing, and discussing ideas together make for dynamic working sessions and produce a sense of shared accomplishment from the drawn artifacts that result.

In professional settings, collaborative drawing can be a strong means to establish investment in and adoption of ideas by project teams, stakeholders, and clients. This is accomplished both through the comparative novelty of the process and the physicality of drawing. Novelty spurs interest in the process. Physicality stimulates attention and engagement. Everyone draws, participates, and watches as the ideas actively take shape.

BASIC WHITE-BOARDING

While white boards promote discussion and record ideas during a collaboration, it is not without its drawbacks (e.g. the ink smears, and their wall mount does not encourage good body posture for quality drawing). White boards make it too easy to erase and remove history; to capture early ideas, you should take photographs. In contrast, sketching on large-format paper is a better alternative—an accessible way to build a permanent, tactile history of the creative process that shows the full evolution and range of considered ideas, both strong and weak.

GENERAL DRAWING AND PIN-UP

This form of collaborative drawing simply involves the use of individual drawing, followed by a collective pin-up of ideas for general discussion and a possible subsequent reordering afterward. This form, however, is not exactly collaborative during the drawing phase. It is therefore better to have participants exchange drawings one or more times before a pin-up, with the instruction to add to (not critique) one another's drawings in a constructive way. This step yields more interest and thought in the collaborative idea exchange.
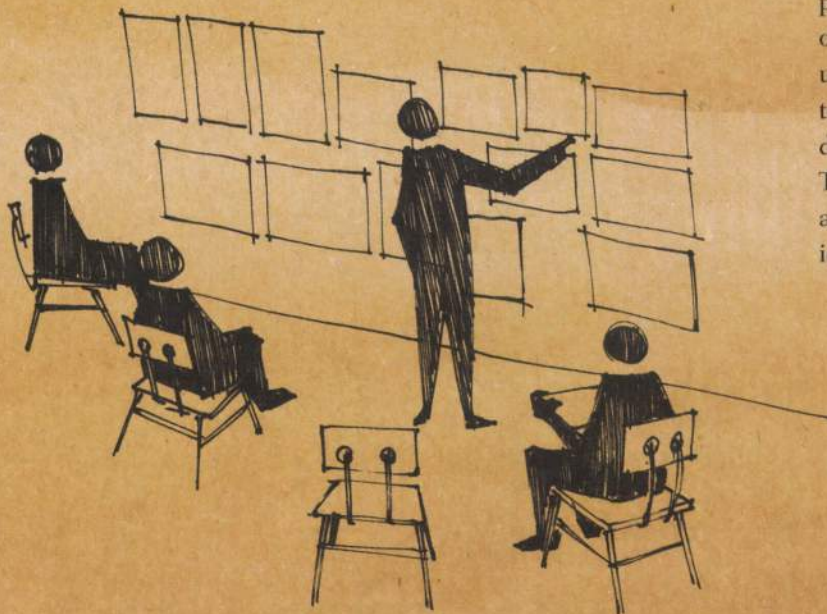
ROLL SHEET COLLABORATIVE DRAWING

Collaborative drawing on a roll sheet involves a single, large sheet of paper (such as a 30-inch-wide, or 70-centimeter-wide, roll paper) on which participants draw simultaneously. Sitting or standing around a table in a small team provides an intimate setting where everyone can focus on the sketching surface. Each member receives and uses sketching supplies with the aim of simultaneously getting all initial ideas out, creating a common place from which to start. The result is an egalitarian flow of ideas and possibilities on a single page that together summarize the group's understanding or vision. While this format lacks structure for a clear organization to support analysis, the aesthetics and freeness of this collaborative drawing form can be a compelling way to subjectively present ideas while building consensus through participation.
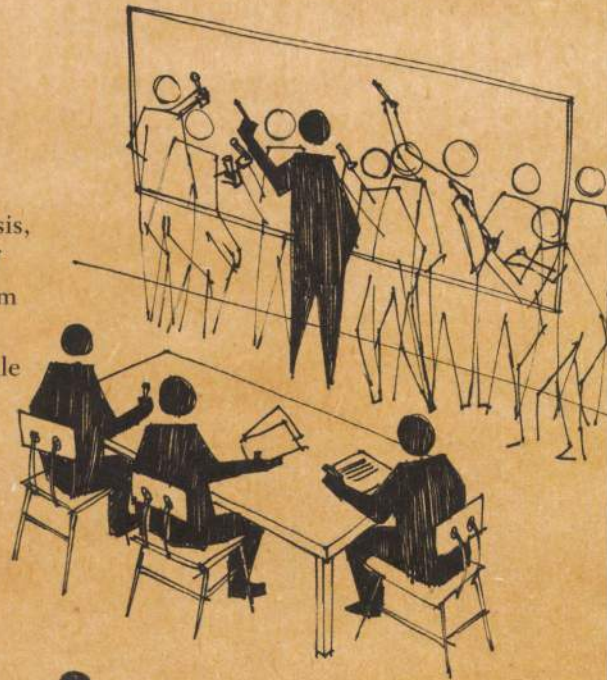
STRUCTURE-BASED COLLABORATIVE DRAWING

Use of a prepared formal grid, column, or matrix structure as part of collaborative drawing keeps sketching more organized than a free-form cloud of ideas. This can be helpful when the drawing subject is either very broad or requires careful analysis to identify findings. A gridded matrix can capture an evolution of ideas across X and Y axes. Post-it notes or single sheets of paper for larger drawings can be stacked in the Z-space direction to further iterate depth.

HIRED-GUN "COLLABORATIVE" SKETCHING

Favored by corporate boardroom settings, this format involves a "hired-gun" professional sketcher who can quietly record a conversation and ideas as others are verbally engaged in discussion. This strategy is frequently employed by executives for client meetings, design reviews, and strategy sessions, as the "graphic facilitator" or "artist" works in the background to visualize ideas, show relationships, and provide organization and structure to the recorded conversation. Depending on the talents and speed of the professional sketcher, this approach can be an effective way to visualize issues and ideas; however, it does rely heavily on the ability of a single person to understand and illustrate complex subjects with which he/she may not be readily familiar.

DINNER TABLECLOTH

Many kid-friendly restaurants provide paper tablecloths and crayons to diners. Hosting a team or client meeting around a casual dinner table may provide a relaxed situation that enables serendipity and a free sharing of ideas. Crayons are a familiar and nonthreatening means to encourage novices to sketch while also constraining the focus to the ideas—not the quality of the sketches themselves. Crayons level the playing field between designers and nondesigners—but the designers can always pull out their fancy pens if needed. Plus, crayons leave marks that are loose, giving the sense that no idea is totally concrete.

GROUP VISUAL NARRATIVES

Group visual narratives are similar to structure-based collaborative drawing, except that they involve creating a narrative or story. "Quick-start" worksheets, such as those discussed on pages 284–285, provide a basis for the individual creation and subsequent sharing of ideas. The worksheets spur rich team discussion and help to organize the key message. Each individual's ideas are then brought together to create a visual story that summarizes key points. Transferring sketches from the individual worksheets to larger paper enables each team member to participate in drawing and crafting the sketch. The result is a large visual narrative that is now an artifact that can be posted or photographed for public presentation. See Part 5 for more information on considerations and techniques for content, layout, and structure.
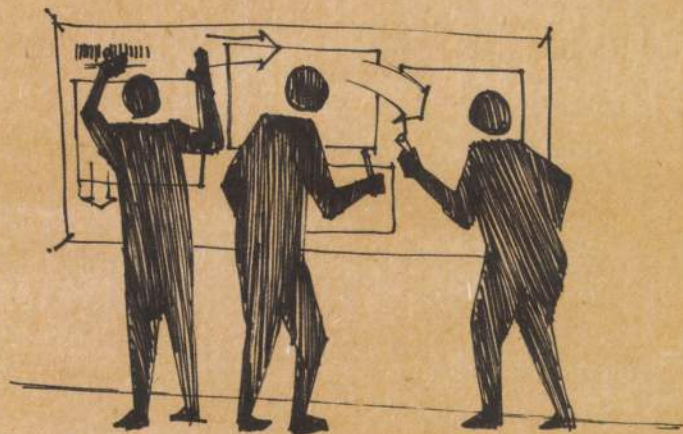
Q If members of my team group don't have any formal drawing training, how can I encourage them to sketch and draw ideas?

A You may find that members of your team lack formal drawing training and may even be resistant to participating in a collaborative sketching session. Overcome this issue with a gentle nudge and by fostering a supportive, accessible atmosphere in which the focus is on ideas, not the quality of the visual expression. Most people in general are visually oriented and respond strongly to images. Drawing, after all, should feel like a throwback to childhood, when drawing pictures was fun and exciting. Successful collaborative drawing sessions begin with an expert—someone to lead who can draw (simply, without showing off) and can help others to draw better. Then you need the invitation to participate—passing the pencil or marker off to someone else in the team is one form of invitation. Keep pace with a decisive and deliberate turn-taking process, as opposed to an all-out scribble race. This sets a tone that encourages thoughtful exchange and creates a more inviting atmosphere for participants of all skill levels.

team-based drawing exercise (the most fun visualization exercise ever)

For this group drawing exercise, consider using the quick-start worksheets as a framework. The goal of this exercise is to work both independently and collaboratively to develop a group drawing that illustrates a theme. For team-building and brainstorming warm-ups, this exercise is really useful if the drawing topic includes a primary activity that is location-based with key players. This way, you have to sketch people doing things in context over time.

STEP 1 Pick a theme. A team receives an absurd theme that is a challenge to visualize. The more absurd the topic, the more fun this exercise will be. If you have multiple teams, you can keep the themes secret and try to decode the other group's drawings at the end as a game.

STEP 2 Independently sketch out the quick-start worksheets to get all of your ideas out on paper.

STEP 3 Share your drawings with your team, and discuss how you chose to visualize the theme and what aspects you focused on. This discussion should be lively and insightful.

STEP 4 Pin up your worksheets, step back, and analyze. Discuss how to distill your individual narratives into one story.

STEP 5 Collaboratively draw one story for your team's theme.

STEP 6 Pin up and present the theme, or see if the other team(s) can guess what your theme is by looking at the drawing.

GENERATING, SHARING, AND DISCUSSING IDEAS TOGETHER MAKE FOR MORE DYNAMIC WORKING SESSIONS AND PRODUCE A SENSE OF SHARED ACCOMPLISHMENT FROM THE RESULTING DRAWN ARTIFACTS.

