# THEY SAID IT WOULDN'T WORK

## The inventor is an artist who tinkers with ideas and materials to create new devices that stretch the world

BY IVARS PETERSON

*"Invention is the process of searching through one's grab bag of unconventional ideas to find a simple way of fulfilling a given need."*
— Robert A. Moog

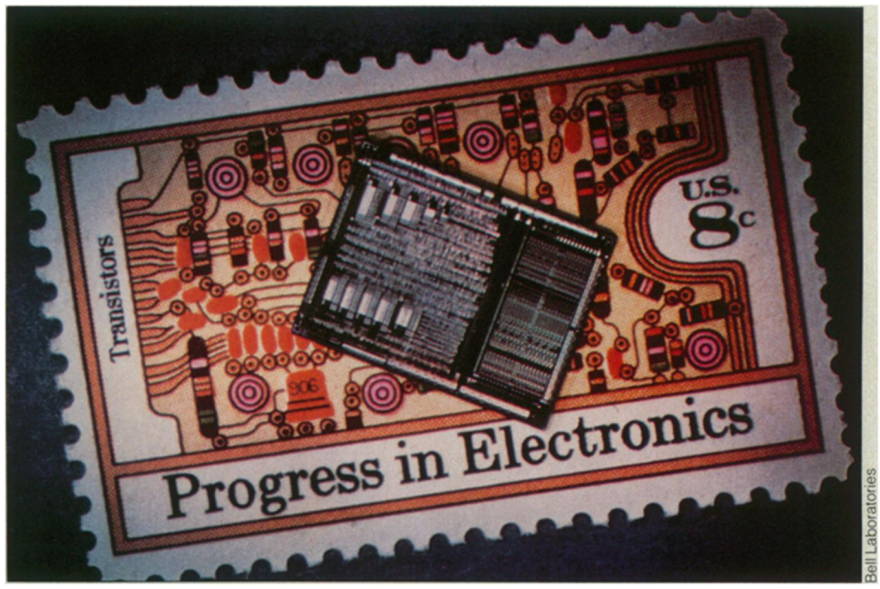
Take the simple words "name we sweet that any call as rose a which other smell would by" and shuffle them. At some point among the random rearrangements, a word combination flashes into being with a meaning that goes beyond the meanings of the individual words. Artists create something new by taking old words, old musical notes or familiar colors and putting them together in a new way.

Invention is an unpredictable, illogical process. Inventors pluck their creations out of a mad melange of ideas, memories and experiences, sometimes for pleasure and sometimes in response to needs. They take gears, integrated circuit chips, scraps of metal and bits of plastic and put them together in new combinations. If the result is neat, elegant and efficient, it is beautiful. And the world learns to use telephones, phonographs, radio and television, zippers, disposable razor blades, ice cream cones, Bakelite, Polaroid, Xerography, transistors, artificial heart valves and music synthesizers.

Frustration is the motivation behind many inventions. "When something bothers me, I do what everybody else does," says Jacob Rabinow, consultant to the Office of Energy-Related Inventions at the National Bureau of Standards. "I curse like hell, but then I begin to think, what can I do? Most people just curse."

Rabinow is in a special class because he's a professional inventor, with more than 200 patents and many more inventions to his credit. He invented a watch that speeds up inside if you move the hands forward because it was late, and slows down when you move the hands back. If the time change is more than ten minutes, the speed doesn't change. SCIENCE NEWS-LETTER in 1948 described another of his inventions, a magnetic particle clutch, as "a discovery of number one importance." He has also created a pickproof lock, a new type of venetian blind made from a single ribbon, a tangent-arm phonograph, three-dimensional microfilm and a camera with two-eyed viewing.

In 1922, Edwin E. Slosson, the first director of Science Service, described his dissatisfaction with his phonograph: "It scratches like a woolen sheet. It has a nasal tone like a New England old maid speaking French with a cold in her head.... My favorite musical instruments, the pipe organ and the bass drum, come out mere ghosts of themselves. A choir sounds like a quarrel."




