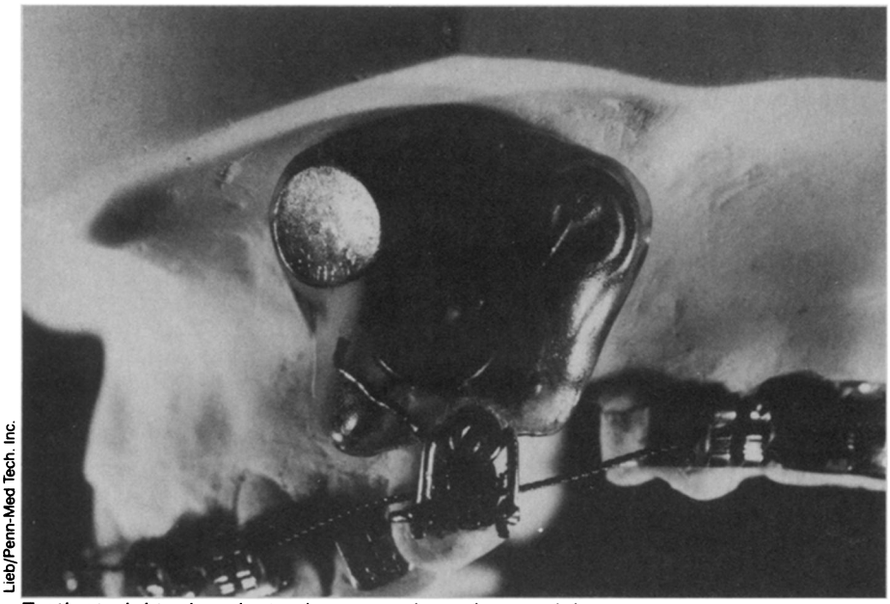
BRIGHT IDEAS THAT STILL SHINE

The spotlight of media publicity swings erratically, on one day highlighting a novel scheme for collecting solar energy, on the next picking out a dextrous, piano-playing robot, then skipping on to something else. After brief stays at the center of attention, these novelties often seem to disappear without a trace. Newspapers, magazines and TV broadcasts turn to newer ideas. People forget.

But it takes more than public apathy to keep good ideas down. Even ridicule or technical difficulties do little more than slow the development of such ideas. Away from the public eye, researchers and inventors refine their creations and continue experimenting.

Four years ago, three brief items appeared in SCIENCE NEWS. One described a new computer language called FIRST (SN:5/8/82,p.313). Another discussed the invention of an electrical device that would speed up the straightening of teeth (SN:5/15/82,p.331). A third item sketched a videotape recording system that allowed television viewers to see three-dimensional images without the use of special aids like colored glasses (SN:9/28/82,p.331).

A recent investigation shows that all three of these projects are alive and, to varying degrees, moving ahead.



Lieb/Penn-Med Tech. Inc.

Teeth-straightening electrode mounted on a jaw model.

When the article on FIRST appeared, the reaction of many readers was: "Oh no, not another computer language!" But its developer, physicist John Scandrett of Washington University in St. Louis, insists that deciding the value of a new computer language is a question that ought to be settled by experiment. "I've got enough case studies now," he says, "to substantiate my feeling that [FIRST] is certainly worthwhile."

Programming with FIRST is largely a matter of defining a hierarchy of commands. Old commands are used to build up a pyramid of new commands. The idea is to build into the language only those instructions needed for a specific application. It's like designing a calculator with special keys that automatically perform certain functions, says Scandrett. At the same time, the language isn't cluttered with words that aren't needed for that application.

Scandrett admits that his idea owes a great deal to a previously invented computer language called FORTH. However, he claims, FIRST is more flexible and runs much more quickly than FORTH. So far, Scandrett has developed versions of his language that would run on IBM, Apple and Macintosh personal computers.

Although copies of FIRST have been distributed to many colleagues, Scandrett's own consulting firm, FIRST is FAST, Inc., has been its principal user. "We've had a variety of fascinating projects," says Scandrett, ". . . ones where we recognized a nifty way to solve a problem."