VISUAL CHARADES

Sometimes it helps to do a collaborative drawing session as a warm-up to promote mental flexibility and exchange. Visual charades are one way to do this. Nothing stretches your mind and drawing abilities as much as trying to communicate disparate, nonsensical concepts in serious and effective ways. Comparing your sketches with those of the group may reveal different approaches to layout and organization, focus/emphasis, and importance in the message. You might even find a surprise idea that is useful in a real-world application. This activity can be fun and lively, especially when you can introduce pairing.
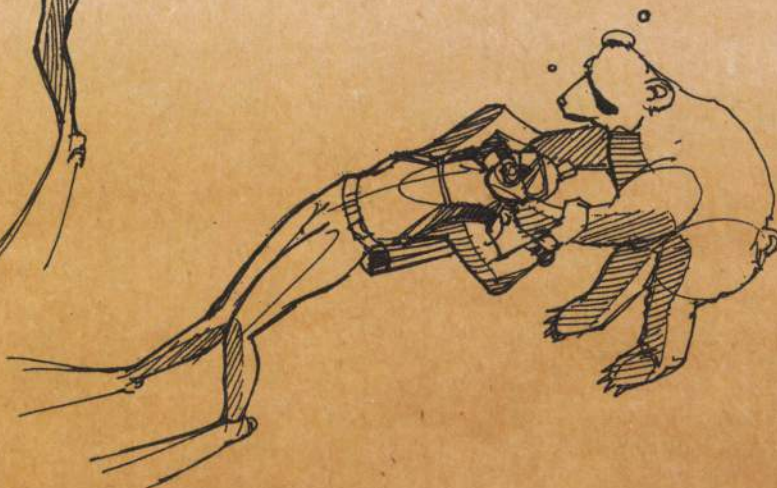
KEEPING IT FUN

Absurd themes for group drawing exercises keep the activity fun and engaging. Working with abstract themes enables you to creatively express ideas and requires team members to discuss each sketch for its communicative properties. Be aware that if a theme closely replicates the type of work you do every day, you may find the group to be less creative. Try these themes to start thinking (sketching) abstractly:

- Circus tent security line
- Museum of military antiquities and ice cream trucks
- Mobile pet grooming and goldfish surgery
- Butcher and surgical supply center
- Rescue system for a volcano skiing resort
- Drive-thru animal adoption and unicorn ranch
- Deep-sea bear wrestling (shown here)

planning and running a collaborative drawing activity

When planning to engage in a group or cooperative sketching session, have an intended outcome. This could be a predetermined number of different ideas or a loose but general consensus about a topic. Exploratory sketching is best used to discover loose relationships for later progressive refinement through iteration that narrows the scope. Running a successful collaborative drawing session depends on a few tricks.

SKETCH ON WORKSHEET

SHARE & DISCUSS

COMBINE TO MAKE 1 DRAWING
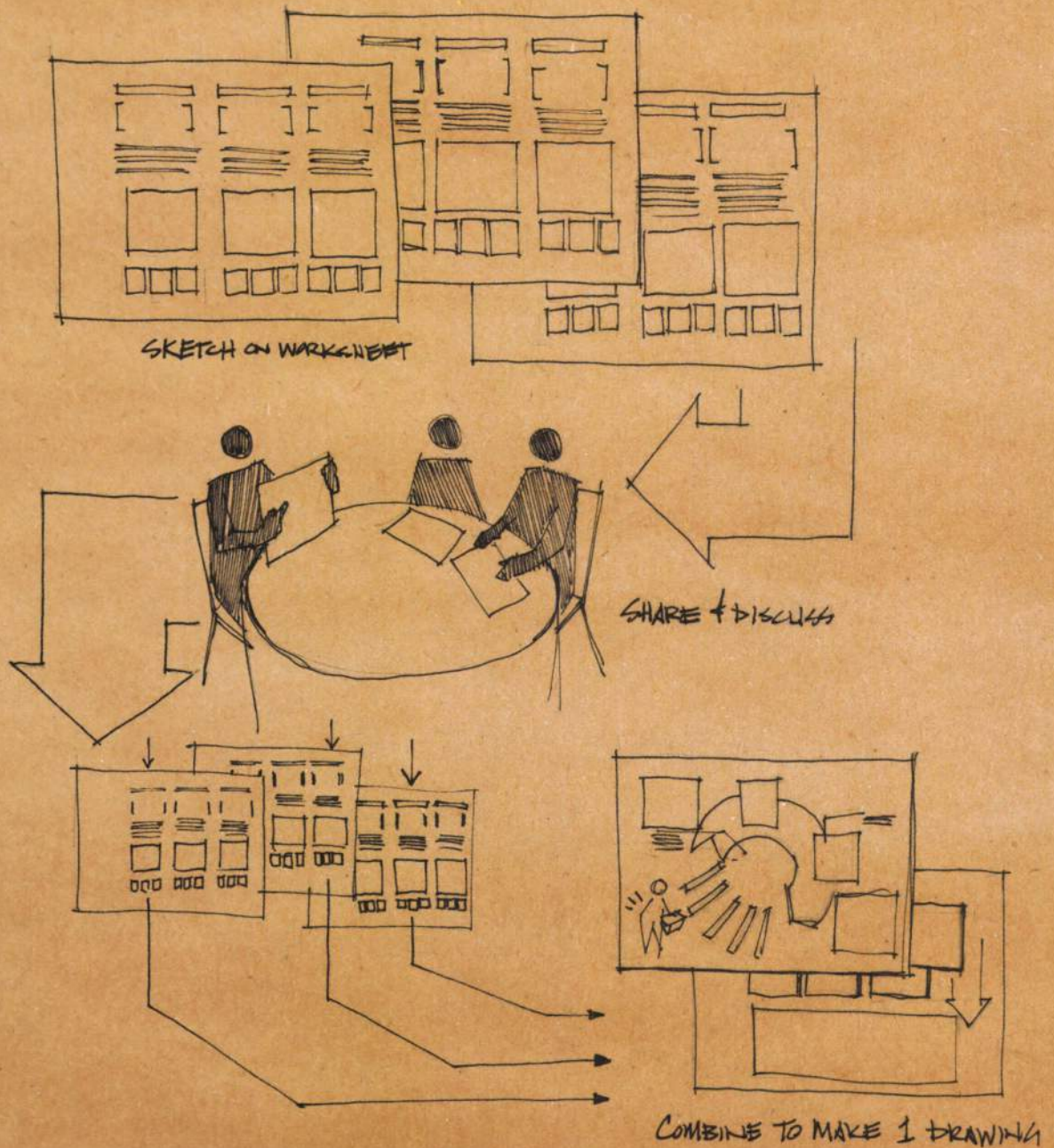
EXPLAIN THE SESSION'S STRUCTURE

Communicate a clear set of session objectives and deliverables that need to be met along the way. Locking a team in a room for three hours with no clear direction or goal can be catastrophic. This does not mean you should overplan. Tackle one big idea at a time to stay on task, but always leave room for serendipity.

START BROAD AND ROUGH FIRST WITH YOUR SKETCHES

Investigate broad and deep to show a wide variety of ideas; then explore the best ideas further and in higher fidelity. More concrete explorations of particularly viable ideas can serve as mileposts during the creative process to highlight key concepts and findings to direct further development.

NO IDEA IS WRONG DURING BRAINSTORMING

Be inclusive of all ideas, regardless of merit, during early phases of collaborative drawing to encourage total participation. Everyone should feel like they contribute something of value to the group discussion. Weaker concepts can be set aside (not discarded) during later review and refinement phases.

ENCOURAGE BUILDING ON THE IDEAS OF OTHERS

Find ways to encourage drawing where ownership is not an issue; this usually involves soliciting contributions to an existing idea and identifying ideas by subject not author. (For example, avoid saying "What do you think of Bob's idea here?") Using a nonpersonal approach is a reliable way to generate robust ideas without the drama.

STEP BACK FREQUENTLY TO KEEP THE CONVERSATION AND ACTIVITY MOVING FORWARD

As a group, step back frequently from the collaborative drawings to keep perspective on the whole effort. After working at a sketch for a while, take a break to reset everyone's focus. Alternate between sketching and structured conversation to provide balance and sustained momentum.

REVIEW

DRAW TOGETHER + SCALE UP YOUR DRAWING

DAMIAN DUFFY AND JOHN JENNINGS are graphic novelists who together founded Eye Trauma Comix and have curated four major comics art exhibitions. Damian is a PhD candidate in the Graduate School of Library and Information Science at the University of Illinois at Urbana-Champaign, and John is an associate professor of graphic design at SUNY Buffalo.

We make comics. We're illustrators, curators, writers, designers, artists, and scholars. All of which is to say, we work on many different projects.

It's difficult to describe exactly how we collaborate, because there's rarely time enough to stop and think about it. Bobbing and weaving through tight deadlines and narrow schedules leaves so little space to raise your head, take a deep breath, look back over your shoulder, and say, "Oh, yeah, that's how we did that."

Generally, our process depends on the project, because each project is different. For our first graphic novel, *The Hole: Consumer Culture*, I wrote a detailed script, not unlike a screenplay, and John drew the images I described in prose. I write my scripts with overly intricate detail for John, who illustrates each frame. I trust him to read the script as a starting point, rather than as instructions. Based on his reading of the script, John draws the images in pencil and marker by hand, scans them in, and edits them with Painter and/or Adobe Photoshop.

Unlike many comics creators, who draw one single page at a time, John works panel by panel, creating a separate 8½ × 11- (215 × 279 mm-) or 11 × 14-inch- (279 × 356 mm-) sized drawing for each frame on the page. This allows him to put an inordinate amount of detail into each image when the images are scaled down and integrated into the completed page.

Then, using Adobe Illustrator, I put text to the pictures, hand drawing and digitally manipulating vector graphics into the shapes of word balloons and sound effects. This turns out to be part of my writing process. While I begin by copying and pasting words from the script into text boxes, I continue to edit until the text matches John's drawing.

Our collaboration is never that neat and orderly, even within a single project. "Dialog" is certainly one way to characterize our collaboration, but perhaps "conversation" describes it better. "Conversation" evokes a more informal, malleable ebb and flow of overlapping statements, the game of catch we play with our ideas, the sort of free-flowing interaction with which we approach each book we make, art show we curate, workshop we run, or lecture we deliver together. As storytellers we are constantly engaged in collaborative ideation, continuously shaping the narrative as we wade deeper into the work and the project takes on its own personality.

The essay you're reading was originally a comic I wrote and drew, and John did the colors. Sometimes it's effective for us to work that way too, as our collaborative process enables us to make this handoff seamless. We once had a colleague call us the "four-handed creator"—we liked that, because it was a good description for how we work together.

COLLAB

WORDS AND PICTURES BY DAMIAN DUFFY

COLORS BY JOHN JENNINGS

ORATION

HELLO. THAT'S JOHN. I'M DAMIAN.

WE'RE J2D2 arts

WE MAKE COMICS. WE'RE ILLUSTRATORS AND CURATORS AND WRITERS AND DESIGNERS AND ARTISTS.

ALL OF WHICH IS TO SAY WE WORK TOGETHER ON MANY DIFFERENT PROJECTS.

AND THIS IS ALL ABOUT HOW WE DO THAT.

I'M JOHN. THAT'S DAMIAN. HEY.