*The invention of the transistor has led to integrated circuits such as the* BELIMAC-32 *microprocessor. The chip, only 1.5 centimeters square, has as much processing power as some minicomputers.*

The phonograph of the future, Slosson wrote, would be a "light" weight system that would "record its music by a ray of light reflected from a minute mirror stuck on the back of the diaphragm of the mouthpiece and cast upon a roll of sensitized celluloid like a motion picture film." A few years later, such a system introduced sound movies, while today laser beams dip into the nooks and crannies of digital discs.

Imagine the exasperation that drove a trio of English inventors to design and patent an assembly-line restaurant, in which patrons sit on a slowly moving conveyer belt and receive their courses at carefully prescribed intervals to ensure they vacate the table within a reasonable time. Or the motivation behind the invention of knitting needles with illuminated points, nonskid horseshoes and innumerable other gadgets.

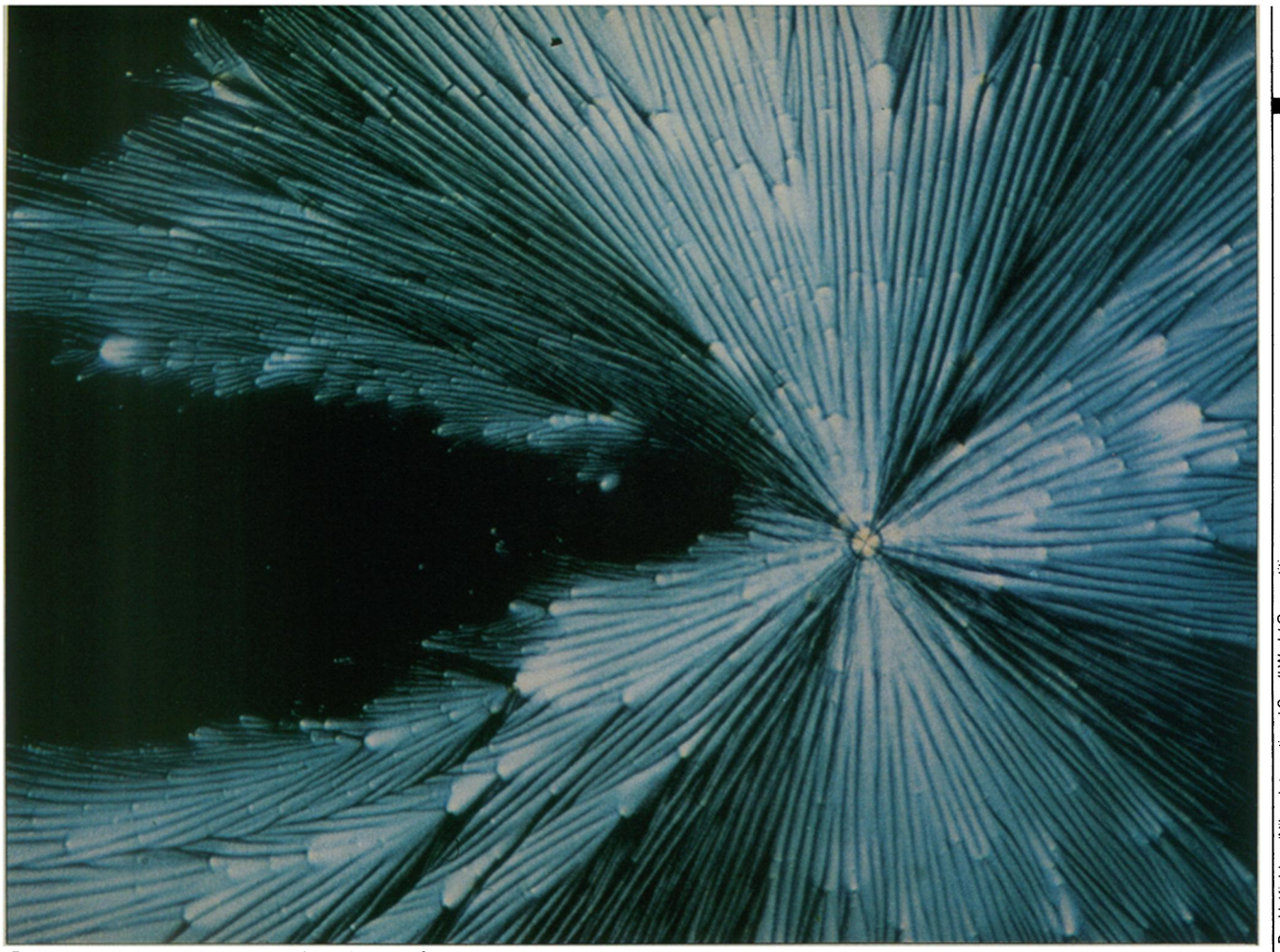
A 1922 SCIENCE NEWS-LETTER editorial announced the coming of a new radio epoch. "Summer static hampers receiving but spurs on the inventor. He has visions of a future that the world has not dreamed of."

