U S West May End Its Role in Bellcore, The 7 Bell Firms' Big Research Venture

By Johnnie L. Roberts
Staff Reporter of The Wall Street Journal

U S West Inc. is threatening to shed its stake in a giant research venture owned by the seven regional Bell companies, in a dispute that industry officials say casts doubt on the effectiveness of joint-research projects.

With 7,200 employees, hundreds of research projects and an annual budget exceeding $900 million, the consortium, Bell Communications Research Inc., is among the nation's largest research and engineering joint ventures. Known as Bellcore, it serves as the seven Baby Bells' version of American Telephone & Telegraph Co.'s highly respected Bell Laboratories research concern.

By agreement, none of the seven owners can leave the venture without giving three years' notice. U S West said it had sent a letter to Bellcore fulfilling that requirement.

Bellcore, based in Livingston, N.J., was formed in the breakup of the Bell System in 1984 to maintain common standards for the nation's telephone system, to ensure smooth operation of the network and to coordinate telecommunications operations during national emergencies. A major focus has been to perform research for the local telephone companies owned by the regional Bell holding companies, which in turn own Bellcore. That research involves network planning and setting common standards for telephone-system equipment and software.

But it is precisely that focus that U S West, based in Englewood, Colo., cites as an "obstacle" to its continued participation in Bellcore. The company believes Bellcore's role should begin to reflect the industry's growing competition, particularly the intensifying rivalry among the seven Bellcore owners. Specifically, U S West believes Bellcore should undertake more projects whose results aren't shared among the seven.

In a letter to Bellcore, U S West said the research company needs to "develop and expand proprietary exclusive research and development activities for individual companies."

A related problem, U S West said, is Bellcore's "governing process, which develops (research) projects by the consensus of the owners/customers."

U S West, which expressed reluctance in taking its action, told Bellcore in its letter that it wants to sell or "otherwise dispose" of its stock in the venture.

A Bellcore spokesman reacted cautiously. "We aren't taking the notice lightly, and we are hopeful it can be worked out," he said. He noted that having seven powerful owners "presents a strong challenge to the people who run Bellcore." None of the other partners has issued similar notices.

U S West's departure, if it happens, wouldn't become effective until 1990. Because of that, some of the other partners dismissed the notice as a tactic by U S West to promote proprietary work. An official of St. Louis-based Southwestern Bell Telephone Co. expressed surprise at the letter, noting that U S West recently joined the other owners in a letter to Bellcore's president supporting the concern's projects. Several others said they were satisfied with Bellcore's role and noted that some of its research is exclusive.

"Our view is that we are satisfied with what is happening with Bellcore, and our relationship with it," said Bruce R. DeMeayer, president of Ameritech Service Co., a unit of Chicago-based Ameritech. U S West has a considerably different view of what should happen at Bellcore."

Robert Morris III, an analyst with Prudential-Bache Securities Inc., suggested that it would be generally imprudent for regional Bell concerns to express public dissatisfaction with Bellcore. Ultimately, telephone customers shoulder the cost of supporting Bellcore, so state regulators might be apt to cut rates if the telephone companies declare that Bellcore isn't effective, he said.

"Frankly, you can't blame these companies for questioning the relationship with Bellcore," Mr. Morris added, however. "They are slowly emerging as competitors among themselves. It is awfully difficult to get proprietary technology."

William G. Burns, a vice chairman of New York-based Nynex Corp. who helped establish Bellcore, said the concept for the venture remains valid, despite the dispute. Bellcore has a "critical mass of highly competent and technical people," he said. "If the regional companies each had to create the capabilities they can have and share at Bellcore, they couldn't afford it."

In fact, U S West has been concerned about the arrangements since the beginning. It is understood that the company concedes Bellcore's vast talent pool but is frustated that it can't get researchers to focus on projects it deems important. Moreover, U S West regards Bellcore's consensus approach as cumbersome, requiring numerous panels and committees. The company also is known to be extremely uncomfortable with sharing information.

Some partners pointed out, and U S West acknowledges, that gradual changes are occurring. A newly commissioned Bellcore task force is studying the issue of proprietary projects and others, such as how projects are funded.

Similar consortiums have shown signs of strain recently. Last week, Microelectronics & Computer Technology Corp. announced that Lockheed Corp., Unisys Corp. and Allied-Signal Inc. planned to leave the 20-member technological research consortium at the end of 1987. And U.S. semiconductor makers are discussing forming a consortium to compete with the Japanese, but the venture faces financial and legal hurdles.

Provides Glimpse of Its Work

Switzerland	$14.01
West Germany	13.85
United States	13.29

By MELINI

NEXT

is "more ambitious" but concedes that the Japanese are ahead in applying TAB to consumer products like pocket televisions.

Bowing to antitrust and competitive sensitivities, however, MCC can't direct its research directly at products. Instead it says it produces "tools" which it gives to its shareholders to build products. But 3M says that isn't a handicap. "We have a culture that is accustomed to taking pure research and molding it to produce products," says Ted Pickens, a 3M spokesman. And Mr. Applewhite, the marketing chief, says that 3M, which sells the tape used in TAB but doesn't actually produce packaged chips, gains a big advantage from being privy to research involving the entire process.

Mr. Woolley points to more tangible benefits. 3M in Austin was "debugging" its own TAB assembly line when MCC made its first big technology transfer in February. "We sent our technicians over to (MCC) workshops and had our own line adjusted in 60 days. It would have taken more than a year without MCC."

they were "as good as gold." At the same time, established manufacturers, employing new substances and technologies, were putting new products of their own on the market. Today, some 10,000 laboratories make hundreds of alloys for dental offices.

"The dentists got confused," says John Williams, president of Williams Gold Refining Co. in Buffalo, N.Y. "They don't understand what they're getting. Essentially, it's our (the industry's) fault. We created a flock of alloys."

Gold is still a major component of dental work, but the quantities vary widely. Dr. Joseph Moffa, a U.S. Public Health Service research dentist, says a survey of

Report

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By ALEXAN

Staff Reporter of THE W

The Bible says "H thy mother," but the quite as respectful.

Indeed, says Julia specialist of Prenti Services Inc. in Para

$6 Billion Particle Accelerator Wins President's Endorsement

'Supercollider' Would Dwarf Existing Projects

By Cass Peterson
Washington Post Staff Writer

President Reagan has formally approved construction of a $6 billion, 52-mile-long nuclear particle accelerator, Energy Secretary John S. Herrington announced yesterday, calling the project a "momentous leap forward" in the exploration of matter and energy.

The "superconducting supercollider," as the device is called, would be 20 times more powerful than any existing accelerator and capable of producing, on a tiny scale, the kind of energy levels that many physicists believe existed at the moment of the universe's creation.

"In high-energy physics, the development of the supercollider is the equivalent of putting a man on the moon," Herrington said. "It will have spinoffs, discoveries and innovations that will profoundly touch every human being."

The supercollider would be the most costly piece of research equipment ever built for any purpose. Reagan's decision is certain to set off a fevered competition among the states for the honor of hosting the massive accelerator, its high-technology work force of 3,000 and its annual operating budget of $270 million. More than 40 states have expressed an interest in the project. Some have spent millions of dollars developing proposals.

Herrington said there is "no front-runner" for the site. A selection plan is being drafted and will be announced later, he said.

The fate of the supercollider has been hanging at the White House for months, caught in a heated debate between scientists and budget officials over whether the nation can afford such a costly research tool at a time of high federal deficits.

While Energy Department officials said they could take from other programs the $60 million envisioned for design work in fiscal 1988, the project will require hundreds of millions in construction funds in succeeding years.

Officials said Reagan resolved the question at a meeting of the Domestic Policy Council Thursday, yielding to arguments that the United States faced losing its leadership position in high-energy physics if the project were not built.

See COLLIDER, A6, Col. 4

WASH. POST JAN. 31, 1987

HINGTON POST

$6 Billion 'Supercollider' Wins President's Approval

COLLIDER, From A1

The United States has the world's most powerful accelerators in operation at the Fermi National Accelerator Laboratory in Illinois. A European consortium is planning a larger machine, however. And Japan is expected to start operating a major accelerator this year.

The Soviet Union has two large accelerators under development, including a device, to be in operation by 1995, more than three times the size of the largest Fermi accelerator. The U.S. supercollider, which would dwarf all those accelerators, is targeted for completion in 1996, if funding is approved by Congress.

"This is a watershed for America's scientific and technological leadership and another clear sign that President Ronald Reagan is committed to keeping this nation on the cutting edge of world leadership and competitiveness," Herrington said.

There are no immediate commercial goals for the supercollider. Herrington emphasized yesterday that it has "no military application. This is not a military project." Scientists contend, however, that similar research has yielded significant benefits in nuclear medicine, computer development and other high-technology fields.

The supercollider would be in an underground tunnel the shape of a race track, 10 feet in diameter and 52 miles in circumference, encircling roughly as much area as does the Capital Beltway.

Inside the tunnel, powerful magnets would propel beams of protons along separate tracks in opposite directions. When the protons reached nearly the speed of light, electromagnetic chutes would open and direct the two beams into each other head-on with an energy of 40 trillion electron-volts.

An ordinary household flashlight battery is capable of 1.5 electron-volts, which is a unit of energy measurement. By contrast, 40 trillion electron-volts exceeds the instantaneous output of all the power plants on Earth.

In that instant of collision, scientists say, the supercollider could approximate in a tiny space the energy level that marked the moment after the "big bang," a theory that holds that the expansion of the universe began with a gigantic explosion.

The energy would be sufficient to create particles that can now only be theorized, enabling physicists to delve more deeply into the fundamental nature of matter and energy. Scientists now know, for example, that the protons and neutrons that make up the nucleus of the atom are made of more basic constituents called quarks.

Physicists say they think that the supercollider will enable them to identify even more elementary particles in their efforts to understand and explain the origins of mass.

Herrington said the United States intends to seek "cost-sharing" commitments from other nations, as well as from state and local governments wherever the accelerator is located.

The "superconducting" in the accelerator's formal name refers to the kinds of magnets developed to guide and move the beams of protons. Essentially the magnets are cooled with liquid helium to the point that electrical resistance ceases. Without such "superconductivity," the magnets would draw massive amounts of electricity and would produce only one-third as much magnetic power, meaning that the accelerator's race track would have to be three times as long.

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WSJ 7/29/88

Publishing Houses Battle for Shares Of Coveted California Text Market

By Gary Putka
Staff Reporter of The Wall Street Journal

See Dick. See Jane. Dick and Jane sell books. The books cost lots of money. See Dick fight Jane. Dick and Jane fight to sell books. Who will win? Who will lose?

We'll soon know.

One of the biggest prizes in publishing—California's grade-school reading market—is up for grabs. It's a competition that's anything but a kid's game. Publishers have spent big and lobbied hard. They say California's list of approved books will influence national market shares for years, partly because it's the first big test for several new series of books that try to answer critics of current texts.

A total of nine states, an unusually large number, will select new readers this year. That will make 1989, when the actual buying begins, a "huge year in the business," says Robert Richards, director of the school department of Harcourt Brace Jovanovich Inc. Industry officials project at least $700 million in sales of new readers and related books next year.

Important Judgment

"It's the biggest year in the history of the Western world as far as reading adoptions go," says Donald Eklund, a schoolbook specialist at the Association of American Publishers. Chester A. Finn, the head of research at the U.S. Department of Education, says California "will put the first imprimatur on (a) new generation of books. The publishers are very concerned with what California says and does."

With takeover fever rampant in publishing and Macmillan Inc. sparring with two hostile suitors, the industry is also more sensitive than usual to possible sales disappointments. If Houghton Mifflin Co., the industry leader in reading, "doesn't get its normal share of reading adoptions, it will be more vulnerable to a takeover," says Alan Kassan, an analyst at Shearson Lehman Hutton Inc.

Mr. Kassan may not be exaggerating. California's surprise rejection of a batch of mathematics books in 1986 cost publishers millions. The state said the publishers focused too much on narrow computational exercises and not enough on solving practical, lifelike problems. Some industry officials say Laidlaw Educational Publishers' failure then helped force its sale by Doubleday & Co. to Macmillan last year.

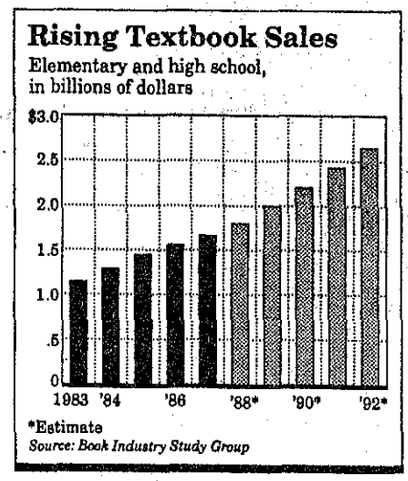
In the current round, 24 companies are vying for California listings. School districts can use state funds to purchase any listed books; to buy other books with state money, the districts must get waivers, which isn't easy. California is one of 22 states with such adoption rules; the rest give local schools more freedom.

Little expense has been spared on the new books. McGraw-Hill Inc. and Raytheon Co.'s D.C. Heath & Co. unit have spent $35 million each. Publishers figure industrywide development costs exceed $200 million for this generation of readers and other "language arts" books, such as English texts. Heath, whose new series has been five years in the making, has spent lavishly on four-color graphics, elaborate teachers' editions and supplements such as workbooks, videotapes and tests.

The dominant theme of the readers was struck by California in its call for new books. The state endorsed a torrent of reading research that says textbooks have been "dumbed-down," overedited and eviscerated of good literature in an effort to make them easy to digest and inoffensive. Many publishers have reacted by hiring some of the very academics who have been critics.

The publishers have also sought a new "literary" look—more childrens' favorites and classics, less in-house writing and abridgment. The likes of A.A. Milne, Beatrix Potter, Maurice Sendak, Dr. Seuss and Shel Silverstein are featured in the early primers. Aesop, Mark Twain and Robert Louis Stevenson make big comebacks.

Whether schoolkids' reading interest will pick up as a result of these changes is anyone's guess. But publishers are already sorting out the industry's winners and losers, based on preliminary recommendations made last Friday by the state's curriculum commission.



Some publishers say Harcourt Brace Jovanovich stands to gain reading market share if the selections are affirmed, as expected, by the state's Board of Education in October. Harcourt and its Holt, Rinehart & Winston subsidiary won approval for three complete kindergarten-to-eighth-grade series of readers, more than any other house.

Others approved for complete K-8 readers were Heath, Houghton Mifflin, Macmillan, McGraw-Hill and Time Inc.'s Scott, Foresman & Co. unit. That bodes well for at least Heath and McGraw, which haven't been big factors before in language arts.

"We're delighted that we made the reading list, but it's a long list," says Loren Korte, Heath's president. "We're going to have a lot of competition."

Only Houghton, McGraw and Scott Foresman made both the reading and English lists through eighth grade. But without being specific, the curriculum commission criticized the books it approved for having too many abridgments and rejected all spelling books, leaving many publishers making conflicting claims about the business impact of the recommendations.

A prominent loser so far, publishers say, is the Silver, Burdett & Ginn unit of Gulf & Western Inc. Widely thought to be the reading leader in past years in California, Silver Burdett failed to submit new materials in that category by the April deadline. Its English texts above third grade were spurned last week. Although no specific criticism was directed at any English texts, the state's report said the books emphasized fill-in-the-blank exercises at the expense of more in-depth writing. Silver Burdett acknowledges that it faces an uphill battle to make sales, but adds that it is preparing a new reading series for other states and will try to sell it to California schools willing to seek waivers.

Other publishers are bitterly disappointed. Open Court Publishing Co. and Science Research Associates Inc., a unit of Maxwell Communications Corp. of Britain, complained in hearings last week that the state's evaluation panels had ruled arbitrarily and made inaccurate statements in their recommendations to the curriculum panel. Open Court's reading series gained only partial acceptance; Science Research's was rejected.

The evaluation panels, for instance, said Open Court's readers abridged Beatrix Potter's "The Tale of Peter Rabbit" and omitted the key words "I think I can" from "The Little Engine That Could." California officials concede that neither assertion was accurate. But Francie Alexander, California's curricular director, says the commission rejected some Open Court readers because of bigger shortcomings—including other abridgments and stories seen as sacrificing students' reading interest for the sake of teaching phonics.

Solicitations Questioned

Some industry officials also are upset at the timing of solicitations for money from California School Superintendent Bill Honig. Mr. Honig phoned several publishers last spring, after many new books were already finished, seeking contributions to Californians for Quality Government, a group campaigning for a failed initiative on the June ballot that would have allowed more state educational funding. Mr. Honig, an elected official, was chairman of the group and often has raised money for such educational causes in the state. Harcourt and its units contributed $50,000. The publishing industry's California political-action committee gave $10,000.

Some publishers, especially smaller houses, felt Harcourt's contribution was an unusually large one they couldn't match. "Some people in the industry think that Harcourt's getting three series was a result of their giving $50,000," says Andre Carus, president of Open Court. Harcourt and Mr. Honig deny this. Mr. Honig says he "wasn't any part" of the adoption process and has spoken to no one who was involved with the materials submitted.

Mr. Honig says some publishers may be criticizing his solicitations to divert attention from their own shortcomings. "They're not excited with me, or with our power" to effect changes in the texts, he says. "The main point is the textbooks," Mr. Honig adds. "They're better."



AT&T'S JOHNSON EXAMINES THE SUPERCONDUCTING TAPE DEVELOPED WITH TEAM MEMBER BATLOGG

'OUR LIFE HAS CHANGED'

THE LIGHTBULB, THE TRANSISTOR—NOW THE SUPERCONDUCTOR REVOLUTION

With the poise of Harry Houdini, Bertram Batlogg reaches into his coat pocket. Slowly, he draws out a piece of flexible green tape and holds it aloft. There is silence. Then gasps and exclamations ripple through the crowd. "I think our life has changed," says Batlogg, who heads solid-state materials research at AT&T Bell Laboratories. The 3,500 physicists jamming the ballroom and surrounding hallways at the New York Hilton burst into shouts and applause.

The simple tape that Batlogg brandished at the annual meeting of the American Physical Society on Mar. 18 was indeed the pennant of a technological revolution. Because it can conduct electricity with no power losses to resistance, the tape material promises to have an enormous technological—and economic—impact. Such so-called superconductors could speed the way to a quantum leap in both electrical and electronic technology.

A torrent of developments is pointing to applications ranging from superfast computers to trains that float on magnetic fields, from less costly power generation and transmission to fusion energy. Although it may take 20 years before the full potential of these laboratory discoveries is realized, the economic impact could be enormous. Some scientists compare the importance of these advances in superconductors to the invention of the transistor. But to Jack S. Kilby, co-inventor of the integrated circuit, that's an understatement. "This is much broader," he says. "It could impact almost everything."

The normally staid physicists at the New York meeting apparently agreed. Like rock music fans waiting to get into a concert, the crowd began gathering for what they dubbed the "Woodstock of physics" 2½ hours ahead of time. When the doors opened for a hastily scheduled 7:30 p.m. session on superconductivity, scientists shoved and jostled each other for the 1,150 seats. The rest craned to

AMERICAL BANKS

hear from the hallways or watched on video monitors outside. "I came to see history," declared one scientist as he elbowed his way to a seat. He wasn't disappointed. More than 50 researchers reported brand-new experimental results. Several revealed information phoned in from their laboratories just hours earlier. With only five minutes allotted to each, the session ran until 3 a.m.

The advances have been a long time coming. In 1911, Dutch scientist Heike Onnes first observed that some metals became superconductive when cooled to almost absolute zero—the point at which all motion of atoms ceases. That opened tantalizing prospects for huge markets. But the only way to get near that ultracold temperature of –459F—or zero on the Kelvin scale that scientists prefer—was cooling with costly liquid helium.

CHASING THE GRAIL. So the search began for materials that would exhibit superconductivity at warmer temperatures. The effort, however, was slow and discouraging. In 1941, scientists discovered alloys of niobium that became superconductive at 15K. By 1973 the best superconductor operated at 23K—warm enough to make a few applications, such as magnets for medical imaging, economical. But this was far from the physicists' Holy Grail of "room temperature" superconductors. Many despaired that such materials were even possible.

In just the last four months, however, researchers in the U. S., Europe, Japan, and China churned out a stunning set of discoveries. They created a group of materials that become superconductors at temperatures that can be achieved with inexpensive liquid nitrogen. That made frigid superconductors red-hot. "It's the most exciting development in physics for decades," declares Neil W. Ashcroft, director of the Laboratory of Atomic & Solid State Physics at Cornell University. "The pace of discoveries can hardly be matched." And the dream of room-temperature materials is no longer unthinkable. "We've knocked down barriers and removed our blinders about what's possible," says Paul A. Fleury, director of the physical research lab at AT&T Bell Labs.

No one, least of all K. Alex Müller, a physicist from International Business Machines Corp.'s Zurich research laboratories, expected the barriers to higher-temperature superconductors to tumble so quickly. It was Müller who set off the current research rush a little more than a year ago with the discovery of a superconducting oxide of copper. Hunched in a chair during a lull in the New York meeting, the 59-year-old Müller seems ill at ease with the attention he is getting. "It was so unexpected," he says quietly, stroking his beard.

Müller holds the prestigious post of IBM Fellow, which frees the company's distinguished scientists to pursue projects of their own choosing. With the freedom to explore, Müller took a cue from research in the U. S. and France to examine a little-known group of oxides containing copper and nickel. Normally insulators, the materials had displayed some intriguing metallic properties. So for nearly three years, Müller and his colleague, J. Georg Bednorz, mixed hundreds of compounds and tested them for signs of superconductivity. In January, 1986, they measured superconductivity at a record-breaking 30K in an oxide containing lanthanum, barium, and copper. Müller, who expected a rise of several degrees at best, was incredulous.

Bednorz, a former student of Müller's, was so excited he wanted to report the results immediately. But Müller refused. The history of superconductor research is littered with unsubstantiated claims and the tarnished reputations of the scientists who made them. Fearful that his peers would denounce the results, he insisted on additional tests. "I didn't want to ridiculize myself," he recalls.

Only after they had confirmed their findings did Müller and Bednorz publish a paper. And then many U. S. scientists missed the paper when it was published last April because Müller chose a German journal not widely read in the U. S. Some who did read it doubted the findings. "I just couldn't take the claims seriously," says one physicist who now regrets his skepticism.

THE COLD RUSH. By fall, however, a handful of research teams was experimenting with Müller's compound. In December, reports discussed at a Boston scientific meeting created a sensation. Müller's work had been confirmed by a Tokyo University research team led by Shoji Tanaka and another group at the University of Houston headed by physics professor Ching-Wu "Paul" Chu. Immediately, scientists at more than a dozen labs, including AT&T, Argonne National Laboratory, and the University of California at Berkeley, began experiments on the substance.

It was easy to jump on the research bandwagon: The promising oxides can be whipped up in the chemistry lab of any junior college. Simply grind the chemicals with a mortar and pestle and heat them in a furnace. Regrind the result, press it into pellets, and heat it again with oxygen. So by the end of December, researchers at AT&T, the University of Tokyo, the Institute of Physics, Academia Sinica in Beijing, and the University of Houston announced they had cooked up oxides that smashed Müller's record.

The scientists have been at it ever since. Chu and his close-knit team of six pushed the temperature of Müller's ox-

THE MERCURY SOARS FOR SUPERCONDUCTORS

–28F (240K) Now numerous research groups report indications of superconductivity at temperatures a conventional freezer could achieve.

–284F (98K) In February, 1987, scientists at University of Houston push the limit beyond the 77K temperature at which semiconductors can be cooled by liquid nitrogen.

