Leaders of Hi-Tech Industry Urge Hard Line Against Japan

ELECTRONICS, From C11

seize markets in personal computers, advanced memory chips, robotics, biogenetics, satellite communications and other emerging industries as they did in automobiles, steel, shipbuilding and stereo equipment.

But not all the participants took such a hard line as Galvin and Norris. David Packard, chairman of the Hewlett-Packard Corp., for example, said he would "urge our trading partners" to remove nontariff barriers to imports of American products.

In Galvin's view, that approach should be scrapped because it has allowed the Japanese to gain the impression that this country is not serious about enforcing trade agreements or forcing Japan to trade on an equitable basis.

The Japanese, he said, do not believe the United States is going to confront their "extreme protectionism." As a result, he said, they are making a "targeting effort to make dependent the American high-technology industries." Japan, he said, is embarked on a "centralized, collective effort to place us in a dependent mode."

Norris, the crusty, individualistic, 71-year-old founder of Control Data, said at a luncheon with Washington Post editors and reporters that the time has come for strong action against Japanese computer and electronics companies, which he said are acquiring knowledge and technical data in the United States while closing their domestic markets to American products.

The Japanese, he said, "have people running all over the labs at MIT." He said the United States should "exclude them from MIT and Stanford and so forth. That would get their attention. That's the area that would hurt them the most on an ongoing basis."

He acknowledged that any such step would invite Japanese retaliation, but he said "if we shut them off from research, they would lose more than we would . . . you have the choice of sitting here and letting them keep screwing you or doing something about it. I agree with Bob Galvin; it's time to act. In fact, it's 10 years too late."

Norris is practicing what he preaches in his latest innovative venture, Microelectronics & Computer Technology Corp. This company, fostered by Norris, is a research and development cooperative funded by 10 major computer and electronics corporations, which will contribute personnel and money and have equal access to the results.

Control Data and Motorola are among the 10 founding partners of the company, which is known as MCC. Its president and chief executive officer, appointed last month, is retired admiral Bobby R. Inman, former deputy director of the Central Intelligence Agency.

Norris said that when MCC was being established, "no Japanese company asked to participate, and we were able to set it up on the basis that we'd only invite in companies who are either headquartered in the United States or a branch like North American Phillips."

MCC will hold title to whatever advances it makes in such fields as computer architecture and computer-aided industrial design, Norris told the conference. "Although participating companies will have initial rights to the technology and receive preferential treatment, technology will be licensed to other companies on reasonable terms," he said.

He did not say what "reasonable terms" would be for Japanese companies, but he noted that "there are not very many American companies that want to sell any technology to Japan. They've learned by bitter experience."

Japanese scientists, he said, will be excluded from MCC research labs "unless there's some agreement between MCC and the Japanese government."

In the long run, he said, cooperation between American and Japanese researchers would benefit both countries, provided the exchanges were made on an "equitable" basis, and, to achieve that, "I don't really think you'd have to go too far. You have to be serious, you can't bluff, but once you shut them out of one or two projects, you'd start to see some of these issues resolved."

THE WALL STREET JOURNAL.

To Increase Profits, Venture-Capital Firms Are Investing Earlier in Fledgling Concerns

By Richard A. Shaffer
Staff Reporter of The Wall Street Journal

When William Dambrackas flew to Boston last winter to raise money to start a business, he assumed he would have to make dozens of trips to venture capitalists around the country to find financing. After all, he didn't have a prototype of the product he wanted to make, and his business plan consisted mostly of resumes instead of the usual financial projections and market studies.

Mr. Dambrackas's company, Equinox Systems Inc., Miami, still lacks a prototype and doesn't plan to begin shipping its product—a switchboard that enables computers to telephone each other—until next spring. But Equinox was in business two months after the Boston visit, with $1.1 million provided by TA Associates of Boston, the only venture capitalist Mr. Dambrackas asked for money.

"I was all prepared to get turned down and have to go knocking on more doors," says Mr. Dambrackas, the president of Equinox. "I had heard that venture capitalists bet more on the jockey than on the horse. But I was amazed that someone would invest in a company that didn't yet exist."

More and more these days, venture capitalists are financing the birth of new companies. The typical venture-capital concerns used to provide money only after a few hundred thousand dollars or more had been put into a business by relatives and principals, and only after the company already had a product well along in development.

But now, the values of young companies are rising so rapidly that venture capitalists who invest at the traditional stage often can't make the five to tenfold profit they typically require. In addition, it takes more money to start companies these days, and new companies now seem to need more help with management, marketing and product design.

As a consequence, investment bankers such as Hambrecht & Quist Inc. of San Francisco, which used to invest in young companies only when they sought to expand, usually through a second or third infusion of outside funds, are more often becoming an initial investor. Companies such as Sevin Rosen Management Co. of New York and Robertson, Colman & Stephens of San Francisco, which always invested in some companies at birth, are now doing more of it. And companies that specialized in start-ups—Kleiner, Perkins, Caufield & Byers of San Francisco; Mayfield Fund of Menlo Park, Calif., and J.H. Whitney & Co. of New York—are finding more imitators. According to a study by Venture Capital Journal, a Wellesley, Mass., trade publication, about 45% of all venture financings last year went to early stage companies. That's up from less than 10% a decade ago.

"The early stages are where the money is," says Richard D'Amore, an associate at Hambro International Venture Fund of Boston, which recently decided to invest in younger companies.

Typically the early stage investor builds a company around an engineer or scientist with an idea and an entrepreneurial urge. The investor recruits experts in manufacturing, marketing, management or whatever other skills the scientist or engineer lacks.

But a few venture capitalists try to start even earlier. They analyze trends in markets and technology, detect a market need, and then conceive a product to meet the need. Then they begin to recruit an entire corporate team, including somebody to create the product.

"The later stages of investing are becoming very crowded, so the best opportunity now is to come in with seed money," says a partner in a venture-capital firm.

"The later stages of investing are becoming very crowded, so the best opportunity now is to come in with seed money, or to invest even before the company has a business plan," says Carl Carman, general partner of the Masters Fund of Boulder, Colo., and a former vice president of Data General two weeks ago with $12 million in capital from two firms—Kleiner Perkins and Robertson Colman—and from 18 chief executives and senior officers in companies that recently sold their first shares to the public.

"Many of our investors have trod the start-up road very recently, so we know what it takes. By getting in very early, we'll get more of a company for our money, so it could be very lucrative," Mr. Carman says.

Only about a half-dozen companies now place similar emphasis on investing in companies at the earliest possible moment—among them, Alpha Partners of Menlo Park; Bay Partners of Mountain View, Calif.; Crosspoint Venture Partners of Palo Alto, Calif., and Venture Founders Corp. of Waltham, Mass. But about 60 venture-capital companies would like to offer such services if they had the staff, according to a recent informal survey of 170 venture-capital companies by Technology Ventures Inc., Cleveland, which acts as a middleman in financing young companies.

Investing at earlier stages also requires more of a venture capitalist's time. For example, an important factor in the success of Lotus Development Corp., a software publisher, and Compaq Computer Corp., a maker of portable computers, was the efforts of Benjamin M. Rosen, a partner in Sevin Rosen Management, the lead investor in both companies. Mr. Rosen, a widely known securities analyst before he turned to venture capital, used his contacts to get space for Lotus and Compaq products on the shelves of such major retailers as ComputerLand and Sears, Roebuck & Co.

Lotus, begun only 18 months ago, publishes an all-in-one computer program that has become the most popular business software for personal computers. Lotus sold its stock to the public last month for the first time at $18 a share and the stock now is trading at about $26. Compaq's portable, first shipped last January, has become the best seller among the half-dozen computers that closely imitate International Business Machines Corp.'s personal computer. Competition from IBM has shaken most other personal-computer makers, but Compaq has managed to profit from the giant's success and earlier last week said it, too, plans to go public. In one of the largest initial stock offerings recently, Compaq is trying to raise about $90 million.

"The success stories make it look easy to get a company off the ground, but it's not," says Robin Grossman, a Sevin Rosen associate. "Even for companies I'm not very involved with, I spend days working on a product rollout, for example, interviewing public-relations and advertising agencies, helping plan marketing strategy."

Some venture capitalists aren't prepared to provide such expertise. As a result, more venture companies are adding partners with industry management experience, and more are insisting on seats on the boards of the companies in which they invest. Adler & Co., for example, has been asking the executives of some of the companies in which it invests to serve as special limited partners to help the managements of other Adler-financed companies.

"Unless you have some in-house marketing and operating talent, it's difficult to play a role in building a company," says Steven W. Lindseth, vice president of Technology Ventures. "But picking the right team in the first place — perhaps even being part of it yourself — can be crucial to the success of these ground-floor investments."

INTERSTATE

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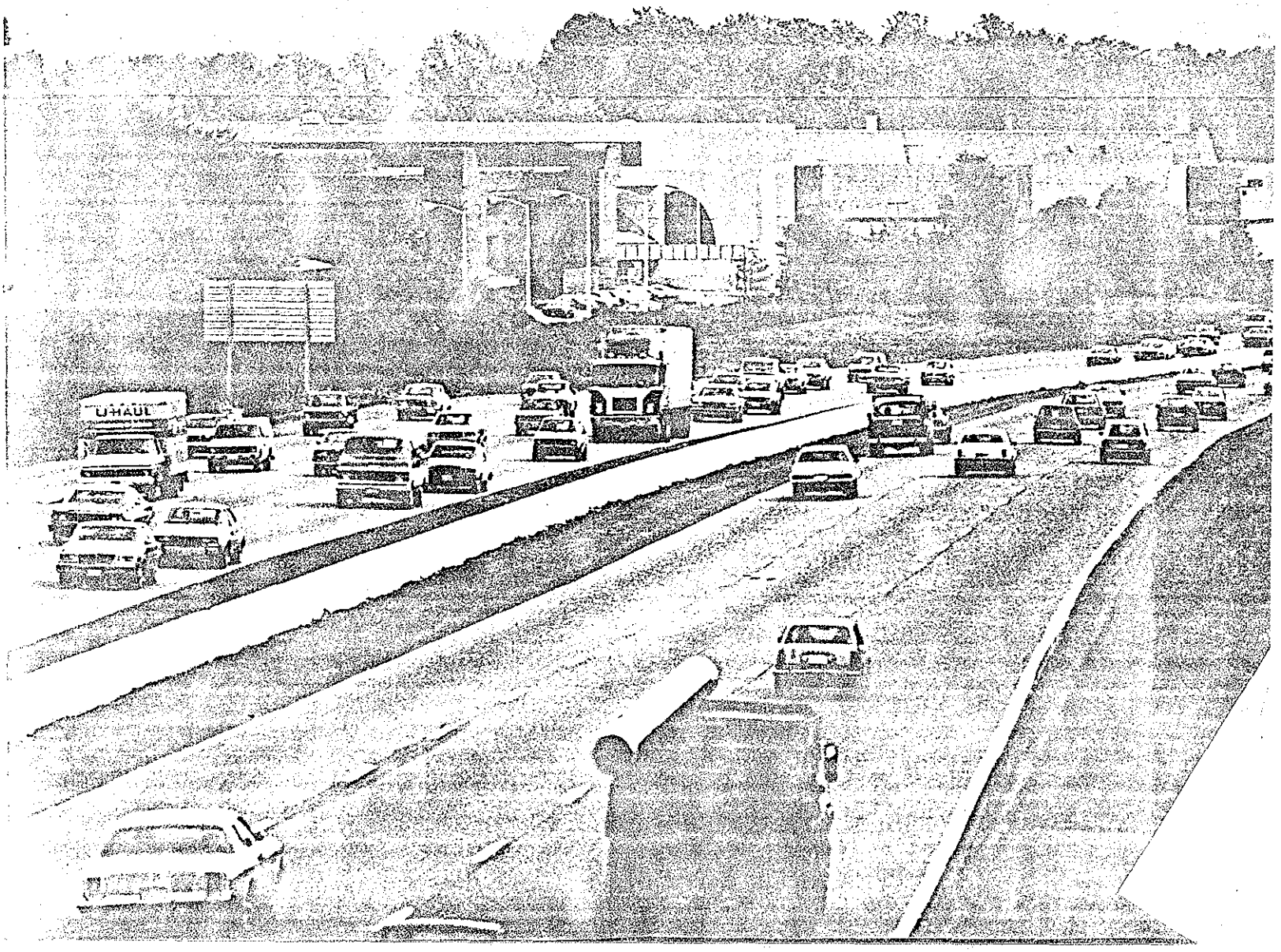
"Satellite Alley"

By JEFF KOSNETT / Photos by RICHARD LAKIN

The southern end of I-270 (below) is highly developed and carries heavy traffic loads daily. An aerial view looking south (opposite top) shows some of the development along the highway. Comsat (opposite below) is one of the many space-related operations located on 270 which have given it the Satellite Alley nickname.



To thousands of Marylanders, I-270 is the way from Washington to Frederick, with connections north and west. To more than 80,000 scientists, engineers, technicians, and computer wizards, I-270 is more than a mere highway. It's the backbone of a concentration of telecommunications, electronics, biomedical, genetic, and environmental expertise that may be unmatched in the nation.

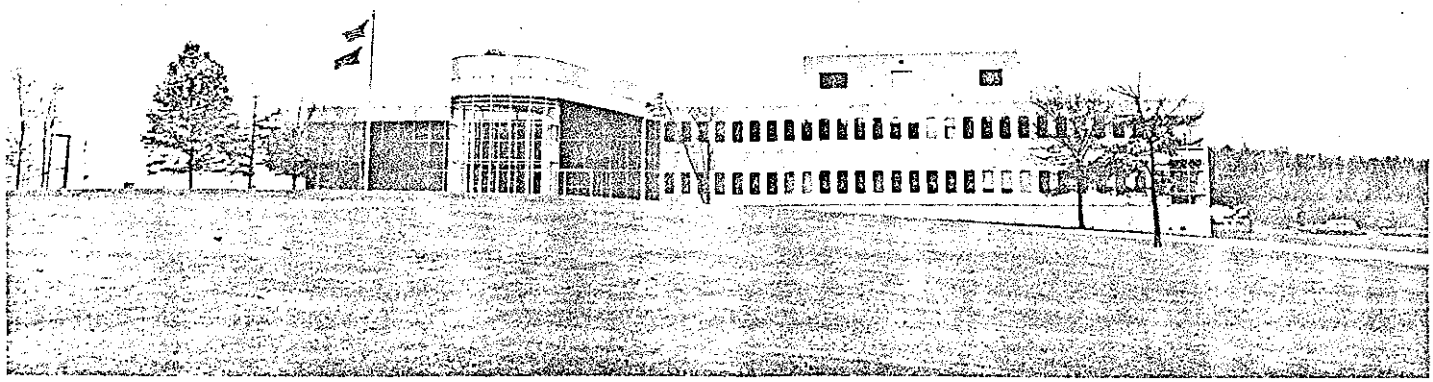
This collection of brains and investment—dubbed "Satellite Alley" after northern California's well-known "Silicon Valley"—has transformed Montgomery County from a tree-lined address of commuting Washington lawyers and government officials into Maryland's richest self-sustaining local economy.

The county is one of the few places in the region, if not the country, where the number of jobs is growing several times faster than the population. From 1970 to 1980, employment soared 63 per cent while the number of residents increased 11 per cent. The county government estimates 55 per cent of the residents who work earn their paychecks in Montgomery.

This economic progress has brought not only security and development to much of the county, but a feeling of being "not just another suburb." The I-270 corridor "is really the pride of the county—the people as well as the government," says Duc H. Duong, manager of the Business and Industrial Division of the County Office of Economic Development.

I-270's economic impact began in the 1960s with governmental research installations. After the National Institutes of Health, National Bureau of Standards, and the Energy Research and Development Administration sprouted in rural





territory, highways, housing, schools, and shopping centers naturally followed.

Several factors have played a role in the development of the corridor over the past two decades. The federal presence looms large in recruiting government contractors; defense electronics is expected to grow rapidly in upcoming years; expansions tend to be local, and most new jobs result from these expansions rather than the relocation of new companies from out-of-state.