Good inventions are simple. The challenge is not just to find an answer, but to find one that is elegant, or "cute," as Rabinow would say. "When it's all worked out, it looks obvious to the Patent Office, to judges and to nearly everyone who sees it, except that for some strange reason, it was not obvious enough to have been done earlier," Rabinow says.

Chemists, for example, owe something to Arthur Rosinger. In 1944, he patented a magnetic stirrer, which was simply a short bar magnet embedded in plastic and propelled by a rotating horseshoe magnet. The artificial heart valve, invented in the early 1960s by Albert Starr and Miles Lowell Edwards, was just a plastic ball in a small cage. Rabinow's magnetic particle clutch had only three elements, a driving shaft with a plate at its end, a driven shaft and plate and the iron-saturated fluid between. A small amount of current was enough to lock the plates together when needed. The device was widely used in aircraft autopilots, in tape drives for computers, in factory machinery and in automobiles like the Renault and Hillman.

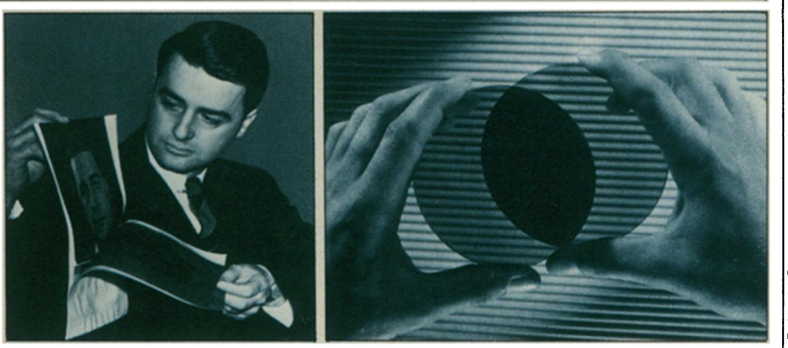
The great invention is not merely an extrapolation of what has gone before. It creates new needs and opens up possibilities that never existed before. From telephones to communications satellites, few foresaw the impact of these inventions. "An invention, by definition, is a new thing," says Rabinow. "The more new it is, the more unlikely it is to be recognized. The inventor has to be the guy who violates the rules to make something new."

In 1936, for the centennial celebration of the American patent system, Watson Davis, editor of SCIENCE NEWS-LETTER, arranged and directed a "Research Parade."