–390F (39K) By the end of 1986, researchers have developed oxides that push the temperature up by 16F.

–406F (30K) In January, 1986, IBM scientists observe superconductivity in a copper oxide.

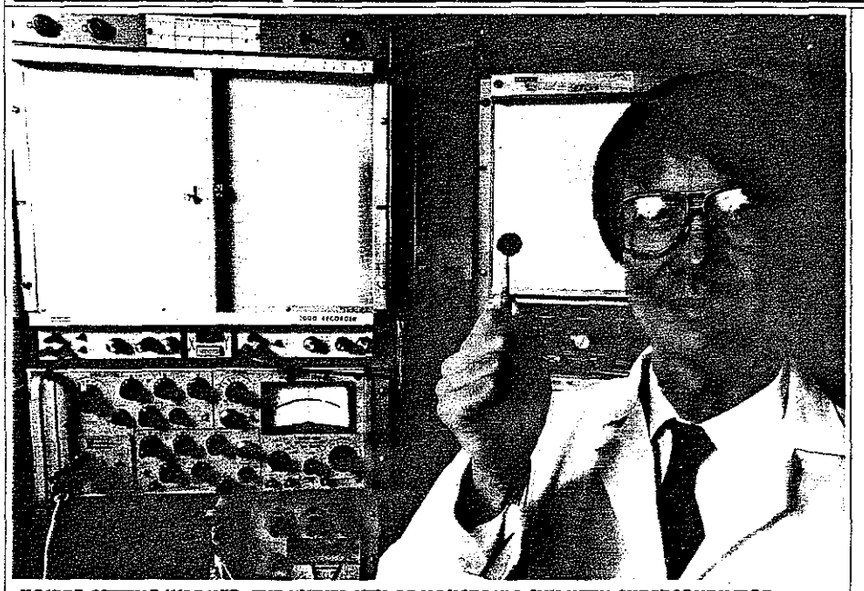
–419F (23K) Improvements in niobium alloys raised the temperature by only 14F by 1973.

–433F (15K) Limited applications become practical in 1941 with the discovery of a niobium alloy that can be cooled with liquid helium.

–452F (4K)* In 1911 scientists observe superconductivity in certain metals at nearly absolute zero.

*On the Kelvin scale, absolute zero is equivalent to –459F.

ROB DOYLE/BW



YOU'RE GETTING WARMER: THE UNIVERSITY OF HOUSTON'S CHU WITH SUPERCONDUCTOR

ide to 52.2K. "But I knew we wouldn't go higher unless we found a new material," Chu says.

So he decided to substitute another element, called yttrium, for the lanthanum in Müller's oxide. Working with University of Alabama scientists under Wu-Maw Kuen, the researchers soon recorded signs of superconductivity at a torrid 100K in that oxide. "But we came back the next day, and it had disappeared," recalls the 45-year-old Chu. The researchers began an intense cat-and-mouse game with the material, trying to stabilize the superconducting properties at that high temperature.

The team tested dozens of recipes with little success, but Chu's optimism never flagged. "He always looks on the bright side," says Pei-Herng Hor, one of his Taiwanese-born colleagues. By early February the team scored: The researchers found a stable compound that was superconductive at 98K, well above the temperature at which inexpensive liquid nitrogen could be used for cooling.

'SCIENCE SUPERSTAR.' Chu kept mum for two weeks, but rumors quickly lifted the veil of secrecy. Researchers at IBM, AT&T, and the University of California at Berkeley immediately set out to discover the secret ingredient. "Chu ran the four-minute mile in superconductivity," declares James E. Shirber, manager of solid-state physics at Sandia National Laboratory. "He broke the barrier to liquid nitrogen." When the news got out, Chu earned the nickname "Science Superstar" from his staff.

That could prove to be an elusive title. Within weeks Tanaka, Z. X. Zhao from the Institute of Physics in Beijing, AT&T, and IBM were pacing Chu. By substituting still other elements such as calcium and lutetium, they concocted a dozen different oxides that become superconductors above 90K.

With so many teams after the ultimate superconductor and the prizes it might bring—perhaps even a Nobel—the tension among key researchers is becoming almost palpable. At the Physical Society meeting in New York, the scientists assiduously noted the dates when they observed high temperatures, developed compounds, or completed other ground-breaking work. "Everyone is writing history to make themselves look better," observes one physicist.



IBM'S K. ALEX MÜLLER: HIS DISCOVERIES A YEAR AGO KICKED OFF THE RESEARCH FRENZY

At a press conference during the meeting, Tanaka claimed the Japanese were first to experiment on certain compounds. Chu jumped up to add that his lab, too, was working on the same compounds at that date. Such incidents are "just the tip of the iceberg," says Chu. Although Chu and Tanaka used to compare work, the communication stopped once Chu began experiments on yttrium.

"It's frantic, mass hysteria," says Paul M. Grant, manager of magnetism and collective phenomena at IBM's Almaden Research Center in San Jose, Calif. "Everyone's exhausted." Grant, whose weeks of midnight research sessions resulted in the identification of the structure of one of the oxides, has the dark circles under his eyes to prove it. And the research is progressing so rapidly that it has outstripped the usual channels of scientific communication. At *Physical Review Letters*, the leading physics journal, more than 50 superconducting research papers await publication. " 'Recently' in this field now means two days ago," says M. Brian Maple, professor of physics at the University of California at San Diego.

GETTING PRACTICAL. The race to push superconducting materials out of the lab has barely begun, however. Just because a substance loses its electrical resistance when it's dipped in a cold, liquefied gas does not mean it will be much good in the real world. To be practical, superconductors have to be fashioned into wires, cores of magnets, and the thin coatings that form the foundation of computer circuits. And the materials, which are basically ceramics, are brittle—and fragile. "It is a long road between discovery and use of the devices," says Robert J. Cava, a chemist at Bell Labs.

But scientists already are pulling off the basic developments that lay the foundation for commercial applications. One key finding is that the materials may make possible the most powerful electromagnets ever built. Tests at Westinghouse and AT&T indicate that the new superconductors can withstand magnetic fields up to 10 times greater than those possible with such materials as niobium. That could open the way to such applications as tiny but extremely powerful electrical motors and higher-resolution medical imaging machines.

By March, both IBM and Stanford University had used techniques common in the semiconductor industry to produce a superconducting thin film that could be used in computers. At Stanford, Theodore H. Geballe, a professor of applied physics, fashioned a film into a prototype device that might be an ultrahigh-speed data pathway between computer

TOP, COURTESY PICTURE GROUP; (BOTTOM) WALTER P. CALAHAN

chips. An AT&T team that included Bertram Batlogg and ceramist David Johnson used ceramic processing technology to make its tape and small donut-shaped magnets. Japan's Fujikura Ltd. and Sumitomo Electric Industries Ltd. have made prototype superconducting wires.

The prospect of high-temperature superconductors shooting out of the laboratory has scientists lusting nearly as much after potential profits as scientific prizes. Just as semiconductor technology created Silicon Valley, the new superconductors may well create an "Oxide Valley." Already, some researchers are talking about starting companies. And Henry Kolm, who left Massachusetts Insititute of Technology to found a company to develop superconductivity applications a decade ago, believes the new oxides will open the door to venture capital. "People didn't consider helium practical," he says. Liquid nitrogen cooling, however, "is not far from frozen-food technology."

But just who owns the rights to the new technology promises to be a major muddle. The U.S. Patent Office is already sifting through dozens of applications on everything from the structure of oxides to manufacturing processes and devices. IBM and AT&T both contend they have claims for broad patent protection, but "it may be some time before we find out who has what rights," admits George Indig, a patent attorney at AT&T. Observers are predicting messy shootouts in the courts.

The rush of discoveries also leaves physicists with some loose ends. For one thing, they can't fully explain why the oxides are such superior superconductors. "It may be several years before we know what's going on, but there may be no theoretical limit to how high the temperature can go," says Robert Schreiffer, a professor at the University of California at Santa Barbara who won a Nobel for developing a theory of superconductivity. Indeed, by the time the New York meeting broke up, labs in the U.S. and Europe had reported signs of superconductivity well above 100K.

Such reports are spurring a frenzy of activity in Chu's Houston laboratory. Shoes are scattered under desks, and jackets and shirts are hung in corners, as the researchers work around the clock. The full-sized refrigerator is crammed with Chinese take-out food. "When you are No. 1, you always have to work to keep it," says Hor. "You hardly sleep." And Chu has his sights clearly on another record—125K. By mid-March rumors were circulating that he might be close. "Will history repeat itself? Who can tell," says Chu grinning.

By Emily T. Smith in New York, with Jo Ellen Davis in Houston and bureau reports

THE U.S. HAS THE ADVANCES, BUT JAPAN MAY HAVE THE ADVANTAGE

When a Houston laboratory announced a major advance in superconductivity research in February, Japan Inc. wasted no time. Its Ministry of International Trade & Industry immediately began assembling a consortium of government, industry, and university researchers. A MITI official describes the ministry's goal with missionary zeal: to exploit the "fantastic world of future industries" promised by new materials that conduct electricity with virtually no loss of power.

Both leading U.S. universities and major industrial companies such as International Business Machines Corp. and American Telephone & Telegraph Co. are playing a pioneering role in the spectacular scientific advances. But some experts fear that the Japanese ability to organize their research into a program with strong commercial goals could give them the edge in moving the research out of the laboratory.

At the moment, declaring a winner in the superconductivity race is premature. But leaders of the nation's science Establishment marvel at the speed of MITI's action. "I wouldn't call what they have done ominous, but it certainly is a sign of intensifying aggressiveness," says Roland W. Schmitt, General Electric Co.'s chief scientist and chairman of the National Science Board. Adds Carl H. Rosner, president of Intermagnetics General Corp.: "The Japanese have long recognized the tremendous potential of superconductivity, whereas the people in this country have been very shortsighted."

HEAD-SCRATCHING. No one government agency coordinates U.S. attempts to exploit the new science. Nor does anyone know precisely how much the U.S. spends on superconductivity research. But the National Science Foundation, which funded much of the recent U.S. research, estimates that federal agencies are funneling at least $8 million a year to universities.

American scientists and industrialists share the assumption that, as in the past, the U.S. system doesn't need a push from the government to bring innovative technologies to market. "The discoveries have been so spectacular that the level of activity is enormous in every laboratory in the U.S. with any capability in superconductivity," argues Schmitt. And Frank Press, president of the National Academy of Sciences, notes that a surprising amount of the academic work is aimed at applications of the new knowledge, such as thin superconducting films for computer chips.

But not everyone is satisfied. Ching-Wu "Paul" Chu, the University of Houston physicist who is the leading U.S. superconductivity researcher at the moment, thinks more action is needed to meet the combined weight of Japan's governmental, financial, and industrial resources. "We cannot afford not to move the same way as the Japanese," he says. "We really have to have a coordinated effort this time." In between those standing pat and the activists, there are a lot of people just scratching their heads. "Maybe," says one official half-jokingly, "what we ought to do is have some kind of conference to see what we ought to do."

'FIRST WIDGET.' But one aggressive government science administrator is not waiting. James A. Ionson, the astrophysicist who heads the Office of Innovative Science & Technology for the Pentagon's Strategic Defense Initiative Organization, is already busy forming his own consortium. He has lined up an unnamed university, a federal research laboratory, and a handful of small companies. Ionson's consortium will have a specific target: vastly improved space-based infrared sensors for detecting enemy missiles."My concern is that if we don't pull the science into a technology fast, we're going to be beaten to the punch," says Ionson. "I think we've got to build the first widget."

Early proof that the science can be converted into a product might, as Ionson hopes, be enough to spur vigorous development. But there are no guarantees. Even in the basic science, the international competiton is fierce, and other nations are already scrambling hard for products because the potential payoffs appear to be so great. Furthermore, there are signs that the time from discovery to application may be exceptionally short.

Superconductivity is likely to be a severe test of the highly individualistic American system. Even as basic findings are still pouring out of the laboratories, the stark reality of the competitive marketplace looms. And Ionson's embryonic consortium is no match for MITI's directed Japanese effort. In this case, the U.S. may have to consider imitating Japan for a change.

By Evert Clark in Washington

THE NEW WORLD OF SUPERCONDUCTIVITY

Technologies and products once only dreamed of are suddenly coming within reach

Inexhaustible, cheap energy from fusion, desktop computers as powerful as today's number-crunchers, trains that fly above their rails at airplane speeds—all suddenly have taken a giant step closer to reality. But while scientists developing a new breed of "warm" superconductors are planting the seeds of an almost Utopian tomorrow, it will be up to engineers to reap the harvest.

That won't happen overnight. The novel materials that researchers are churning out in laboratories still have to be transferred to the factory floor. Significant hurdles must be cleared before an experimental circuit for a superconducting computer can be turned into mass-produced chips. A small sample of wire is a long way from cables that will span the nation.

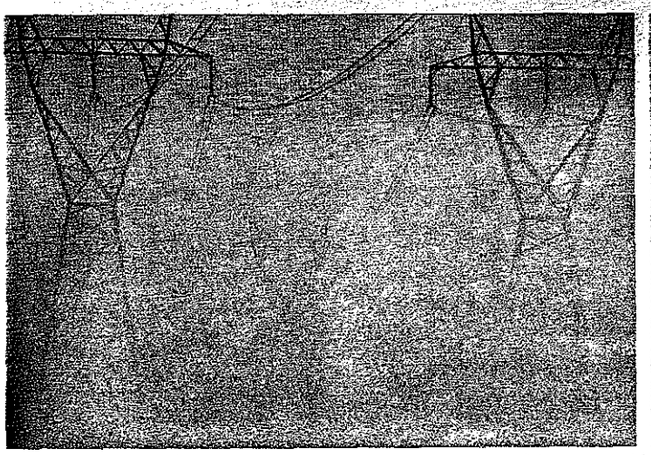
Even in the fleet-footed electronics business, it will probably be 1990 before full-fledged products show up. For electrical utilities, it could take 10 to 20 years before the revolutionary new superconductors make a meaningful impact on power distribution. The challenge of scaling up lab results "could be formidable," cautions Paul M. Grant, manager of magnetics research for International Business Machines Corp.

SCOTCH AND WATER. Until now, superconductivity has been limited to a few applications because the materials available had to be cooled to extraordinarily frigid temperatures with expensive liquid helium. "Liquid helium costs about the same as Scotch," says Walter L. Robb, senior vice-president for corporate research and development at General Electric Co. Liquid nitrogen is 10% as costly—roughly on a par with bottled water. And even with complicated and very expensive insulation systems, liquid helium escapes far more rapidly than liquid nitrogen, which can be protected with simple plastic-foam insulation.

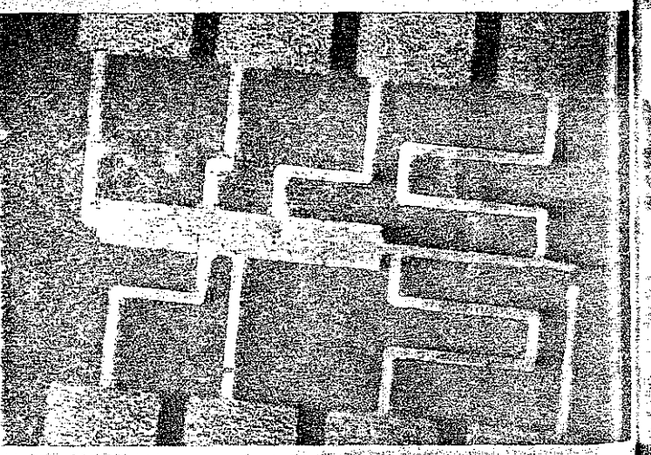
The idea that it may soon be economically feasible to put superconductivity to work in myriad uses is sparking development projects at hundreds of companies worldwide. The payoffs would be enormous. And if room-temperature superconductors are ultimately discovered, the world could be transformed. Such "hot" materials could provide new tools for every technology related to electricity. But just the prospect of superconductivity at liquid-nitrogen temperatures is enough to excite most industrial engineers.

Practical nitrogen-cooled superconductors could save the utilities billions—

FOUR TECHNOLOGIES THAT WILL BE TH



POWER SYSTEMS If electricity can be transmitted vast distances without loss, the country's electrical demands could be met by burning less fuel. As it is, copper wires waste enough power to light up the West Coast. Power plants will become more efficient by using generators made with superconducting electromagnets. And giant electromagnets could even be used to store electricity for use during peak hours. Smaller and more powerful superconducting electric motors will cut industrial power bills.



ELECTRONICS Nothing since the transistor promises to overhaul computer science as drastically as superconductivity. The experimental microcircuit above, produced by International Business Machines Corp., heralds the dawn of a new age in electronics. Tomorrow's electronic systems will pack 100 or more times as much information-crunching power in smaller boxes. With powerful magnets and more sensitive detectors, medical imaging systems will give doctors dramatically sharper pictures.

and save enough energy to put 50 or more power plants in mothballs. Copper wires may be the conductor of choice now, but they lose a lot of power. The copper soaks up 5% to 15% of the electricity flowing through long-haul transmission lines, and still more disappears in local distribution lines. For Pacific Gas & Electric Co., these losses amount to $200 million a year—"plenty of incentive to use a new conductor," says Virgil G. Rose, PG&E's vice-president for operations.

With so much at stake, there has been interest in developing transmission lines and power generators even with existing superconducting technology. Research began in the late 1960s but eventually ground to a halt as the energy crisis faded and the cost of cooling with liquid helium stayed stubbornly high. One line was actually built in the U. S., a 300-ft.-long test installation at Brookhaven National Laboratory. It showed that the technology could not compete with a conventional system unless all the power needs of a city were fed through one line to minimize cooling costs, says Carl H. Rosner, president of Intermagnetics General Corp. But because of the inherent unreliability of such a system, no city would dream of putting all of its watts into one cable. If the new superconducting carriers can be fashioned into cable that can stand up to high power loads and alternating current, 10 or 12 "feeder" lines might be affordable.

Interest in using powerful superconducting magnets to build high-speed trains that levitate above their tracks has also flagged in the U. S., because of high capital costs. That interest, too, could be reviving. But the eventual builders of these so-called maglev trains are more likely to be in either West Germany or Japan, which have continued to fund serious research, or Canada, which still supports a modest effort.

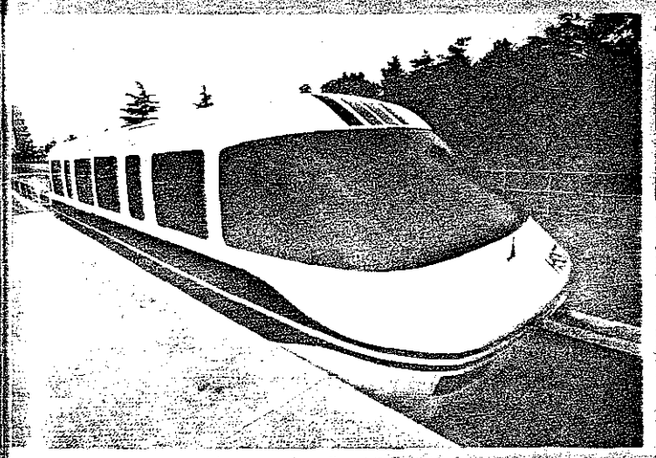
William F. Hayes, a senior research officer with Canada's National Research Council and a maglev believer, bubbles over with anticipation. The new superconductors will have "a tremendous impact on maglev," says Hayes. "The major problems were refrigerating units and reliability. All that's eliminated now." And trains aren't the only vehicles that could benefit. Hayes predicts that superconducting motors one-half to one-third the size of normal motors will one day power ships. They could also help eliminate urban air pollution by making electric cars practical.

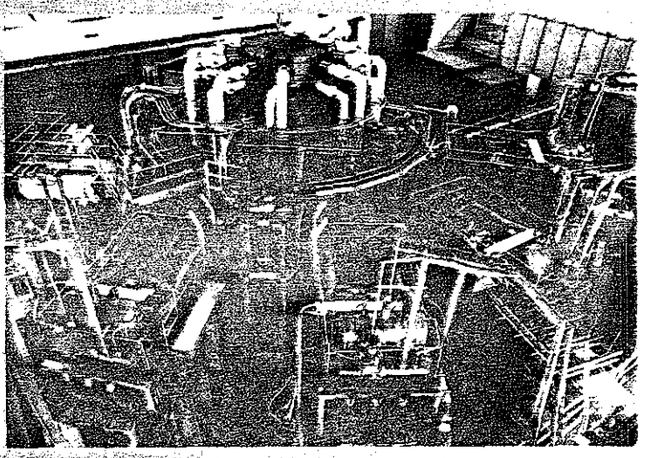
America's best shot at exploiting the new technology is probably in electronics. There, superconductivity will usher in what Sadeg M. Faris calls "the third age of electronics," after vacuum tubes and transistors. Faris worked on superconducting microchip devices known as Josephson junctions at IBM. When Big Blue decided in 1983, after 14 years of work, that the technology was a no-go, Faris left and founded Hypres Inc. In February, less than four years later, Hypres unveiled the first system based on Josephson junctions. Now, Faris asserts that Hypres will be the first to build chips using the new materials, because "no one else in the world has a manufacturing line producing JJ chips."

SUPERCHIPS. That distinction isn't likely to last long. Major electronics companies, from IBM to Varian Associates, are racing to explore the new superconductors. "Guys are working like maniacs," says John K. Hulm, director of corporate research at Westinghouse Electric Corp. "I haven't seen anything like this in years." Westinghouse wants to use Josephson junctions, which are up to 1,000 times faster than conventional silicon transistors, to build radar systems it believes would outperform any now available. At Varian, a leading maker of equipment used in semiconductor fabrication, a crash effort is under way to verify the work on superconducting thin films being done at nearby Stanford University. Such films could be the starting point for tomorrow's superchips.

Health care is another area where su-

THE FIRST TO FEEL THE IMPACT





TRANSPORTATION "Flying" trains should get a big lift from inexpensive and lightweight superconducting magnets and motors. So-called magnetic levitation systems, such as the experimental Japanese train above, use powerful magnetic fields to lift the entire train off the track, so it floats on a cushion of air as it rushes along at speeds of up to 300 mph. That's twice as fast as Japan's famous "bullet trains." Smaller, more efficient superconducting motors could power ships and electric cars.

SCIENCE In their never-ending quest for knowledge, physicists want to smash atomic particles into smaller smithereens or, conversely, to fuse atoms together and mimic the energy-generating furnace inside the sun. To "bottle" an ultrahot fusion reaction in a so-called tokamak device such as this one at Princeton University, magnets more powerful than any now available will be needed. Magnets made with the new materials could also boost the power of future atom-smashers.

perconductors could have an early impact. Nuclear magnetic resonance (NMR) scanners rely on powerful superconducting magnets to produce unprecedented views of the body's organs. The new materials promise magnets 10 times more powerful than those now used. And if NMR machines shed the cost and bulk associated with their present cooling systems for helium, the market for them could be a lot bigger. "You could site NMRs in smaller hospitals, even clinics," says Dr. Paul Winson, director of business development at Britain's Oxford Instruments Group PLC, the leading supplier of NMR magnets. Diasonics Inc., which has sold more than 100 NMR scanners, estimates that cooling with liquid nitrogen might save $100,000 per year in operating costs per machine.

The new superconducting materials may also produce magnets that give theoretical physicists a closer look inside atomic particles. Just eliminating the helium needed to cool the 10,000 giant magnets in the proposed superconducting supercollider would lop $160 million off the projected $4.4 billion cost of the atom smasher—plus cut energy usage by 25%. Researchers argue that waiting for the ability to eliminate helium should not hold back the project, which earned a green light from the President early this year, but they say the possibility of replacing those magnets should be kept open. "We could use them to upgrade the energy of the instrument four or fivefold," says Stanley G. Wojcicki, deputy director of the project. "That would give you a tremendous increase in scientific reach."