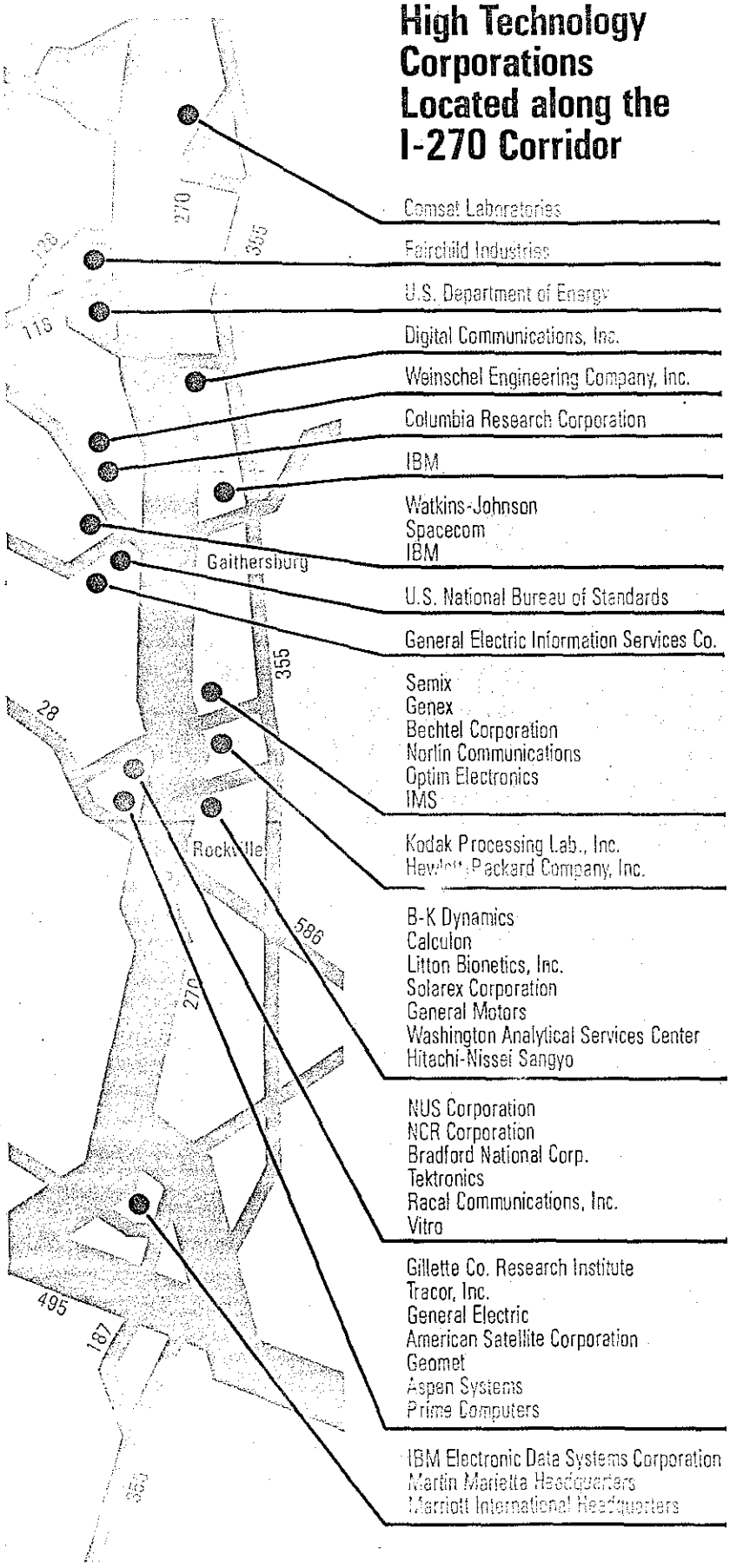
Today, as one cruises I-270 and explores nearby feeder roads, the contrast is apparent: shady suburbs with Victorian houses stop where the laboratories, institutes, and office parks begin. Horses roam as they have for decades in the rolling country across from Comsat Laboratories; cornfields flourish near Fairchild Industries' roadside headquarters. As the current northern "anchors" of the corridor, Comsat and Fairchild are also indicative of many of the companies along the Alley whose futuristic purposes are reflected in the exterior architecture. The 21st-century-like buildings lend an "air of tomorrow" to the entire stretch of highway through Montgomery County. For instance, clustered near the silver-and-white Comsat complex and Fairchild's series of sleek, tan, low-rises is home base of Digital Communications. It's just one of many buildings featuring satellite receiving dishes out front or on the roof, leaving little doubt as to the origin of the Satellite Alley nickname.

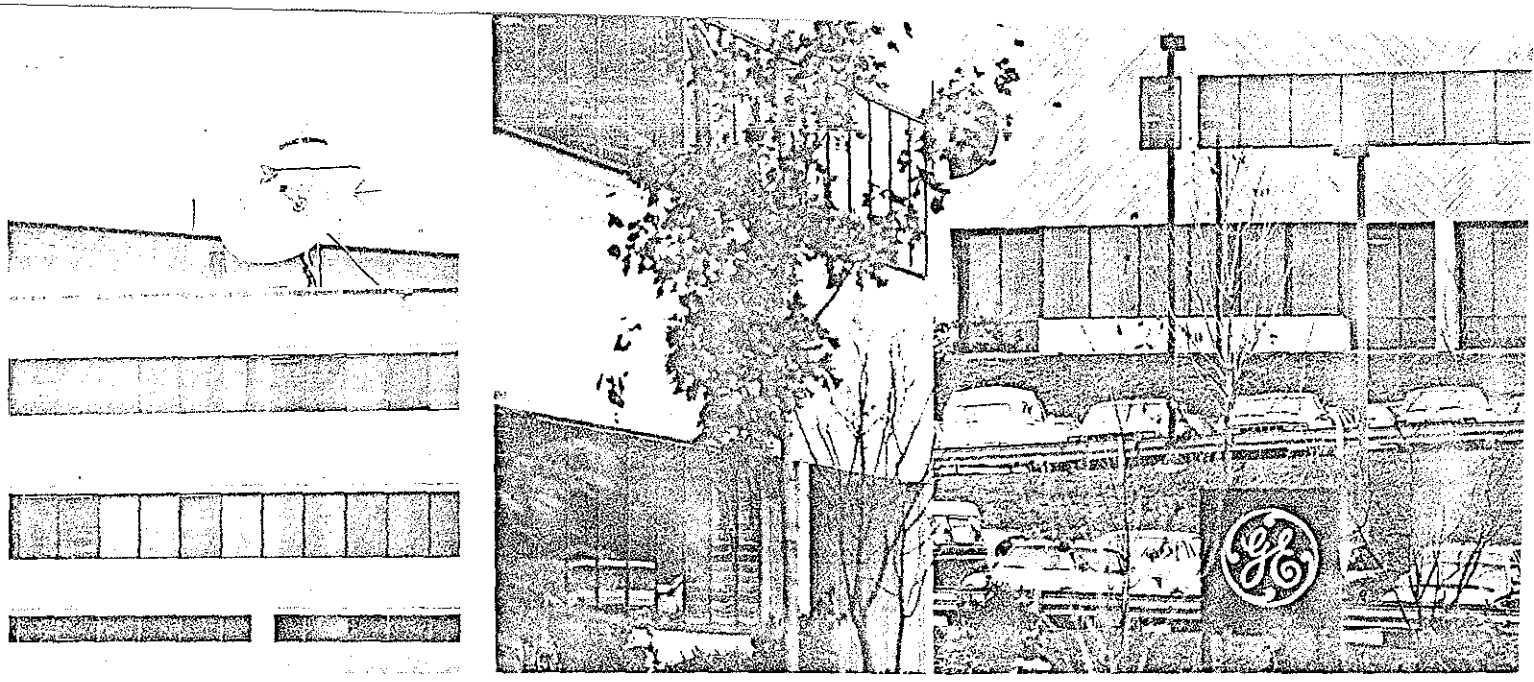
The Department of Energy's vast complex resembles a college campus, complete with a baseball diamond where helicopters land in left field. Also in the campus motif is the National Bureau of Standards, which, with the IBM Federal Systems Division, dominates the Quince Orchard area of Gaithersburg. IBM overflows its main quarters east of I-270 into some of the scores of office buildings nestled among the townhouses, apartments, and retail development in the area.

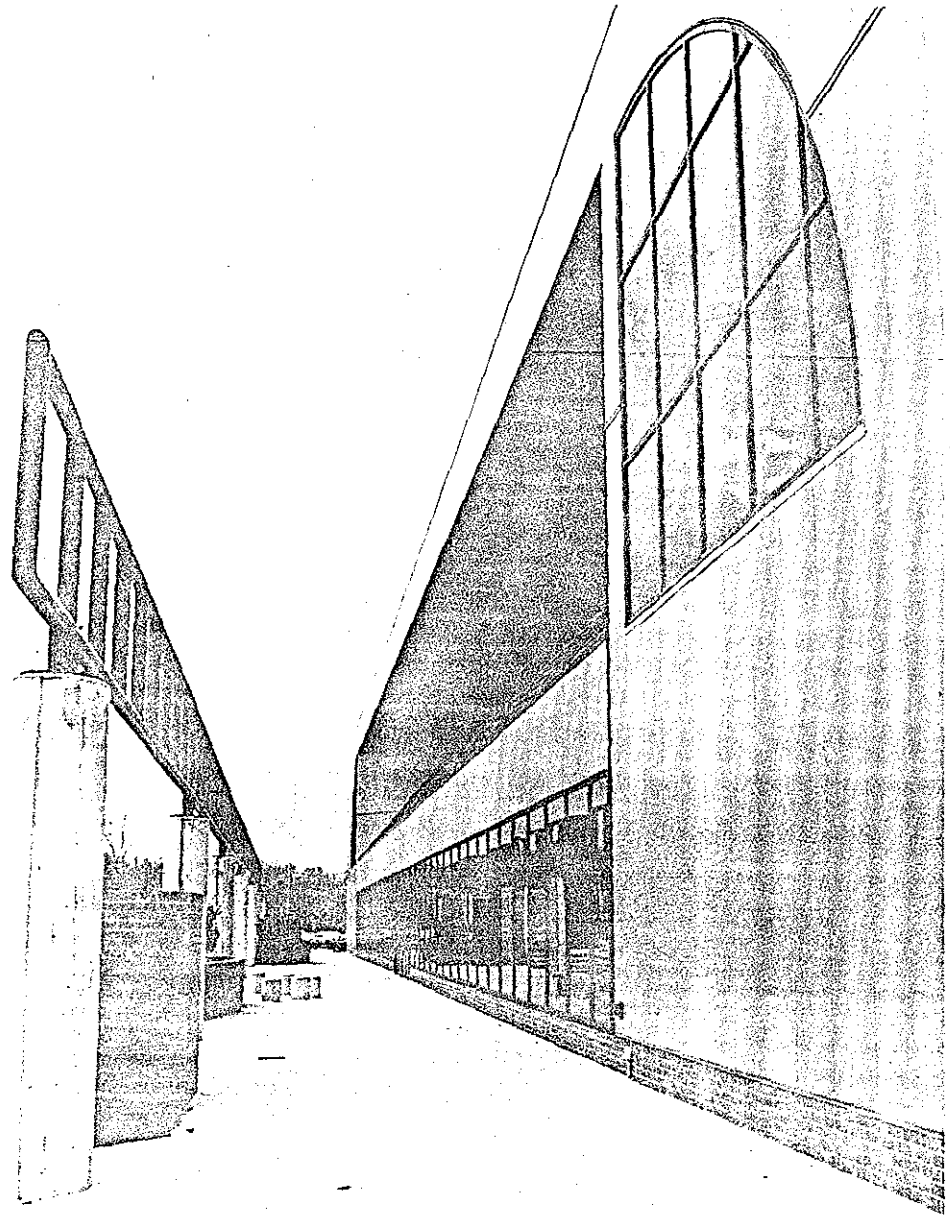
General Electric Information Services, Hewlett-Packard, Bechtel Power, Kodak Processing, American Satellite, Litton Bionetics and dozens of smaller research and computer service firms — some homegrown spinoffs of the giants — dot Rockville and environs. Every building seems to bear a high-tech name on the brickwork or the lawn. The few exceptions are basically allied, white-collar enterprises whose offices contribute to the scientific community's bent for architectural distinction.

Many companies on the Corridor are

High Technology Corporations Located along the I-270 Corridor







Some of the I-270 "tenants" include Digital Communications Corp., a Comsat spin-off (top left); and General Electric (above). Unique design makes each structure distinctive (left).

among the most advanced in their fields. Comsat, with its history of breakthroughs in broadcasting and telecommunications, is the father of numerous once-small firms that have earned distinction. Notable among these is Digital Communications, which produces "the guts" of satellite carrier systems, equipment for earth stations, and the parts to decode and unscramble TV signals sent by satellite.

The area's rapid development (especially north of Rockville) and the need to move thousands of people *en masse* in and out of giant employment centers twice a day has driven traffic planners back to the drawing boards. The rapid transit system and a newly-planned Interstate spur in the Shady Grove area, which undoubtedly will help, are still a year or more away.

However, the slower-than-customary population growth does give local officials time to catch their breath. A priority in Montgomery County is to avert the damaging effects of overcrowding and astronomical housing costs and taxes that are driving computer and semiconductor industries from the Silicon Valley to other western states.

Meanwhile, in Frederick County

The development potential of the I-270 corridor is now being felt at its northern end in Frederick County, bringing new

housing and industry to the base of the Catoctins.

Workers having to commute to jobs out of the area have helped bring Frederick County into the high-tech economy. Donald R. Date, Frederick's economic development director, says a company opening its doors in the county is deluged with applications from local residents tired of driving long distances each day.

The National Cancer Institute installation at Fort Detrick at the edge of Frederick and plentiful land are ready-made magnets for industry in Frederick County. The newest local showpiece is Solarex's "solar breeder," the world's first, near the junction of I-270 and I-70.

Also significant to the county's continuing economic development are industrial parks and research centers surrounding the city of Frederick as well as office development near the county's well-equipped airport.

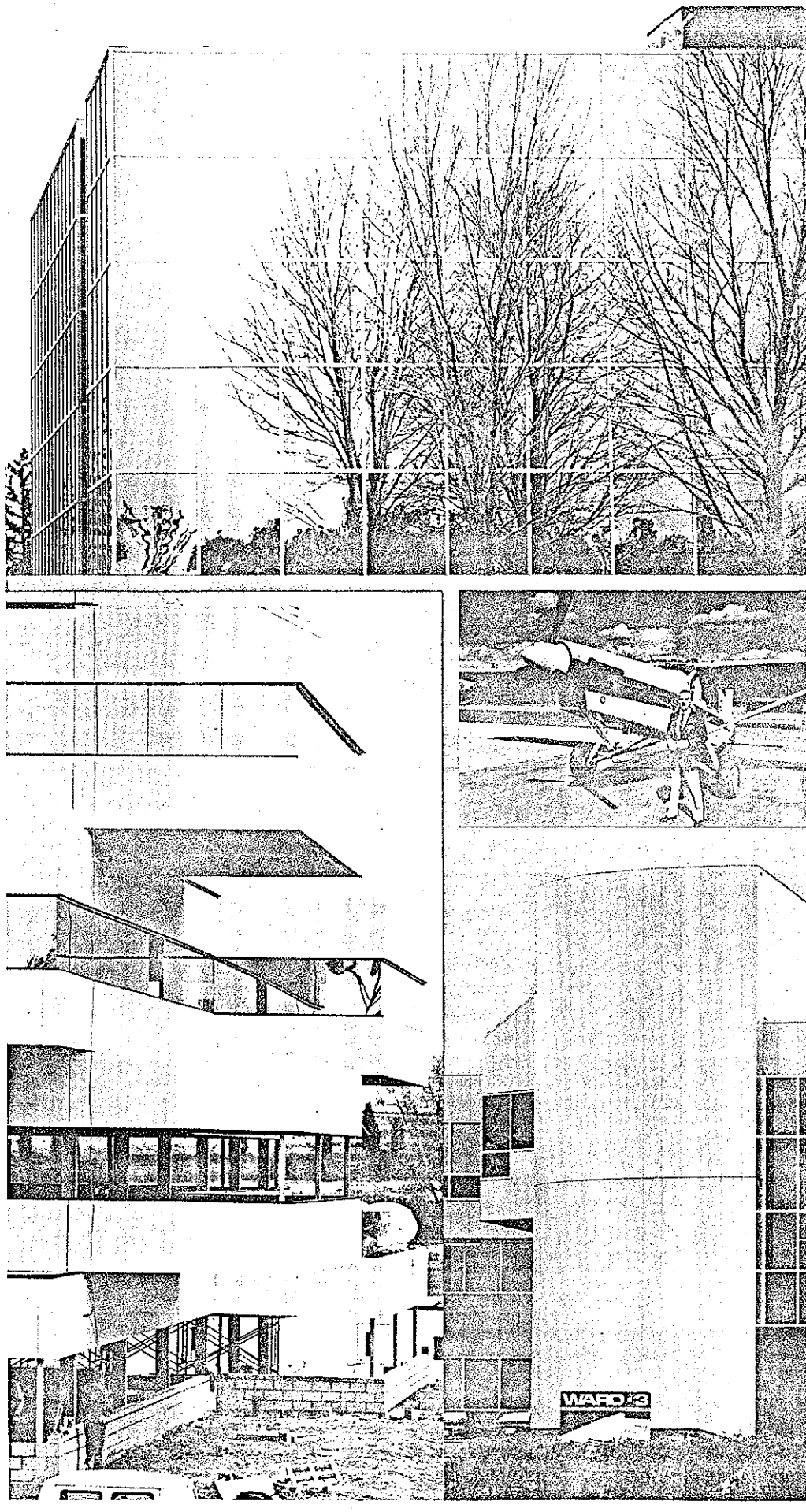
The thrust of the county's development, according to Date, will be three-pronged: light manufacturing, high-tech, and research and development firms.

He views the northern end of the I-270 corridor as being "very important for future employment." The county is reserving the open land along the Interstate for economic development through its Master Land Use Plan. Mr. Date expects the area to reach its fullest potential for accommodating industry within the next three to seven years.

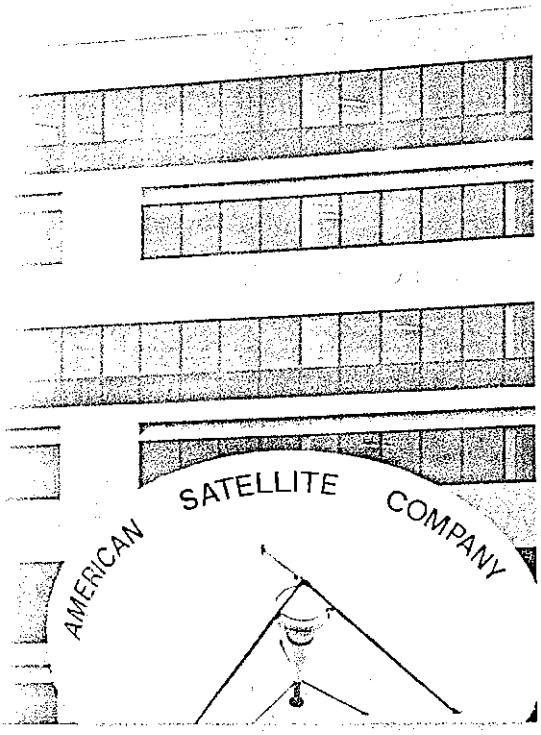
Looking ahead, the day is coming when Comsats and Fairchilds will line the corridor from Montgomery County to the Monocacy River, bringing to the rolling farmlands and wooded hills the look and technology of the 21st century.

The southern end of the corridor also does not depend on labor-intensive manufacturing of computers and electronic parts. High land costs here make assembly-line manufacturing impractical, although Montgomery County officials do recognize a need to generate entry-level jobs for the less-skilled.