Per H. Kjeldsen/Nikon International Small World Competition

*Polarized light produces a striking image that unveils microscopic details in ascorbic acid crystals.*



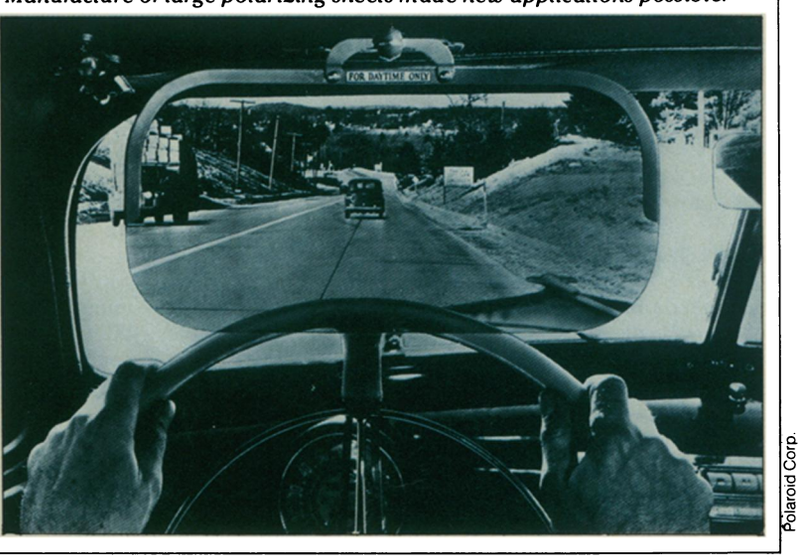
Polaroid Corp.

*From the invention of Polaroid light-polarizing plastics to a camera that turns out a finished picture in one minute, Edwin H. Land has more than 500 patents to his credit.*
*Manufacture of large polarizing sheets made new applications possible.*

Edwin H. Land has written: "... the steps from fantasy to the real thing may take decades of planned science, planned discovery and imagination, at once wild and yet brilliantly disciplined, to provide the details for removing countless intricacies and barriers."

The story of Land's light polarizer, Polaroid, began in 1927 with an interest in television and a concern about automobile headlight glare. The needed invention was a thin, large-area, inexpensive light polarizer. Land's solution was a sheet of plastic containing oriented, microscopic, needle-shaped crystals of herapathite, a synthetic compound related to quinine. After a public demonstration at Harvard in 1932, the material went on sale two years later. The shortage of quinine during World War II forced a change in the way Polaroid was manufactured. This led to the creation of a noncrystalline polarizer made from stretched, transparent plastic filaments stained with a polarizing dye.

Over the years, numerous applications, from sunglasses to scientific instruments, were found for Polaroid. Ironically, Land was never able to persuade manufacturers or federal authorities of the value of Polaroid filters in reducing headlight glare, one of the needs that originally motivated the research.




Polaroid Corp.

Bulky vacuum tubes overshadow a pencil-thin transistor. A 1948 SCIENCE NEWS-LETTER cover story predicted that the transistor, invented by John Bardeen, Walter H. Brattain and William Shockley at Bell Telephone Laboratories, "may result in more stable and durable radios, television sets and electronic devices." The transistor was more than a better mousetrap, more than a replacement for the vacuum tube. Today, semiconductor electronics and integrated circuits, descendants of the original transistor, are found everywhere, while expanding widely the ability to communicate and compute.