AND THAT'S HOW TO MAKE GRAPHIC NOVELS THE J2D2 WAY!™

EXCEPT NOT REALLY. OUR COLLABORATION IS NEVER THIS NEAT AND ORDERLY, EVEN WITHIN A SINGLE PROJECT.

DIALOG IS ONLY NEAT AND ORDERLY WHEN IT'S WRITTEN DOWN AND COPY EDITED.

...rarely
...o stop
...t it.

...n artists on one
...r side studying and
...rsity, putting dollars
...living.

...etches thin.

...ing through tight
...ow schedules leaves
...se your head, take
...back over your

"OH YEAH. THAT'S HOW WE DID THAT."

...DIFFERENT.

...ED SCRIPT.
...OSE.

...Unlike many comics ...artists, who work page by page, ...drawing one single page at a time, John works panel by panel—

CLICK

the art of the
nonpersonal critique

When work is put up for discussion, the author is in a vulnerable position. True, honest constructive criticism is about discussing the validity or craft of an idea, not about one's character or abilities. Discussions generally go best when judgment is suspended, all participants are encouraged to share ideas, and alternatives can be explored in real time. Anonymous pinups and reviews are useful in establishing a shared understanding and making plans to refine ideas into more viable concepts. If the sketches are the carriers of the ideas, then the pinup is the conduit for enlightened discussion.

1 PIN UP EARLY AND GIVE THE AUDIENCE TIME TO ABSORB THE ENTIRE COLLECTION.

2 ASK THE AUDIENCE/VIEWER TO COME CLOSER AND LOOK AT THE WORK.

3 BRING A SKETCHBOOK TO TAKE NOTES.

4 PULL INDIVIDUAL PIECES OFF THE WALL TO HAVE FOCUSED DISCUSSIONS.

5 ENCOURAGE EVERYONE TO TALK AND MAKE CONNECTIONS TO PREVIOUS COMMENTS.

6 ASSIGN SOMEONE TO SERVE AS THE KEY FACILITATOR OF THE DISCUSSION.

7 CAPTURE THE WORK WITH A PHOTOGRAPH AS RECORD.

8 USE COLORED POST-IT NOTES TO FLAG KEY CONCEPTS. SOLICIT SUGGESTIONS FROM THE AUDIENCE/GROUP BY SUPPLYING EACH PERSON WITH A STACK OF POST-ITS AND A FINE-LINE PEN. ESTABLISH GROUND RULES FOR OFFERING SUGGESTIONS, AND ALLOW INDIVIDUALS TO DRAW IDEAS ON EACH SHEET AND STICK THEM TO THE WALL NEXT TO THE SKETCHES. YOU CAN COLOR-CODE THE POST-ITS FOR EDITS/CHANGES, FOR ADDITIONS, OR EVEN FOR ACCOLADES.

9 CONDUCT THE SESSION IN A SHOW-AND-TELL FORMAT IN WHICH TEAM MEMBERS ATTEMPT TO PRESENT ONE ANOTHER'S IDEAS— LIKE DESIGN KARAOKE.

10 REORGANIZE AND MOVE PIECES AROUND TO MAKE GROUPINGS THAT FOLLOW DISCUSSION. ALTERNATIVELY, DROP A PILE OF SKETCHES ON THE FLOOR OR PLAY GRAB BAG, AN ACTIVITY IN WHICH TEAM MEMBERS PULL SKETCHES AT RANDOM FROM A BOX AND STRUCTURE AN ACTIVITY TO ASSESS AND ORGANIZE THE IDEAS.

5

DRAWING TO TELL A VISUAL STORY

IN THIS SECTION, WE BUILD DIRECTLY UPON THE FOUNDATION OF explanatory sketching to develop visual stories—sketches that use narrative structure to tie multiple aspects of an idea together into one memorable presentation. Whether recording observed activities, describing product interactions, or envisioning future scenarios, visual narratives serve to emphasize the human experiences with design concepts. While the form of a visual narrative can appear as a diagram, conceptual map, and so on, this section focuses on a collection of basic ways to craft visual stories.

In literature, the written story presents accounts of characters and their experiences. Visual narratives are the visual equivalents to written stories; they reveal the contextual relationships of products, systems, and persons during an event. In forms such as storyboards that are used in planning animations or movies, they capture key moments of action or interaction (observed and/or envisioned). Visual narratives range from a structured single-frame scene (one vignette) to free-form, flowing layouts of multiframe vignettes that show a sequence or continuum.

Visual narratives are primarily drawn for a public audience but can also serve to clarify your own understanding of an idea. Often they present conflicts and problem areas, accompanied by opportunities to resolve them. Considering the audience's knowledge of the subject, viewing distance, and how the visual will best support your argument are all important in deciding on how much to show and in what format.

PLANNING VISUAL NARRATIVES

TO TELL A good visual story, you must first consider what would cause someone to want to "read" your story. There must be an overarching idea to communicate, such as a problem, situation, message, or event that provokes thought. Once you identify your story, exploring different points of view and vantage points will help you determine the best way to "tell" this story (the message format). Since structuring content, setting each scene, and developing the drawing's overall visual structure are important, keep your story brief and focused.

Telling a visual story can be challenging, because of the variables—how the characters are visually constructed, how you show what they are doing, what visual elements in the environment you reveal, and so on. Start with a flexible plan, and try some quick sketches to test your ideas. A sequential visual narrative should include a clear beginning, middle, and end—demonstrating key events in "chunks." You may include some form of conflict resolution to show solutions or you might illustrate continuing problems through a subject's emotional states. Communicating a sense of rhythm and movement with features such as repeated characters and visual cues to "stitch" scenes together will make for a clearer, more compelling account. There is no single, best layout format for making a visual narrative, but one convention is to use rectangular- or square-framed scenes arranged in a linear or grid structure. This is a basic form; you may need to experiment in layout to create a more compelling reading flow.
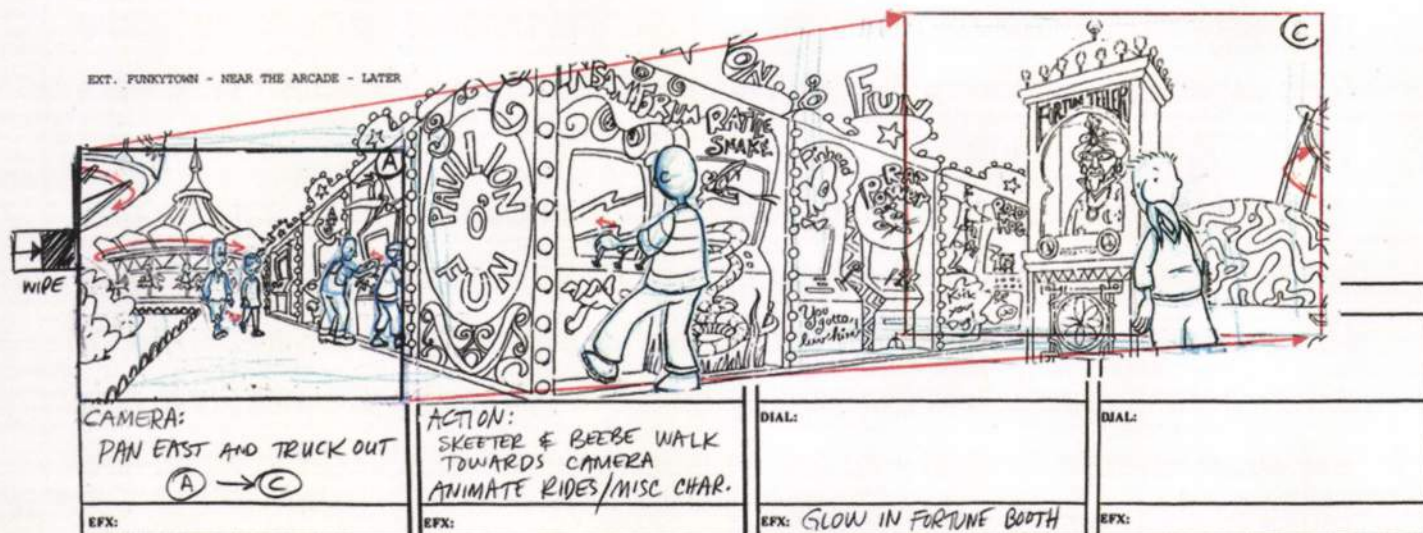
Storyboard from *Doug's 1st Movie,* courtesy of Disney Television Animation

SKETCHING ACTION OVER TIME

Sketching events or actions across multiple frames depicts a story from beginning to end and may better illustrate the subtleties of interaction in a step-by-step manner. When you view a storyboard or other visual narrative, your eyes first scan the page to get an overall impression of the action and then focus on key points. Structured multiframe visual narratives use framing and layout to establish order, sequence, and hierarchy of images. Each frame provides a distinct window into the page space to better capture the audience. The spacing between frames may allow for the audience's imagination to fill in actions intentionally not depicted; this may engage your audience if they have to work a bit (but not too hard).

VIGNETTES

The use of vignettes or still frames that capture moments in time presents an opportunity to closely mimic the animation of life and, by extension, the experiences that accompany it. The effect can be a synthetic yet evocative form of communication and investigation, providing the means to present an analysis of an event captured as a notable moment in time.

To the left and below are two single-frame vignettes depicting common encounters we've all experienced (or witnessed) at Starbucks. Note the use of body position, expression, and scenery to enhance the communication. The use of text makes the second example more concrete, yet the abstract (props and body posture) add humor.

"Give me a short half soy half milk with cream mocca vanilla decaf skim extra hot caramel latte with whip cream, triple shot of caramel, pinch of nutmeg in a Venti cup, and an extra shot of vanilla..and..."
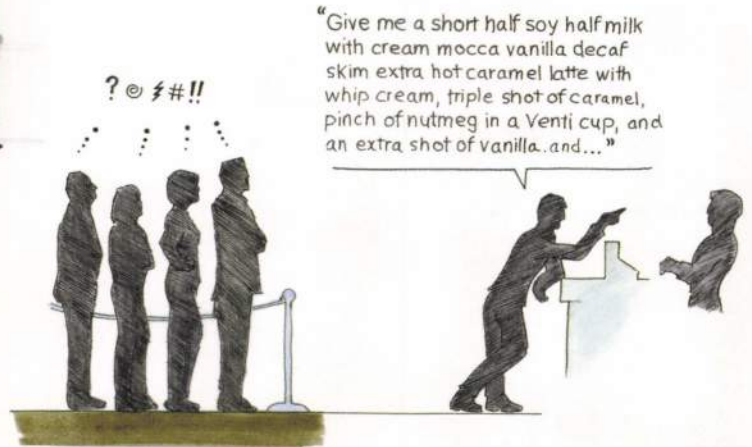
SINGLE-FRAME SCENES/ VIGNETTES

Single-frame scenes are used to quickly represent action or interaction within a context. To expedite sketching, they are usually done from an orthographic (elevation or plan) viewpoint so that issues of foreshortening and perspective don't compromise the intent. Single-frame scenes, also called *vignettes,* set up as a simple side view/elevation or perspective view must provide visual cues or props to fill in the background behind the subject to create a sense of context. Focus on simple messages to depict a single incident or a brief action over a short period of time. You might try some layering to develop the situation around the event with details, text, and perhaps breaking the frame edges.