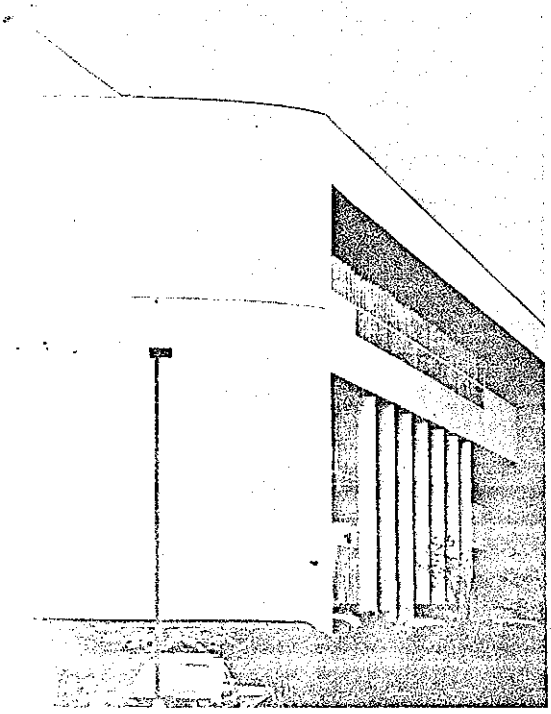
Whatever it takes to get the job done, Montgomery is prepared to do. For Mr. Duc and his counterparts in Frederick County agree that, to a large degree, the future of their areas lies along the winding ribbon of asphalt known on the road maps as I-270.



JEFF KOSNETT *spent four years as a business writer for* The Sun *before taking his current job as Associate Editor for* Changing Times. *This is the Columbia resident's third contribution to MARYLAND Magazine.*



CLOCKWISE FROM TOP RIGHT:
Another new office building on Shady Grove Road in Gaithersburg joins the boom. American Satellite Co. is on Research Blvd. in Rockville. The Systems & Applied Sciences Corp. is in Rockville, while the 270 Corporate Center is in Germantown. Al Maye, corporate pilot for Fairchild Industries, has watched the growth along I-270 from the air.



Biotech "Boom" in Montgomery County

Though we may not be aware of it, one of the most rapidly expanding technologies of the 1980s—and the one most likely to affect us in the most intimate ways—involves neither hardware nor software, silicon chips nor missile guidance systems. It is the "technology of life," the engineering of biological organisms—and Montgomery County, with NIH and numerous "big name" genetic engineering firms, is a primary focus of this scientific revolution.

Bioengineering, as it is called, is both a very new and very old technology. In a formal sense, it may have begun when Gregor Mendel, a scientifically-minded, 19th-century Augustinian monk, demonstrated that living organisms pass along some kind of hereditary factors (later dubbed genes) from generation to generation, factors that determine, among other things, whether little Suzy gets her mother's blue eyes or her father's brown ones.

In 1954, the genes themselves were isolated. They proved to be giant molecules, fashioned of a substance called deoxyribonucleic acid (DNA). Once biochemists had learned to read this "genetic code," it was perhaps inevitable that they would also discover a way to rewrite it.

This breakthrough came in the early 1970s, when chemical tools, called *restriction enzymes*, were developed that allowed scientists to slice apart the genes of certain bacteria and recombine them with the genes of other organisms, thus creating hybrid organisms that had never existed in nature.

So what good is this for us, one might ask. These recreated bacteria can be "designed" to serve as microscopic chemical factories manufacturing useful substances such as human insulin, for diabetics, and human interferon, used in cancer treatment.

Their advantage is that they are neither artificial nor animal-derived and hence are fully potent and unlikely to cause allergic reactions; further, they can be produced in large quantities for low cost, a considerable boon in the case of interferon, which in its natural form is worth many times its weight in diamonds.

Some visionaries see even more astonishing vistas beyond the current boundaries of biotechnology, including the genetic engineering of human beings and the conquest of death itself.

With such promise comes great peril, and it was perhaps inevitable, when concerned scientists and citizens raised a cry in the mid 1970s over the potential risks and abuses of this technology, that the National Institutes of Health in Bethesda would become involved as a kind of clearing house for determining the safety of genetic technologies.

Because NIH contracts most of its genetic research to private firms, it has served as a magnet for corporations seeking to gain lucrative government funding for their R&D, thus turning Montgomery County into a kind of genetic silicon valley, one of three major biological boom areas in the United States. (The others are in California, where the technology was born, and in Massachusetts, near Harvard and MIT.)

Apparently, this corporate strategy has paid off. Of the funds appropriated by NIH for genetic research since the mid 1970s, fully 90 per cent have been spent in Montgomery County! Biotech companies, such as Genex and Bethesda Research Laboratories, Litton Bionetics, and Biosci, represent the cutting edge of what is already becoming a major high-technology industry. And they have further been encouraged by the Montgomery County government, now involved in the creation of a major biotech center off I-270—the Shady Grove Medical Park.

The best known of these gene-splitting firms is Genex, founded by J. Leslie Glick and based near Rockville. Almost as well known is Bethesda Research Laboratories, which started in 1975 with President Stephen Turner carrying enzymes from laboratory to laboratory in a bucket.

These are the "big-shots" of the genetic engineering world, but there are also any number of feisty smaller firms. One such is EMV, near Gaithersburg. Vice President James MacAlear, not one to stint on imaginative speculation, predicts a time when the gene splicers will be able to genetically engineer ultra-miniature, "living" computers from the very molecules of life, molecular electronic circuits which may even be capable of biological reproduction!

A far-reaching vision indeed—and one that weds the gene-splicers with the more conventional high-technology firms that thrive along the I-270 corridor.

By Chris Lampton

New Technology Puts Strains on Old Laws

Item: Company A spends $40 million to develop and market a tiny, highly sophisticated silicon chip to run a home computer. Company B buys the product, copies the chip for $60,000 and markets its own, cheaper computer. Does Company A have a legal remedy against Company B?

* * *

Item: Cable television system A, located in a rural county, provides viewers 25 channels, among them WTBS, whose signal is beamed in by satellite from 600 miles away in Atlanta. Cable system B, in an urban area 600 miles from Atlanta, also brings in WTBS. Should cable system A, because it is in a small, less competitive television market, have to pay a higher royalty fee than system B for bringing in copyrighted material via WTBS?

* * *

Item: The FBI suspects that Mr. X is running an illegal betting operation on his home computer and wants to monitor his system. Does the current wiretap law require court approval for such FBI activity?

* * *

These are but three examples of a myriad of difficult questions facing Congress, all the result of the technology explosion of the last decade. The issues touch copyright and criminal law, raise questions about personal privacy and national security, and in some instances affect relations between the United States and other countries.

While several House and Senate subcommittees have looked into various aspects of new technology, the bulk of the issues reside in the Senate and House Judiciary committees, which have primary jurisdiction over copyright and criminal laws.

Subcommittees with copyright jurisdiction have held hearings on a range of issues in the last year, and the two panels plan a special seminar in Florida in February devoted to new technology. Fort Lauderdale was selected because it is the site of the International Business Machine Corporation's (IBM) new plant that produces a commercially successful personal computer. The members will have an opportunity to use the most innovative computer equipment from IBM and other companies, which will bring equipment to the seminar. In addition, members will meet with panels of businessmen and academicians to discuss technology issues.

The seminar is evidence of a new congressional dilemma. Members — most of them with little or no technological background — are being asked not only to understand the complex workings of computers, microchips, satellites and the like, but to fashion laws that will properly regulate a multifaceted industry.

The Supreme Court in the last four years has dealt with a variety of issues raised by new technology, and while the court has dipped a toe into these murky waters, it has made clear that Congress should set the course.

In the most recent case, involving copyright law and the use of home video recorders, Justice John Paul Stevens wrote: "Repeatedly, as new developments have occurred in this country, it has been the Congress that has fashioned the new rules that new technology made necessary." *(Weekly Report p. 95)*

Rep. Dan Glickman, D-Kan., a member of the Judiciary and Science and Technology committees, appreciates the complexities of the issues facing Congress, but he worries whether members can legislate properly.

"We have to avoid being trapped in a technological snake pit, where we are enveloped in highly complex technical solutions and we defer to the engineers, the scientists to solve the problems for us. We can't do that," Glickman said in an interview.

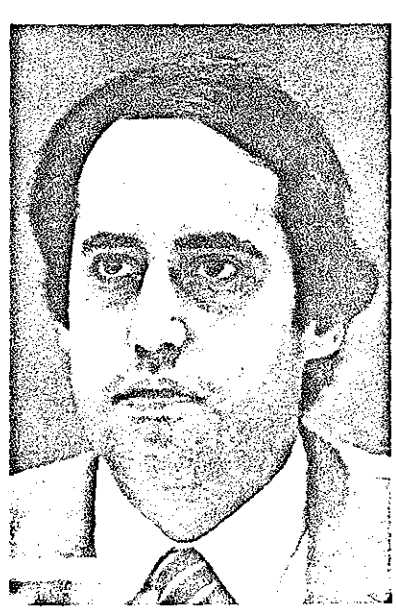
He conceded, however, that a good working relationship between scientists and policy makers "is very much lacking."

Congress Grappling With Complex Issues

New Technology, Old Laws

A decade ago, Congress realized

"We have to avoid being trapped in a technological snake pit, where we are enveloped in highly complex technical solutions and we defer to the engineers, the scientists to solve the problems for us."
—Rep. Dan Glickman, D-Kan.



—By Nadine Cohodas

that new technology was going to create problems with old laws. In 1974, the Commission on New Technological Uses of Copyright was created and given three years to make a report to Congress on technology and the law. Some analysts believe the commission, or something similar to it, should be revived to help members grapple with even more difficult current issues. *(1974 Almanac p. 290)*

Rep. Robert W. Kastenmeier, D-Wis., chairman of the House Subcommittee on Courts, Civil Liberties and the Administration of Justice, which has copyright jurisdiction, also believes that Congress must be careful in handling technological issues.

"One can see problems and issues that reasonable people would like to be able to settle before technology envelops us, overruns us so we cannot respond," Kastenmeier said.

"As you keep looking at these issues, you see questions that are deeper and more complex," he added. "One of the things I'm convinced of is that I'm only looking at part of it, but I have to look at part of it. If I don't, it's too large to comprehend."

Copyright Issues

Copyright law is probably the area most affected by the new technology. The last major overhaul of the law was in 1976, and scientific developments made the act outdated almost before it went into effect in 1978. *(1976 Almanac p. 494)*

Significant questions have arisen about how to protect new creations, such as the semiconductor chip, from copying. Are they intellectual property like books, and therefore subject to copyright protection? Or are they really processes, more properly protected by patent law?

A second set of questions concerns new ways to copy old forms of information. Should extra royalties be required when copyrighted materials — television programs and movies — are transmitted by cable and satellite transmissions, or when consumers use their own video or audio recorders to tape copyrighted materials for their own use? How much is the copyright holder entitled to?

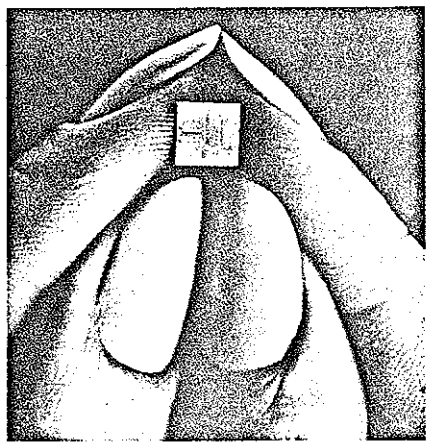
Semiconducter Chips

The semiconductor chip issue is among the most troublesome, in large part because it is so difficult to define what the chip actually is.

It is something like a scientific Dagwood sandwich, a system of intricate layers of material with unique designs etched on them. The designs route electrical signals so they will perform specific tasks.

The main component of the chip is a transistor, which is an electronic device that can amplify electrical signals and can act as an electrical switch.

Transistors must be connected, or integrated, to form a particular circuit, which then performs the function desired by the chip designer, such as controlling the rate of fuel flowing into an automobile carburetor. The transistors, up to 250,000 in a single, tiny chip, are imprinted on semiconductor material, usually a silicon wafer. Silicon is used because as a semiconductor it can either transmit or block the flow of electrical impulses, in order to make the carburetor, for example, perform the desired function.



This silicon chip is the heart of a computer and has 70,000 transistors embedded in it.

Currently, copyright protection is not available for the design or layout of the circuits, nor for the preparation of the photographic masks used to etch the layout into the chip.

It is this protection that the chip industry is seeking. California Democratic Reps. Don Edwards and Norman Y. Mineta, whose constituents include some of the major chip manufacturers and their employees, are sponsors of a bill (HR 1028) that would give limited copyright protection to the chip process.

Edwards explained that currently, a "pirate firm" can photograph a chip carefully developed by a company, analyze it and duplicate the chip's layers for considerably less money than the original product.

"Because the pirate firm does not have the enormous development costs borne by the innovator, the pirate firm can undersell the innovator and flood the market with cheap copies of the chip. Such piracy is a clear threat to the economic health of our semiconductor industry," Edwards said.

Sen. Charles McC. Mathias Jr., R-Md., has introduced a similar bill (S 1201) that is pending before the Senate Judiciary Committee. The Patents, Copyrights and Trademarks Subcommittee, which Mathias chairs, approved the bill Nov. 15.

S 1201 and HR 1028 are similar in many respects. Both would provide copyright protection for the imprinted design patterns on semiconductor chips. The measures grant 10 years of copyright protection to those who develop new designs, giving copyright owners exclusive rights to make, distribute and reproduce images of the mask design and the chips embodying that design.

This provision is a departure from copyright law, which gives an individual copyright holder, such as an author, exclusive rights for his lifetime plus 50 years. Other types of copyright holders, such as an employee who creates a work in the scope of employment, are given protection for 75 years from publication or 100 years from creation, whichever period is shorter.

The bills also protect semiconductor chip users from liability for using a product that may have been made from a pirated chip if the users were unaware the chip was pirated. The Senate bill specifically allows "reverse engineering," which is breaking down a chip for study and analysis.

The semiconductor industry is solidly behind the chip bills. F. Thomas Dunlap Jr., an official with the Intel Corporation and representative of the Semiconductor Industry Association (SIA), told Kastenmeier's subcommittee July 30 that "it has taken the SIA four years to agree on this extension of copyright law to protect chips. It is our belief that this is the only practical method of protecting our valuable patterns."

Gerald J. Mossinghoff, commissioner of patents and trademarks, testified Dec. 1 before Kastenmeier's panel that the Reagan administration "strongly supports legislation along the lines of HR 1028."

Mossinghoff said patent protection would not be sufficient because the patent process is too lengthy, and because the layout of the circuitry is not appropriate for patent protection.

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Trade secret protection is available, he said, "but only up to the time that the first disclosure or unrestricted sale of the chip is made."

The copyright bills have their detractors, however, and one of them is the U.S. Copyright Office. Dorothy Schrader, associate registrar of copyrights for legal affairs, has testified in opposition to both the House and Senate bills, though she said the office believed that semiconductor chips need some sort of legal protection.

In Dec. 1 testimony before the House panel, Schrader said proposed definitions of what would be covered under the bill were stretching the constitutional basis of copyright law — Article I, Section 8 of the Constitution, which speaks of protecting "writings."

"This explicit extension of coypright to electronic devices represents a dramatic departure from 200 years of copyright legislation," she said.

Schrader said the copyright office favored developing legislation that would grant to an "industrial design" protections similar to those granted by the copyright proposals. Schrader said the design concept avoids all of the problems of forcing "traditional copyright policies and principles" to fit a new technological development.

A design bill (HR 2985) currently is pending in the House Judiciary Committee.

Concerns about the copyright bills also were raised by the Association of American Publishers and the Association of Data Processing Services Organization. Spokesmen for both organizations said they were concerned that the copyright approach would distort well-established interpretations of copyright law.

Richard H. Stern, a computer law specialist and consultant to the semiconductor association, opposes the design concept. In an interview, Stern said design protection aims at something that is "ornamental," while the chip problem deals with something that is "functional and utilitarian."

At Kastenmeier's Dec. 1 hearing, Emory University law Professor L. Ray Patterson suggested that a new "industrial copyright" be created, separate and distinct from an author's copyright.

Patterson said that "copyright protection for the semiconductor chip in traditional terms can be analogized to a copyright for books that protects the printing press as well as the book."

Patterson said his industrial copyright proposal, while giving some of the protections envisioned in S 1201 and HR 1028, would be neater conceptually than either measure.

Kastenmeier said there is a consensus that chip protection is needed, but he remained noncommittal about whether legislation would be enacted this year. His staff is trying to draft a new bill that incorporates suggestions made at the hearings.

In the Senate, a senior Judiciary aide said prospects are good for committee approval of S 1201.

Software Protection

Semiconductor chip protection is not the only copyright issue raised by computer technology. In 1980, Congress passed a law specifically giving copyright protection to computer software (PL 96-517). Since then, there has been a handful of federal court decisions amplifying the issue.

One important ruling came in a case brought by Apple Computer Inc., which sued the Franklin Computer Corp. for copyright infringement. Apple was seeking protection for computer operating instructions that were etched on a chip. Operating instructions tell the computer how to handle information.

Apple sought to stop Franklin from copying operating instructions for two popular Apple models. A federal district judge had ruled against Apple in 1982, denying the company's request for an injunction. But in August 1983, the 3rd U.S. Circuit Court of Appeals ruled that operating instructions were protected by copyright law, even if the instructions were embedded in a chip.

This was the first time copyright protection had been granted to operating instructions. In the past, such protection had been available only for so-called "applications" programs — those that take one kind of data and transform it into another.

Although Franklin said it would appeal the decision, the company settled with Apple in early January, agreeing to pay Apple $2.5 million.