Ultimately, physicists hope the new superconductors will hold the key to practical nuclear fusion. Such reactors need powerful magnets to contain the intense heat of the reaction, which will be even hotter than the sun. The U. S. magnetic fusion effort has been trimmed by 20% since 1985, to $345 million this year, and Princeton University's Plasma Physics Laboratory, the site of the major U. S. fusion project, is being outspent by rival projects in Europe and Japan. The new superconductors, hopes Robert M. Hill, a senior scientist at SRI International, could revive fusion's prospects.

They may even boost Star Wars. The Strategic Defense Initiative Organization's Office of Innovative Science & Technology has already marked $500,000 for superconductor research this year and plans to buck it to $2 million next year. The interest is easy to fathom. After all, space-borne systems built with superconductors wouldn't have to be cooled: In space, "room temperature" is even colder than liquid nitrogen.

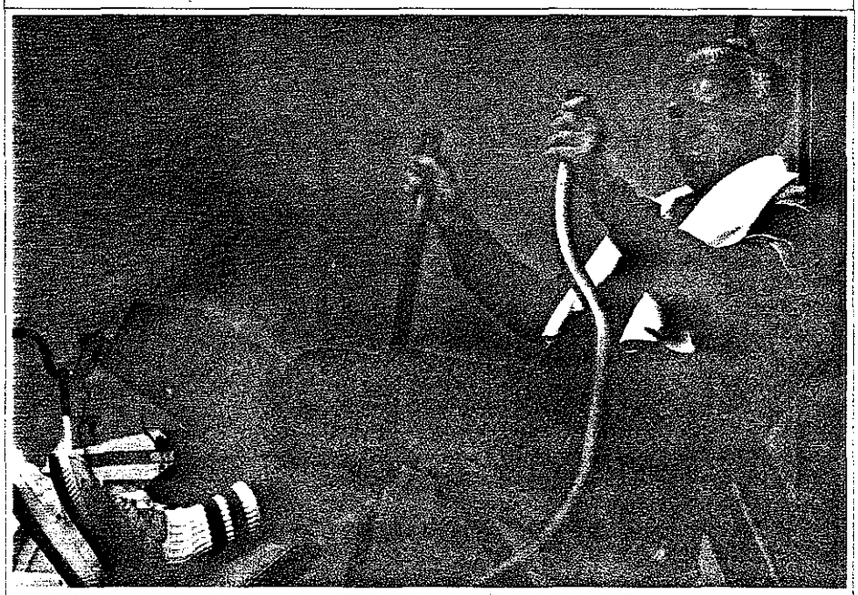
By John W. Wilson in San Francisco and Otis Port in New York, with bureau reports

Information Processing

TELECOMMUNICATIONS

CAN GTE KEEP FOILING THE RAIDERS?

It's retrenching, building defenses, and hunting for prey



CHAIRMAN BROPHY: ANALYSTS SAY GTE'S STOCK IS STILL UNDERVALUED

How much restructuring is enough? For Theodore F. Brophy, chairman and chief executive of GTE Corp., sales or joint ventures of operations accounting for 10% of annual revenues is plenty. But Wall Street, which is still hunting for undervalued breakup candidates, is giving Brophy no respite. Despite a protective thicket of regulators, asset-rich and underleveraged phone companies such as GTE are no longer immune. The Bell System breakup proved their pieces are worth more than the whole. So, the steel-willed, patrician Brophy is being challenged to boost shareholder values.

That pressure escalated last fall, when Canada's Belzberg family bought a less-than-5% stake in $15 billion GTE and called for its partial breakup. Brophy checked the threat by winning shareholder approval in December to stagger the elections of directors and adopt an 80% voting rule on takeovers. GTE also split its shares 3 for 2, boosted the dividend 13%, and began a 3% stock buyback. That pushed its shares up 23%, to a less vulnerable $43. As for more restructuring, says Brophy: "You can improve net income for a time [with more leverage]. But I don't believe you're making any contribution to the future."

Brophy's problem is that while he has hiked GTE's total stock-market worth to almost $14 billion, some Wall Street analysts say that is still barely half the company's breakup value. And just over the horizon are some fundamental changes in the phone business that could make a breakup more possible.

CABLE EXPERIMENT. One is deregulation. Already 13 states have stopped regulating phone profits based on assets and equity invested. Now they let companies earn whatever they can—so long as they hold down rates and maintain good service. Under previous "rate-base" regulation, a phone company buyer could earn money only on the depreciated historical cost, or book value, of the assets acquired. With deregulation, a buyer could pay more than book value and still reap a good return on equity if he could cut costs or boost revenues.

A second factor is new technology. By the early 1990s, customers will have access to a basketful of voice, video, and data services over telephone lines. Many of these will be unregulated. Whoever owns the computerized phone network

A case study for Federal Labs. Pfizer 4/7

AGBIOTECH EMPHASIS

SIX FIRMS TO TEAM UP ON FERMENTATION

Call Jake David Norm */

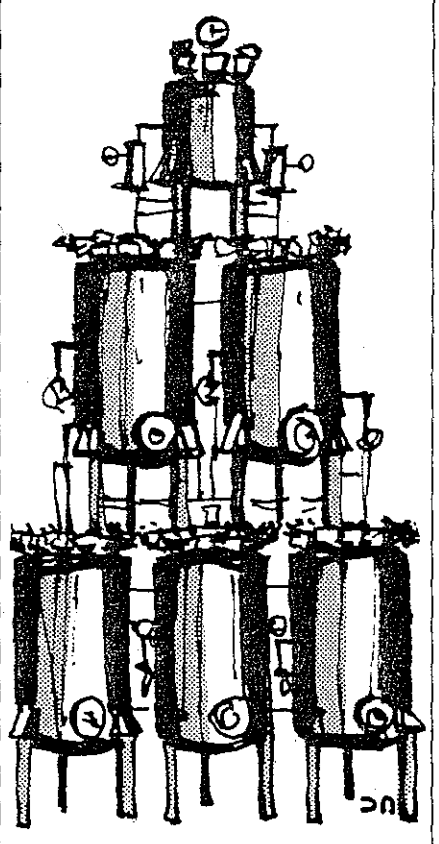
NAPLES, Fla.—Five multinational corporations and one small biotech company are forming a consortium to focus on fermentation technology. The new venture, which was slated for official announcement in mid-March, will take advantage of heavy federal and state support to emphasize agricultural applications. Reportedly, the collaboration will include Amoco Corp. (Chicago, IL), American Cyanamid (Wayne, NJ), Dow Chemical (Midland, MI), Hewlett-Packard (Palo Alto, CA), International Minerals and Chemicals Corp. (IMC, Northbrook, IL), and biological pesticide specialist Ecogen (Langhorne, PA).

The search is now on for a chief executive officer of what is to be called the Biotechnology Research and Development Corp., but BRDC will have no in-house scientists and a very small staff. R&D will focus on five general areas: membrane technology, secondary metabolites, molecular genetics, bio-production, and information collection and analysis. The majority of the consortium's sponsored research will be performed at the Northern Regional Research Laboratory (Peoria, IL) of the U.S. Department of Agriculture (USDA), and at the University of Illinois (Champaign). Toward this end, USDA's Agricultural Research Service (ARS) is contributing $2 million a year for at least five years. The State of Illinois will come up with $4 million in funding during that period, while the member companies will kick in $1 million each. "For a million bucks, we get access to $20 million in basic fermentation research," says Ecogen president John Davies. He announced his firm's participation in the collaboration during February's Industrial Biotechnology Association (Washington, D.C.) meeting on "Financial Issues."

"One of the reasons for the consortium is to get industry and the public sector more tightly linked," explains Gerald Carlson, director of the Midwest area for ARS. And, he says, participants were chosen whose biotech interests are complementary rather than competitive.

BRDC's primary organizer is CILCORP Ventures Inc. (CVI, Peoria, IL), a unit of the holding company that owns Central Illinois Light Co. CVI president Del Schneider says that CVI began the project during 1984's tough economic times as a way to diversify the region's economy away from heavy manufacturing. Also involved was Agricultural Research and Development Corp. (ARDC), itself a joint venture between CILCORP Ventures and the Economic Development Council of Peoria. ARDC general manager Scott Cisel says the new collaboration is "the first such consortium developed under the Federal Technology Transfer Act of 1986." He adds that the organizers pitched the concept to some 50 corporations—all of whose businesses are predominantly anchored within the U.S.—before signing up the half-dozen founders. Provisions have also been made for adding new members in the future.

Pioneer Hi-Bred International had played an early role in advising BRDC's formulators but eventually opted against joining, according to William Marshall, president of Pioneer's microbial genetics division (Johnston, IA). "We already know a great deal about these subjects," he says. "We really weren't interested in an elementary education in fermentation and microbial ecology, and we really weren't interested in sharing what we already know." Another factor in Pioneer's decision, Marshall adds, was that the consortium will own any technology developed. He says that Pioneer's main interest centered around the large collection of naturally occurring microorganisms housed at the USDA lab in Peoria. But, he says, the company should be able to access these strains without joining the consortium.



"The companies that were really interested in the joint venture were those that wanted a window onto biotechnology as opposed to those that were into it up to their hips," Marshall concludes. And he believes that BRDC could prove quite valuable for companies that are somewhat new to biotech or are unfamiliar with accessing public-sector research.

Although the member companies have not announced their specific reasons for joining BRDC, some logical guesses can be made. Dow, for example, recently began to unveil its move into agbiotech via the purchase of United AgriSeeds (Savoy, IL). Cyanamid might well be interested in production methods for its bovine growth hormone. IMC is developing porcine growth hormone. Hewlett-Packard's interest would likely be in bioreactor monitoring and control. And Ecogen's main thrust is on *Bacillus thuringiensis*-based insecticides.

"Everything that we are currently working on will be a product of fermentation," says Ecogen's Davies. "I think the consortium will give us an opportunity to gain some fermentation expertise that would be prohibitively expensive to develop on our own."

Ecogen's entry into the consortium is accompanied by new financing from CILCORP Ventures. In the deal, CVI purchased $500,000 worth of unregistered Ecogen shares and provided the biopesticide company with a loan of $1 million to cover Ecogen's contribution to the consortium. Also, CVI will receive warrants to purchase 100,000 Ecogen shares at $10 each. Thus, if CVI exercises its purchase option, Ecogen will have raised the money to cover the loan's principal.

Ecogen also received another dose of good news in mid-February when the U.S. Environmental Protection Agency informed the company that it is planning to approve Ecogen's Dagger™ G biofungicide. Used to control "damping-off" disease in cotton, the product is based on a non-engineered strain of *Pseudomonas fluorescens*. Ecogen expects Dagger G to be available for commercial use during this year's cotton-growing season, which begins in early April. —**Arthur Klausner**

High-Tech Life Reshapes U.S., Analysts Say

Hill Study Predicts Rapid Transformation

Associated Press

The next two decades will be a time of massive change in which virtually every U.S. product, service and job will be reshaped, according to a four-year government study of new technologies.

The congressional Office of Technology Assessment study released yesterday said that emerging technologies should offer chances to expand educational opportunities, extend life, reduce illness and make work more rewarding by using machines for tedious, repetitive jobs.

But the study warned that rapid change also threatens to "shake the foundations of the most secure American businesses."

"We know that we are moving away from an economy heavily dependent on raw materials, where most businesses were isolated from international trade," said project director Henry Kelly.

As one example of how change already has reshaped the country, the study said the number of lawyers, bankers, scientists and accountants needed to supply Americans with food is now roughly equal to the number of farmers.

The study said that for the country to take full advantage of emerging technologies, Congress should consider making fundamental changes in tax laws and government regulations.

"Regulations designed to protect consumers . . . may have outlived their usefulness in areas ranging from banking to housing to electric utilities," the study said.

In the tax area, the study urged reducing or abolishing the tax on capital gains and revising or abolishing the corporate income tax. The report said these taxes reduce needed investment to boost U.S. productivity.

for home mortgage interest should be limited to a fixed amount because it makes little sense to encourage investment savings in the form of home purchases, but not permit the complete deductibility of educational expenses.

Among the report's predictions:

■ New technologies for collecting, storing and manipulating information have the potential to revolutionize the economy. Businesses are already spending 40 percent of their investment dollars on computers and other "information" machines, double the 1978 share.

"The potential productivity gains in this area—the movement and organization of information—are at least as great as those produced [by] the first Industrial Revolution," the study said.

■ Increased foreign competition was inevitable with the post-World War II recovery of Japan and Western Europe and the emergence of sophisticated production in places such as Korea and Taiwan. Undisputed U.S. economic leadership may be lost, but the change does not necessarily mean that U.S. living standards will decline.

■ Consolidation of farm ownership is likely to continue so that by the year 2000, the 14 percent of farms with annual sales higher than $250,000 will account for 80 percent to 90 percent of total sales. Likewise, grocery stores will continue getting larger. "Super stores" with 200,000 square feet of space and offering 20,000 products account for 28 percent of all grocery store sales.

■ The U.S. housing industry, to combat the decline in home ownership, may follow the trends of Sweden and Japan, moving toward prefabricated homes built on assembly lines, sold in showrooms and assembled on the site.

■ The nation's educational system is on the brink of major technological changes through the use of computers that will make learning more productive and fun while allowing teachers more time to spend with individual students.

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State to step up efforts to attract biotech firms

By Mary Knudson

Propelled by its unique federal resources, Maryland has leaped to third place in the national race to lure biotechnology companies despite the lack of a coordinated effort by state government to nurture that growing industry, according to a congressional researcher.

"Maryland has moved up in the last year and has at least 38 biotechnology companies recognized by the OTA," said Kathi Hanna, of the congressional Office of Technology Assessment, which is about to release its first major study of U.S. investment in biotechnology. The study ranks Maryland behind only California, with 111 biotechnology companies, and Massachusetts, with 54, Dr. Hanna said.

Two years ago, Maryland would have ranked no higher than fifth, according to estimates the OTA made in gathering data for its report, Dr. Hanna said. But Maryland has moved ahead of New Jersey, which has 24 biotech companies, and New York, which has 20, she said. More than 95 percent of a company's work must involve biotechnology techniques to qualify as a biotech firm under OTA's strict standards.

Dr. Hanna said Maryland's success has little to do with state leadership. Biotech firms are locating here, especially in Montgomery County, to be near such federal resources as the National Institutes of Health, the Food and Drug Administration and the National Bureau of Standards, she said. That trend has been bolstered by recent federal guidelines giving government scientists financial incentives to collaborate with industry, she said.

"There are tremendous resources in Maryland, so that even if [state government] doesn't spend a lot more money, a little more coordination by the state could help biotech to flourish," Dr. Hanna said. She feels state officials need to "strengthen the internal network" by coordinating biotech efforts of industry, state and local governments and universities.

That's exactly what Gov. William Donald Schaefer has in mind with the establishment of a state technology office intended to coordinate the assorted technology interests throughout the state, including biotechnology, high-tech manufacturing, computers, telecommunications and automation, said J. Randall Evans, the state secretary of economic and employment development.

Robert G. Snyder, of the Montgomery County Office of Economic Development, agrees the new state office is important. "First, it will establish a climate and visibility for high technology for the state that hasn't been as visible before. And second, it will help develop a biotechnology program for the state," he said.

However, the General Assembly provided a starting budget of only $500,000 for the office, half of what Governor Schaefer had sought. And that money depends upon approval this fall by legislative budget committees of a detailed plan of what the office will do.

Although the state government's role in attracting biotech companies has been minimal so far, Montgomery County is widely credited with implementing an aggressive and effective program to lure such firms.

One example of a biotech company that was drawn to Montgomery County is Cell-

See **BIOTECH,** 2C, Col. 4



THE SUN/WILLIAM G. HOTZ SR.

Julie Ann Light is a molecular biologist with Cellmark Diagnostics in Germantown. The company came to Montgomery County because of its proximity to federal agencies and the county government's accommodating attitude.

Montgomery Co. helps make state one of the nation's biotech centers

BIOTECH, from 1C

mark Diagnostics, a young firm with 34 employees that uses genetic information from samples of blood, semen, hair or skin to identify people in criminal and paternity cases.

Robert H. Gottheiner, president of the firm, said he located in Germantown last April to be near the federal agencies involved in technology and in law enforcement.

"I wanted to be generally in a high-tech area," he said. "I began to look at different places and was led to a spokesman for Montgomery County."

Henry Bernstein of the Montgomery County Office of Economic Development told Mr. Gottheiner that Montgomery County not only was home to the major federal agencies that regulate and often collaborate with biotech firms but also was already organized to attract such firms and help them get set up.

Mr. Gottheiner said he was impressed to learn that the county had established the Shady Grove Life Sciences Center, containing a medical center, branches of both the Johns Hopkins University and University of Maryland, the Center for Advanced Research in Biotechnology — operated with the University of Maryland and the National Bureau of Standards — and land for private research and development firms to build facilities.

The Montgomery County High Technology Council and area biotech companies also host Biotechnology Network Breakfasts, profiling a different biotech firm each month and providing an opportunity to "network" and discuss common problems. Both the National Institutes of Health and the National Bureau of Standards are members of the High Technology Council and participate in the breakfasts.

"We're very deliberate in pursuing biotechnology," said Deborah Boudreau, manager of corporate marketing with the county Office of Economic Development. "It's not just a fluke. We don't just wait for it to show up on our doorstep. We have prospecting missions where we build on relationships we have with com-

> *"There are tremendous resources in Maryland, so that . . . a little more coordination by the state could help biotech to flourish."*
>
> **KATHI HANNA**
> **Congressional researcher**

panies or meet new companies, use direct mail and host delegations from other countries" that are looking for business locations. The county also participates in biotechnology conferences and exhibitions nationally and internationally, she said.

The county's big plum, she acknowledged, is the "great advantage of federal laboratories and other federal agencies being located here."

However, despite the presence of such resources, Maryland is hobbled in its efforts to encourage biotech development by a lack of public and private seed money for new and existing business.

Mr. Evans concedes that such financing has been given short shrift in Maryland, but he says that problem will be addressed in the plan to establish the state technology office. He said that the state needs to have more venture-capital seed money available and that "on the other end, we've got to try to commercialize discoveries."

He cited the example of a pill developed by Johns Hopkins Applied Physics Laboratory researchers. The pill checks the body-core temperature of a person or an animal as it moves through the digestive system. Temperature readings register on a monitor.

The thermometer pill was licensed to a young company named Human Technologies Inc. in St. Petersburg, Fla.

"Why can't we encourage those researchers to set up a company in Maryland?" Mr. Evans asked. "There's a thousand stories like that, at the University of Maryland, Hopkins Medical School, Homewood campus and Applied Physics Lab where [scientists] are doing tremendous research. What Maryland needs to do is take the next step and commercialize that risk."

Maryland's need for seed money to bring research out of the lab and into the marketplace may soon be eased. Last month, in separate announcements, the Dome Corp., a for-profit joint venture of Johns Hopkins Health System and Johns Hopkins University, and the Abell Foundation, in cooperation with two venture-capital firms, said they are planning seed funds for that purpose.

The Hopkins group is planning a $10 million to $20 million seed fund to be raised by a new company, Triad Investors Corp. The Abell Foundation, together with an affiliate of Alex. Brown & Sons and New Enterprise Associates, is creating a $15 million fund.

Meanwhile, the state has not yet come to grips with what commitment it intends to make for a major part of the biotech effort — the ambitious Maryland Biotechnology Institute, announced in 1984 by the University of Maryland. The university faces funding problems of another sort — capital funds for building.

University plans call for the institute eventually to be made up of five centers — for medicine, marine biology, agriculture, ethics and the basic science center already underway in Montgomery County. But only the basic science center, which got a loan from Montgomery County, has its own building under construction. The Marine Biotechnology Center is operating in space leased from the Community College of Baltimore, and the state has not allocated money to construct buildings to house the other centers.

The governor and legislature continued the institute's current level of operating funds at about $5 million, but Governor Schaefer declined to ask for an additional $600,000 the university sought, said Donald L. Myers, UM vice president for general

See **BIOTECH,** 3C, Col. 1

New state office will direct effort to attract biotech firms

BIOTECH, from 2C

administration.

The state turned down UM's request for $3 million to buy the old downtown Hutzler warehouse, in the 700 block of West Lombard Street, which it eventually wants to renovate at a cost of $17 million to $21 million to house the medical biotech center. The biotech institute also did not get $300,000 that its head, Rita Colwell, said she "had very badly wanted to do research on oyster disease."

"I think with all the pyrotechnics over higher education, some of these practical applications got lost" during the legislature's deliberations, Dr. Colwell said. But she, UM President John S. Toll and Dr. Hanna of the OTA agreed that the major reorganization of the higher education system achieved during the legislative session eventually will benefit the university's biotech efforts by raising the quality of the school and providing more money overall.

The legislature did give the biotech institute $800,000 in new money to plan a $27 million plant sciences building that will house the agricultural biotech center. Both Dr. Toll and Dr. Colwell said they are satisfied with the overall funding they got for biotechnology this year, although Dr. Colwell conceded it is unlikely the state will provide all the capital funding she had hoped to build the institute.

While the university's role is considered vital in Maryland's biotech efforts, state officials believe that its programs must work in concert with other biotech development programs. Getting the disparate agencies and institutions involved to work together will be the job of the new state high-tech office, said Mr. Evans.

"There needs to be a much more coordinated effort," he said. "We do hope to do that. The faster we get started, the more we'll get done."

Goal at Hopkins: turning good science into good business

By Peter H. Frank

The Johns Hopkins University — widely lauded as the region's premier private research institution — has found itself in the difficult position of reaping both the credit and the blame for the condition of the local biotechnology industry.

As the single largest recipient of funds from the National Institutes of Health and with overall research grants of more than $250 million, the university is considered an attractive wellspring of scientists, ideas and prestige.

The school's top professors and students, who have been tapped by many local companies for consulting and laboratory work, provide a solid base of potential scientific talent for businesses that want to locate nearby.

But, as a non-profit academic institution with a culture of closed-door research and behind-the-scenes discoveries, Hopkins has been accused of an anti-business attitude that keeps struggling entrepreneurs at bay and potentially lucrative inventions in the closet.

Critics commonly point to the Massachusetts Institute of Technology and Stanford University as models that, they say, Hopkins has been slow to emulate.

"The culture at Johns Hopkins, it seems to me," said Robert L. Montgomery, former president and chief operating officer of Crop Genetics International in Hanover, "is that pure research is good and grubbing for money is, 'thank God, something we don't have to do.' "

Mr. Montgomery, who left Crop Genetics in April after more than four years with the company, is now president of Immune Technology Inc., a new biotechnology company in New York.



THE SUN/BO RADER

Jared L. Cohon, vice provost for research, with research scientist Madeline Shea.

In Hopkins' defense, university officials point to various steps they have taken recently that are intended to cast off the school's acknowledged ivory-tower image.

An array of new and planned programs, they say, demonstrate their attitude of willingness — if not eagerness — to share the university's substantial resources for the financial good of the community and the school.

"In part, it's an unfair rap," said Jared L. Cohon, vice provost for research at Hopkins. "The process by which a biotech industry spawns up around a university is a complicated issue. Anyone who says they understand it is fooling themselves.

"We get singled out," Dr. Cohon said, "because we are Johns Hopkins, this is Baltimore, and we're all talking about biotech."