One major application has been in factory automation and process control, especially when great speed and extreme precision must be combined. In one case, Scandrett's company developed a computer program to control giant lasers used to make metal-to-glass seals during the manufacture of magnetic switches. A FIRST program also operates a microprocessor-controlled switch tester that can measure currents down to a millionth of a millionth of an ampere.

Perhaps the most dramatic manifestation of FIRST is in a gigantic, welded-steel sculpture hanging in the atrium of a new office building in Jiddah, Saudi Arabia. The sculpture is dotted with about 40 translucent gold balls that each contain a xenon flash lamp and a little computer. A nearby closet holds a computer-controlled cosmic ray detector, which records the arrival of particles that constantly bombard the earth. With the arrival of a mu-meson, the counter fires, and based on the time delay since the last arrival, one of the sculpture's flash lamps is triggered.

Scandrett's software isn't available in retail stores, and he hasn't published anything about the language or its ap-

plications. "I'm interested in doing that, though, because I've learned a lot," he says. "I've been sifting over my accumulated experience trying to think how to write that down in a way that would be useful for other people."

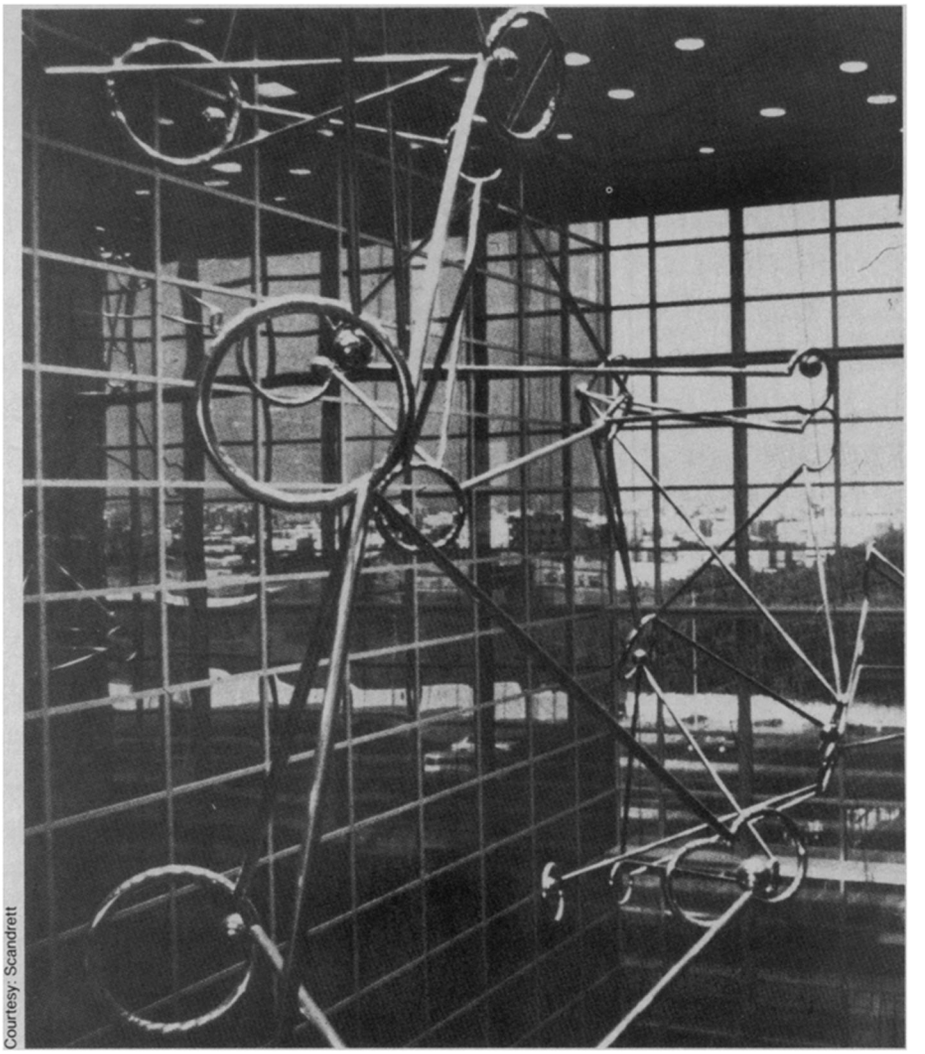
The idea of using an electric current to speed up teeth-straightening seems a little like magic, but in 1982, two researchers, orthodontist Zeev Davidovitch and materials scientist Edward Korostoff at the University of Pennsylvania in Philadelphia, proposed just that. They developed an electrical device, the size of two nickels stuck together, to deliver a constant current of about 20 microamperes to teeth that need to be shifted. Early tests on cats showed that with this electrical device, braces had to be worn only half as long.