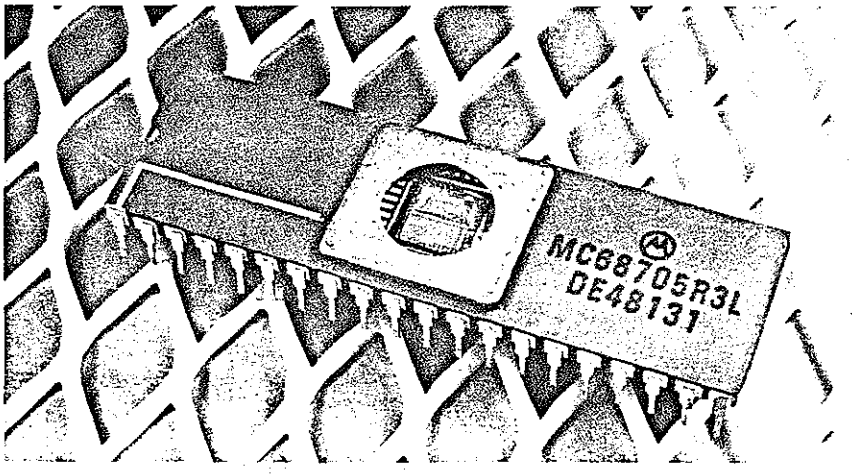
Many specialists in computer and copyright law believe there still are unresolved software issues, despite the court cases. They note that the Apple case, for example, is not a Supreme Court decision and technically is not binding on the other federal appeals circuits.

In addition, there remain difficult questions over what is an infringement. Stern, for one, believes copyright law needs to be revised so that computer software is covered more specifically. In an article for IEEE MICRO, a professional association magazine, Stern wrote that the owner of a copyright on a book "can stop only the making and selling of copies of the book, not the use of the book.... Doubtless this principle is perfectly sound for cookbooks and pictures.

"But much of the value of computer software is in its use, and software proprietors may lose much of the value of their creations, and much of their incentive to invest in further creations, if their 'use' value can be appropriated without compensation."

New Copying Methods

An entirely separate set of copyright issues surrounds technology that provides new ways to copy traditional copyrighted material. Questions



This is a microcomputer chip sealed in a protective ceramic package. The chip has a memory whose information can be erased by a beam of ultraviolet light.

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abound concerning the right of the copyright holder to collect new royalties vs. the right of the public to have access to copyrighted material.

No better illustration of the problem exists than the case decided by the Supreme Court Jan. 17 on the use of video cassette recorders for home taping, a copying process that often involves "time-shifting," or taping of programs for later viewing.

A 5-4 majority ruled that consumers do not violate federal copyright law when they use video recorders to tape television programs for their own, non-commercial use. The court also said that companies that make and sell the machines do not violate copyright law by making the video recorders available to the public.

In the case, *Sony Corporation of America v. Universal City Studios, Inc.*, Universal contended Sony was liable for contributing to copyright infringement because it marketed Betamax video recorders used by consumers to tape television programs copyrighted by the movie studio.

While the court ruled to the contrary, the justices invited Congress to take a new look at the law.

Copyright issues, wrote Justice Stevens, involve "a difficult balance between the interests of the authors and inventors in the control and exploitation of their writings and discoveries on the one hand, and society's competing interest in the free flow of information and commerce on the other. . . ."

Royalty Legislation

The entertainment industry agrees with the court that home taping should not be a copyright infringement. However, it believes the copyright holders — scriptwriters, songwriters, movie studios and the like — are entitled to royalties from home taping.

For more than two years, the industry has been pushing legislation that would add a royalty surcharge to the price of video recording machines and blank tapes. The monies would go to the Copyright Royalty Tribunal, which would then disburse them to copyright holders. The tribunal was established by the 1976 law primarily to collect and disburse copyright royalties paid by cable television.

Jack Valenti, head of the Motion Picture Association of America and chief spokesman for the entertainment industry on this issue, contends that without royalty protection, the American public will be the ultimate loser because the number of creative works will decline.

Legislation (S 31, HR 1030) is pending in House and Senate Judiciary subcommittees to provide new royalties to copyright holders. But prospects for passage are unclear. Kastenmeier said shortly after the *Sony* decision that he doubted this Congress would act on a royalty bill.

Record, Television Rentals

Separate from the home taping issue is a dispute over the rental of records and video materials. Craft unions and copyright holders, including motion picture and record companies, songwriters and publishers, support legislation that would bar the rental of phonograph records, motion pictures or other audio-visual work for direct or indirect commercial advantage without the permission of the copyright owners. The copyright office also supports such bills.

The Senate already has passed a bill (S 32 — S Rept 98-162) covering record rentals. S 32, which passed June 28, amended the "first sale" doctrine of copyright law under which some rights of copyright owners expire at the point of the first sale at the wholesale or retail level.

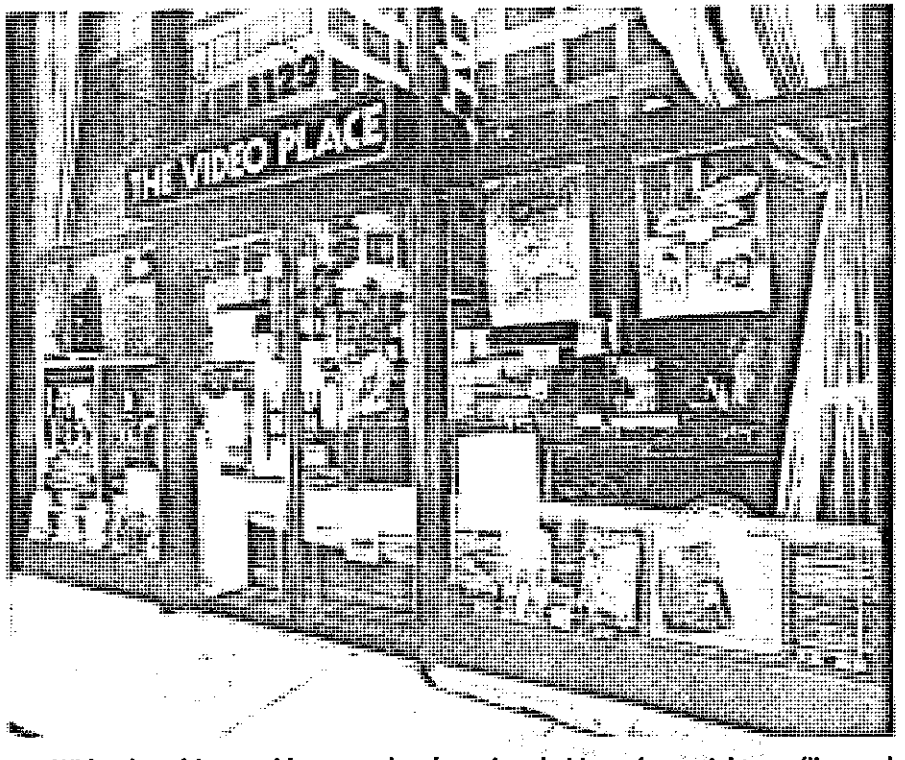
Under the bill, permission of owners of the copyright of the song and the record would be required before a record could be rented. The bill would allow libraries to lend records.

In supporting the bill, Senate Judiciary Chairman Strom Thurmond, R-S.C., said that while there are only about 250 record rental outlets in the United States, more than 1,700 exist in Japan, causing economic damage to that country's record industry. The same could happen here, he warned.

Thurmond said that records are rented almost exclusively for the purpose of taping, displacing sales and depressing the market. "The fact that subsequent taping is clearly the motive behind the rental is demonstrated by the fact that some record stores even include a blank tape in the price of the rented record," he said.

The Senate Judiciary report noted that under S 32, the copyright owners "would be free to decide how best to market their creative property by sale, by rental or both. However, they would be under no obligation to authorize rentals."

Opponents of the bill, including the consumer electronics industry, record rental stores and some consumer groups, contend the legislation would give record companies control



With sales of home video recorders booming, holders of copyrights on films and other visual materials are urging Congress to impose a royalty surcharge on every machine and blank tape sold. Such bills are pending in both chambers.

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over the rental market, including the right to eliminate rentals altogether. They also dispute whether depressed record sales can be blamed on record rentals.

A similar House bill (HR 1027) is pending in Kastenmeier's subcommittee. The chairman said that even though there is only a small record rental business in the United States, Congress may want to legislate "before there is an industry of renting records that becomes formidable.... It may well be the case that we should legislate before the problem arises."

Legislation is pending in the House and Senate copyright subcommittees that also would amend the "first sale" doctrine for video rentals. However, neither of the bills (S 33, HR 1029) has moved.

Those bills would bar the rental, lease or lending of a motion picture or other audio-visual work for direct or indirect commercial gain without the copyright owner's permission. Neither measure would affect non-commercial transactions such as lending by a library.

Consumer electronics groups and most video rental store owners oppose the legislation.

Cable TV and Copyright Law

The growth of cable television in the last decade has presented another set of questions about proper compensation for copyright owners and protection of revenues for local television stations.

Cable television systems, using satellite dishes, tall master antennas or microwave relay systems, pick up signals from a variety of sources and transmit them into subscribers' homes through a cable. Cable systems can transmit both broadcast signals, which are the signals of stations licensed by the Federal Communications Commission (FCC) and available to any television owner, and non-broadcast signals. (Many news, entertainment and sports networks reach their customers through non-broadcast signals.) Cable operators also can originate programming from their own studios.

Under current law, cable television systems pay a compulsory license fee to the Copyright Royalty Tribunal for use of copyrighted materials. This arrangement has spared cable systems from negotiating directly with every copyright holder when they retransmit a signal carrying copyrighted material.

In 1972 — the infancy of cable television — the FCC restricted the number of signals that could be imported by a cable system from outside the local service area.

The reason for the rule was protection of local television stations, which the FCC believed might be harmed by competition from distant stations. The threat was perceived to be greatest in rural areas, where there were fewer stations. As a result, the FCC limited the number of distant signals carried by cable systems based on their location.

Cable television systems in the top 50 television markets were permitted to carry up to three distant, independent, non-network television signals. They paid .799 percent of gross receipts as a royalty rate for the first signal, and .503 percent for each of the second and third signals.

"Repeatedly, as new developments have occurred in this country, it has been the Congress that has fashioned the new rules that new technology made necessary."

—Justice John Paul Stevens

Systems in markets 51-100 could carry two distant, independent television signals, paying .799 percent for the first signal and .503 percent for the second. Those systems in smaller markets, defined as any town with at least one television station that is not in the top 100 markets, were permitted only one independent, distant signal. They paid .799 percent of gross receipts for that signal.

In 1980, the FCC, after careful study, decided no justification existed for the distant signal restrictions and repealed them. When the FCC repealed the limits, the copyright tribunal began proceedings to determine an appropriate royalty rate for new distant signals.

The new rate set by the tribunal took effect March 15, 1983. It required 3.75 percent of gross receipts for each distant signal beyond the ones allowed under the old rule — a substantial hike from the old rates. Thus, the smallest systems would have to pay 3.75 percent of gross receipts for their second and third distant signals, while the largest systems could continue to bring in three signals at the old rate. The 3.75 percent rate would not apply for them until a fourth distant signal was brought in.

The royalty tribunal said the new rate was based on an assessment of what cable systems would have to pay for distant signals in a free market, in the absence of the copyright licensing scheme.

The new rate was immediately challenged by the National Cable Television Association (NCTA), which represents about 2,000 of the country's approximately 5,800 cable system owners.

The NCTA claimed that the tribunal acted improperly in raising the royalty rate so dramatically. However, the rate was upheld in a Dec. 30 decision of the U.S. Court of Appeals for the District of Columbia. The court said that Congress intended the tribunal to have wide latitude in setting royalty rates, and that there was no evidence to conclude that the tribunal had acted unreasonably.

Since the rate went into effect 11 months ago, cable companies and satellite common carriers, which provide signals to cable systems, have charged that the rate severely damaged their businesses because the cable systems cannot afford as many distant signals.

Rep. Sam B. Hall Jr., D-Texas, sponsor of a bill to ease the impact of the new rule, told Kastenmeier's subcommittee Oct. 19, 1983, that the tribunal's rule meant "immediate discontinuation of many distant broadcast signals by cable systems and a consequent wholesale loss of programming to the public.... This loss was particularly severe in rural areas," Hall said, "where diverse television service is needed but is all too often lacking."

Hall's bill (HR 3419) would provide exemptions from the tribunal's rate structure for broadcast stations such as WTBS in Atlanta that engage in national marketing and negotiate directly with copyright holders for use of their materials.

Rep. Mike Synar, D-Okla., has introduced a separate bill (HR 2902) that would permit all cable systems, regardless of market location, to carry at least three distant signals without having to pay the new 3.75 percent royalty rate. He said his bill presumed that systems would continue to pay royalty rates for the first three signals under the old formula.

In House subcommittee testimony Oct. 19, NCTA President Thomas E. Wheeler said NCTA research showed that 76 percent of those

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cable operators liable for the new copyright fees had had to drop one or more distant signals they had added after the FCC deregulation in 1980.

The Motion Picture Association applauded the new rate structure. Fritz Attaway, its counsel, said in an interview that the old rates were inadequate and amounted to a "subsidy" for cable systems. "For the first time, we received something approaching fair market value."

Cable and Canada

Still another cable issue involves the United States and its Canadian neighbors, an issue of particular concern to Sen. Patrick J. Leahy, D-Vt.

The problem, according to Leahy, is this: Canadian cable systems are able to pick up U.S. broadcast signals and retransmit them to Canadian viewers. However, the Canadian systems are not paying any compensation to U.S. copyright holders whose works are embodied in those signals, even though U.S. cable operators must pay Canadians for similar use of their copyrighted works.

Leahy has introduced a bill (S 736) to address the problem. He calls it the "international copyright fairness bill," and although it would apply to any foreign country, it is primarily aimed at Canada. Leahy's measure would require that before royalties are disbursed to non-resident foreign nationals for cable retransmissions, the Copyright Royalty Tribunal must find that the claimant's country provides equivalent compensation to American copyright holders for use of their materials. If no such finding can be made, the tribunal would retain the claimant's fees.

"Canadians remain entitled to their fair share of cable copyright royalty fees," Leahy said when he introduced the bill last March. "However, a fair share must be fair to everyone. That is all we are asking of the Canadian government, a fair opportunity for Americans to be compensated for the use of their creative works."

Leahy's bill is pending in the Senate Judiciary copyright subcommittee, where a hearing was held on the measure Nov. 15, 1983.

Spokesmen for the Canadian Broadcasting Corporation and the Canadian Association of Broadcasters acknowledged there were problems to be worked out between the United States and Canada. However, both representatives and David Ladd, the U.S. register of copyrights, who also testified, expressed strong reservations about Leahy's proposal.

A Judiciary Committee staffer said privately that Leahy was really more interested in "getting the Canadians' attention" on the problem than passing the legislation.

Dirty Dishes?

The problem of unauthorized use of copyrighted material surfaces in still another technological area — use of "dishes" and decoding devices set up in back yards or on rooftops to snag signals. This issue, according to Attaway, is often less a copyright issue than a matter of federal communications law.

When a person installs a receiving dish to bring in special programming, such as from pay television stations offering movies, he does not violate the copyright law unless there is a "public performance" of a program.

There is no public performance if the person simply views the program at his home, even if he invites friends over to watch. However, if a dish is installed at a bar or a fraternal lodge, and groups of people can watch it, this, according to case law, would be a "public performance" and in violation of the copyright laws.

The law is somewhat unclear in this area, Attaway said, because there is no clear definition of what is a "public performance."

Most often, according to Attaway, dish owners violate a section of the 1934 communications act that bars the unauthorized interception of broadcast or radio signals.

Enforcement of this law has been spotty, and virtually non-existent against an individual homeowner. Instead, the lawsuits initiated in the past few years have been brought by television services against the makers of signal decoders, which are necessary to unscramble the signals transmitted by some pay television services.

Security/Privacy Issues

Copyright questions are only part of the problems raised by the new technology. Equally difficult issues concern the security of computer systems and the information each system contains.

The issues were succinctly stated last Oct. 24 by computer security specialist Willis H. Ware, a member of the corporate research staff of the Rand Corporation. Ware testified during one of three days of hearings on security questions before the Science and Technology Subcommittee on Transportation, Aviation and Materials, headed by Rep. Glickman.

"Computer security is of importance whether the information to be protected is personal in nature and therefore relative to privacy; whether it is defense in nature and therefore related to the security of the country; or whether it is sensitive in nature and therefore relevant to corporate welfare in the private sector," Ware said.

"The important point to be noted is that a comprehensive set of security safeguards within and around a computer-based information system is an essential prerequisite for assuring personal privacy."

Computer Security

The issue of computer security has been underscored in recent months because of reported instances in which so-called "hackers" have been able to break into government and private sector computer systems. One of the more notable episodes involved the "414" group, named for the telephone area code of young computer enthusiasts in Milwaukee, Wis. Over a period of time, these young men gained access to about 60 computers, including systems at Memorial Sloan Kettering Cancer Center in New York City and the Los Alamos Laboratory, a government nuclear weapons research center in New Mexico.

Spokesmen for Los Alamos said the intruders did not gain access to classified or sensitive data. Sloan Kettering officials said the intruders threw administrative records into disarray but that no patients were harmed.

To help prevent such occurrences, members of Congress have introduced bills (S 1733, HR 1092) to make unauthorized use of computers a federal crime. However, the bills have not been well received.

One Republican Senate Judiciary staffer who has studied the legislation said that as drafted, it sweeps too broadly. He said it could give the federal government jurisdiction over a wide range of activity that more properly should be left for state law enforcement.

Similar concerns were expressed by John Shattuck, head of the Washington office of the American Civil Liberties Union (ACLU).

Some representatives of private industry testified in support of computer crime legislation at the Science

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and Technology hearings. They said that such a law at minimum would make the public more aware of the computer crime problem.

Chairman Glickman said he does not expect legislation to come out of his panel in 1984, but he said the subcommittee will issue a report on the subject.

Determining just how much computer crime exists is difficult. In testimony Oct. 17 before Glickman's panel, Floyd I. Clarke, of the criminal investigative division of the FBI, said there was "no method in place now to observe the statistical dimensions of computer-related crime.... There is no one agency at this time that has jurisdiction for computer-related crimes and very probably there cannot be because of the wide application of computers."

Clarke said the FBI views a computer as an "instrumentality of some other form of traditional crime, for instance theft or larceny. It is much like a gun, a knife, or a forger's pen."

Several of those who testified said the government could help the private sector with security matters not by crime legislation but by establishing guidelines for adequate security.