Maryland is third in the nation in the number of biotechnology companies — which are viewed as a primary source of future employment and economic vitality in the state — according to a study by the congressional Office of Technology Assessment that is to be released soon.

Among the reasons often cited for the industry's growth in Maryland is proximity to the federal regulatory agencies in Washington, to the National Institutes of Health and to Hopkins.

As a result, the university has frequently found itself in the spotlight when questions — and frustrations — are raised concerning what is needed to further enhance the industry's growth in the region.

Biotechnology executives say a crucial way Hopkins could help support the industry's growth and spawn new companies is by transferring technology, that is moving inventions out of the school's laboratories

See **HOPKINS,** 3C, Col. 1

MARYLAND'S BIOTECHNOLOGY FUTURE

Hopkins seeking to shed anti-business image, encourage entrepreneurs

HOPKINS, from 1C

and into the marketplace.

That is one of the reasons Dr. Cohon's position was created in July 1986. The university still seems unsure of its role in connection to this and related issues and, as a result, it remains far behind other top research institutions in this regard.

MIT and Stanford, both widely credited with being instrumental in the creation of the booming biotechnology industries near their campuses, have 14 licensing agents each who either help sell inventions to established companies or work with venture capitalists to create a company around a new product.

By contrast, Dr. Cohon said, Hopkins employs three people whose jobs are primarily to license university inventions.

That total does not include the Applied Physics Laboratory, a self-supporting division of the university that receives 90 percent of its funding from the Department of Defense.

A spokeswoman at the physics lab, Helen Dugan Worth, said the division has three attorneys who work to patent discoveries but that the unit has not specifically focused on licensing the innovations. The division receives a "minimal amount" of revenue from earlier licensing agreements, which barely cover the patenting expenses, she said.

At Stanford, said Katharine Ku, associate director in the university's Office of Technology Licensing, "we try to take a proactive marketing approach. Patents should not be the focus. What is important is to establish the relationships so the university and industry can work together."

MIT, which hired Stanford's director of technology licensing two years ago to reorganize its program, said its inventions have spawned six to eight companies recently and that it collected $3.1 million last year in royalties from licensed inventions.

Stanford received $6.1 million in royalties for its fiscal year ended Aug. 30, 1987.

At Hopkins, Dr. Cohon said, "we would like to make millions and millions of dollars from our inventions. I'm not sure the kind of activity we see now would justify that large an operation."

He estimated that the university, excluding the physics lab, collects about $150,000 a year from licensing arrangements. That revenue, he said, barely covers the expenses associated with patenting the inventions.

Possibly more important than the flow of ideas from the university to local industry, the university officials said, is the climate of entrepreneurship created within the schools as researchers see their fellow scientists reap financial rewards for their inventions.

> *"This is not something that happens in a hurry. The community here has been developing for at least 50 years. This is not something that is going to happen in a short period of time just because* a venture fund was established.
>
> **JAMES M. UTTERBACK**
> **Director of industrial liaison at MIT**

Universities typically offer one-third of the royalties received, after certain expenses, to the inventor. The remainder is shared under various formulas by the professor's laboratory, department, school and the university.

Many new companies in the Boston area were founded by graduates of MIT who had studied in this lucrative environment, said James M. Utterback, a professor and director of industrial liaison at MIT.

For those involved in the biotechnology industry in Maryland who have worked elsewhere in the country, the dearth of inventions coming out of Hopkins has been startling. The large amount of grants the university gets from the federal government would suggest that many important and potentially lucrative areas of research are being pursued, the executives said.

"Our experience is that it's not been a sour or negative interaction," Robert Walkingshaw, partner of ABS Ventures in Baltimore, said of his company's relationship with Hopkins. "It's been no interaction, or relatively little.

"It's more than a little surprising that there's been so little inquiry. It's rare that I get a business plan from a Hopkins guy."

Some of that might soon change.

The Dome Corp., a for-profit company formed by the university and the Johns Hopkins Health System — has said it plans to create a new company, Triad Investors Corp., that is expected to raise as much as $20 million within a few months. The funds from the public offering of stock would be used to create a so-called seed fund, the company said.

"The idea is to identify and nurture commercializable inventions and then package and present them to industry for commercialization," said James D. M. McComas, chief executive officer of Dome.

In addition, the Dome Corp. has been working with the city of Baltimore in a joint effort to establish the Bayview Research Center in East Baltimore. The proposed $500 million development, which might take as long as 20 years to complete, is intended to include a collection of offices and laboratory space to be used, in part, by new companies, Dr. Cohon said.

Hopkins is also involved in the Shady Grove Life Sciences Center in Rockville, which is being developed by the Montgomery County Office of Economic Development.

In cooperation with the University of Maryland and Hopkins, the county is spending $35 million to create a satellite campus that would serve the community and offer classes in subjects including engineering, computer sciences and public health.

Among the goals of the project is to establish a research center that could link the schools with local businesses.

One area in which Hopkins has had considerable success has been its efforts to secure research grants from the federal government. For years the leading recipient of NIH grants, Hopkins received $129.55 million from the federal research laboratories for the year ended Sept. 30, 1987.

"They've been successful because they've had a larger number of applications and they are considered excellent," said Melvin S. Fish, special assistant to the deputy director of extramural research at NIH.

"Their reputation is earned by the very best indicator we have, their track record, and they are able to get funded and funded again. They can't get funded just because they have friends on the review committees."

Still, translating good science into good business remains a challenge, even though cooperation between the academic and corporate communities has increased. Last year, Dr. Cohon said, Hopkins received $10 million from corporate research contracts.

Perhaps the most important aspect of Dr. Cohon's position in supporting the growing biotechnology industry near Baltimore is his effort to help businesses find their way through the bureaucratic maze that can stifle cooperation between the school and the community.

Dr. Cohon said he is working on a list of professors and their areas of research to help businesses find specialists at the university. With eight schools, not including the Applied Physics Laboratory, the university has no consolidated list of professors and their interests.

Few expect the changes at the university to occur overnight, however.

"This is not something that happens in a hurry," said Dr. Utterback of MIT. "The community here has been developing for at least 50 years. This is not something that is going to happen in a short period of time just because a venture fund was established."

Frank Grace
What do you think about
this mail.
Lowell

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GENETIC ENGINEERING GEN NEWS

THE SOURCE OF BIOPROCESS/BIOTECHNOLOGY NEWS | Volume 8 | Number 5 | May 1988

NSF Survey Analyzes Biotech Industry's Recent R&D Trends

By John R. Chirichiello

Industrial biotechnology research and development performance in the U.S. amounted to $1.4 billion in 1987, 12% more than was spent on these activities a year earlier.

The rate of growth in industrial biotechnology R&D performance has slowed each year since 1984, the first year for which data are available, increasing an estimated 20% in 1985 and 17% in 1986. In comparison, the Office of Technology Assessment estimates Federal support at $2.4 billion in FY 1987, up from $2.3 billion in FY 1986 and $2.2 billion in FY 1985. Also, between January 1986 and January 1987, the number of scientists and engineers primarily employed by industry on biotechnology R&D programs increased by 9% to an estimated 9,100 after increasing

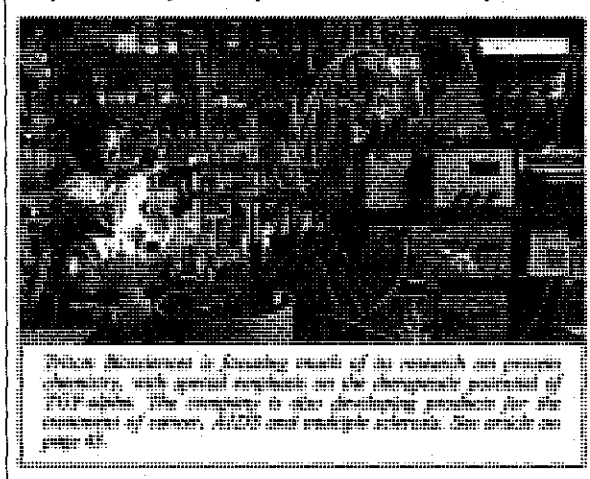
SEE SURVEY, p. 39

Endotronics Gets New Lease on Life After Phoenix-like Rise from Ashes of Bankruptcy

By *Fred Gebhart*

With a refocused business strategy and a hope for life after Chapter 11, Endotronics (Coon Rapids, Minn.) plans to confound disappointed investors, red-faced Wall Street analysts, and an alphabet soup of civil and criminal investigators. "We may have the notoriety of being the first biotech company to go into bankruptcy," says vp for corporate planning and development Susan Michael Smith, "but we're also the first to come out."

Endotronics recently announced that it was no longer in Chapter 11 after submitting a reorganization plan that satisfied most of its creditors. The company now plans to concentrate on basic instrumentation, application instruments and ancillary products and services to complement its hollow fiber bioreactors.



But Endotronics, which manufactures the Acusyst mammalian cell culture system, very nearly dug its own grave. In 1986, father-and-son founders Eugene and Michael Gruenberg received Minnesota Governor Rudy Perpich's Entrepreneurship Award. Today, the pair are reportedly under investigation for fraud and may be named in federal indictments.

To their credit, the Gruenbergs started with a solid product. Customers and analysts alike put Acusyst in the same class as culture systems from Damon, BioResponse, Invitron, Celltech and others. Some even called Acusyst the best of the lot. Instrument sales climbed from nothing in 1983 to $10.5 million in 1986.

SEE ENDOTRONICS, p. 14

Hungary Sees Role for Venture Capital in Biobusiness Growth

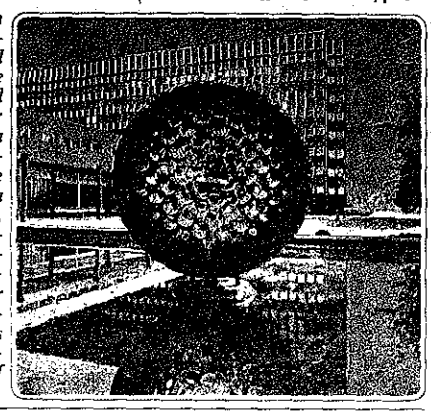
By Miriam Jacob, Ph.D.

The Hungarian Academy of Sciences, like a number of institutions in the West, has adopted the venture capital approach to molecular biology to increase the pace, and profit, of biotechnological development. This became possible when an 1896 law was recently unearthed which made it possible to form an autonomous holding company with capital from both state-owned institutions and outside sources, free from state supervision.

Economic liberalization has been underway for a number of years in Hungary. Although the state-controlled economy is suffering, there is an openness which allows money to be made in capitalist-style ventures. Since the Hungarian market is limited, the duty of the biotechnology enterprise is to export products and expertise and earn money for the country.

Dr. Lajos Keszthelyi, a director of the Biological Research Center (BRC) of the Hungarian Academy

SEE HUNGARY, p. 36



A huge aluminum sculpture of a dividing egg cell marks the entrance to the Biological Research Center of the Hungarian Academy of Sciences. Available for research are a DNA synthesizer, HPLC instruments and electrophoresis apparatus. The center makes its own restriction enzymes because of the limited availability of foreign currency.

Agbio Products Edge Closer to Marketplace

By John Sterling

Genetic engineering firms came a step closer to having their agricultural biotech products approved with the announcement of three new field tests, two already underway and one pending final approval.

Monsanto (St. Louis, Mo.) began small-scale field tests of genetically engineered tomato plants, and Biotechnica International (Cambridge, Mass.) is conducting field tests of recombinant bacteria for improved nitrogen fixation in alfalfa.

In addition, EPA notified Crop Genetics International (Hanover, Md.) of its tentative approval of the company's plans to conduct an open-air experiment of a genetically engineered biopesticide designed to kill the European corn borer.

The announcements of three new field tests might indicate that EPA is ready to approve other field tests more quickly once a company satisfies the agency's safety concerns.

"EPA is approving these tests

SEE AGBIO, p. 15



Biotechnica International began field tests of genetically engineered Rhizobium meliloti at its research station in Wisconsin last month. The tests are designed to study improved nitrogen fixation in alfalfa.

Procyte's Iamin Shows Promise in Wound Healing Applications

By Matthew F. Heil, Ph.D. and David Mackey

With the worldwide market for wound healing technology expected to reach $800 million by 1991, numerous corporations are involved in a close race to grab the proverbial "brass ring."

Current techniques for clinical management of wounds focus on the prevention and control of infection. However, many companies are working on a group of natural wound healing agents—growth factors—that may offer the physician an entirely new option of treatment by actually controlling the wound healing process.

Some of the more familiar agents include epidermal growth factor (EGF), fibroblast growth factor (FGF) and transforming growth factor (TGF). However, a new company located in Redmond, Wash. has added a novel and quite different compound to the list of active wound *healing* biologicals.

SEE PROCYTE, p. 38

Sticky Ends

The U.S. Patent and Trademark Office issued the first patent for a higher form of life to **Harvard University**, for a transgenic mouse developed by researchers at the medical school...**Mark Skaletsky** resigned as president and chief operating officer of Biogen N.V. to become Enzytech's chief executive.....**Novo Industri A/S** received approval from Dsnish authorities to build a plant for producing Factor VIIa for treating hemophilia.. A European patent was awarded to **Plant Genetics** for artificial seed technology...The **Edison BioTechnology Center** in Cleveland approved its initial grants for biomedical and biotechnical research projects...**DNA Plant Technology** and the ContiSeed Div. of **Continental Grain Co.** will collaborate to develop new varieties of plants that produce edible oils with improved fatty acid composition....**Oxford Virology** is funding a research program at the **St Georges Hospital Medical School** to develop a laboratory diagnostic test for Alzheimer's Disease.. **Biogen N.V.** licensed to Smith Kline-RIT, a subsidiary of **Smith-Kline Beckman Corp.**, its hepatitis B virus patents to manufacture and sell recombinant hepatitis B vaccine products in the US and all other nations except Japan

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Forum

PUNITIVE DAMAGES

The Courts Are Curbing Creativity

By RICHARD J. MAHONEY

AFTER the longest-running trial in America's history, a jury in Belleville, Ill., last year awarded one dollar to each of 65 plaintiffs as nominal damages for alleged personal injuries in a case involving one of my company's products — orthochlorophenol crude — which is used to make wood preservatives. Then, in a burst of tortured reasoning, the jury awarded $16 million in punitive damages to the plaintiffs.

More recently, Monsanto's G. D. Searle subsidiary was assessed $7 million in punitive damages in a St. Paul, Minn., case involving the Copper-7 intrauterine device that not only has Food and Drug Administration approval, but also a long history of safe use and medical acclaim.

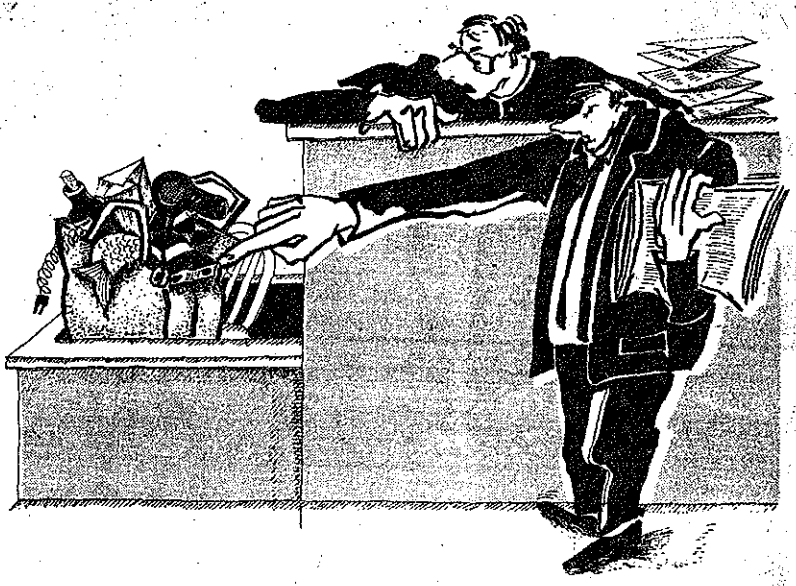
After the Searle verdict, our stockholders — large pension funds and small shareowners alike — lost $700 million in market value. That occurred partly because the significance of the case was greatly exaggerated in the public media, perhaps because of expectations of a big settlement. Both the Minnesota and Illinois cases are being appealed.

These experiences are known only too well by leading American companies. Punitive damages are an anomaly peculiar to the United States and are virtually unknown in the world's remaining civil-law countries. They also depart from usual American legal practice in that defendants are afforded few of the traditional safeguards. The result: Conduct liable for punitive damages is whatever a single jury says it is.

Commenting on punitive damages in a recent Supreme Court decision, Associate Justices Antonin Scalia and Sandra Day O'Connor observed that "this grant of wholly standardless discretion to determine the severity of punishment appears inconsistent with due process."

"Across the board, modern tort law weighs heavily on the spirit of innovation," concluded Peter Huber in his book, "Liability: The Legal Revolution and its Consequences."

A 1988 survey of chief executive officers by the Conference Board showed that uncertainty over potential liability had led almost 50 percent to discontinue product lines, and nearly 40 percent to withhold new products, including beneficial drugs. Half said product liability had a major impact on our international competitiveness, and 75 percent expected it to grow in significance.



My own company abandoned a possible substitute product for asbestos just before commercialization, not because it was unsafe or ineffective, but because a whole generation of lawyers had been schooled in asbestos liability theories that could possibly be turned against the substitute.

The punitive-damages system makes it too easy for lawyers to persuade a jury — possessing little scientific background but believing in the possibility of a risk-free society — to enrich plaintiffs and contingent-fee lawyers with multimillion-dollar windfalls.

In addition, according to the Congressional testimony of Malcolm E. Wheeler, a partner in a major law firm, "manufacturers are paying massive amounts in settlement of cases that should never have been settled, that should never have been filed and that certainly should not be resulting in these kinds of settlement sums."

The following is the dilemma of West Virginia Supreme Court Justice

We abandoned a possible asbestos substitute for fear of lawsuits.

Product Liability Mess" who wants the Supreme Court to set national standards: "As a state court judge, much of my time is devoted to designing elaborate ways to make business pay for everyone else's bad luck."

This "harmless" wealth transfer from out-of-state, "deep pocket" companies to local citizens is wrongly perceived as having no cost. Unfortunately, local citizens are not necessarily the ones who pay in the specific case being heard; otherwise, the results might be different.

Clearly, reforms in punitive-damages law are vitally needed by the entire nation. Reform can come in state and Federal courts, particularly in the Supreme Court, which last week agreed to decide whether the Constitution places limits on punitive damages. In an earlier decision, some members of the Court observed that issues, which, in an appropriate setting, must be resolved."

CONGRESS can also deal with the problem. A bipartisan products-liability bill containing punitive-damages reform won approval in a key House committee this year. In the states, courts and legislatures are making some progress in giving better direction to the penalty's use.

For example: Procedurally, trials of cases demanding punitive damages should be divided into two or more phases. In a first phase, the jury would only determine whether the defendant injured the plaintiff, hearing evidence just on this question.

Then, in second or even third phases the jury would decide on compensatory and then punitive damages if the case were still open. This dividing of trials into phases keeps the jury focused on the cause of alleged harm without being confused by often inflammatory, unrelated testimony on alleged damages.

Eighty percent of judges using bifurcation — a two-phase trial — believe it speeds up trials while improving fairness, according to a Louis Harris poll. New Jersey and Missouri laws expressly provide for some bifurcation, which is allowed by court practice elsewhere but not used frequently enough.

Additionally, good-faith compliance with up-to-date Government regulations like those of the F.D.A. should preclude the imposition of punitive damages. Certainly, this should be the case in an era where Government approval for the marketing of certain products is obtainable only after years of data gathering and careful review. Proposed Federal legislation and New Jersey law provide for an "F.D.A. defense."

Finally, judges should more closely review the amounts given in punitive damages and reduce disproportionate awards. Maximum dollar limits are also needed, and, just since 1986, eight states have enacted award-limit legislation. Who loses with these reform proposals? Only plaintiff lawyers and their already compensated clients who might hit the punitive-damages jackpot. But the whole country wins with potentially important gains in jobs, new and improved products, international competitiveness — and a fairer legal system for all. ■

Richard J. Mahoney is chairman and chief executive of the Monsanto

Forum

PUNITIVE DAMAGES

The Courts Are Curbing Creativity

By RICHARD J. MAHONEY

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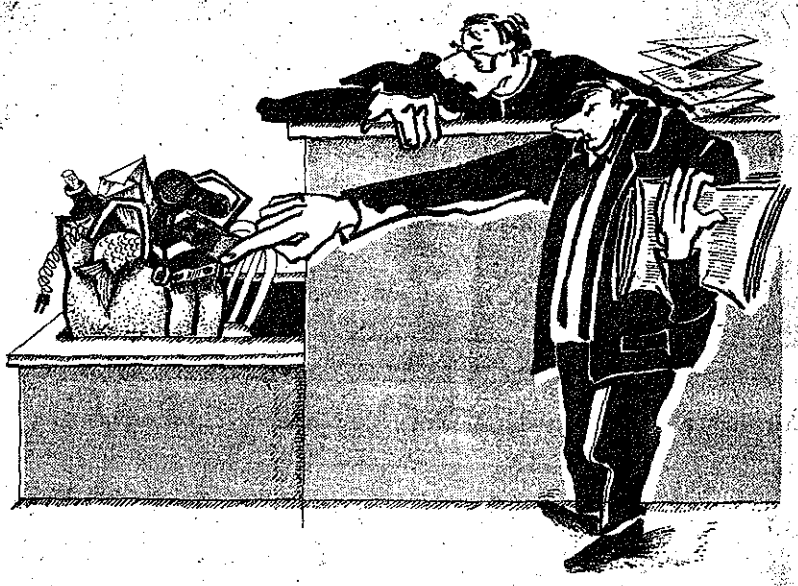
After the Searle verdict, our stockholders — large pension funds and small shareowners alike — lost $700 million in market value. That occurred partly because the significance of the case was greatly exaggerated in the public media, perhaps because of expectations of a big settlement. Both the Minnesota and Illinois cases are being appealed.

These experiences are known only too well by leading American companies. Punitive damages are an anomaly peculiar to the United States and are virtually unknown in the world's remaining civil-law countries. They also depart from usual American legal practice in that defendants are afforded few of the traditional safeguards. The result: Conduct liable for punitive damages is whatever a single jury says it is.

Commenting on punitive damages in a recent Supreme Court decision, Associate Justices Antonin Scalia and Sandra Day O'Connor observed that "this grant of wholly standardless discretion to determine the severity of punishment appears inconsistent with due process."

"Across the board, modern tort law weighs heavily on the spirit of innovation," concluded Peter Huber in his book, "Liability: The Legal Revolution and its Consequences."

A 1988 survey of chief executive officers by the Conference Board showed that uncertainty over potential liability had led almost 50 percent to discontinue product lines, and nearly 40 percent to withhold new products, including beneficial drugs. Half said product liability had a major impact on our international competitiveness, and 75 percent expected it to grow in significance.



My own company abandoned a possible substitute product for asbestos just before commercialization, not because it was unsafe or ineffective, but because a whole generation of lawyers had been schooled in asbestos liability theories that could possibly be turned against the substitute.

The punitive-damages system makes it too easy for lawyers to persuade a jury — possessing little scientific background but believing in the possibility of a risk-free society — to enrich plaintiffs and contingent-fee lawyers with multimillion-dollar windfalls.

In addition, according to the Congressional testimony of Malcolm E. Wheeler, a partner in a major law firm, "manufacturers are paying massive amounts in settlement of cases that should never have been settled, that should never have been filed and that certainly should not be resulting in these kinds of settlement sums."