It is often best to have the person (key player, user, subject, character, persona) serve as the focal point, because he or she is the active component. Construct the environment around the person to emphasize and situate the action/interaction.

Of course products can be the primary subject, too, which puts the human figure in the service of demonstrating the capabilities and performance of the product. A common example is an IKEA instruction pamphlet, where simple humanoid characters are often used to demonstrate how to carry, hold, position, and/or build the furniture components.
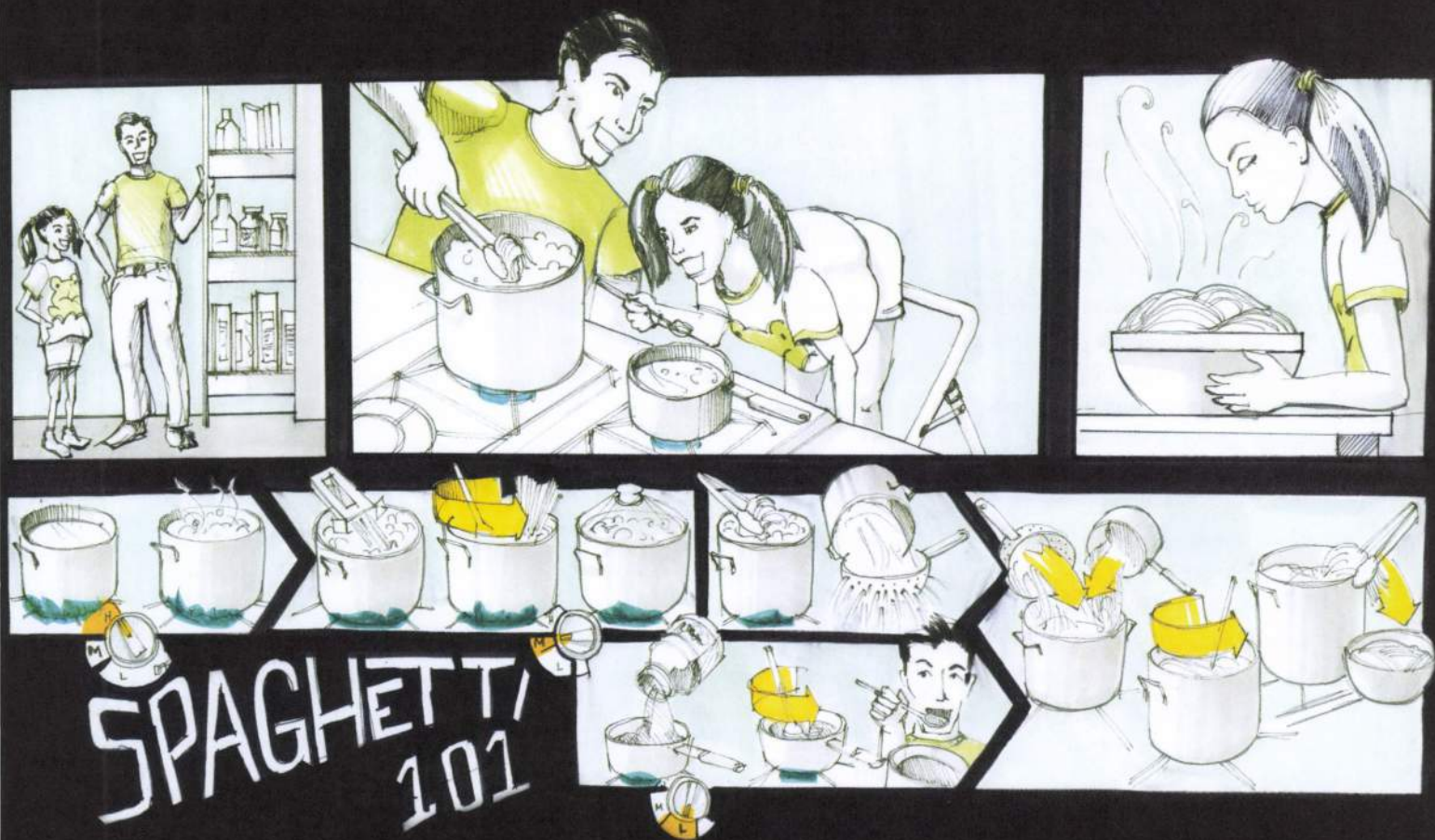
MULTIPLE-FRAME VIGNETTES

The size and organization of multiple-frame narratives may affect their interpretation and impact. Using multiple frames that are the same size sets an expected order where each frame is of equal importance; this is common practice. Organization with a grid establishes a linear progression that is dependent upon how your audience reads, such as left to right and top to bottom. Enhancing the layout with multiple sizes and treatments is dynamic, expressive, and makes the audience look for more meaning in layout. Such compositions emphasize the importance of an overall visual impression. Comic book and graphic novel pages provide excellent examples of how variable-size frames can provide interest and tension to a narrative layout. Consider sketching multiple frames in a variety of sizes and frame types, and employing visual techniques of drop shadows, title blocks, and text to enhance the overall impact.

Multiple-frame narratives are useful in illustrating sequences and scenarios. A sequence focuses on interaction and functional processes. Think of sequences as the protocol of action or interaction with a start/finish model. A scenario focuses on depicting contextual relationships or situations. Scenarios emphasize the interrelation of person, product, context, and interaction/action. Use of a multiframe narrative to show these interactions allows us to represent an event from the viewpoints of the different people involved, or from multiple viewpoints (human view, system view, contextual view). In the context of storytelling, this affords richer, more compelling descriptions of our ideas.

FREE-FORM VISUAL NARRATIVES AND SKETCH CLOUDS

Free-form sketching is a great method to capture ideas through a stream of consciousness. The flexibility and limitless boundaries should afford an open invitation to get your ideas out of your head and onto paper. A free-form (frameless) narrative can function as an effective overview "sketch cloud," or seemingly unstructured blast of sketches on the page. Sketch clouds do not actually lack structure; individual sketches are linked together through scale, position, and proximity to provide visual organization and to create meaning. Sketch clouds may employ top-left to bottom-right sequential flow to promote readability and comprehension of order.

STORYBOARDS

Storyboards are conventional workhorse drawing forms used in the motion-picture and animation industries to systematize the visualization of events and actions over time. Storyboards, like all visual narratives, enable you to visualize key moments and to frame (compose) actions/interactions through particular viewpoints. As a standardized, rigid structure, a storyboard's benefit comes from consistency. It is an organized, modular presentation form that expresses a clear linear reading pattern. When it is paired with title-block elements, a storyboard presents information in a formal fashion that suggests an authoritative view.
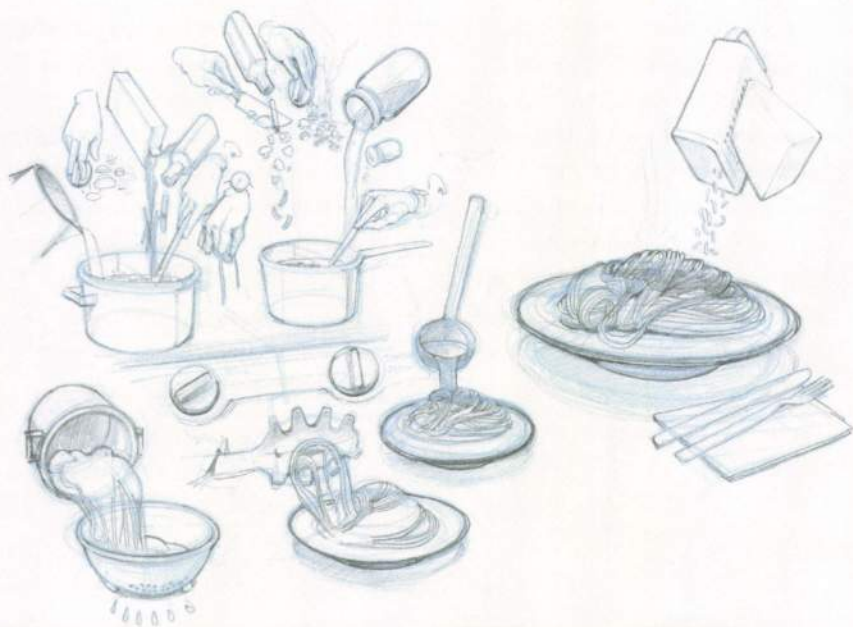
In this Jekyll and Hyde storyboard sequence, the creator, Dan Shefelman, guides the viewer's attention with zooming, positioning, and camera movement (shown in red).

Dan

Dan is 48, happily married with no children. He used to be a BCBSF Blue Options member, but lost those benefits when he was laid off from his job at a tool manufacturing company. He has no idea when he'll find another job, and that worries him. He's fairly healthy, with no major health problems — but his wife, Mary, who works part time at a florist, has serious arthritis. Naturally, he wants to make sure she continues to get her prescriptions. Mary noticed the big, bright Florida Blue store sign at the mall last week and told Dan to go talk to the people there. He's hoping to find someone who can explain his options and help him take care of his wife.

Communications required

- GoBlue P.O.S. Cards
- Plan selection support process charts, portfolio explain
- Pharmacy research
- Clinical content
- Magnet with 24 hour nurse line
- Appointment card to return to store with Mary

Capabilities in action

- Plan selection support
- Process
- Rx shopping
- Clinical content
- Sales tool

Store zones

- Triage
- Private space with big screen for plan selection
- Store library to do research
- Video conferencing
- Open space with ability to close off

Dan walks into the store and is greeted by a Blue advisor. They sit in the lounge area up front and Dan explains his situation and that he is not sure what to do next. The advisor listens intently to Dan to understand his needs and assess the situation. He discovers that Dan expects to find another job in the next 6 months.

They move to a private area to work through Dan's personal health issues. Dan swipes his card so the team member can look up his and his wife's history.

The advisor knocks out all questions Dan has and then compares options to Cobra and Use Plan comparison (individual vs. family plan).

Dan is happy to learn that Mary qualifies for coverage. The advisor recommends and sells Dan GoBlue and hospital/surgical plans. He recommends Mary come in for a visit to help her get the most out of her plan.

During Mary's visit, the advisor shows her how the Rx shopping tool will help save her money by choosing generic and get her other cost savings for her prescriptions.

" I'm so relieved! I'm covered and so is Mary. I didn't lose my health insurance — just my job."

STRATEGIZING
AND SKETCHING

WILL AYRES is a strategic and creative principal at Infinia Group. He consults with leading companies in a variety of industries, such as health care and financial services, to help define their brands and bring them to life.