Jack L. Hancock, a senior vice president of Wells Fargo Bank, suggested that an independent agency be created to certify that a security device or technique meets specified minimum requirements.

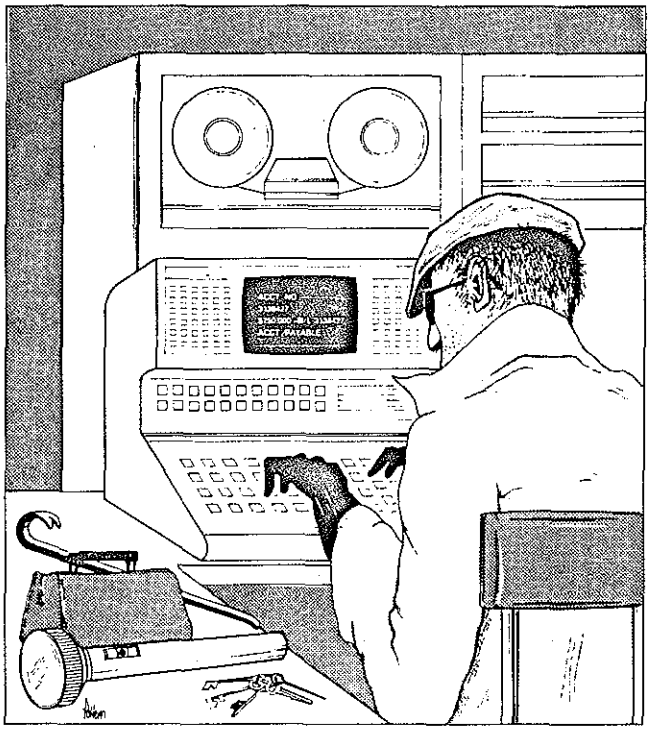
He also discussed what he called "computer ethics."

"It seems as though there is a feeling that attempting unauthorized access to a computer system is fun and games, particularly if nothing is lost or stolen," Hancock said. "This attitude needs to be changed, and schools that teach computer science must also teach the ethics and morals associated with computer use. Otherwise, we will have a very serious crime problem in the future."

At least one company seems to agree with Hancock's observation. On Jan. 20, IBM took out a large newspaper ad telling readers, "Everyone knows that the rules of the road have to be taken seriously. So do the rules for using a computer. Two of those rules are basic: Everyone who uses a computer has a responsibility for the security of the information in that machine. No one who uses a computer has the right to violate anyone else's security.... Both the suppliers and users of computers, software and telecommunications have a responsibility to help ensure that such information systems are used conscientiously, and with the understanding that other people depend on these systems too."

Privacy Matters

Concerns about personal privacy are as pervasive as concerns about computer security. What is at stake, according to the ACLU's Shattuck, is the ability to assure citizens that personal, and perhaps sensitive, information about them is kept private. "The technology has so far outstripped the protections of privacy that a great deal of new lawmaking is necessary," Shattuck said in an interview.



One example that Ware cited in his testimony is the use of electronic mail, the transfer of information by electronic device.

With such services "vast amounts of information about people" is transmitted, Ware said. The mere exchange of information relates addressee and sender, he noted, adding that "in principle, such information could be used to establish relationships among groups of people, such as organized groups or circles of acquaintances.

"Obviously such information could be of high interest to the law enforcement community, but the legal umbrella of protection over such information is confused and probably incomplete."

One area that worries Shattuck and many other privacy specialists is the current wiretap law. Under the present 1968 law, it is a federal felony for a third party to intercept the conversations of others by placing an electronic listening device or other "bug" on a telephone or in places such as an office.

An exception exists for federal, state and local law enforcement officers, who can use wiretaps for investigations so long as they have the approval of a specific prosecutor and have obtained a court order.

The law apparently does not apply to tapping into a computer, because the law defines the word "intercept" as the "aural acquisition" of information, and computer transmissions do not involve sounds.

One federal appeals court came to this conclusion, as did various privacy specialists and the General Accounting Office in a 1980 report.

This issue was discussed during a hearing Jan. 24 before Kastenmeier's subcommittee that dealt with the wiretap law generally.

The Rand Corporation's Ware suggested that Congress revise the 1968 wiretap law so that "it is the legal basis for protecting against unauthorized interception wherever it occurs." He cautioned against a "piecemeal" approach that only dealt with certain types of technology.

Although the privacy issue is complicated, Shattuck said it was important to remember that Congress already has dealt with some privacy matters. The 1974 Privacy Act, for example, bars the government's use of personal, private information collected for one purpose for a totally different purpose.

It also permits an individual access to personal information contained in federal agency files and to correct or amend the information. *(1974 Almanac p. 292)*

"We're not writing on a clean slate," he said. "The bottom line politically," Shattuck added, "is that all of these problems are quickly rising to the surface, but I don't believe the legislative solutions to them are going to be that quick." ∎

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Companies Turn Old Ideas Into Profits

Businesses are seeking novel ways to share innovations—and profits—internally

BY AL SENIA

FROM ITS corporate offices in Beverly Hills, Calif., Litton Industries sits atop a wildly diversified high-tech empire that encompasses more than 50 operating divisions around the globe. Litton manufactures everything from naval ships to metal-cutting machines to equipment used to find oil. With so much going on in so many places, one would think that Litton must be a conglomerate of divisions too diverse to go anywhere but their separate ways.

But officials at the $4.5-billion company are closer than one might suspect, thanks to a corporate policy that encourages the spread of ideas and innovations from one division to another. When Litton's Guidance and Control Systems Division developed a line of highly successful inertial navigation systems for jet fighters, it didn't just sit back and watch the profits roll in. The division hustled some experts over to another Litton group serving the commercial aerospace sector. That group adapted the guidance technology for civilian aircraft; the result has grown into a $200-million annual business.

Litton is one of a growing number of U.S. manufacturers who are discovering that new, money-making technologies often are best found in their own corporate backyards. By grafting technological capabilities from one division onto the products of another—or even creating a new business group around a product or process—companies are getting a much bigger bang from developments that otherwise might remain isolated in a single, limited market.

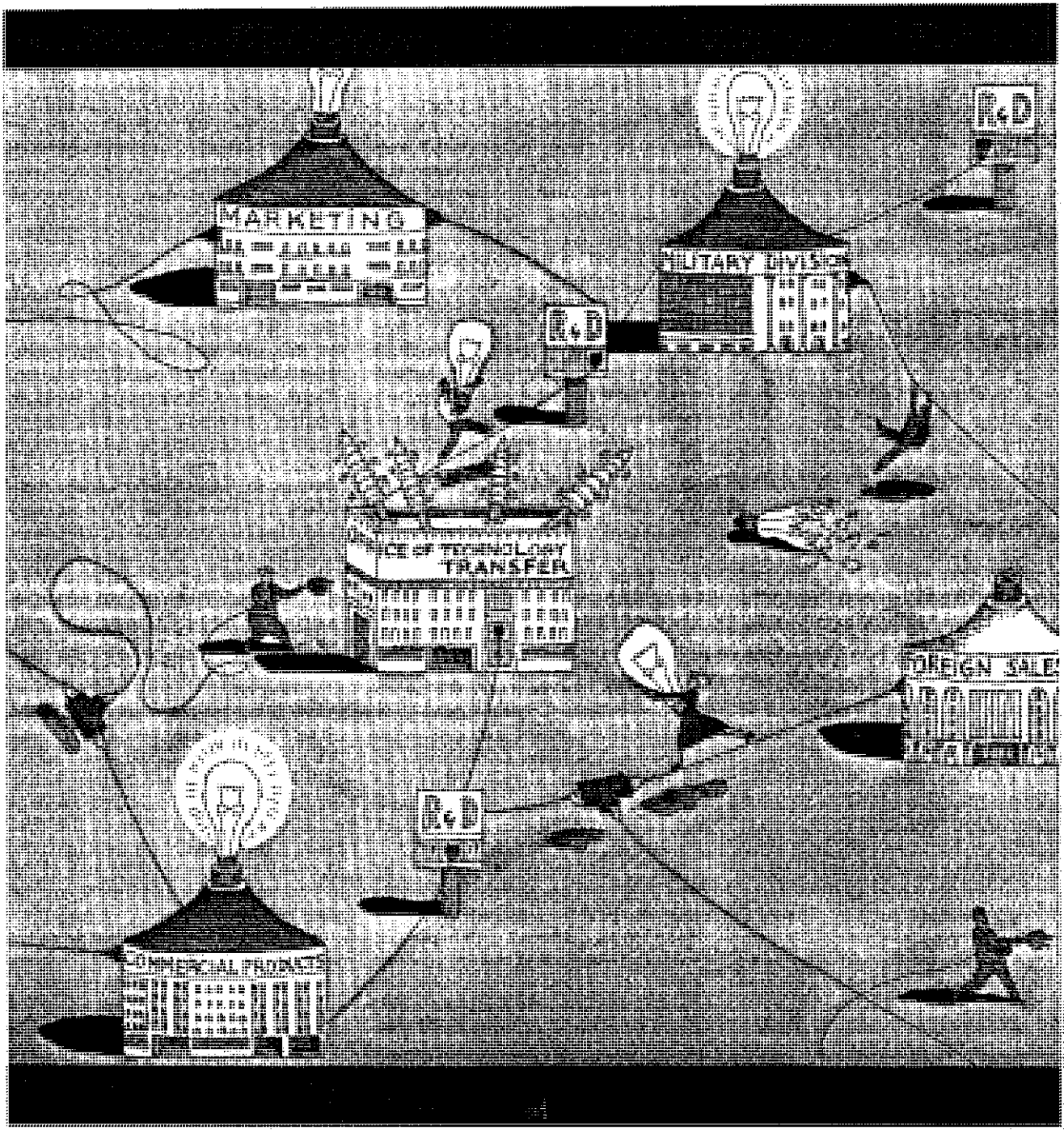
This concept, called technology transfer, is not new. Typically it is used by large, multifaceted companies that serve both military and commercial markets. Because modern military technology usually requires large research investments in products for which demand is often relatively low, technology traditionally flows from a company's military division to its commercial sector, which revises it to meet the needs of commercial markets.

Ever-increasing competitive pressures are making many U.S. companies much more aggressive in targeting key processes or products and providing the support necessary to spin off commercial successes.

"Technology transfer is certainly becoming more common within U.S. companies," observes Peter S. Glazer, vice president of advanced technology for consultant Arthur D. Little. "They've seen, for example, how successful Japanese companies have been at it."

Companies that have profited most from such exchanges generally foster cross-fertilization in two ways. First, they set up a corporate culture that encourages open communication among divisions. Second, they establish networks that provide a formal way for divisions to exchange technology.

The change to a more open corporate culture may be the more difficult of the two tactics, because it requires a

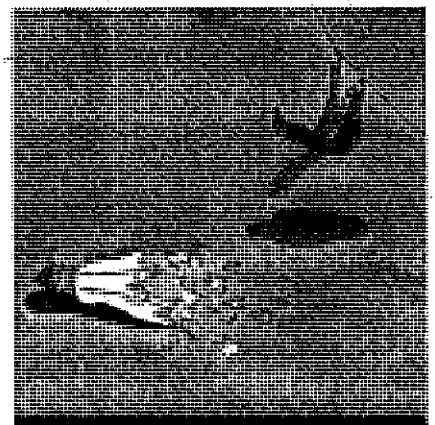


change in attitudes that have become entrenched. Unlike their Japanese counterparts, many U.S. companies have found it productive to pit divisions against one another. Progressive managers are realizing that this practice does not promote the exchange of ideas. "The successful companies have opened up communications much more," says Glazer.

One way to promote such a culture is to show employees that the company is committed to cross-fertilization. For example, TRW, through its Technology Transfer Awards Program, bestows gold, silver, and bronze medals as well as cash grants from $2,500 to $10,000 for projects that improve profitability, productivity, or product quality.

A technology-transfer network, because it is more tangible, is easier to institute and manage than employee attitudes. TRW recently established a computerized technology index that lists key personnel and their technological capabilities. This index tells company engineers and researchers what technological resources are available within TRW, and—important in a company of 86,000 employees—where to find the experts.

Texas Instruments, which also is recognized as an industry leader in technology transfer, has linked senior technical managers and engineers from its half-dozen business groups in its Corpo-



A TRANSFER WHOSE TIME NEVER CAME

rate Engineering Council. Further, the company singles out technologies for transfer to new areas, assigning a team of experts to move the process along. Current targets include a program to move static random-access memory (SRAM) chips from the company's semiconductor division to its defense electronics group. Another team will develop commercial gallium-arsenide microchips for the semiconductor group, based on expertise acquired in the company's defense group.

Texas Instruments' network operates on other levels as well. The company publishes a technical journal six times a year for its employees. Each division has a technical coordinator, who serves as a gateway through which outside developments may enter. Also, the top 500 company researchers prepare "interest profiles" for a computer database, much like TRW's technology index. "Employees are expected to make their information available to their colleagues as appropriate," says Michael Lockard, chairman of the Corporate Engineering Council.

None of this appears stupendously innovative, Lockard concedes. But taken together, he says, it makes a big difference.

At other companies, the right formula has yet to surface. Even though the concept sounds simple, successful transfer of technology isn't necessarily easy, as General Motors, among others, has learned.

The automotive giant has been sitting on a treasure trove of innovation since its 1985 purchase of California-based Hughes Aircraft, a defense company heavily oriented toward research and development. Although some analysts warned from the start that widely diverse corporate cultures could pose problems, the Hughes acquisition was generally expected to set the stage for major technology transfers between the aerospace and automotive sectors. GM chairman Roger Smith pledged that Hughes would help the automaker remain competitive by applying "its expertise to GM's manufacturing needs at our 152 plants nationwide." He also predicted that the Hughes association would redefine "the basic car or truck from a mechanical product that includes a few electrical subsystems to one with major electromechanical and electronic elements."

Such advances have yet to materialize. Both GM and Hughes have been bogged down by quality concerns and competitive battles in their respective industries. As predicted, the two corporate cultures have been difficult to mesh. Critics also contend that technology transfer at GM is not the high priority it has been at other companies, such as Texas Instruments or TRW. It certainly has not been made as highly visible to employees, they say.

Nevertheless, Mounir M. Kamal, technical director of mechanical, electrical, and electronic engineering for GM Research Labs, still has high expectations for the Hughes/GM association. Within one to three years, he says, Hughes' expertise in missile-control sensors will probably be put to work in producing advanced anti-skid braking systems for cars. Similar sensor technology is expected to make its way from Hughes into GM shock absorbers and other components that will control a car's movement for better comfort and handling. Technological expertise may flow in the other direction as well; advanced structural techniques to control noise in GM cars may soon be applied to aircraft.

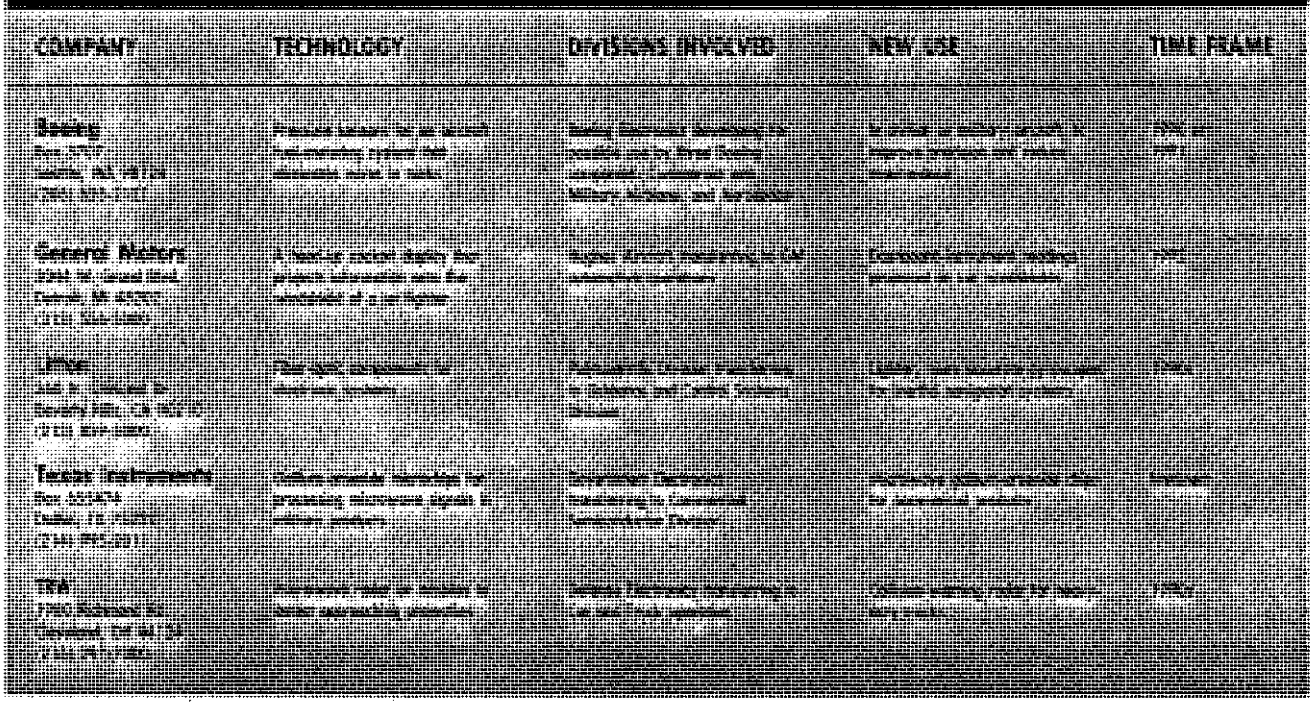
One thing the company has learned about transfers is the need for patience. "Success is not a simple occurrence," says Kamal. "What a research lab may produce and what a customer needs is often not the right item at the first crack. Success really depends upon the ability of the researcher to look at the market and redesign, reiterate, and reform the product."

Patience and determination were behind one of the most successful technology transfers at TRW, which resulted in the RedaRed oil-well electric cable made by the company's Lawrence Cable division. The product evolved from efforts to halt cable corrosion in deep oil wells, where high temperatures and chemicals destroyed the rubber jacket on wires in the company's submergible oil pumps.