The following is the dilemma of West Virginia Supreme Court Justice

We abandoned a possible asbestos substitute for fear of lawsuits.

Product Liability Mess" who wants the Supreme Court to set national standards: "As a state court judge, much of my time is devoted to designing elaborate ways to make business pay for everyone else's bad luck."

This "harmless" wealth transfer from out-of-state, "deep pocket" companies to local citizens is wrongly perceived as having no cost. Unfortunately, local citizens are not necessarily the ones who pay in the specific case being heard; otherwise, the results might be different.

Clearly, reforms in punitive-damages law are vitally needed by the entire nation. Reform can come in state and Federal courts, particularly in the Supreme Court, which last week agreed to decide whether the Constitution places limits on punitive damages. In an earlier decision, some members of the Court observed that issues, which, in an appropriate setting, must be resolved."

CONGRESS can also deal with the problem. A bipartisan products-liability bill containing punitive-damages reform won approval in a key House committee this year. In the states, courts and legislatures are making some progress in giving better direction to the penalty's use.

For example: Procedurally, trials of cases demanding punitive damages should be divided into two or more phases. In a first phase, the jury would only determine whether the defendant injured the plaintiff, hearing evidence just on this question.

Then, in second or even third phases the jury would decide on compensatory and then punitive damages if the case were still open. This dividing of trials into phases keeps the jury focused on the cause of alleged harm without being confused by often inflammatory, unrelated testimony on alleged damages.

Eighty percent of judges using bifurcation — a two-phase trial — believe it speeds up trials while improving fairness, according to a Louis Harris poll. New Jersey and Missouri laws expressly provide for some bifurcation, which is allowed by court practice elsewhere but not used frequently enough.

Additionally, good-faith compliance with up-to-date Government regulations like those of the F.D.A. should preclude the imposition of punitive damages. Certainly, this should be the case in an era where Government approval for the marketing of certain products is obtainable only after years of data gathering and careful review. Proposed Federal legislation and New Jersey law provide for an "F.D.A. defense."

Finally, judges should more closely review the amounts given in punitive damages and reduce disproportionate awards. Maximum dollar limits are also needed, and, just since 1986, eight states have enacted award-limit legislation. Who loses with these reform proposals? Only plaintiff lawyers and their already compensated clients who might hit the punitive-damages jackpot. But the whole country wins with potentially important gains in jobs, new and improved products, international competitiveness — and a fairer legal system for all.

Richard J. Mahoney is chairman and chief executive of the Monsanto

July 1980 Consumer Reports

The FTC starts a new life

After months of wrangling, a divided Congress finally agreed in late May to let the Federal Trade Commission live for three more years. Since 1976, the FTC had been forced to rely on a series of one-year funding resolutions, which has put something of a damper on its long-range activities.

Surprisingly, the new funding bill, known officially as the Federal Trade Commission Improvements Act of 1980 (H.R. 2313), was much less punishing to the FTC—and, by extension, to consumers—than consumer groups had feared. (See "The Assault on the FTC," CONSUMER REPORTS, March 1980.)

The turning point was President Carter's item-by-item outline to a Congressional delegation of an FTC bill he would consider minimally acceptable. This carried out his promise to consumers in February that he would veto a bill that threatened to cripple the FTC. The President had numerous objections, but he was particularly opposed to a provision that would have given either house of Congress the power to kill an FTC final rule simply by passing a resolution of disapproval before the rule took effect.

The President's message helped consumer-minded lawmakers nudge the FTC's opponents toward a moderate compromise on that and other points. In large measure, those lawmakers succeeded, rallying behind Representative James H. Scheuer (D., N.Y.) and Senator Bob Packwood (R., Ore.). The final version of the bill included the following:

Legislative veto. Congress will be able to kill an FTC rule if, within 90 days of the date that the rule becomes effective, *both* the Senate and the House adopt resolutions disapproving it.

Even a two-house veto presents practical and legal questions. Most obviously, it delays any rule for 90 days while Congress decides whether to kill it. And any rule submitted to Congress within 90 days of adjournment must be held over until the start of the next session, when the 90-day clock begins again.

And the legislative veto may well be unconstitutional, as President Carter and the U.S. Attorney General have stated. First, it takes away the President's veto power over Congress. Second, the Constitution gives the President, not Congress, the power to administer laws—for example, by issuing trade-regulation rules through the independent agencies.

Two other, subtler dangers lurk within the legislative veto, according to Robert B. Reich, the FTC's director of policy planning. The first is that businesses affected by a proposed FTC rule may decide that, rather than helping the FTC shape the rule, they will wait until it is released and then take the cheaper and more efficient step of lobbying Congress to kill the rule. The second danger, says Reich, "will be the inevitable tendency by the FTC staff to check out the terrain with the Hill on a rule"—that is, to try to forestall vetoes by writing rules that will conform to Congress's mood.

In our view, that tendency could expose the FTC (and other regulatory bodies) to the special-interest pressures so evident in legislative proceedings.

Funeral rule. In an almost complete turnabout, Congress gave the FTC permission to issue a funeral rule substantially the same as the one issued in March 1979 and delayed because of Congressional ire. The FTC can require funeral directors: to furnish consumers with itemized prices; to get permission before embalming, using expensive caskets, or providing other services; and to stop making such misrepresentations as "embalming preserves the body." Even those requirements fall far short of the protection the FTC had originally considered (CONSUMER REPORTS, August 1979).

Children's advertising. Congress permitted the FTC to continue its rulemaking on children's TV commercials, but said that any rule will have to be based on whether the advertising is *deceptive* rather than *unfair*. The FTC had placed unfairness at the heart of its proceedings, since current law specifically allows the FTC to issue rules governing unfair as well as deceptive business practices. (Regardless of subject and audience, the FTC won't be allowed to base *any* advertising rule, for the duration of its three-year funding, on unfairness.)

While Congress gave the FTC permission to use the massive record collected thus far in putting together a final rule, the new limitation may hinder the children's advertising proceeding and other investigations to come. Advertisers, and sellers generally, are skilled at finding manipulative practices that fall short of deception but manage to accomplish the same promotional result.

While Congress prohibited the FTC from using unfairness in a trade-regulation rule affecting an entire industry, unfairness can still be the basis for legal action against an individual company.

Insurance. The FTC will be allowed to study the insurance industry only if the Senate or House commerce committees ask it to. That is the result of recent FTC studies that angered the insurance industry, especially a hard-hitting probe of the low rates of return on cash-value life insurance.

The Congressional restriction is, however, better than an earlier proposal to take the FTC out of insurance investigations altogether. It leaves the door open to permit studies of auto-insurance rate discrimination, debit life, and "medigap" insurance, all of which were previously on the agency's investigative list, and all of which involve practices that may victimize consumers. But it also leaves the door open for insurance-industry lobbyists to convince the commerce committees that no studies need to be done.

Public-participation funding. Congress made only minor changes in the FTC's authority to give money to citizens' groups that may make valuable contributions to rulemaking proceedings but can't afford to participate without financial help. (CU, for example, has received aid for taking part in the proceedings on funeral practices and children's TV advertising, among others.)

Congress placed a $75,000 ceiling on the amount that any person or group can receive for one rulemaking proceeding, and no one can receive more than $50,000 in one year. Congress also set aside, for the first time, 25 percent of the $750,000 public-participation budget to be granted solely to small businesses.

Attorneys' fees. Congress backed away from a Senate proposal that might have forced the FTC to pay attorneys' fees to companies or individuals if the agency sued and lost.

For the most part, FTC officials deny vigorously that the agency has become gun-shy on tough or controversial issues because of the recent pounding from Congress. The officials concede, however, that they have become more realistic. Evidence that might support a rule is examined more critically than before, they say, and it is clear that the number of proposed rules will be far below the level of a few years ago. Will the FTC become too cautious as a defender of consumers in the marketplace?

"There is a big difference between caution and timidity," says Robert Reich firmly. "I don't see timidity here." But consumers will have to monitor the FTC carefully in the future for assurance that Reich is right. And it would be a good idea, when other regulatory agencies come up for approval, to keep a wary eye on a Congress that has proved susceptible to business pressure.

LATKER

Putting a Price On Patents

By setting a range of prices, the licensing model encourages negotiation for inventions



Bruce Marquart, Peter Vollers, and Allah- model that sets predictable negotiating

By Jackie Friedrich

In April, 1979, Peter Vollers was consulting for the Swedish Industrial Development Corp., a venture capital subsidiary of Statsforetag AB, which is particularly interested in bringing American technology to Swedish companies. One particularly slippery task came Voller's way when he was asked to rationalize the price for a hydraulic safety valve for a Swedish tool manufacturer.

When Vollers, a recent graduate of the Columbia Graduate School of Business, interviewed industry specialists to determine how they arrived at prices for technology, he found the prevailing rule-of-thumb approach irrational. He hypothesized that a computer-guided graphic capital investment model could prove most helpful not only in this case, but in hundreds more like it.

Working from his apartment and utilizing timesharing and Columbia University computers, Vollers and his partners, Bruce Marquart and Allahyar Akhavan, developed a model utilizing over 140 separate factors as they applied to a particular invention. While the model won't fix a price for an invention, it will, among other things, document what a licensor can rationally expect. On the other side of the coin, it determines how much of a royalty a licensee can absorb and still have an attractive return on investment.

"The model doesn't appraise asset or replacement value, as in real estate," Vollers explains. "Rather, it assesses the riskiness of cash flow streams and the effect this has on income possibilities for the licensor." As a result, the licensor and licensee can see where a new business is sensitive from an economic standpoint.

According to Vollers, this kind of documentation leads to tighter bargaining since the model sets a predictable negotiating range. And, since the model sets up a range of equitable prices, it fosters an atmosphere of cooperation and compromise which can steer parties toward agreement and away from the kind of Mexican stand-off which occurs when prices are light years apart and neither party will budge from his position.

Vollers and Marquart, both 31, had begun work on the model through International Technology Resources Inc., a New York City company they had incorporated for $1,000 in the spring of 1978 while still MBA candidates. A consulting firm which specializes in licensing, ITR had by this time built enough of a cash flow (through consulting fees from such clients as the Swedish Development Corp., Avon Products Inc., and SCM Corp.) to allow the partners to develop their licensing model. They brought on board another Columbia alumnus, Akhavan, 28, whose specialty is computer programming. Each partner—Vollers, president; Marquart, vice-president, marketing; and Akhavan, vice-president, new products—owns one third of ITR.

The model, which has been on the market since last summer, sets pricing boundaries: The maximum royalty burden for an invention is at one end, and the minimum acceptable price at the other. These boundaries are shown in graphs and tables.

The maximum royalty burden, which becomes the outer limit of the pricing boundary, is determined by testing various royalty provisions. This exercise shows how an increase in royalty payments to the licensor would affect the investment decision by the licensee.

Setting the lower boundary, the model estimates the various out-of-pocket costs incurred by the licensor. This sets the minimum acceptable price, below which the licensor will not sell his technology.

In between the maximum royalty burden and the minimum acceptable price is a gray area—the "least alternative threshold." Negotiations usually focus in this range, which represents the amount it would cost a licensee to design around the patent, invent from scratch, acquire alternative technology—or to openly violate the patent.

One of the first clients to come ITR's way is Arthur M. Harris, a prolific Hollywood, Fla., inventor with 220 to 230 patents to his credit, including a metered pump used on Primatene Mist and a non-wetable surface licensed to a division of American Hospital Supply Corp. for use on disposable trays. His latest invention is disposable forceps to be used in biopsies. The device took about four months to bring to the patentable stage and two years to receive a patent (it was issued last April). The plastic instrument can be tossed out after each operation because of its low cost, about $15 retail, compared with about $200 for typical metal forceps now on the market.

Along the way, Harris picked up two partners, Technology Catalysts Inc., an Arlington, Va.-based startup company which offers services such as technology scouting, feasibility evaluations, and ITR's model to its 260 clients; and Marketing Technology Inc., a Dallas-based consulting firm which was appointed agent for Harris' forceps. In return for about $50,000 worth of expertise in developing marketing and business plans, the two companies received half-interest.

Prior to coming to ITR, Harris had negotiated with some 20 companies. His asking price had been a $100,000 lump sum payment, $100,000 minimum royalties per year, and a 10% royalty over the 17-year life of the license agreement. There were no takers.

In Technology Catalysts' behalf, ITR tackled the forceps. Vollers and his partners developed a model which set Harris' minimum acceptable price at $200,000.



Brian Wolfe

yar Akhavan devised a computer-guided boundaries for licensees and inventors

assuming that the inventor would help bring the forceps to the production stage. The licensee's least cost alternative was set at between $300,000 and $600,000. The maximum royalty burden was given a range of from 8% to 10% over a five-year period, at which point the licensee's return on investment would approach 20% to 25%.

Through market analysis, Vollers ascertained that the forceps have a potential for annual sales of $70 million to $90 million in the U.S. The licensee, he felt, could sustain the 10% top-of-the-line royalty. But he also deemed it unlikely that any buyer would pay such a large percentage in the first years of sale for a product not yet at prototype stage.

The model set a target of $18 million return to Harris and his partners over 10 years. "We assume that capital gains taxes will cut the return to $13 million," Vollers says, "and inflation will reduce it to about $6 million in real 1980 dollars." Vollers suggested that Harris might have to bring his product closer to commercialization and assume more of a risk to make the forceps attractive to a buyer. One way to do this would be to take his income out *after* the investor in order to encourage the licensee to bring the product to the commercial stage. Harris also could decrease his royalty percentage, and supplement his income with other compensatory factors, such as asking for a 20-year "know-how" agreement whereby he would work closely with the company to further develop the forceps.

"The best company for Harris to license to would be a medical equipment manufacturer with sales in the $3 million to $20 million range," Vollers suggests. "They should sincerely be looking for product expansion. Most larger companies do very little outside licensing."

According to Michael Treble, president of Marketing Technology, three firms are currently negotiating with Harris, including one that would set up a joint-venture arrangement. Another avenue would involve licensing the forceps overseas, allowing a foreign company to bring the product to prototype stage, at which time the product would be more saleable in the U.S. Yet another possibility is to gather some venture capital and start a company from scratch. Treble particularly credits the investment model for clarifying this last possibility. "We would be looking for $1.2 million over a five-year period," he says. "That would allow us to develop additional products and give us a return in excess of 25%."

The model makers say individuals lose a lot of money by 'seat of the pants' style of negotiating

At presstime, Harris had reached no deals with licensees or venture capitalists. But both Marketing Technology and Technology Catalysts are expecting big doings from their partnership. Richard DiCicco, president of Technology Catalysts, says he has found the model particularly useful in proving to buyers that the price is fair. "Most licenses are for a 10-year period," DiCicco explains. "The model can predict, for example, that a licensee will be in a cash bind in year four. We can then negotiate and take off a few royalty points in that year so the business won't go down the drain."

The model also takes into account such assumptions as inflation. "The model can make the price of fuel a line item," DiCicco continues. The line item "can be manipulated mathematically. We can put a clause into the contract that says: 'If the price of oil goes to X, then we will lower a royalty point.' "

As Marquart, Vollers' partner, points out: "Many deals fail because no one could work out the impact of the change within a half of a percentage point. The model can do that in 30 seconds."

By the end of 1980, Vollers says ITR's revenues had amounted to $100,000. In addition to Technology Catalysts and the Swedish Industrial Development Corp., ITR has signed on such clients as a major European transportation company, the Japanese Trade Center, and Twining Tea. In a sense, the model remains untested, however, since negotiations in which it has played a part have yet to be finalized.

While each of the client corporations could have performed in-house analyses similar to the ones provided by ITR's model, each determined that a less expensive approach was to hire Vollers' firm to do it. For the initial $5,995 fee, clients receive ITR's "veal cutlet model," Vollers says, the 140-factor, full-scale model which provides a recommended price as well as alternative pricing strategies. For additional services, ITR receives a $2,000 monthly retainer.

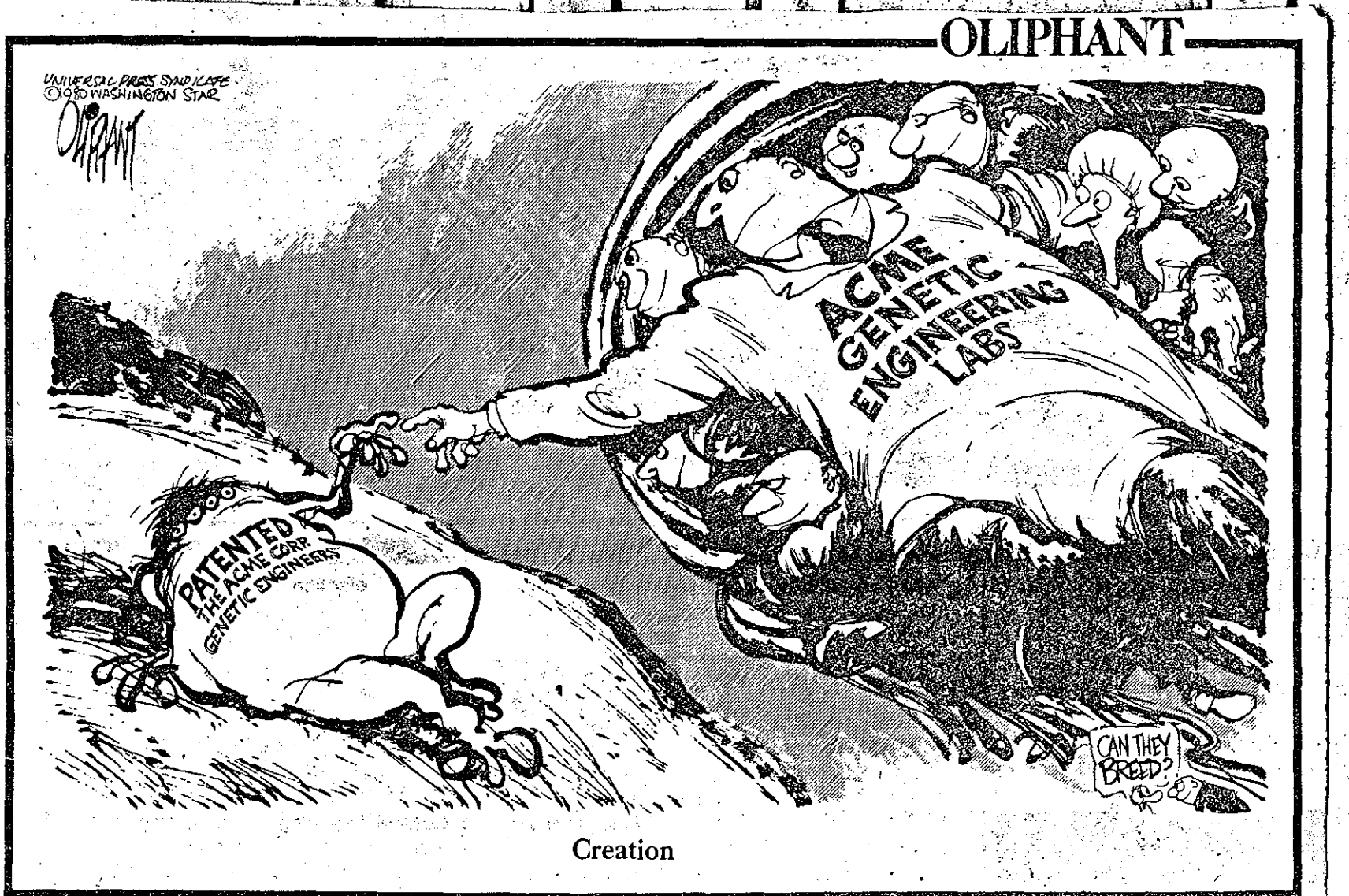
Vollers expects ITR will have 10 clients within the year, primarily licensors and licensees in the chemical and medical fields. He "conservatively" estimates 1981 revenues at $300,000.

While Vollers and his partners work primarily with large companies, the model makers say their hearts are with the inventors and small research and development companies. This group, Marquart says, "has lost a lot of money by the seat-of-the-pants approach," because they come to negotiations with large companies on unequal footing. Either the technology is undervalued or the inventor asks for conditions so unrealistic that deals never come to fruition.

To put ITR's services within the grasp of the individual inventor, Vollers says they have developed "a quick and dirty analysis," a model utilizing 12 factors that costs a mere $1,500 a crack. They have signed on two clients so far.

Vollers offers one word of caution: "If an inventor feels he has pulled the wool over the licensee's eyes, that's the time to worry." He points out that many licensees tire of paying royalties which they consider too costly, and an inventor may be forced to go to court to collect unpaid royalties. "One in six patents is declared not valid—and that's not good for the inventor," Vollers says.

ITR's model can perform numerous functions in addition to setting price guidelines. It can consider a variety of tax consequences, for example, or translate the laws of a foreign country into numbers that can be analyzed as line items, or perform "post mortems" on deals to determine if the licensee made a good bargain. But there is at least one thing it cannot do. "The model can't guarantee successful negotiations," Vollers acknowledges. "It does guarantee you'll operate within reasonable ranges. It will tell you when to say 'no' to a deal." ■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CAN THEY BREED?

Creation

Article on Eureka

WASH. STAR 4/28/80

Rod MacLeish

The decline of the solitary genius

The man who invented the zipper was named Whitcomb L. Judson. If he tried to market his idea in this day and age he'd probably have a bad time.

He'd have to file 400 government documents, Ralph Nader would get all hot-eyed and appoint a Task Foce on the Perils of Pinched Flesh; the button industry would take out ads on the op-ed page of *The New York Times* denouncing Whitcomb Judson for imperiling the jobs of thousands of button-makers.

Mr. Judson, along with Benjamin Franklin, Alexander Graham Bell, Ernest A. Hamwi (he invented the ice cream cone) and King C. Gillette (safety razors), is featured in a new road show assembled by the Small Business Administration honoring 12 American inventors.

The idea behind the show is to encourage contemporary inventors. Apparently there's been a fall-off in inventing lately.

Small wonder. The present American scheme of things isn't very encouraging to the solitary genius toiling away at a bright idea in his basement.

The individual inventor is gambling that his time, brains and what cash he can scrape up will eventually pay off. His competition is institutional invention called Research and Development. It employs thousands of brainy people and spends millions of dollars at low risk.

The expenses of commercial research and development are passed on to the consumer. If R & D invents a weapon that will reduce the population of Albania to green flakes, the government picks up the bill.

Old-fashioned inventors like Mr. Judson, Thomas Edison and George Westinghouse were inspired by obvious needs. They invented useful things that didn't exist. Leonardo Da Vinci tried to invent air conditioning in the 16th century after the Duchess of Milan complained about the heat.

Research and development does produce much that is life-enhancing. but a lot of commercial R & D is profit-pressured and tends to focus its energies on what we want, not what we need. Home video tape recorders, Barbie Dolls and hang gliders result from market research, not the inspiration of geniuses. Such things don't have to exist.

Individual inventors are often seen as threats to the inefficient American order of things. The two guys who produced that car which went an astonishing number of miles on practically no gasoline gave Detroit a migraine headache.

Necessity is no longer the mother of invention, the groupthink of R & D resists inspiration, the system is stacked against the individual genius. This country still needs road surfaces that don't crumble into potholes, sensible automobiles and a good five cent cigar. What's invented for it are Barbie Dolls and hang gliders.

WASH. POST. MAR. 14, 1979

U.S. Would Relax Preference To Small and Minority Firms

By Art Pine and Claudia Levy
Washington Post Staff Writers

The Carter administration has agreed to overturn longstanding policy requiring key federal agencies to earmark specified portions of their procurement business for domestic firms, small business, minority enterprises and other groups.

