

R & D GAP

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During years spent studying vision development in babies, University of Washington professor Davida Teller grew increasingly aware of the need for a quicker eye test.

True, the standard measuring method was "theoretically elegant." But it took half an hour per eye and wasn't easy to perform on a fractious moving target.

So Teller, a professor of psychology, physiology and biophysics, set out to devise a test that takes less than five minutes.

The result: Teller Acuity Cards, now in worldwide use and playing a leading role in treatment of eye ailments.

But getting her discovery to the marketplace took Teller several years. "The more unusual your scientific creation," she says, "the harder it is to sell."

And, though America now has a quicker eye test for infants, apparently the nation still has a blind spot when it comes to transforming research ideas into reality.

The problems that Teller had to overcome to sell her idea reflect a crucial issue involving our future living standard.

The question is simply this: Is America falling behind in converting worthy scientific ideas into something useful for the rest of society?

"Until the 1950s we led the world in the application of technology," says Eugene Eschbach, manager of intellectual property development at Battelle Pacific Northwest Laboratories in Richland.

"Now we lead the world in science, but the Japanese lead us in applied technology."

At first glance, the statistics don't look worrisome. In 1986, the latest year for which complete figures are available, America spent about 1.8 percent of gross national product on civilian research, West Germany 2.6 percent, Japan 2.8 percent and Britain and France 1.8 percent each. In actual dollars, we spent more than Japan and Germany combined. And if you judge the situation by the way Americans consistently win the lion's share of Nobel Prizes, we remain the world leader in science.

For one thing, the growth rate of this country's research and development spending has slowed in recent years, rising 6 per cent from 1987 to 1988 after seeing double-digit increases in the early 1980s.

For another, Van der Werff believes we do a poorer job in targeting our research directly toward the market. "For many university professors," he says, "once the research to confirm a hypothesis is complete and the paper sent to a journal for publication, that's the end product."

Reflecting a similar viewpoint, Teller tartly observes: "Some people in academia think you've sold your soul if you sell an idea and it ends up being turned into something useful and making a profit."

Arguably, there's the heart of the problem: Rarely do scientists make a prototype - which is the point where industry gets interested.

But that seems to be changing, as many universities in the 1980s grope their way toward a better marriage of research and reality. The red-hot topic now among engineering educators, for example, is how to beef up the teaching of engineering design and manufacturing techniques.

Also, van der Werff says that just about every major university and state government is investing to some degree in moving suitable ideas out of the lab and into commerce.

That's why the Washington Technology Center was established in 1983 on the University of Washington campus. The state-funded center, headed by Edwin Stear, former chief scientist of the U.S. Air Force, is designed to link the university, private industry and federal government in research projects. It has guided about nine small companies that convert university ideas into products.

Eastern Washington will soon have a counterpart - the Spokane Intercollegiate Research and Technology Institute - as focal point in the

inland Northwest for high-tech education and research, particularly on electronics. Other states, notably Pennsylvania, New York, Michigan, New Jersey and North Carolina, have established similar centers.

“Often you start on a project by just

putting a couple of university researchers and a couple of industrial researchers in the same room,” says Van der Werff, who is a Washington Technology Center board member. “Also, part of success in technology transfer depends on connections. But much of it hinges on just having somebody who will sit down and make 50 phone calls to prospective clients.”

The Seattle University dean of science is himself doing a national survey for the recently formed Carnegie Commission on Science, Technology and Government to help determine the best ways of advising state governors on how to solve their scientific and technical problems.

Most big universities now have in-house offices of technology transfer similar to the Washington Technology Center. But Washington is also served by the entrepreneurial Washington Research Foundation, whose job is to sell technology from the UW and other state public research institutions. The foundation was established in 1981 on a \$700,000 loan guaranteed by local business.

“We had to learn how to make a go of it or die,” says foundation president Robert Sloman. “Now this is one of the few successful technology-licensing centers in the country, and we have lots of people visiting us from other states and other nations to study our operation.”

The foundation doesn't provide development money, but it does hunt for companies that will. “We sell by matchmaking,” Sloman says, “matching the idea to the company.”

Resulting products range from intraocular lenses to food-processing machinery, from vaccines to ultrasound diagnostic equipment. A big slice of licensing profits is returned to the university and the inventors.