In the following year, clinical trials involving 60 female patients confirmed that the method doubles the speed of tooth movement in humans. However, the metal prototype device produced more than the normal amount of mouth irritation. This was probably due to small, electrode-induced chemical changes in the mouth. Another two years of work, involving researchers at Drexel University in Philadelphia, produced a new, nonirritating electrode in a smaller, more comfortable package. "We came in because of this weak link," says biomedical engineer Richard Beard at Drexel, "and did our job."

By this time, the original inventors were no longer involved. Davidovitch became head of the orthodontics department at Ohio State University in Columbus, and Korostoff went on to other materials science research. The original inventors, however, will share in royalties from sales of the device when it finally reaches the market.

Development and commercialization has fallen to a small company, Penn-Med Technology, Inc., in West Conshohocken, Pa., which brought in the Drexel group. Much of the Drexel work was funded by the Advanced Technology Center in Philadelphia, a state-sponsored agency for promoting new technologies. "There have been a lot of people working on this," says Beard.

Now, says Nathaniel Lieb, Penn-Med's chairman and president, the device is almost ready for clinical testing again. That will begin at the University of Pennsylvania school of dental medicine after development work is completed and permission for the tests is obtained. "I'm very optimistic that it will work for almost any type of orthodontic treatment," says Lieb. "[The project] is very much alive."



Courtesy: Scandrett

A dramatic manifestation of FIRST: Cosmos, a gigantic, welded-steel sculpture that flashes when an attached computer detects a cosmic ray hitting the earth. The sculpture is hanging in the atrium of an office building in Saudi Arabia.

For physicists Edwin R. Jones and LeConte Cathey and media arts specialist Porter McLaurin of the University of South Carolina in Columbia, the past four years have been somewhat frustrating. Although many people have shown interest in their scheme for producing three-dimensional TV images, very few have taken their discovery seriously enough to investigate it further or to invest in it. "Although we've had our hand out," says Cathey, "nobody's put any money in it yet."

Their process, called Visidep and now patented, seems to depend on a special kind of optical illusion. Periodically inserting frames photographed from one point of view into a sequence of pictures filmed from a slightly different viewpoint produces an illusion of depth. This can be done with a single video camera and digital image processing equipment.

The effect may be related to the way birds and other animals quickly shift their heads back and forth to get distance information, says Cathey. The real discovery is that this same capability also appears to be built into the human mind. "All we've done is to go the other way around," he says, "by moving the object [instead of the head] so that you think you're moving your head to get the same depth information."

But physiologists and other medical researchers refuse to take this effect seriously. They see it, but they don't believe it, says Cathey. "What we're doing is flying in the face of dogma in the medical profession." Recently, however, a group of researchers and students at the University of Arkansas in Little Rock have expressed an interest in studying this phenomenon in detail.

Meanwhile, the inventors need at least $250,000 to replace homemade components and to put together a complete, functioning system. They had to sell their original video cameras to help pay patent attorney fees.

Jones and Cathey are trying to interest the Army in funding their work. Their scheme may be useful in training programs that require simulations, for example, on rifle ranges or in tank cockpits. Several production companies are also testing the Visidep process, using special animation machines. Visidep may yet make its commercial television debut as a three-dimensional, 30-second sales pitch. — *Ivars Peterson*