The new procedures, which are expected to provoke a storm of controversy, are part of a long-sought provision in the multilateral trade agreement, which is in the final stages of negotiation.

As part of that trade pact, the United States has agreed to allow foreign producers greater access to bidding on federal contracts here in return for a pledge by European governments and Japan to open up more of their procurement business to American exporters.

To carry out its part of the agreement, the administration has pledged to relax current restrictions in federal procurement policies that have required key agencies to grant special preferences to domestic firms, small business and minority companies.

Sources said the changes will allow foreign manufacturers to bid on an estimated $10 billion in added business. In exchange, European governments have promised to lift restrictions on about $25 billion worth of business to allow U.S. firms to bid.

The difficulty domestically is that, while the changes will help U.S. exporters, they will hurt the very firms that four previous presidents had

See TRADE, A20, Col. 1

Small and Minority Firms Face Loss of Preference

TRADE, From A1

tried to protect. As a result, although the liberalization has been long sought by U.S. policymakers, it may spark some ire.

Rep. Joseph P. Addabbo (D-N.Y.), chairman of the House minority enterprises subcommittee, is expected to make a speech on the House floor today denouncing the provision as a setback for longtime efforts to encourage black-owned businesses.

According to the administration's own figures, the shift would affect approximately $9 billion worth of the $18 billion in federal procurement contracts now awarded to small business. Officials yesterday had no separate breakdown for minority firms.

However, administration officials stressed that the tradeoff also would enable U.S. firms, both large and small, for the first time to crack the lucrative foreign government procurement market.

In general, the easing of restrictions would apply only to government purchases whose value exceeded 150,000 "special drawing rights," an accepted international measure that currently translates into about $190,000. That figure would rise if the dollar declined.

However, the liberalization would apply only to selected government agencies. It would not affect entities such as the Tennessee Valley Authority, or Defense Department purchases of shoes, steel, textiles and a spate of other specifically exempted items.

Officials said the United States still is negotiating for broader Japanese concessions. The administration wants Tokyo to allow bids on purchases by the Nippon Telephone and Telegraph Corp. and other big firms.

Critics of the administration's action contended that relaxing the small business preferences would in effect leave most government procurement here in the hands of large corporations. Small business now provides about 20 percent of Washington's $90 billion yearly purchases.

The current "Buy America" order requires federal agencies to award purchase orders to U.S.-based firms unless foreign companies underbid them by at least 6 percent—or up to 12 percent in the case of small businesses and 50 percent in the case of Defense Department contracts.

Norm Latker

THE NEW YORK TIMES, FRIDAY, APRIL 28, 1978

Yes, Throw Money at Problems

By Theodore Levitt

BOSTON—Every sustained wave of technological progress and economic development everywhere has been fueled by greed, profiteering, special privileges and megalomania.

The presumption that we can now have in an orderly, planned, pust and dignified fashion some great liberating wave of scientific and technological development to "solve the energy problem" is fantasy.

Greed must be served with privileged subsidies, special favors, profiteering, waste and even graft. Enormous sums must be easily available, and more expected, in pursuit of sometimes vague and wishful promises. These are as inescapably necessary now as they have always been.

Not even Thomas A. Edison, putatively the most incorruptible of our industrial benefactors, was simply a kindly old man catnapping between inventions in his laboratory. He had much in common with his contemporary John D. Rockefelled. In those days nobody mistook either for selfless missionaries out only to improve the world. It was not simply to bestow honor that the proper noun "Edison" appears yet today in the names of so many large electric companies.

America's "manifest destiny" was driven by the greed of adventurers, speculators, inventors, politicians and builders who regularly wrenched what we would now call illicit gains from tawdry practices. Even the Jamestown settlement was a monopoly grant to the privileged and the favored.

Nor are the Manhattan Project, which produced the atomic bomb, or the bomb, or National Aeronautics and Space Administration, which sent men to the moon, evidence to the contrary. In both, private firms, speculators and scientists, often in league with politicians, received almost unlimited and, by comparison with current practice, unsupervised billions from a Government eager for fast results.

The great revolution in electronics that infuses us so fully today began during the Korean War when subsidies, grants and contracts (combined with highly felicitous tax treatments) tumbled massively and seemingly wastefully out of Washington in undiscriminating abundance to professors, scientists, engineers and organizers—all turned hustlers in pursuit of riches and power.

The Manhattan Project was the model. It "proved" the wisdom of putting big money behind proposals clearly focused on the translation of a theoretical possibility into a practical result. So it must be now for energy research and development.

Raising further the price of oil to encourage the development of other energy sources helps, but mostly only those already well-funded—the large corporations, which are thereby encouraged to bet on possibilities not yet developed. And *that* they are doing, though in insufficient magnitudes. It encourages little those thousands of other potential sources of ideas and applications that are fundless.

Tax "reform" has so drastically cut capital gains and income-offsetting incentives that the flow of venture capital for nascent purposes has virtually dried up. In 1968 over 300 high-technology companies were founded in the United States; in 1976, none.

The Government increasingly has to supply the venture funds that, because of tax "reform," have stoppped being supplied by the private sector itself. Hence the Department of Energy will spend $2.8 billion for private research and development this year.

But this compares with $43 billion we will ship abroad this year for oil. A Band-Aid for a hemorrhage. And it's applied grudgingly, with the analytical care of a brain surgeon. But why all this extreme care? Does it matter that we might mistakenly or irresponsibly give some money or special tax benefits to charlatans at home for a time rather than to cartels abroad for generations?

Hundreds of shoestring scientists and technicians struggle throughout the land on solar-energy systems, underfinanced, understaffed and short of sophisticated help. Yet the sun shines, the wind blows, the oceans heave, the coal waits, and the concepts are more promising than was the atom bomb.

Research on hydrogen-based fuel and fuel cells has poked along on fiscal scraps for over 40 years. Work on geothermal energy languishes, largely for want of drilling technologies that penetrate deep layers of granite and for want of corrosion-resistant metals. No price was too high to develop new metals for our lunar landing. Now, by comparison, minuscule funds from Congress for really urgent needs are doled out cent by cent by [redacted]

How rational is it to forgo thus the possibility of saving hundreds of billions of dollars and redressing the balance of the world's economic and political affairs? What matters it that some of the money, perhaps a great deal, is wastefully spent, that some might profit excessively and others fraudulently? What matters it that at public expense private fortunes might be created at home in order to reduce our contributions to fortunes abroad? Though it is said that "you can't rush science or development," surely you can starve and strangle it.

What's needed is that almost irresponsibly massive infusions of money become almost irresponsibly available for large and diverse numbers of moderately plausible proposals for energy-crisis alleviation. The Congress and the Department of Energy can get things moving by eagerly spending a great deal more, and a lot faster. At most, one needs only to guard against obvious thieves.

[redacted] with $43 billion shipped abroad each year to the Organization of Petroleum Exporting Countries cartel, how is it prudent to spend so little to stop it, to practice a paralyzing prudence in the distribution and surveillance of such skimpy funds?

Why ask where more research and development funds would come from when funds are constantly found for overseas oil and for tax-avoiding investments in municipal-pollution-control bonds?

War is a condition in which we'd rather die than change our minds. No cost is too great. Why is it "too costly" to tap the fires of the earth or sun, or the brains and organizing skill of private performers, in order to preserve our independence and promote our interests, as in war? [redacted]

Theodore Levitt is professor of business administration at the Harvard Business School.

NJL's package

Jack Anderson

Small Firms Stinted on Research

Following their ephochal 1903 Kitty Hawk flight, the Wright brothers got a five-year runaround from Washington before receiving any government financial help to pursue their aeronautical research. Small-time inventors and innovative businessmen today are getting the same short shrift, even though billions are being doled out by the federal government for research and development.

Butter-fat corporations lap up the cream from the research subsidies, even though they're interested more in profits and cost-cutting than new inventive breakthroughs. Small companies with fewer than 1,000 employes get skim milk from the federal churn.

Yet the little enterprising businesses rather than the corporate giants have been responsible for such developments in this country as insulin, zippers, power steering, ball point pens and self-winding watches. This was in keeping with the tradition of individual inventive geniuses symbolized by the Wright brothers, Alexander Graham Bell, Samuel Morse and Thomas Edison.

The superiority of small business research has been cited in a study which the Office of Management and Budget strangely never published. The study credited firms having than 1,000 employes with almost half of the industrial innovations between 1953 and 1973.

According to the study, 16 small technology firms created 25,558 jobs for American workers during the 20-year period because they came up with new ideas. Yet the budget office was advised that small firms were drawing inadequate funding from the government, getting less than 4 percent of the research and development layouts.

Spurred by the report, the budget office drafted a memo intended for all federal agencies, urging vigorous efforts to channel more of the research to small businesses "which are having difficulty in competing in the big leagues."

The memo added, "there is considerable evidence that the small proportion of federal research and development work that is being awarded to small technologically based firms is contributing to a serious loss of high technology capabilities in our nation. It is important that we see some real progress within the first 18 months of the administration."

This ringing call for a new deal was never sent to the agencies. Les Fettig, head of the office that was supposed to be directing the crusade, said the report and the memo were news to him until we asked what happened. He explained that the documents "fell through the cracks" during the transition period between the Ford and Carter administrations.

Fettig said his office is alert to the problem and is taking steps to make it easier for small businesses to get research and development help.

Footnote: Investigation shows that the Energy Department under James Schlesinger has been perhaps the worst offender in government in encouraging research at the Little League level. The department claimed it awarded 10.3 percent of its research contracts to small operators in the 1977 fiscal year. The General Accounting Office has challenged the statistic. GAO auditors found the amount was about 2.6 percent, because the Eenergy Department has counted subcontracts that trickle down from the big corporations.

Postal Proposal — An idea that could help reduce the postal deficit and provide the pay increase postal workers are demanding has been run up the flagpole for Postmaster General William F. Bolger. He seems ready to salute it.

Bolger is giving serious attention to the imaginative proposal of Miami public relations wizard Hank Meyer that the hundreds of thousands of mail boxes and postal delivery trucks throughout the United States be used as advertising space.

Meyer stressed in his private presentation to Bolger that he wasn't suggesting the Postal Service provide billboard-style space for promoting junk products. Under his plan, the advertising and public service messages would be subject to approval of the postal authorities.

Vacant space is available on an estimated 180,000 postal vehicles and 400,000 street deposit boxes, which could be rented for advertising.

Bolger still hasn't made a decision but if the Postal Service adopts the idea, an advertising agency would be selected by competitive bidding to run the ad operation.

On the last page of the Business Week article, there is a story about a small company who wouldn't take Government funds because of possible loss of invention rights. The company gave the Japanese 49% of the company for the necessary venture capital rather than lose these rights.

Norm.

VANISHING INNOVATION

A hostile climate for new ideas and products is threatening the technological superiority of the U. S.

A grim mood prevails today among industrial research managers. America's vaunted technological superiority of the 1950s and 1960s is vanishing, they fear, the victim of wrongheaded federal policy, neglect, uncertain business conditions, and shortsighted corporate management. They complain that their labs are no longer as committed to new ideas as they once were and that the pressures on their resources have driven them into a defensive research shell, where true innovation is sacrificed to the certainty of near-term returns. Some researchers are bitter about their own companies' lax attitudes toward innovation, but as a group they tend to blame Washington for most of their troubles. "[Government officials] keep asking us, 'Where are the golden eggs?' " explains Sam W. Tinsley, director of corporate technology at Union Carbide Corp., "while the other part of their apparatus is beating hell out of the goose that lays them."

That message—and its implications for the overall health of the U. S. economy—is starting to get through. Following months of informal but intense lobbying led by such executives as N. Bruce Hannay, vice-president for research and patents at Bell Telephone Laboratories Inc., and Arthur M. Bueche, vice-president for research and development at General Electric Co., the White House has ordered up a massive, 28-agency review of the role government plays in helping or hindering the health of industrial innovation. "Federal policy affecting industrial R&D and innovation must be carefully reconsidered," wrote Stuart E. Eizenstat, the White House's domestic policy adviser, in a recent memo outlining the review's intent.

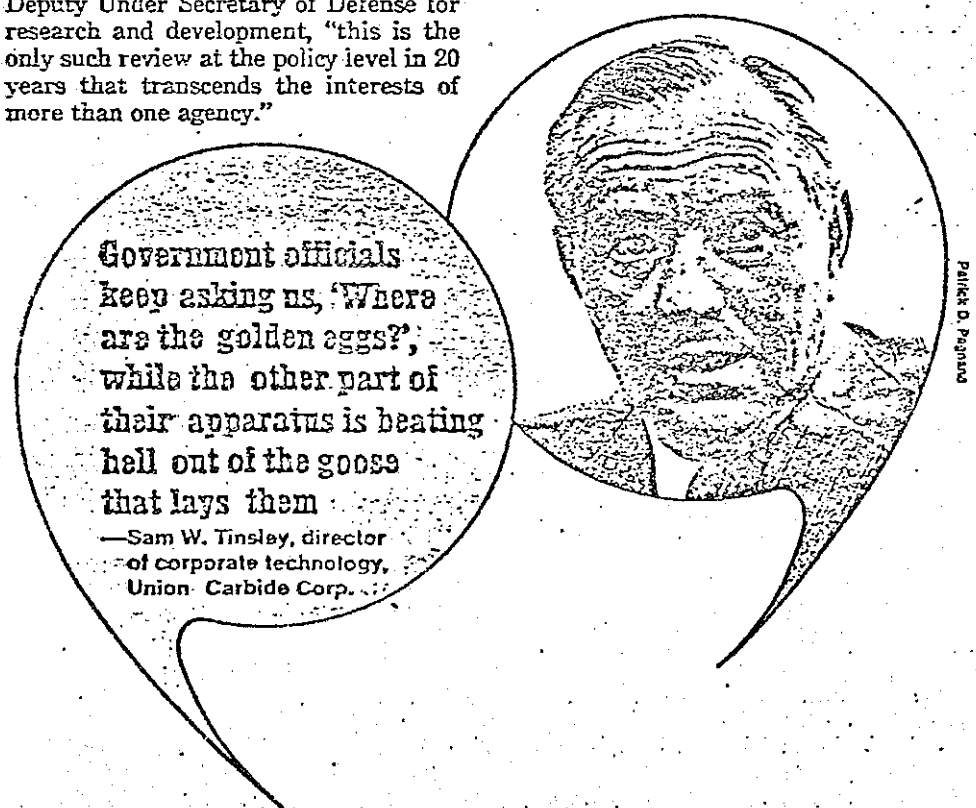
One thing that the study clearly will not accomplish is a quick fix for the deepening innovation crisis. The problem is regarded as immensely complex by the Administration, and is inextricably tied to other economic dilemmas now facing Carter's White House.

"Historically, the government's role has been to buy more science and R&D," says Martin J. Cooper, director of the strategic planning division at the National Science Foundation (NSF). "Now maybe we better go with investment incentives." Says Jordan J. Baruch, Assistant Commerce Secretary for science and technology, who will be the review's day-to-day manager: "This study developed in an environment of people concerned about economics, business, and technology."

The Administration's concern is underscored by the fact that it is organized as a domestic policy review, the highest sort of attention a problem can receive within the executive branch. Among its objectives, such a review must produce options for corrective action by the President. According to Ruth M. Davis, Deputy Under Secretary of Defense for research and development, "this is the only such review at the policy level in 20 years that transcends the interests of more than one agency."

The White House also seems determined not to conduct the study in a governmental vacuum. Baruch is soliciting input from groups such as the Industrial Research Institute (IRI), the Business Roundtable, and the Conference Board. "We want both CEOs and R&D vice-presidents," says a White House official. Labor groups have been asked to participate, too, along with public-interest groups. Congressional leaders such as Senator Adlai E. Stevenson (D-Ill.), chairman of the Senate subcommittee on science, technology, and space, have been brought into the early planning. And the 28 agencies involved extend beyond obvious candidates, such as the Environmental Protection Agency, to the Justice Dept. and even the Small Business Administration.

The study's scope is so sweeping, in



Patrick D. Pagnano

fact, that some federal officials are talking about a "thundering herd" approach to policymaking. But one government science manager demurs. "It beats having one guy write a national energy program in three months," he sniffs.

Philip M. Smith, an assistant to Presidential science adviser Frank Press and an early organizer of the study, concedes that "a lot of people have told us that we are likely to fail." But such skepticism, he believes, does not take into account the considerable clout of those involved in the effort. Commerce Secretary Juanita M. Kreps, for example, is chairing the study, and she heads a coordinating committee whose members include Charles L. Schultze, chairman of the Council of Economic Advisers, Administration inflation fighter and chief trade negotiator Robert S. Strauss, and Zbigniew Brzezinski, Carter's national security adviser. Even more important is the support of Eizenstat, who, says Smith, "is very interested in this particular review."

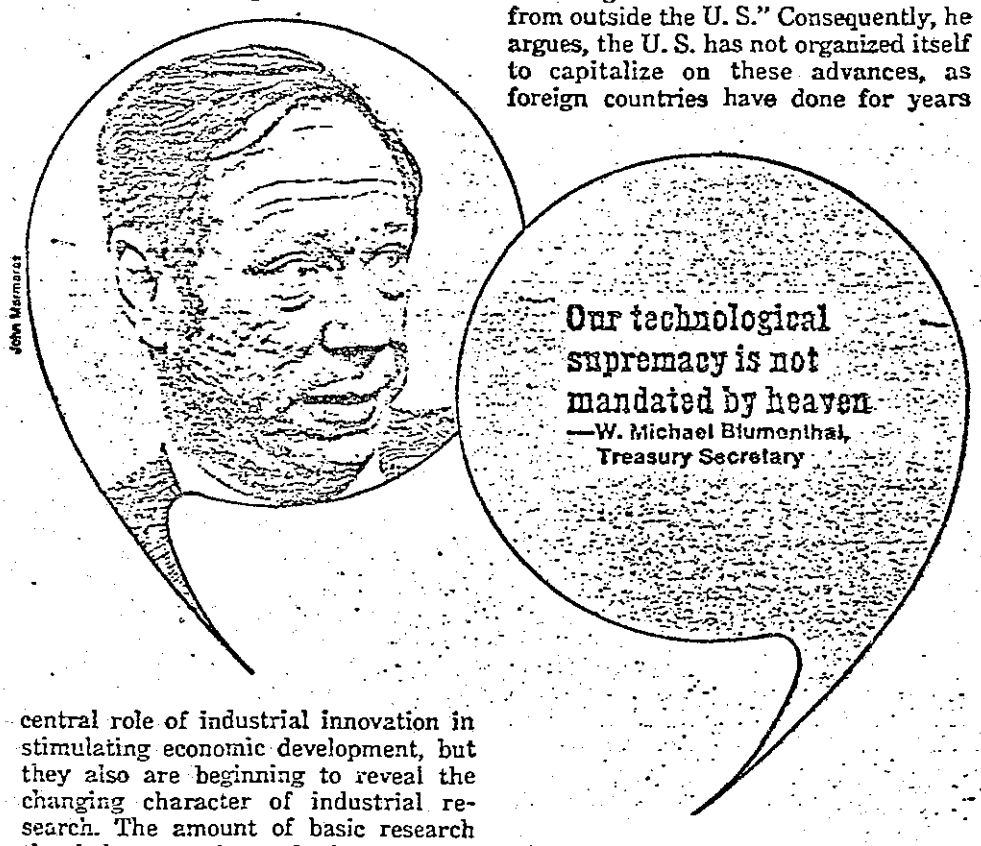
Finding 'new directions'

On the other hand, there is already grumbling within the Agriculture Dept., which was left off Kreps's committee. "We are red-faced," says a high-ranking Agriculture official. "We are out of the project because this Administration and those before it do not place any priority on agricultural research." However, Jordan Baruch insists that the department will play a role in the study. Agriculture experts point out that farm commodity exports of over $24 billion play a key role in the U. S. balance of payments. They note also that superior technology is the basis of the commanding American position among world food exporters.

Whatever its outcome, the White House policy review is being undertaken at a time when, as Frank Press puts it, "we badly need some new directions." Many experts view with alarm the declining federal dollar commitment to R&D, which has dropped from 3% of gross national product in 1963 to just 2.2% this year. For its part, industry as a whole has more or less matched the inflation rate and then some with its own spending. But such macroscale indicators do not tell all. "We've got to find out what the story is sector by sector, because each industry is going to be different," says Press. "We also have to find out what's going on abroad."

Better data on the relationship between industrial innovation and the health of the economy are becoming available. According to a 1977 Commerce Dept. report, for instance, technological innovation was responsible for 45% of the nation's economic growth from 1929 to 1969. The study went on to compare the performance of technology-intensive manufacturers with that of other industries from 1957 to 1973, and found that the high-technology companies created jobs 88% faster than other businesses, while their productivity grew 38% faster.

The numbers help to establish the central role of industrial innovation in stimulating economic development, but they also are beginning to reveal the changing character of industrial research. The amount of basic research that industry performs, for instance, has dropped to just 16% two years ago from 38% of the national total in 1956.



And a new IRI survey of member companies for the National Science Foundation demonstrates how federal policy has directly altered the nature of the research effort in another way, making it more and more defensive. The study shows that surveyed companies increased R&D spending devoted to proposed legislation by a striking 19.3%, compounded annually, from 1974 to 1977. And the rate was 16% a year for R&D devoted to Occupational Safety & Health Administration (OSHA) requirements. "When overall R&D spending is not growing nearly this fast," note the survey's authors, George E. Manners Jr. and Howard K. Nason, "other categories of effort—especially research—must be suffering."

Other observers compare the viability of industrial innovation in the U. S. with that of foreign countries. One expert is J. Herbert Hollomon, director of the Center for Policy Alternatives at Massachusetts Institute of Technology. According to Hollomon, a reason the U. S. is losing its leadership is that "we're arrogant—we have an NIH [not invented here] complex at the very time a majority of technological advances is bound to come from outside the U. S." Consequently, he argues, the U. S. has not organized itself to capitalize on these advances, as foreign countries have done for years with American knowhow. Since as much as two-thirds of all R&D is now conducted by foreign laboratories, Hollomon says, it should be no surprise that they have taken the lead in such technologies as textile machinery and steel production.

"We essentially prohibited West Germany and Japan from defense and space research," says Hollomon. "So it's no accident they concentrated on commercial fields." He adds: "I believe other nations better understand that the innovation process is important."

Says a research director for one high-technology company: "For a country like ours, the technology leader of the world, what has been happening is downright embarrassing." Indeed, even the presumed sources of strength in a consum-

er-oriented society are today under intense pressure. "Our experience with Japan in the consumer electronics industry—namely televisions, radios, audio, and transceiver equipment—shows some of our weaknesses," testified Gary C. Hufbauer, a Deputy Assistant Treasury Secretary, before a congressional subcommittee. In 1977, he said, "we had a $3.6 billion trade deficit with Japan in high-technology goods, and about two-thirds of this was accounted for by imports of consumer electronic goods."

The role of regulation

The cumulative response to these developments has been alarm. "The system has now sharpened its pencils in a way that discourages changes that are major," worries Robert A. Frosch, head of the National Aeronautics & Space Administration. "We have been so busy with other things that we may have inadvertently told the people who think up ideas to go away."

Even labor unions, which historically have left R&D decision-making up to corporate board rooms, now are complaining about lack of innovation. "Having helped to develop and pay for this technology," says Benjamin A. Sharman, international affairs director of the International Association of Machinists, "American workers have a right to demand government responsibility for using it to create new products, more jobs, better working conditions, and general prosperity." And Charles C. Kimble, research director of the Electrical, Radio & Machine Workers union, goes so far as to suggest that labor should now have a say in how industrial research money is spent.