TRW's Electronics and Defense Sector had already begun researching synthetic rubber for missiles, tanks, and airplanes. Jon Martin, the sector's expert in rubber technology, took on the oil project in 1975. He visited oil fields, ran lab experiments, and developed a solution: jacket the oil cables with a rubber compound called EPDM.

Oil-industry experts debunked the solution, claiming that, under high tem-

FIVE TECHNOLOGIES RIPE FOR THE PICKING



peratures, a cable treated with EPDM would swell and burst its protective armor. Resistance was so strong that no company would agree to test the material in a well.

So Martin devised his own test, using pressure vessels that simulated conditions in an oil well. Not only did EPDM succeed, but RedaRed cables have become the industry standard. "They have gained the major share of the oil-well cable market," says Arden L. Bement, the TRW vice president who oversees innovation exchanges.

Despite difficulties, technology transfers continue to yield highly profitable new businesses or even new divisions. For example, recent cross-fertilizations at TRW include the development of a commercial business in large-scale integrated circuits. The electronic systems group originally developed the technology for use in defense-industry signal-processing. "Now we're selling to both commercial and government markets," says Bement. "The entire business was spawned from a technology transfer from one group. Now it's a self-standing company division."

Technology for Texas Instruments' digital signal processors, first developed to meet stringent military specifications in the military-products group, was transferred to the semiconductor group, where it yielded a successful commercial line. Though related, the military and commercial products differ in their operating temperature ranges, voltage requirements, and packaging.

■

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■

"The successful transfer required a tightly coupled organization," explains Robert Veal, Texas Instruments' manager of military components. "There had to be close cooperation between the design people, the commercial business, and the military group that initially developed the product."

For companies that have experienced the payoffs of technology transfer, such close cooperation is becoming standard business practice. For example, Litton's Guidance and Control Systems Division—which passed its inertial navigation system to a commercial products division—is now getting assistance from another Litton sibling. Fiber-optics expertise on loan from the polyscientific division is being harnessed to create the next-generation gyroscope, which is expected to weigh less and be more accurate than the laser-based gyroscopes now in use. Because these new gyroscopes are part of the inertial navigation system sold to the military, they will probably make their way to the company's commercial navigation business as well.

This may be a glorified version of hanging around the office water cooler, but companies that promote such communication among departments are finding it pays off in new profits. ■

Al Senia is a freelance writer who specializes in the aerospace industry, science, and technology.

N.Y. Times 1/7/89

Can Milken Sell Bonds For Soviet?

By JAMES STERNGOLD

Is there a market for ruble-denominated junk bonds? Is the Soviet Union ready for Michael Milken, the head of the junk-bond department at Drexel Burnham Lambert Inc.?

Those questions may be answered soon. Last month, Mr. Milken met Mikhail S. Gorbachev, the Soviet leader, during his visit to Washington for the meeting with President Reagan. He may also be heading to the Soviet Union next month to pursue business opportunities.

Ventures With Soviet

Mr. Milken said yesterday that he was among a group of American business executives who met with Mr. Gorbachev. He then met with other Soviet officials, and he proposed several ideas for involving Drexel in Soviet enterprises, including ventures in medical technology and in underwriting commodity-backed bonds.

Neither Mr. Milken nor Drexel disclosed last month's meeting with Soviet officials, the news of which was reported yesterday by a Wall Street official. "That was supposed to be a secret," Mr. Milken said later yesterday in confirming the meeting.

Mr. Milken all-but-singlehandedly created the $150 billion market for high-yielding, low-quality junk bonds, an enormously influential and profit-

Continued on Page D18

Can Drexel's Milken Sell Junk Bonds for Russians?

Continued From First Business Page

able force on Wall Street.

He and Drexel are also the subjects of an insider-trading investigation involving the firm's relationship to Ivan F. Boesky, the former takeover-stock speculator, as well as Drexel's involvement in several takeovers. Drexel has denied any wrongdoing and has not been charged.

Details of Meeting

Mr. Milken said that senior Soviet officials told the American executives during last month's meeting that they were concerned about the decline in Soviet exports to the United States. They were interested, he said, in suggestions for improving their export sales.

Mr. Milken said that he attended the meeting with Dr. Armand Hammer, the chairman and chief executive of the Occidental Petroleum Corporation who is a Drexel client. Dr. Hammer has had a close association with the Soviet Union for decades.

"My feeling was that they could use their scientific knowledge," Mr. Milken said, "particularly in the area of medicine." He said that the Soviet Union had developed some advanced techniques for treating eye diseases and cancer that could become profitable enterprises.

Praise for Soviet Scientists

He said he suggested that Soviet scientific enterprises form ventures with American medical companies to profit from this technology.

"Soviet scientists could see how they could create value from their activities," Mr. Milken said. "The scientific community has such stature there that, if they got involved, it would be very positive for both countries."

The Soviet ministers seemed receptive to his suggestion, Mr. Milken said, and a group of Drexel officials plans to visit the Soviet Union for five days in early February. Mr. Milken said he might be part of the group.

Mr. Milken said he had also proposed that the Soviet Union, a resource-rich nation, consider issuing bonds backed by such commodities as gold or oil. Drexel has underwritten such bonds for American companies.

Maxwell wins approval to buy from Pergamon

BY CLAY HARRIS

MR ROBERT MAXWELL, despite a reputation as an iconoclast, has a keen eye for the neglected tradition overdue for revival.

Scheduling a shareholders' meeting of Maxwell Communication Corporation, the printing and publishing group, for New Year's Eve was a large step in this direction. On Thursday, however, Mr Maxwell, never a man for half measures, barred the press from the meeting.

At a briefing afterwards, Mr Maxwell said journalists had been excluded because the attendance of some 100 shareholders meant there was no room. He would not say how many were also MCC employees.

Mr Maxwell, however, had also clearly been angered by what he described as "misleading" and "ignorant and stupid comments" in some newspapers about possible institutional opposition to the deal on which shareholders were due to vote at the meeting. He read from photocopies of articles, with the offending phrases highlighted in blue.

Earlier, Mr John Egan, MCC group press adviser, had told journalists that security guards would remove them from the Mirror building in Holborn, London, if they did not leave.

It was a gesture worthy of the 1970s heyday of Mr Harry Hyams, who revelled in playing cat-and-mouse with the press eager to attend New Year's Eve closed meetings of his Oldham Estate property company.

By the time he faced the press, Mr Maxwell was a man vindicated. MCC's agreement to buy three electronic and book publishing companies from its majority shareholder, the Maxwell family-controlled Pergamon Group, for up to £100m, had been approved unanimously on a show of hands.

In the five-minute meeting, no shareholder had asked a question, much less questioned the wisdom of the deal, Mr Maxwell said.

Although a poll had not been called, he revealed that 1,577 shareholders speaking for 43m shares had submitted proxies in favour of the deal while 65 shareholders representing 2,037,752 shares had submitted proxies against.

The total number of proxies submitted represented only 7.4 per cent of MCC shares and 15.4 per cent of the independent minority of shareholders eligible to vote. Pergamon, and MCC directors associated with the Pergamon companies, did not vote.

The low level of participation shows that their example was voluntarily followed by some of the largest institutional investors. Mr John Holloran, MCC chief executive, said he had discussed the acquisition with about 30 large investors.

Despite his victory, Mr Maxwell gave short shrift to questions about the deal. Why, he was asked, had MCC shareholders not been given an independent accounting report on the three Pergamon subsidiaries?

"Because, Mr Genius, the Pergamon accountants are the same as the Maxwell Communications accountants, and they go by the name of Coopers & Lybrand," he thundered.

Mr Maxwell said a small US acquisition was imminent in the field of intellectual property rights, an area he sees as ripe for world-wide packaging and exploitation in the coming decade.

He also said MCC would be gaining a Paris stock market listing, as well as that previously announced for Frankfurt, in the next few weeks.

Negotiations to buy the New York Post from Mr Rupert Murdoch were proceeding, Mr Maxwell said. If they were successful, Mirror Group Newspapers would own the newspaper while MCC would print it under contract.

In a dig at his rival, Mr Maxwell contrasted Mr Murdoch's "debt-led" News Corporation with MCC's strong equity position. "The market crash is an excellent opportunity for Maxwell Communications," he said.

Managers of seven of the Mirror Group's eight pension funds had shifted 25 per cent of their portfolios from equities to gilts only two weeks before the October crash, Mr Maxwell said.

"The advice originally came from the chairman of the investment committee, and you're looking at him."

Waverley sticks by Gulliver buy-in

By Clay Harris

Waverley Cameron, the Scottish stationery group, has repeated its support for the buy-in by Mr James Gulliver despite an increased stake by a shareholder believed to oppose the deal.

Mr Gulliver, who is to step down in September as chairman of Argyll Group, owner of the Presto and Safeway supermarket chains, controls Sanda Investments, a company which would hold 64 per cent of Waverley Cameron after a proposed share issue.

Flavell Communications, which has signalled its opposition to the plan, has lifted its holding to 20.4 per cent, closer to the level at which it could be assured of blocking the plan. Sanda's solicitors are endeavouring to confirm whether Flavell intended to vote against the proposals.

Mr Kevin Doyle, who controls Flavell, said on New Year's Eve that resolution of the issue had been delayed by the holidays.

Waverley Cameron urged shareholders to support the proposal at a forthcoming egm, for which the date has not yet been set, and not to sell their shares. Mr Gulliver, newly appointed non-executive chairman, has not taken part in the deliberz-

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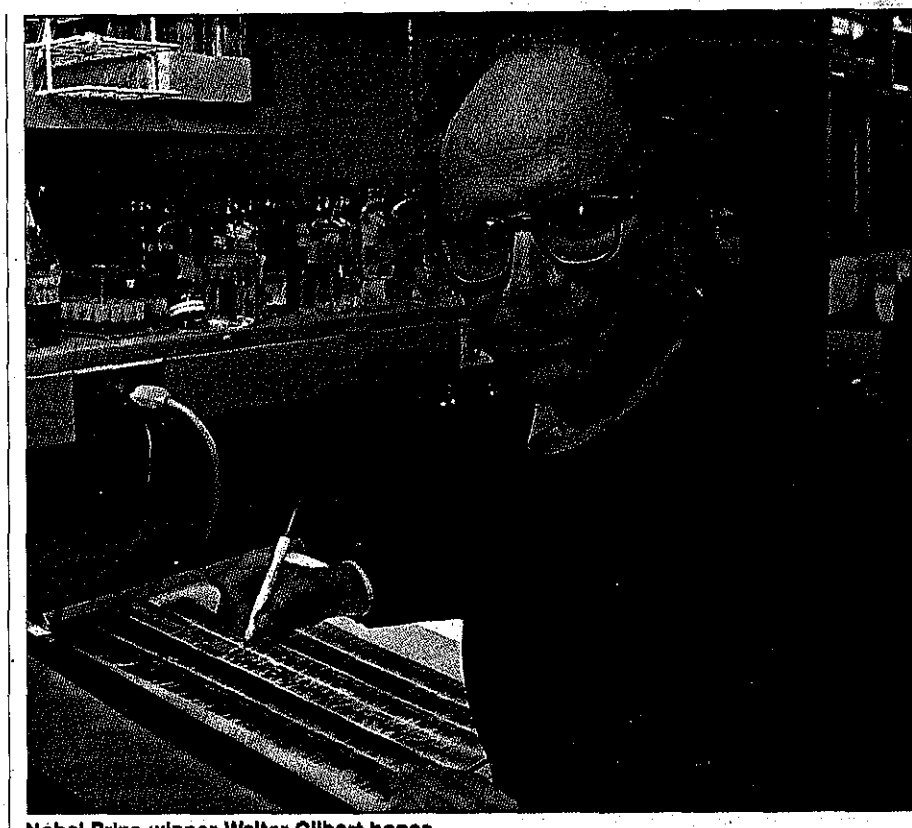
Reading the human blueprint

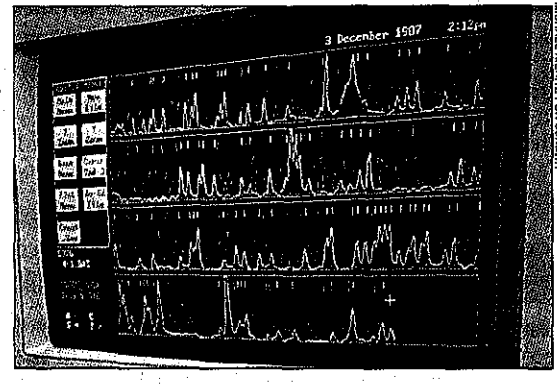
MEDICINE ■ The goal is to decipher every human gene. But some biologists wonder if it's worth the unprecedented cost

■ Physicists have their atom smashers. Astronomers have their telescopes. Now, it's biologists' turn at big science. Only this time the object under scrutiny will not be a distant star or an atom, but ourselves. The ambitious goal is to decipher the 3 billion individual ciphers that together form man's genetic code—what amounts to a complete chemical formula for a human being.

Called the human genome initiative, the scale and scope of the project are unprecedented in biology's history: It will take several decades to complete and could cost between $500 million and $3 billion. Proponents justify the hefty price tag by insisting that the project will guarantee United States leadership in the increasingly competitive pharmaceutical industry. They also point to its huge scientific dividends. By working out the precise functions of genes responsible for genetic diseases such as cystic fibrosis and Huntington's disease, scientists may be able to devise powerful new therapies. Eventually, this expedition into the core of human existence promises answers to some of the most profound questions in modern biology: How does a single fertilized egg grow into an organism as complex as a human baby? What genetic changes turn a healthy cell into a cancerous one? How do genes direct the aging process?



Nobel Prize-winner Walter Gilbert hopes to raise $8 million in private capital to do the job. Below: A partially deciphered gene. Colors show the identity of the gene's chemical subunits



MICHAEL KIENTZ FOR U.S.NEWS

A genetic atlas

The first steps toward unraveling the entire human genetic code already have been taken. That is to determine the location of specific genes on the long strands of DNA that make up the 46 human chromosomes. Each gene, which directs the production of a single protein in the body, is made up of a chain of some 1,500 chemical subunits known as bases. It is the sequence of these bases that specifies the exact chemical structure of the protein. Structural materials that make up blood, muscle and skin, the hormones that course through the blood stream and the enzymes that drive each and every step of metabolism—all these substances are made of protein.

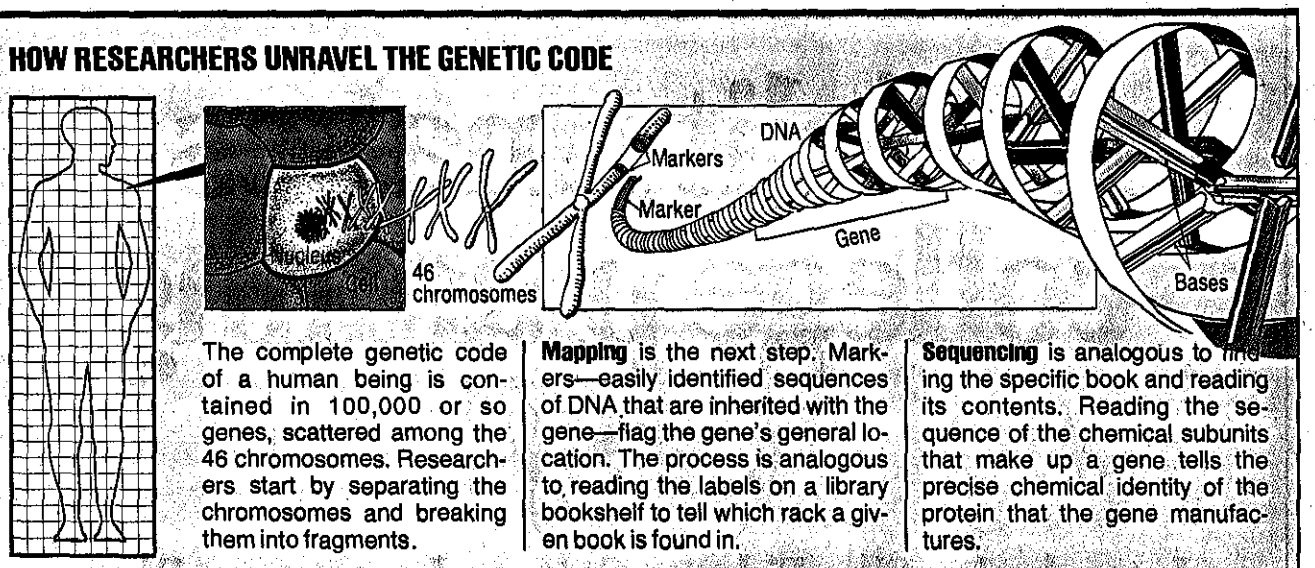
In the past few years, scientists have mapped the approximate locations of at least 400 of the 100,000 or so human genes. The first to be targeted for study are those associated with the 3,000 known hereditary disorders. By reading the sequence of bases in these defective genes, it will be possible to determine exactly why the gene either fails to function or produces a malformed protein. But that's just the beginning, for researchers are now discovering genes that influence the onset of a host of common diseases not usually thought of as hereditary, including heart disease, rheumatoid arthritis and Alzheimer's disease.

Disease fighters

In addition to genes associated with illness, the mapmakers are charting the locations of genes that produce immune proteins such as interferon that fight disease. But the majority of these immune chemicals still remain to be discovered and their genetic blueprints traced to specific chromosome locations. "We've only identified about 1 to 2 percent of all the body's proteins," says Leroy Hood, a molecular biologist at the California Institute of Technology. "Think what powerful [disease-fighting] tools lie ahead when we find the other 98 percent."