Brand consultants operate in two distinct yet complementary worlds. In one, we develop a clear and differentiating brand strategy or story. In the other, we invent ways of bringing that story to life. I enjoy working where those two worlds meet, because it's where we begin to connect powerful ideas to real life.

Before delving into the details of design systems and implementation, we sketch out the brand experience in broad strokes. We prefer sketching at this stage, because it helps our clients focus on concepts rather than on design details. We create scenarios and visual stories that offer glimpses of what the brand would look, feel, and sound like; how it would reach people; and what it would mean for the business and employees, physically and emotionally.

We imagined and articulated the various customer experiences through graphic narratives.

Three years ago, a client of ours in health insurance made the bold move to open up retail stores to encourage people to come in and get advice on their options from real people in a welcoming environment.

We imagined and articulated the various customer experiences through graphic narratives, which helped to determine the operations program for the stores—and became the basis for the creative briefs to architects, interior designers, and communications designers.

Not all our stories take the form of a narrative. Quite often, we visualize the potential of a strategy through a series of brand touch points, which are essential in bringing the brand's strategy to life. They might be simple, functional objects, such as promotional items, or larger efforts, such as campaigns and programs that inspire and motivate employees.

Quick-start worksheets can help you move from words to images, making the sketching process easier and more comprehensive. These worksheets enable you to plan out the key moments in a sequence, scene, or scenario, and construct the visual narrative from lists. Each column represents a key moment and should be titled accordingly. In the brackets, you can list the elements and actions that are associated with each moment and would become the elements within a single-frame vignette depicting one scene. From this list, you can write a brief summary statement, sentence, or paragraph describing the scene. Then, inside the frames, make some visuals to illustrate the statement—trying alternative viewing angles can change/enhance the message. The goal of these worksheets is to assist in the transition from writing to sketching and to help plan richer visual stories. In a sense, it's laying the verbal framework for the sketching. Of course, this process is flexible, and the visuals and writing should inform each other and, ultimately, the argument.

Events
List out the key points of interaction that can be designed for.

Inventory of Elements
List the key objects, people, elements, that shape this interaction.

Statement
Write a brief summary statement to focus and inform the sketch.

Sketch
Draw this interaction from a key viewpoint. Integrate people, elements, objects and context to create a compelling scene.

Alternative View Thumbnail Sketches
Draw this interaction from multiple angles. Play with scale, cropping, proximity, and detail.

Try using the worksheets in the following order to plan and sketch out scenarios.

1. Identify and order some of the key moments or events within an experience/activity/interaction. Try to list between three and five to make a simple story with a beginning, middle, and end.

2. List all objects, players, elements, and actions involved in each event. You might find that your list begins to represent the scenery and choreography for each event.

3. Write a summary statement that describes each event. Make sure to note the person, the action/interaction, and the indicators that begin to point toward a design problem or opportunity.

4. Sketch the event from a variety of angles. Try zooming in and zooming out. In one view, you might also try focusing on the person and in another focusing more on the product or interaction. Sketching these variations will provide alternative viewpoints and allow you to think through the event from multiple perspectives.

5. Bring your written statements and sketches together to form a visual narrative on a second worksheet that shows only five frames. Choose the most revealing viewing angles and most descriptive sketches to make your narrative succinct.

To download our Drawing Ideas Quick-Start Worksheet, please visit www.drawingideasbook.com. Alternatively, you might try developing your own. You may find that you need more or less frames per page or greater space for writing. Regardless, a template approach like this will help you to get your ideas down quickly and more completely.

PREPARING TO DRAW VISUAL NARRATIVES

WHEN PREPARING TO sketch a visual narrative, you might get ready as you would for writing. Consider if you are telling a simple short story or a lengthy elaborate composition. You must also consider the overall message of your piece as a guide for constructing key points. In other words, you might create an outline for your sketch that highlights the key moments with notation for suggested visuals. The quick-start worksheets offer you a format to quickly thumbnail scenes and consider alternate views. Following are some further considerations for planning your visual narratives:

WORKING QUICKLY WITH THUMBNAILS

Making thumbnails of scenes is a great way to try out ideas and determine the best composition to illustrate your story. While thumbnail sketches capture ideas in a rough form for yourself, consider trying a variety of levels of detail and refinement to experiment with enhancing content and accessibility. Since figures are very telling components in any visual narrative, you might start with roughly shaped silhouettes to show body position and gesture and then work toward more concrete representations demonstrating facial structures, clothing, and emotion. Of course, one of the most important aspects of creating a visual narrative involves picking the right paper. Typically, 11" × 17" (ISO A3) bright white copy paper is sufficient for pens, pencils, and markers; however, for presentation-style drawings, a higher-quality pen or marker paper will enable cleaner lines and a higher fidelity drawing.

FILTERING IDEAS

It is always good practice to generate more sketches than needed for later editing. Having a greater pool of visual alternatives from which to choose enables a more informed selection. Structuring the content of the visual narratives to create a compelling storyline may create a more complete story by including multiple threads and different points of view (person, system, product).

It is also important to pinpoint the key moments that enable you to craft the strongest visual story. In this sense, being able to quickly generate alternatives will help you become more agile in your process.

Consider using Post-it notes as a planning tool.

LINEAR PROGRESSION OR NOT

Telling a story in a linear manner from beginning to end is a very functional approach. Try revealing the "answer" first and then going back to revisit earlier points in the sequence. When designers present their work, they often show research and premise claims first, then progress to concept generation next, and then reveal the final concept. This, again, is a functional sequence. Consider alternatives. Revealing the conclusion first in some detail may serve to ground subsequent sketches and ideas. This provides a frame of understanding for the audience to reference as it views the narrative. Building sequentially from the "end" through the beginning and then back to the "end" may have more impact as the audience will understand process or sequence from a more informed standpoint.

EFFECTIVELY NARRATING TO YOUR AUDIENCE

As noted in the Explanatory Sketching section of this book, the relationship between content and audience is extremely important. This is equally true with visual narratives. Setting goals of a few key points to raise for discussion or to illustrate in the context of a larger presentation will keep the narratives on target to complement research and design activity. If your audience is knowledgeable about the subject, visual narratives can be used to support existing knowledge or highlight overlooked areas— emphasizing either high-level strategic ideas or low-level tactical concepts. A novice audience may be more inclined to focus on the details of the narrative itself. In both cases, it is imperative to understand the visual "intelligence" of your audience as well as their expectations. A well-crafted, well-rendered visual narrative can be compelling, but for expert audiences who demand more, layout and composition of the narrative may have more impact in the transmission of your message. Effective visual narratives can function on their own without the assistance of verbal delivery.
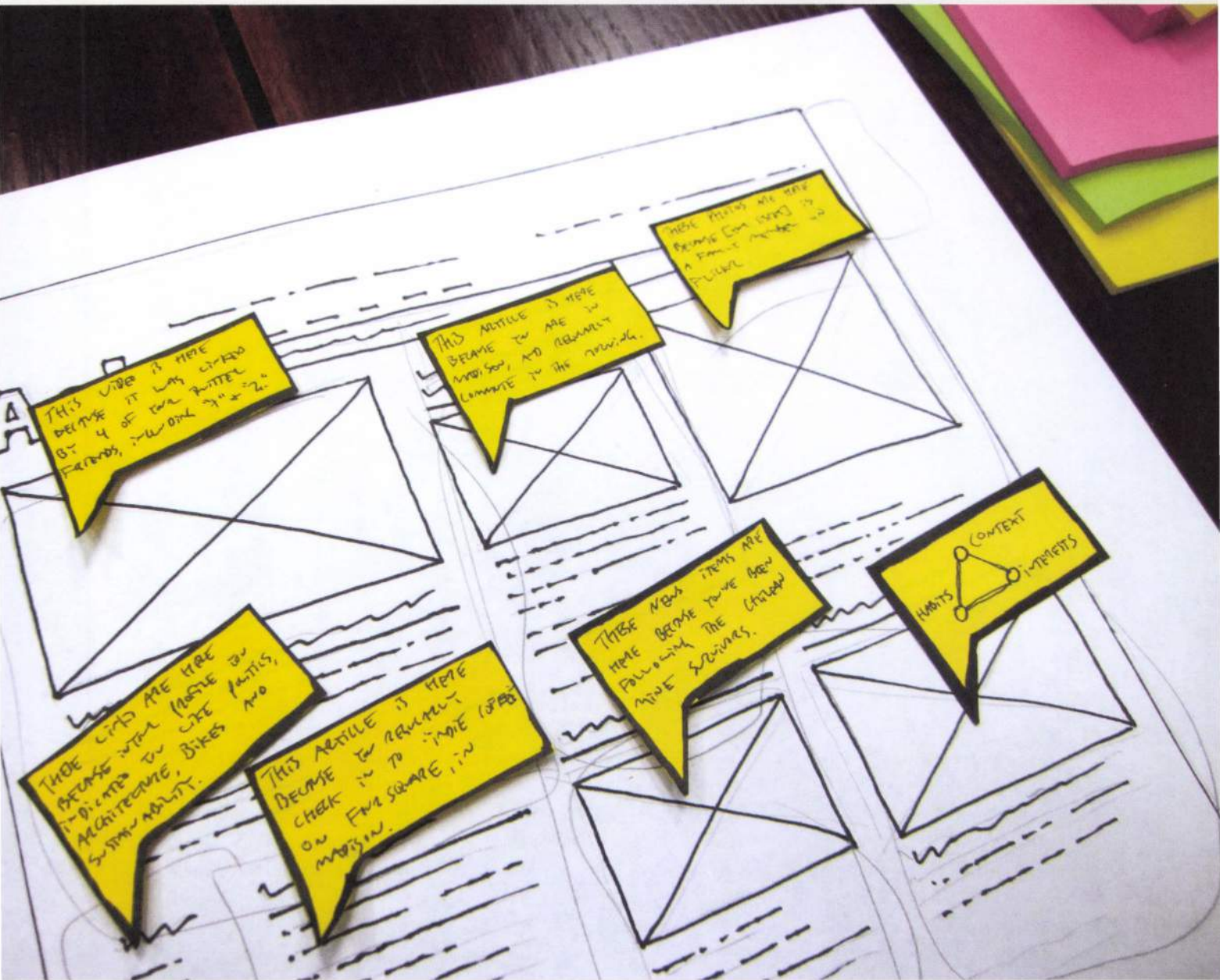
Sketching on separate pieces of paper allows for quick reordering to find the right sequence for your visual narrative.
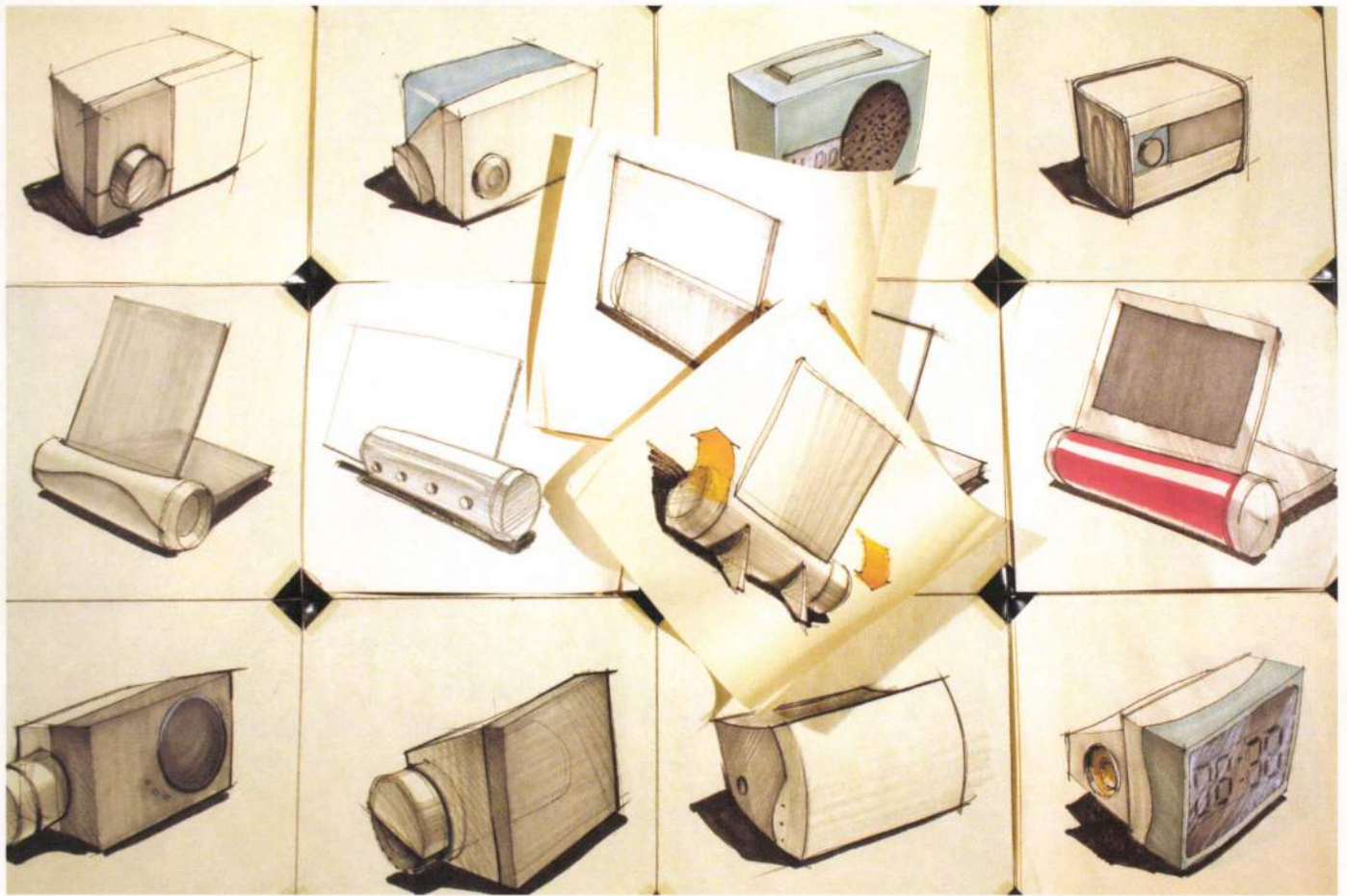
INTENT

