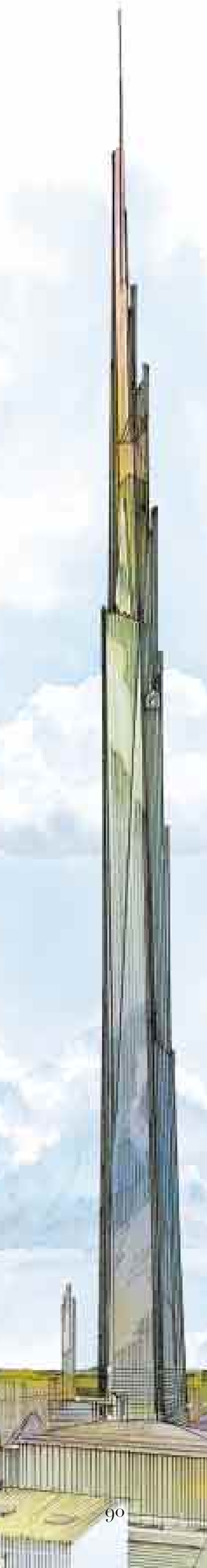
The GREATEST Projects Never Built

Many well-laid engineering plans went astray—and in some cases, it was lucky they did

by Mark Alpert



ENGINEERS' DREAMS: **Megaprojects that never made it off the drawing board include (*from left to right*) the mile-high skyscraper, the Bering Strait dam, the nuclear-powered airplane, the Panatomic Canal, the L5 space colony and the Beacon of Progress.**

To the ancient Babylonians, it must have sounded like a wonderful idea. "Let us build us a city and a tower, whose top may reach unto heaven; and let us make us a name, lest we be scattered abroad upon the face of the whole earth." At least that's how the Book of Genesis tells the story. The construction started well: the builders had plenty of brick, mortar and laborers. What they didn't count on was the wrath of the Lord. Outraged by the ambitions of the early engineers, the Almighty killed the project by forcing the workers to speak in different languages. The Tower of Babel became the first in a long line of marvelous structures that, for one reason or another, were never built.

In the past century alone, visionary architects and engineers have proposed a host of stupendously impractical projects. Some prominent examples are the mile-high skyscraper, the nuclear-powered airplane, the Superconducting Super Collider and the L5 space station. Divine anger didn't kill any of these plans—they were done in by extravagant costs, unforeseen construction problems, shifts in political backing and the often belated realization, "Hey, do we really need this thing?" The history of these proposals suggests a basic lesson that should be taught in all engineering and architecture schools: just because something *can* be built does not necessarily mean that it *will* or *should* be built.

Consider, for instance, the Beacon of Progress. In 1900 Désiré Despradelle, an architecture professor at the Massachusetts Institute of Technology, proposed the construction of a 1,500-foot-high (457-meter-high) obelisk in Chicago overlooking Lake Michigan. The Beacon of Progress, which would have been nearly three times as tall as the Washington Monument, was an elaborate expression of the French-born Despradelle's love for America. He planned to adorn the obelisk with statues of lions, eagles and female figures representing the 13 original colonies. Despradelle and his students worked on the design for several years, and it won numerous awards. Their plan, however, had a glaring flaw: the obelisk's base could not have supported the immense weight of the granite monument. The Chicago Architectural Club exhibited drawings of the Beacon of Progress, but the city's builders politely declined to take up the project.

Half a century later America's greatest architect envisioned an even more grandiose structure. In 1956 Frank Lloyd Wright, then in his late 80s, presented his plans for the Illinois, a 528-story skyscraper that would have towered a full mile above Chicago. Shaped like a giant rapier, the steel-and-aluminum building would have provided office space for 100,000 workers, parking for 15,000 cars and landing decks for 150 helicopters. In fact, the skyscraper could have housed the entire government workforce of the state of Illinois.