Determining the sequence of bases in a gene until recently has been a tedious process, requiring a painstaking chemical analysis to determine the identity of each and every base. Now, an automatic sequencer developed by Hood and colleague Lloyd Smith can "read" an entire gene in a day or so. The process entails tagging fragments of genes with fluorescent dyes, whose colors are then scanned by a laser beam and the information recorded by a computer. New sequencers promise

HOW RESEARCHERS UNRAVEL THE GENETIC CODE



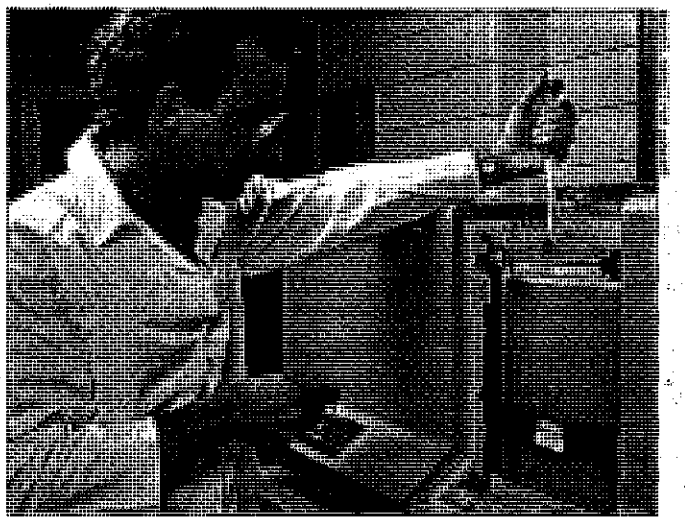
The complete genetic code of a human being is contained in 100,000 or so genes, scattered among the 46 chromosomes. Researchers start by separating the chromosomes and breaking them into fragments.

Mapping is the next step. Markers—easily identified sequences of DNA that are inherited with the gene—flag the gene's general location. The process is analogous to reading the labels on a library bookshelf to tell which rack a given book is found in.

Sequencing is analogous to finding the specific book and reading its contents. Reading the sequence of the chemical subunits that make up a gene tells the precise chemical identity of the protein that the gene manufactures.

to make the process 10 times faster.

But even assuming such advances, some researchers question whether the brute-force approach of sequencing the entire genome even makes sense. Only about 4 percent of all the DNA found in chromosomes actually contains genes—that is, sequences that direct the manufacture of proteins. The rest seem to be evolutionary driftwood—DNA cast off so long ago in our evolution that the sequences have mutated into total gibberish. Robert Weinberg of the Whitehead Institute at the Massachusetts Institute of Technology is one of several leading geneticists who cannot see the point in "wading through a sea of drivel to emerge dry-shod on a few tiny islands of information."



Lloyd Smith and his automatic gene sequencer

Another obstacle is a turf battle between the Department of Energy and the National Institutes of Health. DOE is advocating a Manhattan Project approach: A focused program that would develop advanced sequencers and computers in a crash effort to unravel man's entire genetic code. Although DOE would seem an unlikely government body to become involved in such an endeavor, the agency has gained considerable expertise in the field through studies of how genes are damaged by radiation.

Footing the bill

The National Institutes of Health, however, is already spending $300 million a year to study the genes of diverse life forms, including $100 million exclusively on human genes. And NIH prefers to fund smaller groups of researchers working in individual laboratories across the country, rather than managing a single megaproject.

With government plans still up in the air, at least one group is trying to raise capital to do the job privately. Nobel Prize-winning biochemist Walter Gilbert of Harvard University, a founder of Biogen, one of the pioneer biotech companies, is calling his new venture Genome Corporation. He even has plans to copyright human gene sequences—an unsettling thought to many researchers who would prefer to see the information remain in the public domain. Legal scholars point out, however, that copyright protection is only afforded to authors of original works. Says Susan Rosenfeld, a New York City attorney who specializes in legal issues related to genetics, "About the closest candidate in this case is God."

Gilbert isn't intimidated by the Almighty's competition. If he can't copyright his gene sequences, he will compile his genetic data into a commercial data bank and charge users a fee to gain access to the information through computer-phone links. That won't preclude scientists from gaining the data by other means. But many scientists may prefer the convenience of the data base, just as subscribers to data bases such as Nexus can save a trip to the library by scanning its files for newspaper articles.

As for raising the additional $8 million in venture capital needed to launch his company, perhaps Gilbert and other entrepreneurs could benefit from the advice of biologist David Tepfer of the Institut de la Recherche Agronomique in Versailles, France. In a letter to the British journal *Nature*, Tepfer arrives at a financing scheme after posing the obvious question: *Whose* genome should be sequenced first? After all, each individual's genes are somewhat different. Not to be swayed by nationalistic interests, Tepfer quickly rules out such candidates as Ronald Reagan, Margaret Thatcher and François Mitterrand. "My suggestion," he writes, "is that it go out to tender. Unfortunately, J. P. Getty and H. Hughes are dead, but there must be somebody who can afford to be sequenced." ■

by Kathleen McAuliffe

Presidential Advisor William Graham

calling for further activity, including the formation of centers and several national laboratories, as well as a substantial Defense Department research program in high-temperature superconductivity.

One of the government's most important roles is to act as a catalyst—to make sure that industry understands that, in today's highly competitive international environment, it is essential that we pursue technologies before they are fully developed in the laboratories of our competitors. Other countries have been striving to catch up with the United States, as they recovered from the destruction of World War II. They had to move into advanced technology at a pace that was faster than ours. Several of these countries have caught up with us, and are now accustomed to innovating and advancing technology more rapidly than we are.

■ *HT Business: Is the government's interest in superconductivity related to defense?*

GRAHAM: We depend on advanced technology to provide for our national defense. In that sense, any advanced technology can be quite important. But even if there were no defense applications for high-temperature superconductors, we would still be pressing very hard. The government strongly supports basic research in underlying, enabling technologies. In 1988, we plan to spend $9 billion on basic research.

At the same time, in the president's view, and I agree with him, the government has no place in conducting research to develop products. The government has no skill or incentive in that business. Far better for the private sector to take the initiative in that area.

"It is essential that we pursue technologies before they are developed in the laboratories of our competitors."

■ *HT Business: How effectively is basic, government-funded research finding its way into commercial products in the private sector?*

GRAHAM: I would say that government by and large has done poorly in the past, is improving today, and can still do much better in the future.

We always knew that spin-offs from space programs were valuable, but I don't think we have focused strongly on pressing that process. This applies not just to the space and defense programs, but also to basic research.

We're taking a number of innovative steps to try to increase the technical transfer from basic government-sponsored research to product development and production in industry. For example, we're allowing researchers in government laboratories to license proprietary discoveries; thus, both the laboratory and the researcher derive some benefit from the license. At the same time, by giving companies exclusive licenses, we're giving them the protection they need to pursue proprietary developments.

In many ways, a discovery that is everyone's intellectual property is no one's intellectual property. Not many industries are going to put $50 million into a basic technology if they know a competitor can take advantage of their work. Therefore, exclusive licensing is one of the measures that has been incorporated into the technology-transfer acts of 1986 and the executive order facilitating technical transfer.

Another dimension to encouraging technology spin-offs is the engineering research centers we are establishing at various universities around the country. These are interdisciplinary centers that draw substantial support from industry and, on occasion, from government laboratories as well.

■ *HT Business: The Strategic Defense Initiative has been the subject of heated political debate. Do you think the program will survive beyond the Reagan administration?*

GRAHAM: After more than three years of assimilation in this country, I think there is a widespread consensus that research on strategic defense is very valuable and important. The issue has shifted more toward determining when we should move to developmental programs focused on various stages of deployment.

I think it's quite important that we move toward deployment because, first, the Russians are moving aggressively in this area and already have an operational system deployed in the Moscow area. Also, as we move aggressively toward deployment, it will add the discipline that can only come from moving toward specific goals and practical implementations.

■ *HT Business: So you think the program is on firm political footing?*

GRAHAM: I think there is still a major effort in some quarters of Congress to treat SDI not as a national security issue but as a political issue, and to underfund the program seriously. If that is allowed to continue, it will have very detrimental effects on our overall strategic defense capability in the next few years.

■ *HT Business: Has the administration made any plans concerning deployment?*

GRAHAM: Not quite. SDI has been almost entirely a research program. It's important we continue this. But in addition to that, it is important that we initiate a development program addressing specific system concepts such as architectures, capabilities, effectiveness, and so on, to make sure our research is moving in the correct direction.

■ *HT Business: Do you think development will begin before the end of this administration?*

GRAHAM: If Congress provides the funding the president requests.

■ *HT Business: It's been two years since the Challenger disaster. How is the space program doing?*

Saturday Dec. 5, 1987

THE WASHINGTON POST

NIH, French Institute to Fund AIDS Research

Royalties From Antibody Tests Used to Create 2 Foundations

By Philip J. Hilts
Washington Post Staff Writer

Two foundations to fund AIDS research have been created by French and American scientists as a result of the agreement between the two groups to share credit for discovering the cause of the disease, officials of the Department of Health and Human Services announced yesterday.

The new foundations will be jointly administered by appointees of the Pasteur Institute in Paris and the National Institutes of Health here and will be dedicated to funding worldwide research on acquired immune deficiency syndrome.

The agreement, which resolved the dispute between the groups of scientists, was signed March 30. In addition to saying that labs led by Luc Montagnier at Pasteur and Robert Gallo at the National Cancer Institute would share credit for discovering the cause of AIDS, the agreement said that money coming from AIDS antibody tests would be shared equally.

As part of the three-year dispute, both the French researchers and their American counterparts claimed the right to patent and sell the technology resulting from the discovery of the AIDS virus.

Court battles had not settled the question of who had patent priority or who had contributed most to the discovery. But the standard test for signs of AIDS came out of the research of both labs, and each side created a version of the antibody test. The tests are now sold around the world, bringing in more than $5 million per year.

Both sides agreed to give 80 percent of the royalties from the antibody tests to the foundation called the French and American AIDS Foundation, and yesterday a check for $3.7 million was presented to establish it.

A quarter of that money will be put into research and education on AIDS in developing nations. Most of the rest of the money will be passed back to Pasteur and NIH for use in research on the biological, medical, and social aspects of AIDS.

Some of the first year's funding of the French and American foundation will also be used as startup money for a second foundation, to be called the World AIDS Foundation.

This foundation will then solicit funds on its own in an effort to fund research outside the Pasteur Institute and NIH, "to help fill any gaps in the worldwide effort to combat the AIDS epidemic, complementing the efforts of other bodies such as the World Health Organization," according to a statement released by HHS officials yesterday.

DECEMBERE 10, 1987

TO: LH & NL

FROM: JL

SUBJECT: COMMENTARY FROM GOMORY, SENIOR VP SCI & TECHNOL OF IBM.

I think his commentary on "cycling ideas into profits" has particular relevance as we enter the new ball game. We must not forget the words of wisdom he offers here. IBM, even though it may not be the best nor the most innovative, has consistently led the field in performance and has something new coming across the board almost every month.

"People in the manufacturing-and-development cycle must be up to date by going to meetings, talking, seeing the outside."

"Development team and manufacturing team must have very close ties."

"The speed with which an idea moves from the concept to product spells the difference between "perceived" innovation and a humdrum company. Two companies in the same technology base - No. 1 takes it, gives it resources, gets it out, and starts on another. Company 2 takes 2x as long to get the product out - meaning it will be 4x as long before the second one comes out. The first is perceived to be INNOVATIVE; the second an also ran.

"IT'S NOT NECESSARILY THE SEA OF IDEAS THAT YOU LIVE IN THAT MATTERS; IT'S YOUR ABILITY TO PULL THOSE IDEAS INTO THE CYCLE AND TURN THE CRANK"

Why U.S. leadership in science isn't paying off

Innovation vs. invention

In a conversation with U.S. News, *Ralph Gomory, IBM's senior vice president for science and technology, tells how American business can do a better job of exploiting new ideas.*

■ One of the mysteries that people ponder is how the U.S. can lead the world in science and technology but not necessarily win the product race. There's a widespread notion that first a new idea appears and then you build a product around it. For example, the transistor comes along, and you create the chip. I call this the "ladder process."



STEPHEN FERRY—GAMMA/LIAISON FOR USN&WR

However, another process that I call the "cyclic development process" is totally different and overwhelmingly more common. In it, you're not dealing with a wholly new product but with one that's already there—a printer, a computer, conceivably an automobile. You made it last year. Your job is to bring out a new version, to refine it. In this cyclic process, a team designs a new version of the product and, working with the manufacturing end of the business, gets it to market. The development team then starts again on the next round. It's a continuing process.

Cycling ideas into profits

How quickly you go around the cycle from one round of products to the next is very important. Suppose you have two companies, both living in the same storehouse of technology, both building on the same infrastructure, all aware of new ideas coming from universities. But suppose one company has a two-year cycle—the time from the start of a product's development to the time it begins to come out in quantity—and one has a three-year cycle. If they start together, the one with the two-year cycle will have its products out first. Everyone will say, "That's an innovative company. They have all kinds of new ideas."

But what you are seeing is not technical innovation, in the sense of inventing; you are seeing the speed of the development cycle. You only have to go around that cycle a little faster than the other guy a few times—maybe even once—and you will have a commanding product lead.

In the areas that I know, the effective foreign competition, including the Japanese, has excelled in this cycle process rather than in introducing novel ideas. The problem is the cycle itself.

Keep those conduits open

People in industry know the development cycle. Those in government and academia have much more of a ladder picture in their minds. However, my experience has been that even in industry the consequences of the cycle are not thought through completely. One problem is that it is difficult to affect the cycle from outside. The people who are in it are the only ones who can introduce new ideas because it takes a detailed knowledge of what is there to make a new idea acceptable. That makes the whole thing rather impervious to ideas from the outside. It's one of the reasons we can be the world's most advanced country in the fundamentals of science and technology and not necessarily benefit from that leadership.

It is very, very important to make sure that the people in the manufacturing-and-development cycle are up to date. Because they are often the only conduit for new ideas, you have to let them go to meetings, you have to get them in touch with universities. That isn't necessarily the habit. It's not obvious that it is more than a frill to let them go to a meeting. If they are not up on what is happening technically in other companies or in the great research universities, a high level of technology will go to waste or, more likely, be seized by a competitor.

The focus is on the companies. For instance, the development team and the manufacturing people must have very close ties: You design a printer not only to print clearly but also so it can be put together easily in the factory. We in the U.S. have a great scientific base. We need to exploit it. It's not necessarily the sea of ideas that you live in that matters; it's your ability to pull those ideas into the cycle and turn that crank. ■

Conversation with William J. Cook

PETE V. DOMENICI
NEW MEXICO

United States Senate

WASHINGTON, D. C.

3 December, 1987

Norm Latker
Director, Office of Federal Technology Management
U.S. Department of Commerce
Washington, D.C. 20230

Dear Norm,

I would like to take this opportunity to wish you success in your new venture and to thank you for all your assistance while you have been Director of the Office of Federal Technology Management at the Department of Commerce.

I know we share a lot of common goals for the commercialization of U.S. scientific and technical achievements. It is only through the combined efforts of all of us, whether we represent government, universities, or private industry, that we can meet the international challenge to compete effectively in product development. I appreciate the contribution you personally, have provided to this goal.

Good luck in all your future endeavors.

Warm personal regards,

Pete V. Domenici
United States Senator

PVD/fkf

Licensing Issues

John Preston, the new Director of the Technology Licensing Office (TLO), summarized the current philosophy and operation of the TLO. Since the Visiting Committee, at its previous meeting, had been harshly critical of the TLO's efforts and performance, we were pleased to have an insight into the new program and management of the licensing effort. To a man the Committee was pleased and complimentary about the revitalized TLO. We congratulate Ken Smith on this turnaround and applaud, in particular, the choice of John Preston to head the effort. They are off to a good start on a sound course.

The total licensing income of all U.S. universities will be about $30MM in 1987, of which Stanford represents $6MM and MIT $3MM. This is remarkably small considering that the total universities' research expenditures in 1987 will be $6B (or $10B if one also includes the university-managed organizations such as the Lincoln, Livermore and Los Alamos laboratories in the total). The opportunity to identify and transfer commercially useful new technology must, in the aggregate, be virtually limitless given the enormity of the pool of effort on which the U.S. can draw. If the entire system was producing licensing revenues at the Stanford rate ($6MM licensing income on $203MM of current research expenditures) it would yield $180-300MM per year for U.S. universities instead of $30MM per year. That is surely an unreasonably high short term target but the large disparity measured against current performance suggests the scale of the opportunity for licensing income growth.

A new thrust of the TLO is the willingness to experiment with the taking of equity in an entrepreneurial company in lieu of some portion of a more conventional cash royalty stream under a licensing agreement. Four such transactions have been concluded during the last year and two more are currently being negotiated. Mention was made, and an animated discussion ensued, of the special concerns and problems that arise when MIT faculty members are principals in a company which is on the other side of an MIT licensing agreement for which an equity-involving transaction has been proposed.

 Norm - Stock found this somewhere

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The other side of the coin is that the government may be handicapped in lawsuits outside of the Washington Beltway, especially in jury trials, because of resentment against the massive power of the government, seen as a plaintiff who creates an uneven playing field. Also, the government may be handicapped by not using outstanding patent trial lawyers to present its cases.

The entire matter should be reviewed to determine if there is not a better approach. The caseload is expected to grow as the scope of importance of the FT^2 program becomes more fully appreciated.



U.S. Inventors Getting Lion's Share of Genetic Engineering Patents

Recent figures from the U.S. Patent Office show that U.S. inventors received 78% of all U.S. patents granted last year on genetic engineering inventions, while foreigners -- half of them Japanese -- only received 22%. Compare that to the fact that foreigners received 46% of U.S. patents of all types and the health of the U.S. genetic engineering leadership can be appreciated. This 78% figure is a dramatic increase: U.S. inventors only received 43% of the U.S. genetic engineering patents during 1963-1980.

While the United States has a clear lead in genetic engineering technology (as well as the biotech field in general) it cannot rest on its oars. Japan has targeted genetic engineering and biotech as another area in which it strives to seek world technological supremacy. Large Japanese companies with large amounts of money gleaned from other businesses are buying into the technology of relatively small U.S. companies through joint agreements and equity investments; they are sending its researchers in large numbers to U.S. universities and government labs. The increased value of the yen has exacerbated the situation.

Because intellectual property and technology transfer issues have become so important in this and other high technology areas, they are increasingly becoming a matter of national policy. The result: They may be taken out of the hands of the private sector.