A question with any visual narrative is "Why draw the story?" If a narrative can be made more effectively with photographic images, video, or other means, then use them. Drawing is not suitable for every narrative situation, but a hand-drawn visual narrative can set the stage nicely for discussion. As noted earlier, hand-drawing shows a lack of "finality," so it invites comments, criticism, and discussion. Hand-drawn visual narratives leave more to the imagination than photographs because of their focus on the overall incomplete idea itself rather than concrete detail.

FINDING AN APPROPRIATE LEVEL OF RESOLUTION

Consider how much detail you want or need to show. Presenting a highly polished rendered concept sketch very early in the creative process can be both stifling and invite negative criticism, as it is likely to appear too concrete. Similarly, using a rough sketch to show a final concept may represent an idea as being unresolved. There is a spectrum of roughness to precision, and your sketches should reflect this. Looking back at earlier sections of this book, you will find many examples of sketches used at

various stages of the design process plus some techniques for making your sketches look intentionally rough. Given your audience's knowledge and visual proclivity, you can figure out an appropriate level of precision necessary. Note how the detailed drawings synthesize information to show how the entire system may function.
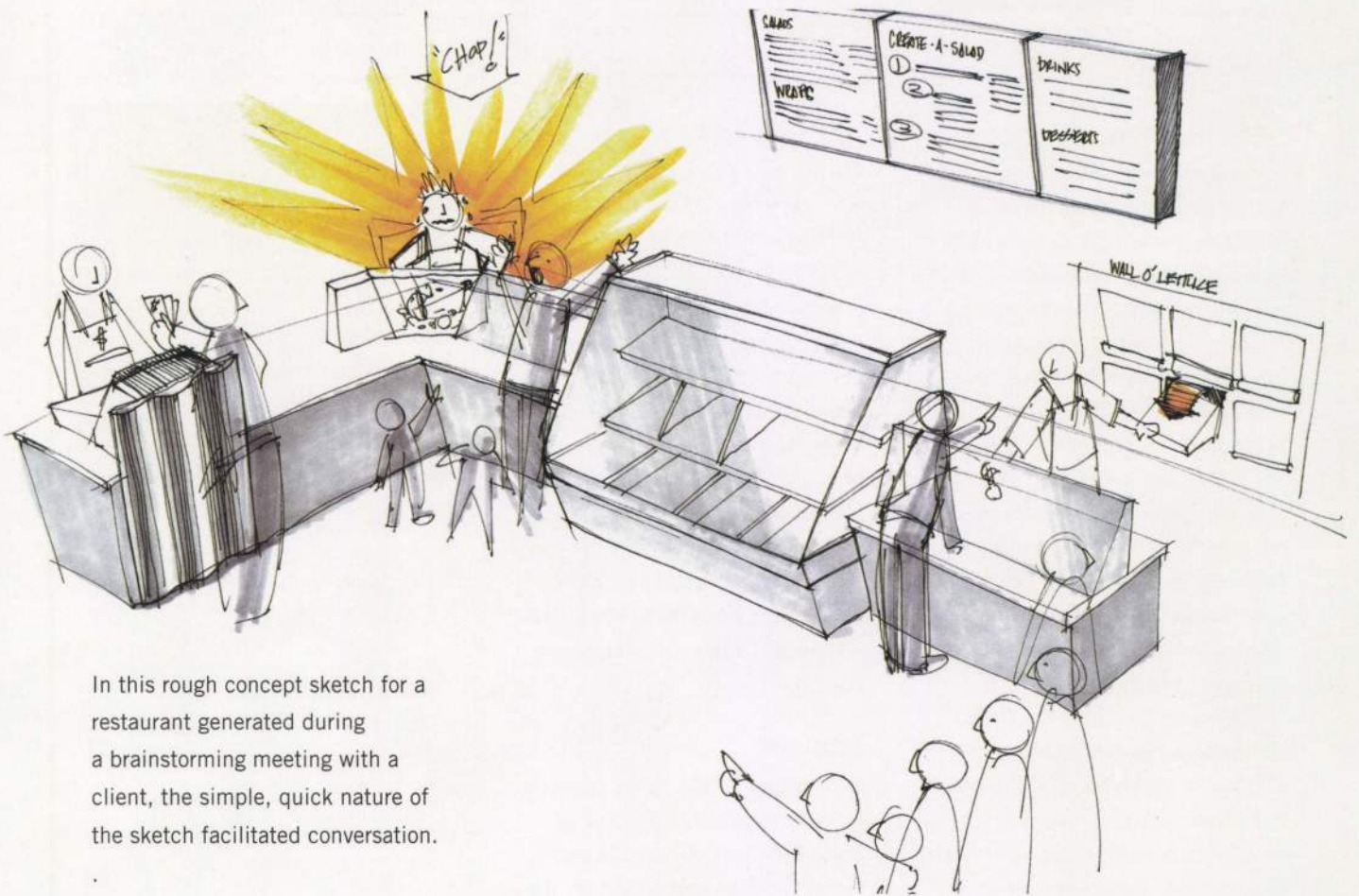
In this rough concept sketch for a restaurant generated during a brainstorming meeting with a client, the simple, quick nature of the sketch facilitated conversation.

This example sketch of a cooking theme depicts a higher level of resolution employing color, detail, and composition.

SETTING THE SCENE

A compelling visual narrative shows peoples' activities with products within an established environment or system to provide context. A scene can be completed with objects, people, environmental elements, and cues for interaction. When sketching a scene, ask yourself the following questions: Who are the subjects/players/cast members? What are they doing? How are they doing it? Where are they doing it? When are they doing it? And most important, why are they doing it?

You may also find it helpful to create a visual inventory of all the pieces/parts and players in the narrative. A visual inventory is more than a list and may include loose groupings of objects, diagrammatic representation of processes, and some sequences of human interaction. The goal is to get the problem space into visual form to reveal connections, natural pairings, and sequences to spark innovative design thinking.

ADDING IMPACT TO NARRATIVE SKETCHES

IRREGULAR FRAMES AND BREAKING THE GRID

Employing overlapping frames, sequential frames, linked frames, or irregularly shaped frames—or breaking an established grid or breaking free from the frame—can all aid in establishing narrative hierarchy and add interest to a drawing. Shown at right an incomplete rectangle and vertical lines create a bounding frame that adds visual interest and suggests context.

ZOOMING

The position of the frame (zoomed in, zoomed out) has a profound impact on the presentation of the subject matter, particularly on the emotive level. Scale can evoke feelings of intimacy, aloofness, solitude, or increased activity.

flat or fat?

Scenes drawn in two-point or three-point perspective are very compelling, add an additional degree of visual interest, and seem more natural to the eye. Simple plan views and elevations of scenes enable quicker sketching of narratives and development of ideas.