Among research managers themselves, excessive or contradictory federal regulatory policy is the single greatest complaint. Hannay of Bell Labs points to Food & Drug Administration requirements as a case in point. According to one study, says Hannay, a 1938 application for adrenaline in oil was presented to the FDA in 27 pages. In 1958, a treatment for pinworms took 439 pages to describe. "By 1972," he says, "a skeletal muscle relaxant involved 456 volumes, each 2 in. thick—76 ft. in total thickness and weighing one ton."

Regulation, says Tinsley of Union Carbide, has put a bottleneck on new-product development in the chemical industry and has so added to the cost of getting any new chemical approved that only those targeted at a vast, assured market are attempted today. Food and drug industry researchers echo that complaint. "Today," says Al S. Clausi, director of technical research at General Foods Corp., "our industry does work that is fostered by unreal and invalid public concerns."

But regulation can have less obvious impacts, such as forcing an industry to stick with old technology rather than to experiment with new approaches to problems. "The overall effect of regulations on the auto industry has been to build an envelope around the internal-combustion device and the whole car structure," says Harvard Business School Professor William J. Abernathy, who specializes in technology management. " 'Don't do anything really new, don't change.' That's what these regulations say." Paul F. Chenea, vice-president for research at General Motors Corp., agrees. "You just don't have time to explore wild new ideas when a new rule is so closely coupled to your current business," he says.

'The science of the matter'

In Congress, where the regulatory laws are written, such thinking has so far found a small audience. "A great number of the regulations that we would call environmental . . . may actually be self-defeating," muses Harrison H. Schmitt, the former astronaut from New Mexico who is the ranking Republican on Stevenson's Senate subcommittee. "Instead of looking at pollution controls, if we were looking at building a more efficient and therefore less-polluting engine, we would not only be solving our environmental problems, but we would be producing a new thing for export."

Schmitt is one of only three federal legislators with the semblance of a science background. "We probably have

How antitrust charges can limit R&D payoffs

Companies that make it across the development minefield and bring superior technology to market still may find a threat on the other side: monopolization charges that keep them from fully exploiting the technology. As old as that problem is, such charges can come as a shock, as they did to Du Pont Co. last April.

Courts established decades ago that the Sherman act prevents a company with a hammerlock on a particular industry from making sound, otherwise perfectly legal business decisions that would, however, perpetuate its dominance. In 1945, for example, Judge Learned Hand found evidence that Aluminum Co. of America unlawfully monopolized its industry by its tendency to "double and redouble capacity" as demand increased. That, said Hand, locked would-be competitors out of the expanding market.

In a similar vein, the Federal Trade Commission said three months ago that Du Pont had used "unfair means" to keep competitors from increasing their share of the expanding market for titanium dioxide, a widely used paint pigment. "The complaint is wholly without basis," says Irving S. Shapiro, the company's chairman.

40% share. Superior technology clearly contributes to Du Pont's dominance. In the 1950s, the company devoted a decade of work—and what a spokesman will peg only at "many millions of dollars"—to develop a new way of making TiO_2. Although the highly automated, continuous process went on stream more than 20 years ago, it still tops the processes used by such competitors as NL Industries, SCM, and American Cyanamid, because it uses cheaper raw materials and produces less acid waste.

The problem with the government arises because Du Pont's 40% share of the $700 million-a-year market is still growing. That alone is enough to send government lawyers poking about for actions that can be attacked. According



Joan Sutton

Du Pont's Shapiro: The FTC's "complaint is wholly without basis."

to Alfred F. Dougherty Jr., head of the commission's antitrust arm, even a 30% chunk of the market "could be a dominant position if all the other firms in the market had a much lower share." In fact, Justice Dept. antitrust chief John H. Shenefield asked his staff to look at Du Pont's TiO_2 policies only to find the FTC there ahead of him.

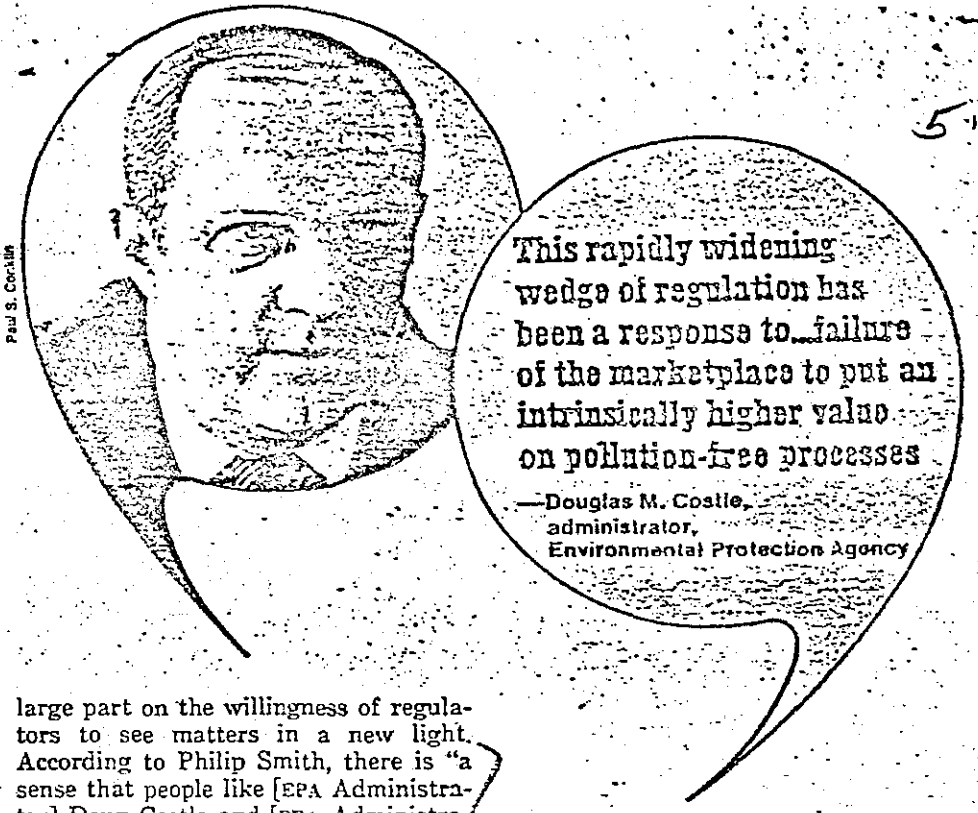
Basically, the FTC says that Du Pont keeps its market share by expanding capacity before the market is ready for more production, thereby forestalling competitors' expansion plans. Du Pont, says the FTC, should get rid of one of two current TiO_2 facilities and a new plant at De Lisle, Miss., that would begin production next year. The FTC staff also wants the company to take competitors under its wing by giving them, royalty-free, the superior technology and knowhow it has built up over the past 25 years.

exercised very poor judgment in the past," he says, "because the Congress overall—members as well as staff—have not been able to understand what is possible technologically and what is not, and therefore not been able to relate the costs [of legislation]."

Jason M. Salsbury, director of the chemical research division at American Cyanamid Co., pleads, "Before the lawyers write the legislation, let them know the science of the matter." Not only may some mandates be beyond what industry can legitimately perform, he says, but the rules force a conservative approach to science. One key indicator of this trend is the increasing number of toxicologists now employed in chemical company research labs. "Toxicologists don't innovate," notes Frank H. Hegley, vice-president for research and engineering at Lever Bros. Co.

Then there is the regulatory bias against new ideas. In the EPA's grant programs for waste-water treatment at the municipal level, for instance, equipment specifications must be written so that gear can be procured from more than one source. That means a company with a unique process is discriminated against. What is more, the mandate for cost effectiveness precludes trying out innovative approaches whose value can only be measured if someone is willing to gamble on them.

If the domestic policy review is to solve such questions, it will depend in large part on the willingness of regulators to see matters in a new light. According to Philip Smith, there is "a sense that people like [EPA Administrator] Doug Costle and [FDA Administrator] Don Kennedy want to work with industry, and they don't want to fight all the time. I think we have a team of people now in government that may be able to do something."



Paul S. Conklin

The investment climate

But industry should not expect a major overhaul of regulatory practices to emerge from the study. EPA Administrator Douglas M. Costle concedes "a tremendous growth in the last decade in health and safety regulations—13 major statutes in our area alone." Though Costle agrees that the economic impact of such rules should be more closely quantified, he contends that "this rapidly widening wedge of regulation has been a response to a massive market failure—failure of the marketplace to put an intrinsically higher value on pollution-free processes."

Most regulators agree that not enough research has been done on the true nature of the environmental problems they are empowered to combat, but they also argue that regulation has led to cost-saving practices, especially in the area of resource recovery, where closed-cycle processes now help capture reusable material. OSHA officials also cite examples where the agency has laid down rules that have led to cost-cutting innovations. But Eula Bingham, the OSHA administrator, emphasizes that the "legislatively determined directive of protecting all exposed employees against material impairment of health or bodily function" requires tough regulation without quantitative weighing of costs and benefits. "Worker safety and health," she insists, "are to be heavily favored over the economic burdens of compliance."

Bingham and her boss, Labor Secretary Ray Marshall, may represent an increasingly isolated view, however. Economic issues have come to dominate thinking within the Carter Administration, and it is precisely these questions that industry has stressed in its discussions with science adviser Press and other White House officials. Just over a month ago, Treasury Secretary W. Michael Blumenthal told a meeting of financial analysts in Bal Harbour, Fla., "We are now devoting a very sizable chunk of our private investment to meeting government regulatory standards . . . and in some of these areas we may well be reaching a breaking point." Blumenthal also noted: "Our technological supremacy is not mandated by heaven. Unless we pay close attention to it and invest in it, it *will* disappear."

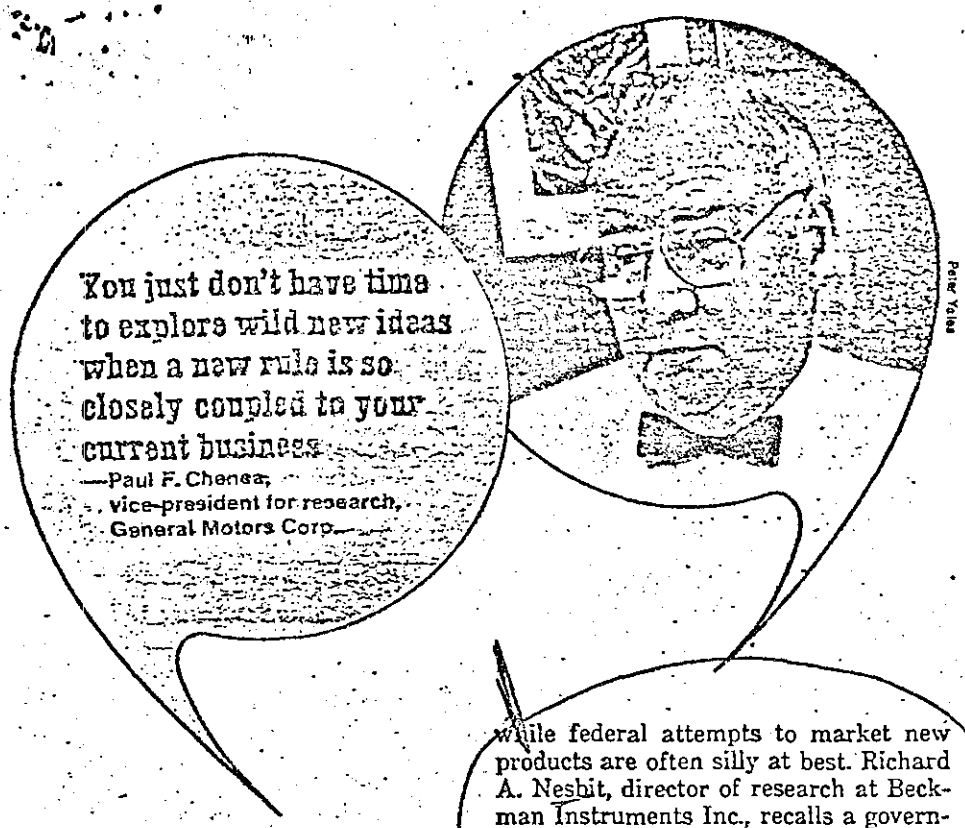
A month before the Blumenthal speech, GE's Bueche suggested to an American Chemical Society gathering that "we step back and look at R&D for what it really is: an investment. It is an investment that, like more conventional investments, has become increasingly less attractive."

Bueche, along with most other research managers, rejects the idea of direct federal subsidies to industrial R&D. Instead, he points out that "perhaps 90% of the total investment required for a successful innovation is downstream from R&D, [and thus] it becomes . . . clear why we must concentrate on the overall investment climate." Bueche attacks Administration proposals to eliminate special tax treatment of long-term capital gains, plumps for more

Whether the need for such onerous penalties can be established—before an FTC judge, the full commission, then a court of appeals and, perhaps, the Supreme Court—may take years to determine. But the approach is not unusual in monopolization cases.

The Xerox case. Just a year ago, the Justice Dept. ended such a suit against Industrial Electronic Engineers Inc. by getting the California company to promise royalty-free licenses to all comers on patents it had used to dominate the market for rear-projection readout equipment for electronic data-processing systems. And three years ago, the FTC settled a complaint by getting Xerox Corp. to open its portfolio of 1,700 copier patents to competitors. Xerox had to license three patents—chosen by the competitors—free. Fees for use of the rest were strictly limited by the FTC.

As severe as those measures may seem, and as discouraging to innovation, the antitrusters contend that it is the only way rivals can eat into a monopolist's dominance of a market. Says Alan K. Palmer, assistant director of the FTC's antitrust arm: "We have to look to what relief will really be effective."



rapid investment write-offs, and says "it is extremely important to provide stronger incentives for technological innovation by making permanent and more liberal the 10% investment tax credit."

Critics in industry

Bueche's arguments suggest the broad—yet often indirect—way in which federal policy runs counter to the best interests of innovation. Fear of antitrust moves from the Federal Trade Commission or the Justice Dept., for instance, has prevented many companies from sharing research aimed at a problem common throughout an industry—including new technology aimed at solving regulatory questions. At General Electric, the legal staff must now be notified if a competitor visits a company research facility, even if no proprietary material is involved.

For their part, Justice Dept. trustbusters claim that fears that their policies stifle innovation are not justified. They say they are flexible enough to recognize the differences in the pace of innovation from industry to industry, and that is why they allow a fair number of mergers among electronics companies. "That's an industry where you don't have to worry about someone cornering the market," says Jon M. Joyce, an economist in the Justice Dept.'s antitrust division. "There's just a lot of guys out there with good ideas."

Industry further claims that the inability to secure exclusive licenses on government-sponsored research leaves much good technology on the shelves, while federal attempts to market new products are often silly at best. Richard A. Nesbit, director of research at Beckman Instruments Inc., recalls a government circular that waxed rhapsodic over the federal commitment of billions of dollars to R&D. Included with the letter was a syringe for sampling fecal matter, and the suggestion that Beckman might want to license the technology. "I wondered if they spent billions to develop that," Nesbit recalls. "The contrast was ludicrous."

Even national accounting procedures draw criticism from industry. A major target is the 1974 ruling by the Financial Accounting Standards Board that stipulated that R&D spending could no longer be treated as a balance sheet item, but must be listed as a direct profit or loss item in the year spent. R. E. McDonald, president and chief operating officer at Sperry Rand Corp., recently told an executive management symposium, "The ramifications of that rule change are quite complex, but the net effect has been to dry up a lot of potential venture capital investments. . . . I can say quite candidly that Univac would not be here today if we had not had the advantage of the old rule for so many years."

The shortage of risk capital has had a tremendous impact on small, technology-oriented companies trying to arrange new public financing. According to a Commerce Dept. survey, 698 such companies found $1.367 billion in public financing in 1969. In 1975, only four such companies were able to raise money publicly, and their numbers rose to just 30 in 1977. Equally ominous is the experience at Union Carbide, which, according to Tinsley, has not been able to compete for venture capital and has thus canceled plans to start a number of small operations built around interesting new technology. Years ago, says Tinsley, Carbide was reasonably successful at getting such funding. "And you must remember that these ideas are perishable," he says. "They don't have much shelf life."

The Treasury Dept., in fact, has an ongoing capital-formation task force that will be integrated into the policy review under the direction of Deputy Secretary Robert Carswell. Carswell notes that "you can't draw a clear line" between R&D support and investment in general, but "if it turns out that we find some form of capital formation gives the economy a greater multiplier effect than another form, we at the Treasury would not shy away from whatever policy would help most."

Washington's changing role

Even as it has pursued policies detrimental to industrial R&D, the federal government has withdrawn as a major initiator of innovation. Research managers generally believe that companies are better equipped than government to bring new technology to society because they are more attuned to market pull. But Lawrence G. Franko of Georgetown University, an international trade expert, recently pointed out to a congressional committee that the U. S. government has in the past played an important role "as a source of demand for new products and processes, and as a constant, forbearing customer in computers, semiconductors, jet aircraft, nuclear-power generation, telecommunications, and even some pharmaceuticals and chemicals. . . ."

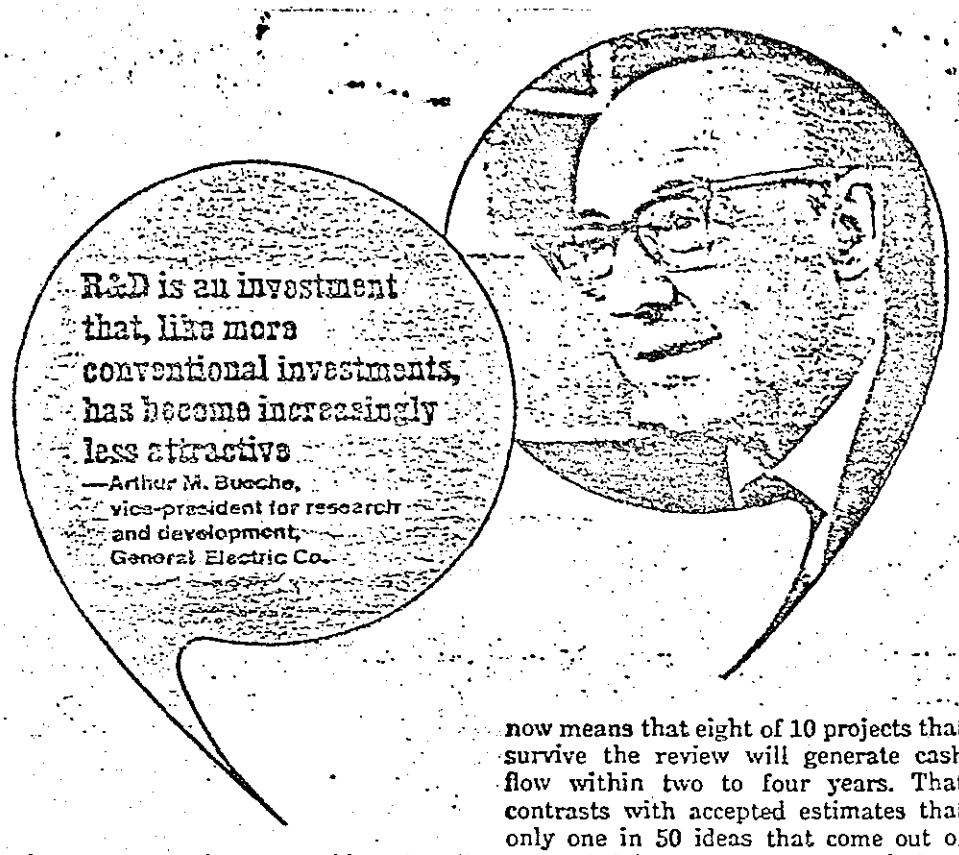
According to the Defense Dept.'s Davis, both Defense and NASA "have faded" in this role, the result of the Vietnam war and concerns over the military-industrial complex. "The consumer marketplace and other government agencies have not been able to pick up where DOD and NASA left off," she says. "The Department of Energy should be able to help with this, but it hasn't yet. And the Department of Transportation just never blossomed in this role." An unreleased IRI study for the Energy Dept. summed up industry's views. The company officers interviewed said government could spur industry's energy R&D only by creating a national energy policy, increasing its managerial competence, and offering financial incentives rather than massive contracts.

On the other hand, there have been some recent, notable government efforts to spur the innovation process. "We've talked to the leading semiconductor companies about our hopes for their innovation," says Davis. She says that the Defense Dept. expects to program $100 million over the next five years for industrial innovation in optical lithography, fabrication techniques involving

electron-beam technology, better chip designing and testing to meet military specifications, and system architecture and software implementation.

At the Transportation Dept., chief scientist John J. Fearnsides wants to involve the private sector much earlier in the government's R&D process, thereby allowing industrial contractors to develop technology alternatives instead of having to cope with rigid specifications at the outset. Such a policy, some believe, might have resulted in major savings for the Bay Area Rapid Transit system, for instance. "It is more expensive to fund a wider range of choices, but only at first," says Fearnsides.

The NSF also has announced a new industry-university grant program for cooperative exploration of "fundamental scientific questions." The aim is to make "a long-term contribution toward product and/or process innovation."



The failures of business

While agreeing on the need for federal policies that bolster innovation, those knowledgeable about industrial research think that the companies themselves share some of the blame for stagnation and must be willing to examine their practices critically. Alfred Rappaport, a professor of accounting and information systems at Northwestern University's graduate school of management, believes that one reason the U. S. lags in R&D is that the incentive compensation systems that corporate executives live under tend to deter intelligent risk-taking. "Incentive programs are almost invariably accounting-numbers oriented and based on short-term earnings results," he says. "That puts management emphasis on short-term business considerations." Another criticism has been of the haphazard way in which companies have launched new R&D programs. In essence, industry should try to learn how to weed out bad ideas early on, say the detractors. To that end, Dexter Corp. has instituted an eight-factor "innovation index" approach to research management that weighs questions such as effectiveness of communications, competitive factors, and timing, and comes up with an "innovation potential" for new ideas. At Continental Group Inc., D. Bruce Merrifield, vice-president of technology, says that "constraint analysis" of new ideas now means that eight of 10 projects that survive the review will generate cash flow within two to four years. That contrasts with accepted estimates that only one in 50 ideas that come out of research labs ever generates cash flow, and not for seven to 10 years.

Large companies often fail to exploit their own resources effectively. In the 1950s and 1960s, some companies set up centralized research facilities, but many of these did not yield the hoped-for synergism—in many cases, apparently, because the different parts of the company were in businesses too unrelated to one another.

On the other hand, Raytheon Co. was highly successful in transferring its microwave expertise to its newly acquired Amana appliance subsidiary in 1967, resulting in the counter-top microwave oven. That was done through a new-products business group set up specifically for such purposes. And more recently, this group, headed by Vice-President Palmer Derby, brought the company's microwave talent to bear on its Caloric subsidiary's product line, resulting in a new, combination microwave-electric range.

In such ways, industry can maximize its potential for innovation in the most adverse environment. But the future health of the nation's economy, many experts believe, requires a much more benign environment for industrial R&D than has existed over the past decade. And Jordan Baruch, the enthusiastic leader of the multi-agency federal study, believes that such an environment is likely to emerge as a result of the Administration's concern.

"We may have bitten off more than we can chew," notes Frank Press, "and it may be that we can't get much done in a year. But even if it takes three or five or 10 years, I think it is historically very important." ■

Turning to Japan for venture capital

The recent drag in U. S. venture-capital commitments has opened opportunities for foreign companies to appropriate American ideas. A case in point is the experience of System Industries Inc., a Sunnyvale (Calif.) manufacturer of minicomputer peripherals.