The foundation's biggest customer is the University of Washington, which is the most heavily funded public research institution in the nation. Consequently, you might expect the foundation to generate lavish license income.

That hasn't happened yet, but the signs are promising. Income has risen exponentially from the \$1,268 of 1982 to \$563,253 last year, and Sloman projects that it will reach \$760,000 this year. The foundation now operates 43 licenses, 18 created last year.

Sloman says he's particularly excited about an ultrasound imaging probe recently licensed to Japan's Fuji photo company and now undergoing clinical trials. It's a very small catheter that will go down any existing fiberoptic video endoscope. While the endoscope films the inside of the gut, the ultrasound probe provides a split-screen image of tissue structure beneath any ulcer or suspicious bump.

Despite the recent success of the Washington Research Foundation, many inventors still feel that transforming research into reality remains a formidable challenge.

Take Seattle University engi

neering research Prof. David Schroeder, who

believes he has invented a low-cost method of converting sea water into fresh water. Schroeder says his bench-scale reactor works fine, but he needs half a million dollars to build a large-scale pilot plant.

“I think that some day it will happen,” he says, and adds wistfully: “But maybe not in my lifetime.” Eschbach of Battelle believes that one of the “tremendously overlooked” key reasons for the decline in America's support of civilian technology is the rise in interest rates.

“Having 30 years of high interest rates . . . has attracted into top management many people whose specialty is finance,” says Eschbach. “These days you don't see many can-do engineer types move up to the presidency of large companies.” In prudent service to stockholders, these financial executives prefer a quick payoff in real estate or leveraged buyouts rather than speculating in long-term technology.

Of course, interest rates in our trading partners have also risen. But Eschbach says that some nations make money available at lower interest rates for long-term technology research.

One of the most intriguing examples of technology lag can be found at Battelle itself. As reported in a Discovery article last year, the company has spent more than 15 years developing a process to get rid of sewage by converting it into oil. A pilot plant - built partly with Japanese investment money for lack of American risk capital - worked successfully. But so far the firm has not obtained the \$20 million investment capital needed to build a full-scale plant.

Says Alex Fassbender, a Battelle spokesman in Washington, D.C.: “It's a chicken-and-egg situation. Municipalities don't have risk capital and industry is averse to taking risks on new technology.” He believes, for example, that the process could save Metro an immense

amount of money now spent on composting and trucking sewage.

The Canadian federal government and the provincial government of Nova Scotia are investing \$10 million to build a full-scale sludge-to-oil pyrolysis plant that Battelle believes won't be as cost-effective as the American concept.

Meantime, Peter Molton, the Battelle scientist who developed the sewage-to-oil process, remains stoical about the years of delay dogging his sewage project. "Personally I'm now at the same point many inventors probably reached in the past," he says. "It's more a sense of sadness than anger."

Teller, the UW scientist who developed the eye test, believes that inventors should "keep nagging" and stay involved in the marketing process.

Certainly she herself stayed involved by nagging the previous management of the Washington Research Foundation. And she even scrounged around the country until she found an Ohio manufacturer willing and able to produce her eye-test invention.

"The real problem," says Teller, "is that technological development requires cooperation among elements in our society with very different goals and expectations. So I think that we scientists have to learn to talk in the language of manufacturers."

TOTAL R & D SPENDING IN THE U.S.

YEAR-TO-YEAR PERCENT TOTAL R & D FUNDS SPENT

INCREASE FROM PREVIOUS YEAR IN MILLION OF DOLLARS

1978 12.5% \$48.1

1979 14.1% \$54.9

1980 13.9% \$62.6

1981 14.8% \$71.8

1982 10.5% \$79.3

1983 10. % \$87.3

1984 12. % \$97.8

1985 10.2% \$107.7

1986 4.4 % \$112.5

1987 4.8 % \$117.9

1988 6. % \$124.9

SOURCE: NATIONAL SCIENCE FOUNDATION

• Caption: PHOTOCRAIG FUJII / SEATTLE TIMES: DAVIDA TELLER, A UNIVERSITY OF WASHINGTON PROFESSOR, DEVELOPED VISUAL-ACUITY CARDS FOR INFANTS AND NONVERBAL PERSONS.RANDEE S. FOX / SEATTLE TIMES: TOTAL R & D SPENDING IN THE U.S. (SEE END OF TEXT FOR TEXT OF GRAPH.

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