BUG TABLE ACTIVITIES

CLOSE UP OF WHAT IS TANGIBLE

PEOPLE VIEWING

BUG BUG CASE

BUG TANK EXPLORATION

← PAN ACROSS CASES →
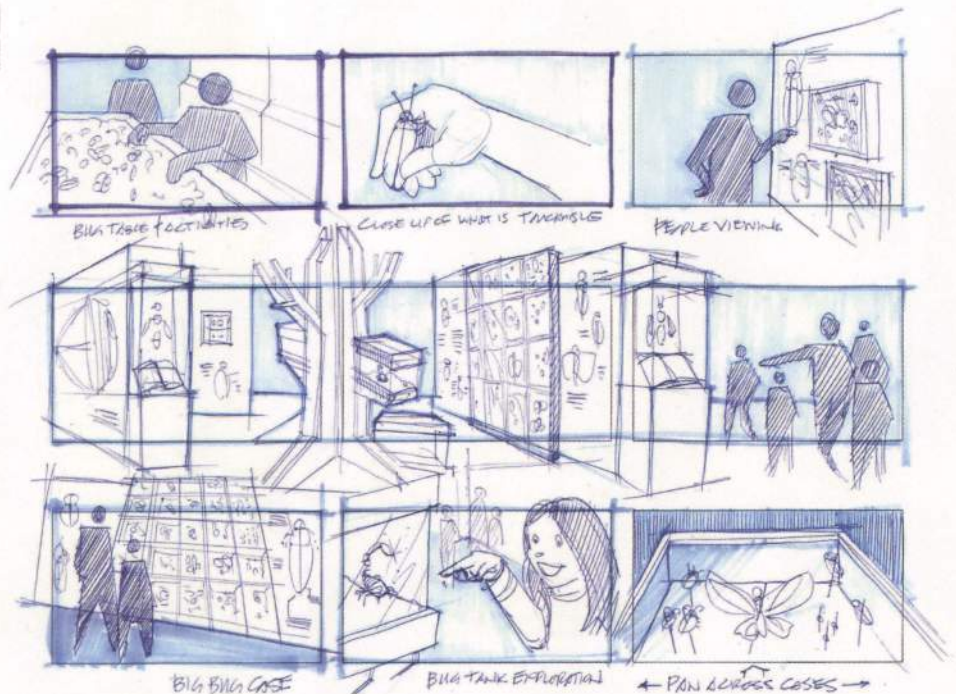
PUSHING THE BACKGROUND BACK

It is very easy to overwork a drawing with too much color and tone, making it muddy and confusing. How much color should you use? Not much but just enough to draw attention to key areas. Spot colors can serve to highlight arrows, transitions, materials, and elements that are noteworthy or important for the understanding of the message. Subdued tones (pastels and light grays) can be used to push the background "back" behind the subjects, giving more emphasis to the elements in the foreground. So the biggest question to ask yourself when picking color is "How will the use of color clarify the scene to enhance the communication of this idea?"

ARROWS AND GRAPHIC DETAILS

Incorporating arrows as background elements to link frames together creates a more dynamic flow between drawings. Irregularly shaped graphic elements can also be useful in creating visual interest and depth within the drawing. Supplementary textual information, such as title blocks, callouts, arrows, and diagrams, will enhance the richness of a visual narrative. The interplay between text and sketch will engage your viewers in a variety of ways and keep them working through the narrative. Breaking the grid or established structure will add visual interest and support a hierarchy of the overall message.
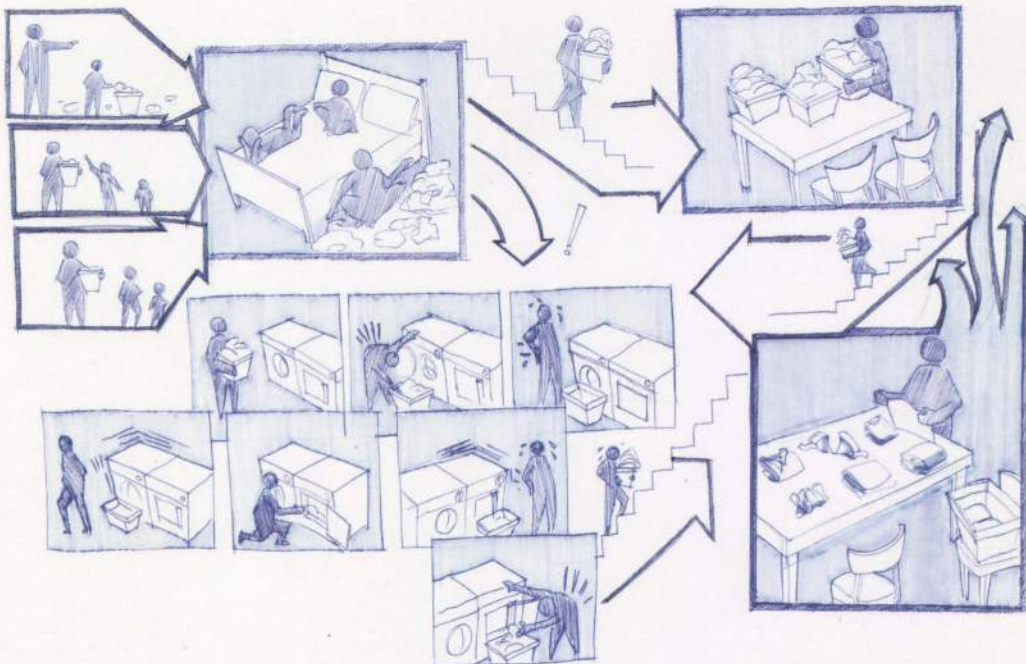
APPROACHES TO STRUCTURING VISUAL NARRATIVES

VISUALIZING A STORY through sketching can be a daunting task. In some cases, the story may not be easily articulated or able to be clearly articulated into key moments. Using a formal structure or framework may prove useful in keeping your narrative organized and on task as you sketch.

Beginning your visual narrative with a blank template—with frames in varying sizes—can help establish hierarchy of key moments in a story.
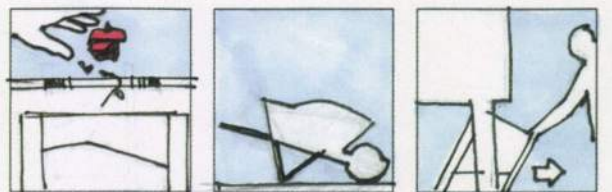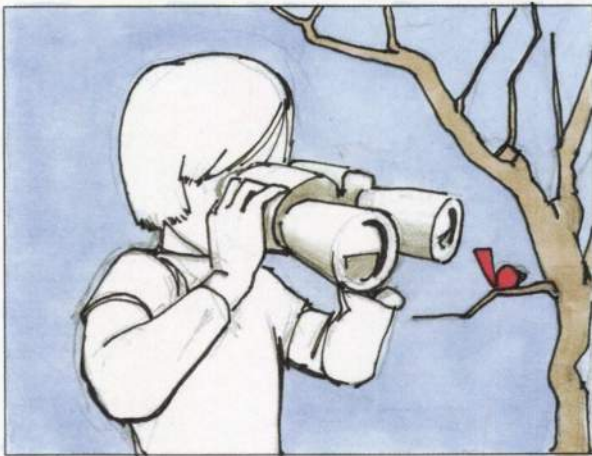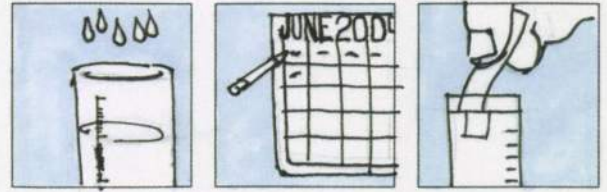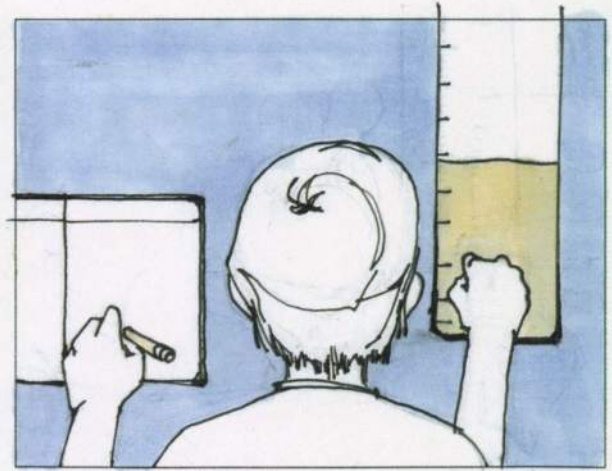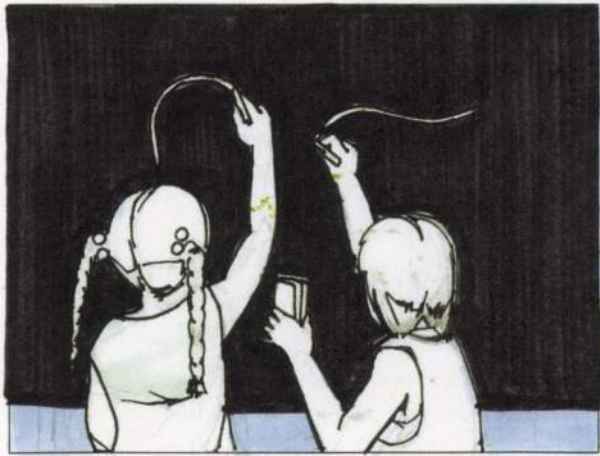
using a formal framework to guide your visual narratives

AEIOU is an interrelated framework that guides designers in thinking through a problem or scenario from a variety of perspectives: activities, environments, interactions, objects, and users. It is originally credited to Rick Robinson, Ilya Prokopoff, John Cain, and Julia Pokorny from the Doblin Group in Chicago. Rick Robinson then carried the framework to E-Lab LLC, where it was made available through company promotional materials. (For further information on this approach, please see *Universal Methods of Design* by Bruce Hanington and Bella Martin.)

AEIOU differs from our Drawing Ideas Quick-Start Worksheet (see pages 284–285) in its formality and strict adherence to these five dimensions of a design space. Elements within this framework together help to form a more complete view of a design scenario and are useful in both field research and ethnographic work as well as concept generation. While the general idea of AEIOU may be helpful in thinking through and generating ideas, using a structured format, such as the Design Thinking worksheets shown on page 298, developed by Mark Baskinger and Bruce Hanington, are useful in organizing thoughts, observations, and ideas into distinct categories.

As you work through the AEIOU framework, you can synthesize your sketching onto a larger sheet of paper to bring the various aspects together into a cohesive statement.

A

ACTIVITIES ARE GOAL-DIRECTED SETS OF ACTIONS. WHAT ARE THE PATHWAYS THAT PEOPLE TAKE TOWARD THE THINGS THEY WANT TO ACCOMPLISH, INCLUDING SPECIFIC ACTIONS AND PROCESSES? HOW LONG DO THEY SPEND DOING SOMETHING? WITH WHOM ARE THEY DOING IT?

I

INTERACTIONS ARE BETWEEN A PERSON AND SOMEONE OR SOMETHING ELSE, AND ARE THE BUILDING BLOCKS OF ACTIVITIES. WHAT IS THE NATURE OF ROUTINE AND SPECIAL INTERACTIONS BETWEEN PEOPLE, BETWEEN PEOPLE AND OBJECTS IN THEIR ENVIRONMENT, AND ACROSS DISTANCES?