In 1969, System Industries went to work on a new ink-jet printing process, forming a subsidiary, Silonics Inc., to develop and market it. By 1973, the research phase was over, and a cash-short System Industries went looking for venture capital to tool up for production. Unfortunately, none was there. With a depressed stock market, and recent increases in the maximum tax on capital gains that cut the expected return on such investments in half, the usual capital sources "couldn't justify taking the same risks they used to," says Edwin V. W. Zschau, the company's chairman and chief executive officer.

Keeping only 51%. Next, he explains, "we were thinking about government funding. But we were discouraged from even making a proposal when we learned the government would get data rights and be able to license it to other people. We didn't see why we should give away those rights just to get a little money." What Zschau finally did give up was 49% of Silonics to Konishiroku Photo Industry Co., the Tokyo-based maker of Konica cameras.

In return, the Japanese company has spent $5.5 million on Silonics, which is enough to bring the new printer to market at the National Computer Conference in Anaheim, Calif., in mid-June. "We have one of the most promising imaging technologies for the 1980s," Zschau now complains. "But we only own 51% of it."

8.

Michael Novak

Wash. STAR
9/3/78

A day for Enterprise

The last thing this country needs is another holiday. Nevertheless, I would like to propose one: Enterprise Day, to be celebrated on the Monday after the first day of spring. Enterprise Day would be a counterpart to Labor Day. Its purpose would be to honor our most endangered, heavily burdened and most fragile resource: the spirit of enterprise.

The system under which Americans live is not very old. Although it may not survive much longer, in its brief passage through the gloom of history it has cast a lovely light. Most of the progress of science, and the vast part of the world's betterment in the conditions of all people, have occurred during the short tenure of this system. A relatively few of the world's citizens discovered a method for unleashing tremendous energies of initiative and imagination. Such energy has always been available. But no society before had learned how to release it.

The word "enterprise" captured the spirit of adventure that characterized pilgrims and pioneers, founding fathers and builders of industry, sponsors of invention, artists and creative thinkers of every sort. The method was simple: Permit individuals to take risks with their own lives, careers and resources. Stand out of their way and let them go directly to the public. Permit them to reap rewards for offering the public the goods and services the public decided, by its own choices, to accept or to reject.

Such an idea was at first deemed both implausible and faintly immoral. Could individuals be trusted? Did not some officer of Reason need to guide their choices? Were not citizens so corrupt that they would choose badly, squander their resources, and be attracted to lowest common denominators? "The public is a beast," some said. "Only philosopher kings can bring about Utopia," others said.

Nonetheless, enterprise took root in a few small parcels of the world's territories. The power and beauty that broke from them were so astonishing that many other nations wished to imitate their achievements. Some did not wish to trust enterprise. Some tried to reach the same goals through servitude. And Planning. Planned servitude.

Enterprise is a resource more precious to the world than oil. For oil, there are substitutes. For enterprise, there is no equivalent form either of energy or of intelligence. The most complex computer is not as sensitive as the free choices of enterprising individuals. Such individuals are an unending source of invention. They are, alas, easily suppressed. Most societies repress them.

We have reached a decisive turn in Western societies. For several decades, statist politicians could claim to provide more goods and services than enterprise alone. There was truth in this claim. But now the cost of government is high, and the productivity of enterprise is falling. Now it is clear that statism clearly means less of everything. Taxes and inflation, by statist action, climb together. Individuals must settle for lower standards of living.

For the first time in a long time, those who oppose the statists — those who nourish enterprise — are in a position to offer ordinary citizens "more." As enterprise goes up, standards of living go up. As statism rises, so do taxes and inflation, bringing standards of living down.

There is now a huge vested interest in statism. One out of every five voters works for the government. It is time to celebrate the idea of enterprise while it still lives. Labor Day has its importance. It is enterprise that invents the projects on which to labor. Enterprise imagines, labor fulfills. Labor Day needs Enterprise Day as autumn requires spring.

And what would truly make the day distinctive is that it should not be celebrated by taking off from work. There is a far better way: It should be celebrated as a day without taxes. On one day a year, sales taxes should not apply. And all earned income from that day's labors should be exempted from income taxes.

This idea, of course, is playful. But a society lives, more than pragmatists think, by celebrations. If we do not celebrate our distinctive social secrets, we may not immediately lose them, but we are certain to undervalue them.

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Something's Happened to Yankee Ingenuity

By Bradley Graham
Washington Post Staff Writer

It's been 99 years since Angus Campbell put the first automatic cotton picker to work, 70 years since Henry Ford passed up his first Model T, 39 years since Du Pont introduced a paper fiber called nylon and 30 years since Edwin H. Land marketed the first instant-picture camera.

All of which helps recall a time when America's inventive spirit seemed unbounded and unceasing. Ideas flowed to the marketplace as fast and furious as mountain rapids flow downhill.

But what was once thought to be an endless stream of U.S. inventions has of late been trickling out less startling and less competitive products. Meantime, adding pain to the drain, the inventive powers of foreign nations have been in ascendance. The question, once raised in a whisper, is now asked in loud and urgent tones: Has American enterprise lost its innovative touch?

Consider these facts:

• The number of U.S. patents issued per year to U.S. inventors reached a peak in 1971 and has declined steadily since. But the number granted to foreign inventors has increased steadily since 1963. In 1977, foreigners claimed 35 percent of all patents issued in the U.S. across a broad range of fields.

• The U.S. balance of trade has worsened, due not only to increased oil imports, but also to more imports of foreign manufactured goods.

• Productivity, which is partly a function of technological innovation, has slumped severely. In the past decade, the rate of growth in U.S. productivity has averaged only half of what it was the previous 20 years. In contrast, productivity growth rates in Europe and Japan have been on the rise.

• From 1953 to 1966, U.S. investment in research grew at an impressive rate of 10 percent annually in inflation-adjusted dollars. However, investment in research by all sectors in the U.S. over the past 10 years has shown essentially no growth in constant dollars. Further, a number of major U.S. corporations have announced recently they intend to spend even less on long-term basic research and more on development of short-term, quick-profit products.

In a world where power and progress are often measured in terms of technological breakthroughs and scientific prowess, such trends are indeed disturbing.

For a nation that has always prided itself on its tinkerers—on those lone souls who brought forth from their garages and basement labs such revolutionary devices as power steering, the office copier and the zipper—they are downright depressing.

From boardroom to research lab, there is a deepening sense that something has happened to the once unchallengeable Yankee ingenuity. Just what, though, no one quite knows.

There is today a pervasive perception that the dynamic vitality of the U.S. economy is faltering. This perception appears to be founded on two concerns: first, that America is not as productive as it used to be; and second, that we are somehow not as inventive either. This is the first of two articles this month which will examine these concerns.

Some insist it is in rapid decline, choked by an unfavorable economic climate, government regulation and, perhaps, by the lethargy and shortsightedness of big business. Others say it has simply taken new forms, becoming more subtle and incremental in nature than grand and revolutionary. Either way, the country's genius for invention does not appear, at least, to be what it once was.

Alarm bells are going off all over. First, Michael Boretsky, a senior policy analyst in the Commerce Department: "All the indicators imply that the rate of U.S. innovation is measurably down. It's very disconcerting."

Next, Dr. Alden Bean, director of research for the National Science Foundation: "There's no solid evidence to suggest that the U.S. is going to hell in a handbasket in science and technology. But there is serious cause for concern about some trends we've seen."

After several years of arm-waiving and shouting about waning U.S. innovation, the nation's research establishment finally caught the ear of the White House. Several months ago, the Carter administration launched a major policy review of things to be done to foster innovation in private industry. The study is being coordinated by the Commerce Department and involves more than 15 agencies. A final report, including recommendations for the president, is expected by April.

But many experts say another study is hardly necessary. The worrisome state of innovation in America has been assessed and reported on many times since the first major policy review conducted by Commerce in 1967. In the interim, the problems only have become more obvious.

For one, the economic climate for innovation is poor. The financial incentives that in the past encouraged the rich and the bold to risk their money on slim-chance projects no longer exist, thanks to increases in the capital gains tax and tighter rules on stock options. Inflation, too, has put the squeeze on capital investment by existing corporations.

Also, with the winding down of space and defense programs, government support of industrially performed research has diminished. Throughout the 1950s, the government annually supported more than one-third of industrial research activity. This level of support reached almost 40 percent in 1962, but has been falling consistently and is 25 percent today.

Increased government regulation, too, has increased operating costs and shrunk the share of profits formerly available for research. So has the higher cost of energy.

Together, these developments have forced a shift in industrial research activities from the offensive to the defensive. "Major effort is being diverted into defensive research," said Howard Nason, president of the Industrial Research Institute in St. Louis. "Much more emphasis is being placed on short-term cost reductions than on long-term product and process improvements."

But as important as such external economic factors may be in explaining the innovation slump, there are certain features about the internal structure of corporate America today which some say have had a debilitating effect on innovation.

Writing in the July-August issue of the Harvard Business Review, Alfred Rappaport, professor of business at

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INNOVATE, From G1

Northwestern University, blames the research lag on the increasing emphasis American business places on short-term results. Rappoport asserts that management incentive programs are biased toward quick profits at the expense of perhaps smarter long-term investment.

"American business would do well to re-examine its own self-administered incentive systems," Rappoport concludes.

Industrial research today is dominated by a small number of very large corporations. The top 10 percent of those firms doing R&D in 1976 performed almost 70 percent of the total U.S. R&D effort. Ten firms accounted for more than 25 percent of all expenditures that year. This concentration may itself work against innovation.

"A large part of the blame for the lack of innovation lies with the oligopoly nature of American industry," said Mark Green, director of Ralph Nader's Congress Watch. "Big companies get habituated to their products and there is a reluctance to break through. If you already dominate an industry, where is the incentive to take a chance on a new and costly approach?"

But the history of innovation in America is ambiguous on this point. Studies done on whether big business or little business is more inventive have come to no conclusive end as a whole.

Certainly, many major innovations have come from outside an established industry. The ballpoint pen, for instance, was invented by a sculptor, the dial telephone by an undertaker. It took an electrical engineer employed by a shipbuilding firm in the 1930s to develop the automatic transmission, called by some the last major innovation of the auto industry. IBM's disk memory unit, the heart of today's computer, was not the logical outcome of a decision made by IBM management—rather, it was developed in one of its labs as a hootleg project, over the stern warning from management that the project had to be dropped because of budget difficulties.

At the same time, certain large firms in the fields of electronics, pharmaceuticals, telecommunications and computers have been highly innovative.

In their seminal study in 1958 on the sources of invention, Harvard professor John Jewkes and his colleagues said they could not conclude that inventions flow primarily from any one source. When the study was revised in 1969, the authors stated only the obvious: that inventions can come from firms of varying size.

Business leaders, of course, refute the charge that they are less innovative today than in the past. "There's no lack on the part of big business to be innovative," said General Motors Corp. Chairman Thomas Murphy in a phone interview. "It's a big country, so we have to be big. We couldn't do all of the things we do if we weren't as large as we are."

To the public, a car may still look like a car. But auto officials say the changes which have taken place inside during the past five years have been as revolutionary as anything which has come before.

"There's a perception problem," said Thomas J. Feaheny, the man in charge of car engineering for Ford Motor Co., where "better ideas" were once not only a management dictum but a successful ad slogan. "We've never been as innovative as we are now. But the things we're doing aren't as glamorous and aren't noticed much by the consumer."

Critics note, however, that what the auto industry heralds as advances in development (the catalytic converter, on-board use of minicomputers to govern fuel efficiency and control pollution, greater use of aluminum and other lightweight durable materials) are, in fact, only more logical applications of off-the-shelf technologies rather than breakthroughs in the state of the art.

Of even greater concern, though, than what has or hasn't happened is the prospect for the future. Many major corporations have tailored research budgets to yield more practicable and immediate results. In 1958, industry allocated as much as 35 percent of its R&D dollar to the "R" part. By last year, this had dropped to 25 percent.

Corporations say the reasons for this shift from research into development have nothing to do with being too big or too comfortable. The reasons, basically, are greater pressures from government regulators to meet health, safety and environmental standards as soon as possible, and greater uncertainty about the likely profitability of longer-term, riskier ventures.

"It used to be much easier to bring new products to market," said Du Pont Chairman Irving Shapiro in an interview. "If you hit something, you'd have more time to develop it. Now it's more difficult.

"Also, the pot of gold at the end of the rainbow just isn't there. The economic environment has changed. Our thinking has had to change, too. It's become more short range."

Added Richard Heckert, Du Pont's senior vice president for R&D: "We're not exploring wholly new areas. We're concentrating instead on opportunities for research in established areas . . . . We are less able to take risks. We have to concentrate on surer projects."

The degree of such thinking does vary from company to company and industry to industry. Certain high-technology fields (instrumentation, computers and electronics) remain rooted in innovation and continue to churn out impressive new products. In other industries, though—particularly those most apt to be subject to regulation and high energy costs (steel, chemicals, paper, packaged goods and autos)—product innovation has leveled.

Part of the difficulty in deciding what to do about the innovation lag is figuring out how to define it. To begin with, innovation defies measurement.

"There are no indicators which you can look at to measure the advancement of knowledge," said NSF's Dr. Bean. "Some people count patents, but that's unreliable in part because some firms don't like to patent things and would rather rely on trade secrets rather than disclose important discoveries. Others count citations in the research literature, but that's unreliable, too."

But even without sure data, many have not hesitated to push the panic button. "You can't use statistics to say there's a problem," said Jordan J. Baruch, the assistant Secretary of Commerce who is directing the government's innovation policy review. "But you'd have to be blind not to see it."

Urgency about the problem is all the greater because America seems uniquely stricken. Western Europe and Japan grow more inventive, or so it appears, while U.S. firms age. Examples abound of foreign firms taking the lead in both new and traditional product areas. The Japanese, for instance, totally eclipsed the American communications industry in the development of video tape recorders. The Germans and Swiss now set the pace in textiles. Inventiveness in the steel industry has centered in Belgium and Austria. Some U.S. cities are even going abroad to scout for new ways to handle old problems. (The Council for International Urban Liaison here publishes a monthly newsletter called Urban Innovations Abroad that goes to 5,000 city officials in the U.S.)

Moreover, U.S. productivity rates have been in a rut for a decade—and that has serious consequences for everyone's real income and for the nation's overall standard of living. Of course, technological change by itself does not make or break productivity. There are other contributing factors, most important among them being capital investment and improved labor skills. But technology is an important ingredient in the mix.

With industry's current bent toward the here and now, there is concern that the U.S. may be cutting its innovative bridges. Some economists, notably Charles P. Kindleburger at MIT, have drawn disturbing parallels between the way U.S. firms are responding to America's battered competitive leads and the responses of British firms in the twilight of the English empire. British firms, just as American firms now, became defensive—that is, rather than redoubling efforts to generate innovations, they curtailed investment and demanded government protection against imports.

Does the current emphasis on small, incremental kinds of advances rather than on big breakthroughs threaten the dominant position the U.S. still holds?

No one is sure. Despite all the studies of innovation and productivity, no one can say whether there is an optimum rate of invention a society should adhere to, or how much innovation is enough.

There does seem to be general agreement, though, on this: The rapid technological growth which the U.S. experienced during the first two decades after World War II was unusual and is not likely to be repeated.

"We made an enormous investment in the war, made some great technological advances during it, and came out of it with a great belief in the power of technological progress," said J. Herbert Hollomon, director for the Center of Policy Alternatives at MIT. "We also were handed an accidental lead, in having survived the war better than anyone else. But one of the things that is increasingly going to be the case is that new technological innovations are going to happen outside the U.S."

Hollomon said that American business has in the past displayed an NIH (not-invented-here) complex, meaning that U.S. managers have been arrogant toward anything not thought up first in America and slow to embrace it. This is one of the things that he said will have to change if American firms hope to continue to compete in world markets. American businesses must learn to be quick to adapt, to exploit foreign inventions as well as their own, he warned.

"The problem is not with basic science," Hollomon said. "The problem really is how effective we can be in adjusting and adapting."

Some have argued that U.S. multinationals may themselves have hastened this competitive bind on America by transferring their best technologies to foreign markets in recent years. Those who say this also urge legislation that would restrict further transfers of technology.

But most who have studied the innovation problem say the solution lies in fostering innovation at home—through a more liberal tax policy, a relaxed regulatory policy, less aggressive antitrust practices and, in general, a more cooperative spirit between business and government such as exists in Japan and the leading Western European countries.

And above all, they argue for greater certainty in government policy. "I think that more than an increase in government support of R&D or a reduction in regulation, what private industry people are interested in is a reduction in uncertainty about government action," said Dr. Bean. "Look, there's enough economic uncertainty in the R&D process without the government."

U.S. Should Heed Reasons For Japan's Rise to Power

By Sylvia Porter
Special to The Washington Star

What are the basic explanations for Japan's competitiveness — which a solid majority of the American people recently polled by Garth Associates believe is superior to that of the United States?

Your Money's Worth

Why has Japan soared from a thoroughly defeated nation at the end of World War II to become such an important industrial powers that we shame only ourselves when we attribute Japanese success to "cheating," or "copying Western technology," or "dumping" goods in foreign markets at unfairly cheap prices?

The fact is that with almost no natural resources of its own, Japan long ago developed energy, industrial and trade policies to deal with the problems we are now facing.

We react defensively to this fact of world power, claims Ezra F. Vogel, a Harvard sociologist who recently published a study of precisely these questions, "Japan As No. One, Lessons for America" (Harvard University Press, $12.50).

These reactions, he adds, "are not only unfair to the Japanese but blind us from learning about Japan's success and condemn us to falling further behind."

There's an ironic twist here, for Vogel's book, written in English and targeted for an American audience, has sold more than half a million copies abroad. Here in the United States, just try scaring up a single copy.

So, back to "why?"

Vogel's explanations:

- An industrial and trade strategy. Instead of spending our own political capital defending small, dying industries, the United States should support those domestic industries which can be competitive on the world market. These "sunrise" fields should be bolstered through tax policies, monetary policy and steadier, more predictable overall federal policies. Dying, or "sunset" industries should be cushioned temporarily and guided into reducing their capacity while retraining their work force.
- A permanent core of government professionals. One reason Japan's bureaucracy is much more powerful and predictable than ours is that it is run by an inner group of experienced specialists who don't move in and out of government with each administration. Such continuity of leadership makes long-range planning possible. Decisions are not upset by elections, cabinet shuffles or short-range political pressures.
- Renewed emphasis on the group or organizational interests. The Japanese have been leaders in creating huge organizations enjoyed by workers. In contrast, Americans regard them as important but as an imposition. The cooperation we once valued in small towns and neighborhoods has not survived in cities and complex corporations. The managers of companies, universities, government offices are more anxious to protect the rights of special groups or avoid lawsuits than to accomplish the overall goal of the institution.
- Consensus building. Such complicated problems as energy policy and international trade issues now demand much cooperation among business, labor, government and the public. These groups seldom see each other except in settings of confrontation in the United States. Not so in Japan, where frequent informal social gatherings reduce mutual antagonisms, Vogel told my associate Brooke Shearer. When various groups negotiate, they don't use lawyers. They use go-betweens known to have the trust of both sides.

"Americans may more easily win an argument," claims Vogel, "but the Japanese more easily win an agreement."

Japan's system is oustandingly effective. We cannot afford to ignore or dismiss it any longer.

Let us listen to what Japan's successes are shouting to us. Let us accept the lessons, benefit from them, determine that we shall catch up and again move ahead under the spur of our own technology, our own superior society, our own imaginative leadership.

Small Business Aid Sought

WASH STAR 6/13/80

By Thomas Love
Washington Star Staff Writer

A House subcommittee has called for a sweeping series of government actions to increase the innovation and productivity of small businesses.

The moves are needed, the subcommittee on investigations and oversight of the Science and Technology Committee said, because of the decreasing productivity of American workers and the declining rate of innovation by the nation's businesses.

Because small, high technology firms have a better record in both areas than the nation's business as a whole, federal efforts should focus on these smaller firms, a subcommittee report said.

"The federal government should adopt integrated, interagency policies that will that will result in greater participation by small, high technology firms," the subcommittee concluded. "The federal government must take the lead in simplifying procurement, patent, management and technical assistance and tax policies that encourage the formation and growth of small, high technology firms."

The assistance is needed, the report said, because of the fine record of the smaller businesses and the troubles they have in getting research and development funding.

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Business Aid Sought

Continued From B-3

Between 1953 and 1973, firms with fewer than 1,000 employees accounted for almost half of the major innovations.

A National Science Foundation study found that small firms produce about four times as many major innovations per R&D dollar as large firms.

"Despite these remarkable statistics, small firms receive only 3.5 percent of the total federal R&D budget," the committee said.

Many other problems face the small companies, the subcommittee found, including "a federal patent policy that discourages commercialization, difficulty in obtaining needed financing, tax policies that discourage invesment in (them) and excessive regulations."

Key recommendations of the subcommittee include:

- An increase in the R&D spending by federal departments and agencies given to small firms. The subcommittee recommends a 1 percent a year raise until the small companies are getting 10 percent.
- A switch from "payment on completion" which is detrimental to small companies to biweekly payments.
- A tax-free "rollover" — similar to that offered homeowners — in profits from investments in small comapanies which are reinvested in other small companies.
- A change in patent regulations to give small firms working on government-sponsored research exclusive rights to inventions and authority to commercialize them.
- The pension-fund policy should be changed to allow a small amount of pension money to be invested in high-risk innovative companies.
- Other tax laws should be changed to allow a tax-exempt reserve for R&D, a 10-year carry-forward of losses and a reduced or non-existent tax rate on the earnings of small, innovative firms during their first five years.
- Reduced and simplified government regulation, a cost-benefit analysis applied to new regulations and regulations based on performance standards rather than specification standards.

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Administration Tries to Halt Regulatory Reform Proposal

By Caroline E. Mayer
Washington Star Staff Writer

The Carter administration is trying to put the brakes on regulatory-reform legislation that it once called a top priority.

Concerned that Congress is moving to enact several unacceptable provisions in the legislation — including legislative veto — the White House is now hoping that neither the House nor Senate will act on its proposal to force federal regulators to pay closer attention to the costs of what they do.

Even though the White House wants agencies to cut government paperwork and red tape, administration and congressional sources say the White House doesn't want to be caught in the politically awkward situation of having to veto a bill that it urged a reluctant Congress to pass in the first place.

"The plug's in the bottle," said one administration official in acknowledging the White House's change of heart.

At issue are two key provisions:

- A legislative veto giving Congress the power to overturn rules issued by federal agencies if both House of Congress passed a resolution of disapproval.
- A change in law to place a greater responsibility on federal agencies in defending their rules in court. Their rules no longer would be assumed to be automatically valid unless proven otherwise.

"These possibilities are unacceptable," said a White House aide.

As a result, one congressional aide said, the White House "decided it was better off putting the nails in the coffin now" rather than later.

Although the legislation is now stalled in the Senate by a failure to iron out differences in two committee-passed bills, the White House moved to stop the legislation while it was being considered by the House Judiciary Committee, sources say.

Last month, the committee's consideration of the bill was abruptly and unexpectedly halted by Rep. Peter Rodino, D-N.J., the committee chairman.

The committee had already approved a legislative veto provision and was in the process of considering the judicial proof provision when Rodino announced the committee would move on and consider the controversial and massive criminal reform bill.

Rodino's action, which sources say came at the request of the White House and House leadership, came only five days after the Senate governmental affairs committee had for the first time approved a legislative veto provision.

Until that time, the Senate governmental affairs committee had been the president's strongest supporter in opposing legislative veto.

Despite White House opposition, congressional aides say both the House and Senate are still intent on passing regulatory-reform legislation.