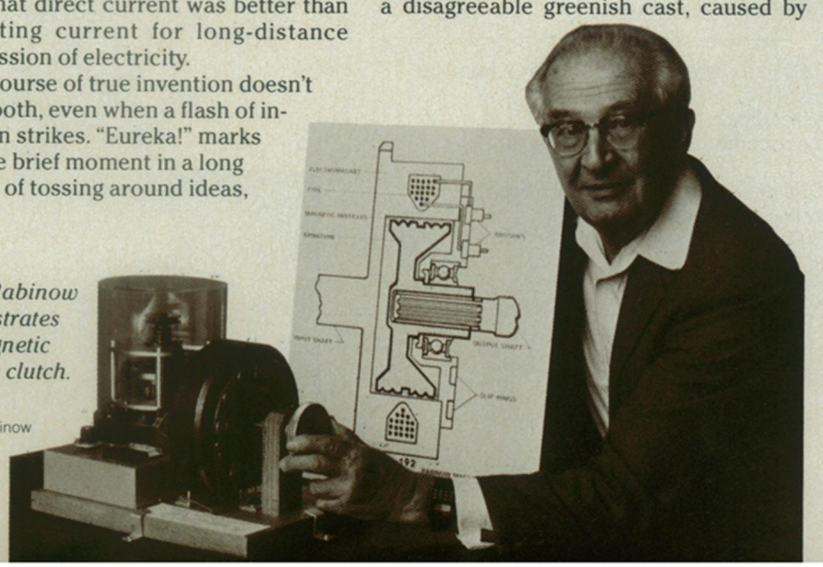
Bell Laboratories

It featured "demonstrations of scientific achievements that may become the industries of tomorrow."

The effects of ultrasonic waves, solar cookers and collectors and the ultimate sound system—a 50-tube creation that allowed music to be reproduced "with a degree of fidelity that makes it extremely difficult to realize the artist is not present in person before you" — were part of the show. George Wheelwright of Land-Wheelwright Laboratories described Land's invention of Polaroid sheets and their possible application for "one of the most troublesome problems of the day—the headlight glare elimination problem." V.K. Zworykin, already at work on television, showed an electron image tube that converted an invisible infrared image into a visible image, while another scientist urged that direct current was better than alternating current for long-distance transmission of electricity.

The course of true invention doesn't run smooth, even when a flash of inspiration strikes. "Eureka!" marks only one brief moment in a long process of tossing around ideas, tedious experimentation and, finally, manufacturing and distributing the invention to the public. Few inventions get this far. Sometimes an idea is an immediate success, sometimes it needs improvements, and often the idea founders or must wait for the right moment.

Television was a picture in an inventor's mind as long as 80 years ago, but it was decades before an acceptable system brought television to the public. SCIENCE NEWS-LETTER in 1927 described a new television process, in which the receiver picture was made up of "50 eye-blended rows of light and dark, which appear pink because the light in which they are painted comes from glowing neon gas." In 1944, the magazine noted some of the improvements that wartime research had triggered. "Pre-war television pictures had a disagreeable greenish cast, caused by the fluorescent screen of the cathode-ray tube. Wartime research has created a new fluorescent screen that overcomes the problem and gives a black-and-white picture almost as good as a newspaper halftone." It also predicted, "Television is destined to provide knowledge to larger numbers of people, truer perception of the meaning of current events, more accurate appraisal of men in public life, and a broader understanding of our fellow human beings."



*Jacob Rabinow demonstrates his magnetic particle clutch.*

Jacob Rabinow

Predicting the future of inventions is a tricky business.

The future of invention itself may be in doubt. Rabinow is concerned about trends that seem to discourage technological innovation. "The inventor takes concepts and sees new relationships," Rabinow says. "The more he knows, the better he can invent. If the education system fails, the inventor fails." Rabinow worries that the education system is not doing its job.

"Companies are now run by professional managers who don't care or know anything about engineering," says Rabinow. There are some exceptions, but for the most part, emphasis is on short-term returns on investments rather than on risky, long-term technological innovation. At the same time, until recently, little money was available for innovators to start their own businesses.

Rabinow says, "Today, invention is hard to do even in the government." The mentality has become more budget-oriented with little flexibility and too much bookkeeping. This strikes at the time and freedom inventors need to pursue their unpredictable visions.

"We need people in the business who are proud of their business, not just to make money but to have something no one else has," says Rabinow. "It's harder to find such people now."

There are signs an increasing number of people see the importance of creativity and invention. Engineering schools are beginning to teach more courses in design and creative problem solving. Organizations to aid inventors are becoming stronger and more numerous. Despite the odds, men and women continue to invent. The Office of Energy-Related Inventions at the National Bureau of Standards has reviewed 18,000 submissions in the last four years.

"The greatness of the human brain is that it always wants to know how things work, and its magnificence lies in that it also receives enormous pleasure and excitement from the knowledge," says Rabinow. □