E

ENVIRONMENTS INCLUDE THE ENTIRE ARENA WHERE ACTIVITIES TAKE PLACE. FOR EXAMPLE, WHAT DESCRIBES THE ATMOSPHERE AND FUNCTION OF THE CONTEXT, INCLUDING INDIVIDUAL AND SHARED SPACES?

O

OBJECTS ARE THE BUILDING BLOCKS OF THE ENVIRONMENT, KEY ELEMENTS SOMETIMES PUT TO COMPLEX OR EVEN UNINTENDED USES, POSSIBLY CHANGING THEIR FUNCTION, MEANING, AND CONTEXT. FOR EXAMPLE, WHAT ARE THE OBJECTS AND DEVICES PEOPLE HAVE IN THEIR ENVIRONMENTS, AND HOW DO THESE RELATE TO THEIR ACTIVITIES?

U

USERS ARE THE PEOPLE WHOSE BEHAVIORS, PREFERENCES, AND NEEDS ARE BEING OBSERVED. WHO IS PRESENT? WHAT ARE THEIR ROLES AND RELATIONSHIPS? WHAT ARE THEIR VALUES AND PREJUDICES?

I | Interactions are between a person and someone or something else and are the building blocks of activities...

General Impressions/Observation
- DOCENT — KID INTERACTIONS ABOU...
- DOCENT CARTS ARE DESTINATION!
- LEARNING. KIDS SEEM TO LIKE
- TICKETING IS TYPICAL, BUT IS FIRS
- SETS THE TONE FOR THE EXPER

Elements, Features & Special Notes
- TEEN DOCENTS
- SOME INTERACTABLES
- BARELY ANY OBJECT
- DIGITAL TOUCHSCREENS
- DINOSAURS ARE BIG!
- BIRDS ARE LOST...
- BUT WAIT, ON
- THIS, OR NEW EXHIBIT?
- [NEED INTERPRET?]
- GIFT SHOP CLERKS
- LUNCH AREA LINES
- VENDING MACHINES
- DIRECTIONALS &
- INTERACTIVES
- OLD SCHOOL THINKING
- & INTERACTION.

Series of Interactions

DINO INFO

O | Objects are the building blocks of the environment, key elements sometimes put to complex or even unintended uses...

General Impressions of the Theme, Style, Materials & Atmosphere
- THE MUSEUM IS A MIX OF STYLES & TYPES OF EXHIBITS. THE
- HAVE GROWN "ORGANICALLY" OVER TIME. THE BUILDING HAS BOTH
- HISTORICAL ARCHITECTURE AS WELL AS NEWER, M
- SPACES. SIGNAGE TYPES ARE NEWER
- EACH EXHIBIT. CONSISTENT SIGNAGE FOR WAY
- EXHIBITS IS VERY DATED. NEEDS AN OVERA
- RESPECTFUL EYE TO HISTORY OF BUILDING
- MEMORABLE THINGS — GUNS &

Sketch Inventory of Key Objects

LIVE BUGS
DEAD BIRDS (SKINS)
DINOSAURS
LARGE SCALE
REAL FURS
KIOSKS
TICKETS (WEARABLE)
GUARDS
GIFTS

A | Activities are goal-directed sets... that people take toward the thing... ing specific actions and processes... something? Who are they doing it wit...

General Impressions/Observations
- MANY SCIENC... GROWN
- FOCUS ON SUBJECT & ARE E
- FLOOR. INTERACTABLES AR
- PEOPLE ONLY AT A TIME...
- INTERACT W/ PRESENTATI... CHECK &
- SMALL GROUP CREATIVE ACTIVITIES

Elements, Features & Special Notes
- EXHIBITS: SOME ARE DATED
- BIG TYPE & COLORS
- PARTICLE BOARD CONSTR.
- KIOSKS
- DOCENTS: TEENS/OLDER
- LOTS OF WAYFINDING
- DINOSAURS!!
- INTERP. SIGNAGE GOO...
- LANGUAGE IS FRIENDLY
- CAREFUL TO LEAD THEM
- AREAS & MAKE
- SEPARAT...

Sketch Summary of Activities

LOOKING
TOUCH SCREENS
EATING LUNCH
LIVE BUGS
SHARING & LEARNING
EXPLORER BUYING

U | ...

Inventory of People

...M WALL AD

...OM ALLIGATORS
...PATIAL BASECAMP—
STUDENT DOCENTS
...IMMONS GALLERY WASTING
N: "BEHIND THE SCENES" DOCENT
FOR RALEO LAB WHICH IS
COOL!!!

ARTISTS
DOCENT

INFO
DINO

Drawing visual narratives can be an effective means to summarize findings in research, to provide a simple overview of complex sequences or scenarios, or to foster a deeper conversation among team members. Visual narratives serve best to show the connectedness of designed objects and systems with people and context, and enable you to consciously edit the story to create an effective message.

While frameworks like AEIOU and our Drawing Ideas Quick-Start Worksheet are effective in organizing your thoughts into a more complete ensemble, remember that design concepts are best explained as stories to which we can all relate. Look to comic books and graphic novels for further examples of visual storytelling, and see how the narrative unfolds through character depiction, context setting, actions, interactions, and more. You may find that drawing ideas is as much about visual storytelling as it is about actually drawing your ideas.

AFTERWORD

AS YOU HAVE have learned in this book, sketching brings agility to your design process, enabling you to quickly study, explore, and communicate your ideas. In both solo and collaborative situations, drawing by hand fosters a broader, deeper understanding of your subject. This ability to clearly express your ideas is essential to effective, compelling design.

Drawing Ideas and other related offerings, such as our Drawing Ideas Workshops, are aimed at kick-starting personal development and promoting a creative, collaborative environment for successful design. We encourage you to use this book as both a source for inspiration and a valuable resource for design technique and strategy—for yourself, your team members, partners, and clients. As you integrate drawing by hand into your design process, consider that it is a fast and direct means to express ideas and enrich collaboration.

As parting advice, we recommend daily drawing practice to develop solid coordination among eyes, mind, and hand. Proficiency and fluidity with drawing takes time and effort. Don't let this stop you from trying and using drawing in the context of your work. Sketching is not an exclusive skill reserved for the best drawers, and not all drawings have to be of museum quality. The examples we include in this book purposely represent a range of approaches and a variety of resolution. Even the most basic sketches can make a notable difference in clarifying and communicating an idea. What is most important to remember is that drawing by hand supports behaviors (recording, exploring, explaining) that are critical to an effective design process—all the way from project brief to resolution of a final concept.

Go draw.

—William and Mark

FOR MORE DRAWING advice, see www.drawingideasbook.com.
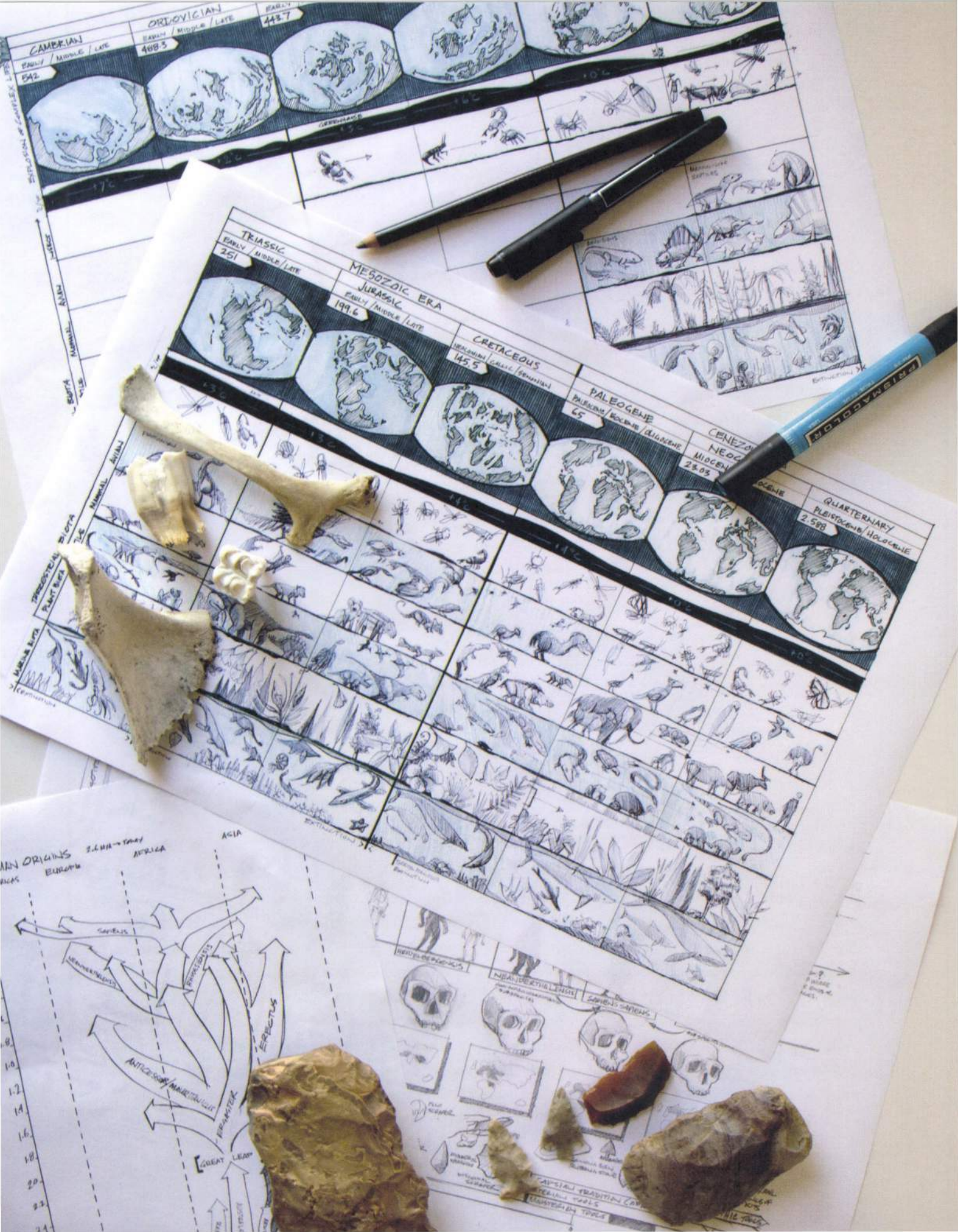
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DRAWING
IDEAs

THE POWER IS IN YOUR HAND

Drawing is a fast, powerful means for exploring your ideas and communicating with others. Whatever your design challenge—a product, a service, a system, or conveying information—a hand-drawn sketch ensures fresh thinking and a greater potential to persuade. For many people, drawing is either an untapped or neglected skill. *Drawing Ideas,* based on the popular workshop, is a complete resource for expanding your drawing ability for agile thinking, practical communication, and superior design.

WILLIAM BARDEL is the principal of Luminant Design, an information design practice in New York.

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