Toledo architect Byron L. West, who attended Wright's presentation as a graduate student at the Illinois Institute of Technology, recalls that the audience was intrigued by the proposal. "Because he was Frank Lloyd Wright, they took him seriously," West says. "But I was with a group of architecture students, and we were a little skeptical." The next day West and his fellow students calculated how long it would take Chicago's elevated rail system to deliver 100,000 workers to Wright's proposed skyscraper. Assuming a fully loaded eight-car train arrived at the building every five minutes, the answer was 10 hours. Another problem was elevators—the Illinois would have required hundreds. All those elevator shafts would have taken up a lot of space, sharply reducing the proportion of income-

BARRY ROSS

generating square footage in the building. Needless to say, funding for the Illinois never materialized.

Thinking big is also a predilection of civil engineers, who often delight in drawing up blueprints for gargantuan dams, canals and bridges. In 1928 German engineer and architect Herman Sörgel described a remarkable plan to increase the landmass of Europe and Africa by draining much of the Mediterranean Sea. Sörgel proposed building a dam across the Strait of Gibraltar to block the current from the Atlantic Ocean. Water levels in the Mediterranean would drop by about 40 inches a year; after a century or so 90,000 square miles (233,000 square kilometers) of new land would appear above the surface. Much of the Adriatic and Aegean seabeds would become valuable real estate. There would be some drawbacks, of course: most of the present Mediterranean ports would be stranded miles from the water's edge, and sea levels in the rest of the world would rise by three feet. But that, according to Sörgel, was simply the price of progress.

In 1957 Pyotr Borisov conceived a similar transformation for the Arctic Ocean. The Soviet engineer argued that the Russian climate could be greatly improved by constructing a dam across the Bering Strait, the narrow stretch of ocean between Siberia and Alaska. Powerful pumps at the dam would spew billions of gallons of cold Arctic water into the Pacific Ocean. The flow would draw warmer Atlantic water into the polar region and eventually melt the Arctic ice cap, which would in turn warm the vast Russian tundra. Borisov acknowledged that his plan would affect the climates of other countries as well—and not all for the better—but he didn't see this as a fatal flaw. In retrospect, it's lucky that Russia sold Alaska to the U.S. in 1867. If the Russians had held on to the territory, they would have been free to build the Bering Strait dam, and the cold war might have taken on a whole new meaning.

None of these schemes progressed beyond the design stage, and no one spent any serious money to determine whether they were feasible. Unfortunately, the same cannot be said for the nuclear-powered airplane. After World War II, U.S. Air Force officials became convinced that they needed a longer-range bomber. A nuclear-powered aircraft, they reasoned, would require only a small amount of uranium fuel and thus could stay aloft for weeks. Its range would be limited, it was said, "only by sandwiches and coffee for the crew." So the air force set out to build a nuclear turbojet engine. In a conventional jet engine, incoming air is mixed with fuel and burned; in the nuclear version, the air would be heated by a reactor.

The engineers quickly ran into a problem: the reactor needed massive shielding to protect the plane's crew and equipment from radiation. An early design called for nearly 50 tons of shielding, which is more than half the weight of an unloaded B-52. And all of it would be for naught in the event of an accident; if the nuclear-powered aircraft crashed, it would splatter radioactive material over a wide area. Citing these concerns, the air force recommended canceling the study, but Congress kept it alive. The politicians were determined to beat the Russians, who were vainly trying to build their own atomic plane. By the early 1960s, though, the air force had come up with a better way to deliver warheads—via intercontinental missiles—and President John F. Kennedy finally killed the program, which had cost taxpayers a total of $1 billion.

JUST BECAUSE SOMETHING *CAN* BE BUILT DOES NOT NECESSARILY MEAN IT *WILL* OR *SHOULD* BE BUILT.

The nuclear foolishness didn't end there, though. In the late 1950s the U.S. Atomic Energy Commission (AEC) launched Project Plowshare to explore the possibility of using atomic blasts for peaceful pursuits. Some scientists envisioned detonating a string of atom bombs to excavate a canal that would replace the one in Panama (the proposed waterway was dubbed the Panatomic Canal). Others considered employing the weapons to dig out harbors in Alaska or to release petroleum from oil tar sands in Canada. The AEC even tested the concept by setting off a series of underground nuclear explosions in Nevada, Colorado and New Mexico. The countries of Central America, however, turned down the Panatomic Canal, and in the 1970s Project Plowshare died a quiet death. About $160 million had been wasted on the idea.

Not all the great unfinished projects of the 20th century were so wrongheaded. Some efforts had admirable goals and were technologically feasible but simply grew too expensive. A good example is the Superconducting Super Collider, a humongous particle accelerator that was slated for the small town of Waxahachie, Tex. Conceived in the early 1980s by the U.S. Department of Energy, the Super Collider was designed to smash protons together at unprecedented speeds and allow researchers to examine the subatomic debris. The beams of protons were to be accelerated by thousands of superconducting magnets situated along a circular tunnel with a circumference of 54 miles (87 kilometers). Particle physicists hailed the proposal, saying the Super Collider would be a powerful tool for studying the fundamental building blocks of matter. Initial estimates put the project's cost at roughly $4 billion.

Presidents Ronald Reagan and George Bush strongly supported the Super Collider, and in the early 1990s contractors began tunneling under the Texas prairie. By that point, however, design changes and unexpected expenses had almost tripled the accelerator's price. Many politicians outside Texas saw the Super Collider as a pork-barrel science project that

BARRY ROSS

MEDITERRANEAN MADNESS: In 1928 German engineer Herman Sörgel proposed building dams to drain the Mediterranean Sea. Europe and Africa would have gained territory (*light green*), but their ports would have been landlocked.

would drain funding from smaller but equally important research efforts. So in 1993 Congress axed the program, even though $2 billion had already been spent. The partially built tunnel was abandoned, and today only a few filled-in access shafts mark its presence. The disappointed physicists learned a hard lesson: big science doesn't always sell. Many set their sights on the more modest Large Hadron Collider, the $6-billion particle accelerator now being constructed outside Geneva.

The construction of manned outposts in space is also seen, at least by some scientists and politicians, as a worthy goal. In 1975 the National Aeronautics and Space Administration sponsored an engineering study to design a permanent orbital community. Basing its plan on earlier concepts, the group proposed a space station in the shape of a giant wheel, more than a mile across. The station would orbit Earth in a stable position called the L5 Lagrangian point, which is equidistant from Earth and its moon. Much of the station's raw materials would come from the moon, including oxides, metallic ores and lunar soil for farming. The station's 10,000 colonists would live along the rim of the wheel, which would revolve once a minute to simulate Earth's gravity. The estimated cost of the station was $200 billion in 1975 dollars, equivalent to some $500 billion today.

Over the past quarter of a century, this grand blueprint has been scaled down dramatically. The International Space Station currently being built by NASA and its partners is designed to hold a crew of only seven astronauts. The station's price tag, however, remains enormous: $100 billion, according to the latest estimates. One problem with space construction is that it costs so much to boost the building materials into orbit. Another difficulty is the lack of an economic need for large structures in space. NASA has studied building solar-power collectors that would transmit power to Earth, and space enthusiasts have envisioned orbital hotels that would carry hundreds of tourists. But neither of these ideas is currently feasible. In the near future, at least, space colonies will exist only in science fiction.

What about the other unfinished projects still lying on humanity's drawing board? Although a Bering Strait dam seems out of the question, some engineers are pushing for the construction of a bridge or tunnel between Siberia and Alaska. And even Frank Lloyd Wright's mile-high skyscraper may someday become a reality thanks to the development of self-propelled elevator cars, which could take up less space than conventional elevators because several can travel in the same shaft. Indeed, many feats of engineering that once seemed beyond humankind's reach have ultimately been achieved. Consider the tunnel under the English Channel, which had been a dream of engineers since the 18th century. The dream finally came true in 1994, when the Chunnel linked England and France with a high-speed railway. Unfortunately, the project went way over budget, costing $17 billion. The Chunnel's revenues could not cover the interest on its debt, and the owners of the tunnel narrowly escaped bankruptcy in 1997. In other words, the Chunnel was an engineering success but a financial failure. The moral for ambitious architects and engineers: be careful what you wish for, because you just might get it. SA

About the Author

MARK ALPERT is an editor at *Scientific American.* In his spare time he is trying to build a nuclear-powered coffee machine.