Foreign Patent Expenses - A Bottomless Hole

Obtaining foreign patent protection is oftentimes very important but can be very expensive. One southern university spent $2 million seeking such protection, with nothing to show for the effort. When deciding whether or not to obtain foreign patents and, if so, in what countries, take time for thorough consideration. This will be time and money well spent. Determine the objective in obtaining such protection and the specific costs involved -- before embarking on the program.

L.A. Times

Part 3

Restoring America's Competitive Edge

Entrepreneurs Wanted

Big Firms' New Motto: Think Small

by Debra Whitefield

Having risen from bread kneader to chief executive of Campbell Soup Co., Gordon McGovern in 1980 inherited a company truly in the soup.

Sales volume was stagnant, earnings were coasting along behind the competition's, it was losing fully half of its marketing team every year and new products—a food company's bread and butter—were scarce.

What's more, Campbell was slow to respond to consumers' shifting preference for higher-quality, even exotic, convenience food packed for quick heating in a microwave oven. McGovern was not even "sure we were an efficient company," a damning comment for a company that prided itself on squeezing every penny out of production costs.

If Campbell was to survive in the increasingly aggressive food industry and beat back competition from an new entrant, the Japanese, McGovern knew he had to untangle the red tape that was slowing decision-making to a crawl and get the nation's biggest soup company quickly back in shape.

"There was only one way to respond, in an entrepreneurial way," McGovern says. "We had to get the company fractured up into small businesses, put people in charge and tell them to get busy."

Like Campbell, hundreds of America's large corporations have been forced by external pressures into an urgent reassessment of how they do business. And in large numbers they are concluding, as did Campbell's McGovern, that the very organizational structure that served them so well in mature, stable markets was inhibiting their ability to adapt and compete in today's environment of fast-changing technology, intense foreign competition and slow growth.

"You can't do business these days," asserts General Motors Chairman Roger B. Smith, "the way you were organized before."

Behind the giant doors that house some of this country's most staid and powerful businesses, a revolution is in the making. The anatomy of the big American corporation is being redesigned.

Urgently trying to foster the same spirit that has animated small businesses in America, such disparate giants as GM, AT&T, General Electric, Atlantic Richfield, Equitable, Kodak and DuPont are restructuring themselves to be more like their smaller, quicker and more aggressive competitors. In the process, they are demanding more creative, venturesome, entrepreneurial behavior from their workers.

Monolithic Kodak reorganized its core photo business into 17 entrepreneurial units to better charge into new businesses. DuPont is tightening its belt, pushing responsibility down the line and consciously adopting a more free-wheeling style of management to restore its competitive edge. NCR, to rekindle innovation, broke its unwieldy organization for introducing new products into a series of stand-alone units that compete among themselves for their parent's business.

And Campbell split itself into 52 autonomous units and inspired managers to introduce new products with all the passion of a big league ballplayer going after a record.

'Historic Transformation'

Much more than an impulsive and misguided attempt at turning a few creative hotshots into corporate entrepreneurs, "what we're seeing here is a historical transformation," asserts management consultant and Yale University professor Rosabeth Moss Kanter. "Companies have always been interested in the new venture. But what makes the romance so much more serious this time is that all the pieces—entrepreneuring, decentralizing, venturing, restructuring—are finally coming together."

"You can't just have a rigid, policy-oriented, controlled, top-down organization and expect people to behave in an entrepreneurial way," says Atlantic Richfield chief executive Lodwrick Cook, who is overseeing the difficult task of redesigning the big oil company's internal organization—dividing it into small profit centers in order to inspire leadership, profit-accountability and score-keeping—even as the organization goes through the painful process of shrinking overall.

To inspire creative thinking and motivate and keep their workers, big companies are letting their offspring play by rules of their own choosing and urging entrepreneurs to chase their dreams inside the big company instead of off on their own.

"The duty of an organization that wants to help people successfully operate a small business inside a large one," says James P. Baughman, General Electric's manager of corporation organization, "is to get the organization out of their way and see what happens."

Some firms, like AT&T, IBM, Allied-Signal, McDonnell Douglas, Price Waterhouse and Security Pacific Bank, have taken a less risky and more conventional road to innovation and entrepreneurship: forming new-venture incubators for the care and breeding of innovative ideas or confining their experiments with entrepreneurship to a group of renegades kept separate from the more genteel mainstream of the company.

But what is making the business world stand up and take notice are the much bolder entrepreneurial experiments under way at such giants as GM, Equitable, Campbell and NCR.

"We keep learning," explains Alex Mair, vice president of the GM Technical Staffs Group, "that relatively small groups that have not been endowed with as much attention or money or facilities seem to be coming forth with lots of inventions."

In their quest for innovation and entrepreneurial spirit, a growing number of Goliaths are even reaching out to the Davids of the business world. To avoid smothering smaller companies, as many giants have in the past, they are buying minority interests in small innovators at an unprecedented pace. Through these alliances, the small company feeds its insatiable appetite for funds, and the big company gets a quick technological fix—all while keeping the small company independent and running at full steam.

Companies came to this behavior reluctantly. For years, they routinely ignored warnings by academicians and some corporate visionaries that the conventional ways of managing were outdated and largely responsible for Big Business's blunders.

"Even as it became widely apparent to everybody that the Japanese were taking over autos and semiconductors, that textiles were in trouble and the Koreans were coming, the response of American industry was to do exactly what they were accustomed to doing but harder, faster and longer," says UCLA management professor William Ouchi, who since the late 1970s has been urging companies to dismantle the paramilitary style of management that U.S. companies adopted en masse after World War II.

Under that model, decisions are made at the top by no-nonsense managers, often in secret, and handed down, often in writing, through a clear chain of command to the rank and file, who do not dare fail in carrying out the orders.

Why the change of heart? A skeptical crowd of academics, business consultants and venture capitalists dismiss this as just the latest evidence that Americans are a faddish bunch.

Just a Fad?

ITT builder Harold Geneen contended in his 1984 book, "Managing," that "entrepreneurism is the very antithesis of large corporations" and that if this love affair with entrepreneuring were anything more than rhetoric, shareholders would be up in arms over the risks involved.

Like every fad, notes Mel Perel, manager of the corporate ventures program at SRI International in Menlo Park, this one has its converts, academics and best-sellers arguing its merits and even a new word invented to capture the spirit of the phenomenon—intrapreneuring, short for entrepreneurship in the big corporation, which consultant Gifford Pinchot III takes credit for coining.

"When you start inventing words," grouses Perel, "you reduce a substantial management practice to a fad, and it becomes hard for people to take it seriously."

But some of America's most visionary thinkers insist that the big-company stampede to entrepreneurship has its roots in something much more serious than a ride on the latest management bandwagon: survival.

If the big companies and big institutions do not innovate, change and "acquire entrepreneurial competence," the social costs of their obsolescence and eventual failure may be unbearable to society, warns management guru Peter Drucker in his new book, "Innovation and Entrepreneurship."

In some combination, companies redesigning their organizations are motivated by these woes: earnings were sliding or nonexistent, sales were no longer artificially boosted by inflation and had become sluggish, market share was being robbed by foreign competitors or more agile small companies at home, and the pipeline for creating new products and developing creative managers had run dry.

Moreover, their record of innovation—stifled largely by the complacency that comes with an age of plenty, as was the case for America in the decades following World War II—had become so dismal that they missed one big technological shift after another and expended all of their creative juices playing catch-up. The birth of the home computer in an entrepreneur's garage instead of in a big corporate laboratory is only the most visible example.

Big companies were losing droves of people to small, start-up operations—where the promise of riches seemed too good to pass up—and were coming under sharp attack for inadequate shareholder returns and the poor quality of their products and services.

Faced with such problems, says IBM chief executive John F. Akers, "it is not only possible for a large company to be entrepreneurial, it is essential."

Although this management liberation movement is still in its youth, with many hurdles yet to jump, some payoffs are already apparent.

An AT&T venture took a product from idea to market in just four months, shaving 14 months off the usual AT&T time. Soup maker Campbell, which had virtually no new-product introductions for a dozen years, has introduced 392 new products over the past five years. Bankers Trust, which checked in with miserly earnings in 1978, now has the best profitability of any large bank in the country.

GE's Experience

Even General Electric, one of the first U.S. companies to decentralize and divvy itself up into small, self-contained strategic business units with a high degree of autonomy from headquarters, is beginning to see some rewards from chief executive Welch's four-year focus on reshaping GE further still into a streamlined, entrepreneurial bank of small businesses. Not only is GE leaner (it has cut several layers of management and reduced its headquarters staff by 15%), its earnings from the company's technology group, where Welch has committed a 42% increase in research and development investment since 1982, have grown 53% in the same period.

Not that embracing entrepreneurial management is a guaranteed ticket to prosperity. Academics and consultants who have studied corporations' earlier experiments with venturing and culture overhauls say the vast majority of the efforts failed—and on as grand a scale as have most corporate acquisitions.

Mighty Exxon killed its new office-equipment business earlier this year after the entrepreneurial instincts the venture was designed to foster were instead suffocated with too much money and its own bureaucracy, the very thing it was set up to escape.

Firm 'Went Overboard'

Even Campbell, whose transformation from a corporate Rip Van Winkle to a nimble, astute marketing wizard set industry tongues wagging, has somewhat reined in its managers' new-found entrepreneurial instincts. The once-plodding food company concedes that it went overboard in the other direction and made some multimillion-dollar blunders that stalled its growth in fiscal 1985.

As the Exxon and Campbell examples point out, companies new to the entrepreneuring game "tend to either overcontrol or undercontrol," says William P. Stritzler, an AT&T vice president who studied dozens of venturing cases after he was tapped to run AT&T's new incubator for new-venture ideas. "Some give people $30 million and tell them to come back in five years and tell me how you did. Others give you $50 million but ask you questions every single day about how you're doing...We're trying to find the middle ground."

To Digital Equipment Chairman Kenneth H. Olsen, the answer is obvious: discipline. "I love to canoe in Northern Canada," Olsen relates, "because I love the feeling of complete freedom you get when you're shooting the rapids with absolute abandon. But doing it well is no accident. Behind it is great preparation, enormous discipline and some 20 years of notes on what to do and not do. To do this entrepreneurial thing right requires unbelievable discipline."

Even those who do find the middle ground quickly learn why Big Business shunned entrepreneurial tendencies for so long.

"One big problem with this type of philosophy," says NCR executive vice president William F. Buster, "is that a big company can't lose big gobs of money—and entrepreneurs spend great gobs of money."

Entrepreneurs also can be undisciplined and difficult to manage. "They're rabble rousers," Control Data manager Claire Kolmodin tells clients who seek her advice in becoming more entrepreneurial. "You won't like them."

Once a manager gets a crack at running his own company, "you can spot him when he walks through the door," says NCR's Buster. "He is more confident of his ideas and less receptive to advice and any kind of direction."

Coping with the culture shock that companies say always accompanies a switch to entrepreneurial behavior also tests a company's commitment to the small-is-beautiful theory.

"If you tackle this," asserts George Vojta, executive vice president for strategic planning at Bankers Trust, which is at the tail end of a radical transformation from a mediocre commercial bank to an agile merchant banking house, "I'll guarantee you there will be no tranquility. You'll subject yourself to bitching, moaning, people quitting and throwing tantrums. The organization is constantly riled up, which is why the odds against it working are so great."

Part 4

Restoring America's Competitive Edge

'Stretch Abilities to the Max' *Lower-Level Workers Get Bigger Share of Rewards*

by Debra Whitefield

Work used to be "repetitive and unchallenging" for Cathryn Rybicki. As a General Motors financial analyst, she was paid well and liked the security. But the environment was "very structured" and many days her biggest challenge was filling out all of the forms that came her way.

So, when GM three years ago formed a 50-50 partnership with a Japanese robot maker, Fujitsu Fanuc Ltd., Rybicki jumped at the chance to trade in the security of GM for a challenge. Today, as assistant comptroller of the venture called GMF, the 33-year-old is making $10-million investment decisions and is a key

player on a team that has built the Troy, Mich., company into a $200-million enterprise employing 550 people. Work, she says, is now fun, satisfying and "stretches my abilities to the max."

Last year, the pay was more satisfying, too. Because GMF believes in great reward for great risk, nearly half of its employees have their pay linked to the company's profitability. For her contribution to GMF's first profit, Rybicki received a share in the winnings that boosted her salary by about a third.

Rybicki is an integral part of a fundamental change occurring in the workplace. Employees at all levels are being invited to expand their horizons and share in the running of America's corporations.

More like owners than paid help, they are setting their own rules, schedules and pay standards, tackling assignments and solving problems that stretch their imaginations and keep their focus on the bottom line. In short, those who contribute to the company's fortunes are beginning to share in them.

"We're giving people a sandbox to come play in...and putting the money where the action is," says Steven A. McNeil, a group general manager at Campbell Soup Co. "It's a demonstration of our belief that the real home runs don't come down from the top."

Similarly, at Atlantic Richfield, chief executive Lodwrick Cook wants "everybody from the high-level manager...to people at the hourly level to feel like they're participating in the decision-making. If people don't feel like they own a piece of the action," he says, "then they're not going to act like entrepreneurs, they're going to act like paid help."

Enticing Carrots

Many of America's small growth companies have been encouraging employee involvement and dangling enticing carrots in front of effective performers for years.

But at the typical large corporation, only a few top executives were thought capable of making the decisions that affect a multibillion-dollar company. To those managers alone have gone the incentives to soar to new heights. Everyone else, assumed to be grateful just to have a job, was melded into a regimented compensation and benefits package based on the one-for-all plan.

"The competitive strength of American firms," Harvard Prof. D. Quinn Mills asserts in his recent book, "The New Competitors," "has tended to be at the top—in the capabilities and hard work of top executives.

"In order to remain competitive," he argues, "American firms are now challenged to strengthen the organization downward."

Helping the Firm Excel

Enticing people with money is one way to do that. Instead of being paid for seniority and the position they occupy, employees increasingly are being offered more money to achieve objectives they help set or to help the company excel.

As an incentive for employees in General Electric's small-business ventures to throw themselves enthusiastically into projects, GE holds out the promise of company stock—which it delivers only if the ventures get their products out on time and meet specific growth targets.

When Bankers Trust wanted to get out of consumer banking and into investment banking, it devised a new pay-raise system to help inspire employees to think of themselves as partners in the new deal instead of hired hands. Raises, once based on seniority, are now calculated on a complicated system that judges each employee on his contribution to the company's profitability. As a result, several employees will earn more than the bank president this year. And Bankers Trust, a mediocre bank seven years ago, now boasts a higher profitability level than any big bank in the country.

And at the Equitable Life Assurance Society's agribusiness operations in Atlanta, where employees once received annual merit raises of 10% at most and had little idea why, they now earn bonuses of 50% to 100% of their salaries and get a computer printout every month showing their contribution to the gross profit margin.

Convincing employees that they won't be fired or demoted for speaking out or for tackling something that fails is sometimes as important as money, companies say, in encouraging employee involvement.

So it was that General Electric threw a big party last year and arranged for a glowing write-up in the in-house magazine—all in honor of a failure. "If GE is to continue to put distance between itself and the bunters of the business world," Chairman John F. Welch Jr. explained in honoring a team that failed to develop a longer-lasting and more efficient light bulb that will sell, "it must take the big swing with increasing frequency. That may mean some strikeouts along the way. But the prospects of hitting a home run make the risks worthwhile."

Losing Is Real Possibility

Others try to emulate not just the participation and rewards of a start-up, but the risks as well, on a theory espoused by Stanford senior lecturer Steven C. Brandt: "You can't feel winning when there is no chance of losing."

Losing big is a real possibility for the 40 Raychem employees hustling to give Raychem's growth—and their pocketbooks—a shot in the arm. The 40 employees, deemed to be particularly important in influencing the company's prospects, put up $10 million for a special issue of stock. They stand to lose millions unless the $700-million Menlo Park technology company reaches the $1-billion sales hurdle by 1988, averages an annual rate of return on its equity of at least 15% a year and improves its earnings by at least 20% a year.

Based on the recent value of a share of Raychem stock, they could either lose almost $4 million of their original investment or make a $44-million profit.

"This makes it a little easier for people to do some tough things," says President Robert Halperin.

There are few negative remarks about participatory management to be heard in the corridors of companies trying it.

Measurable Improvement

GM Chairman Roger Smith claims he already sees measurable improvement in the quality of GM products because of greater worker involvement over the last two years. Campbell Soup cites a dramatic increase in product introductions. Equitable points to higher productivity. NCR, the computer and cash register company headquartered in Dayton, Ohio, cites greater resilience during a recession in its industry. And Kollmorgen, the maker of such technology products as submarine periscopes and printed circuit boards, claims its employees' overall effectiveness has at least doubled.

"People like to play in a game, to play hard and to bet on the score of that game," asserts Kollmorgen Chairman Robert Swiggett. When Kollmorgen broke itself into small teams in 1970 and turned over decision-making power to employees, its output per employee doubled and its on-time delivery rate rose to 90% from 60% within six months —all in the middle of a depression in its industry.

Employees, by and large, are even more effusive in their praise of the new system.

"Wonderful," says Robert Wilkinson of the shift from Equitable division manager to subsidiary president. "As an employee in a large organization you're never totally in control. There are all kinds of frustrations...and you spend a lot of time moving papers from one side of the desk to another. Now, I control my day and worry about the direction of the company."

Toll on the Family

"I'll come by here on Saturday," says George Puskar, president of the Equitable's real estate company in Atlanta, "and I'll look through the roster because we all have to sign in. And it is simply unbelievable to see the number of people working now."

Some worry about the toll that extra responsibility might take. "High pressure and highly absorbing work is hard on a family," notes Yale management professor Rosabeth Moss Kanter.

Rybicki concedes that the 12-hour-plus work days at GMF Robotics have changed her home life. Household chores she did herself are now done by paid help and her husband and child sometimes come in "second place" to her work, which is now "a very main focus in my life."

Still, she says, "I wouldn't go back (to her GM job) for any amount of money."

Not everyone, of course, has taken to the new ways.

"This notion of creative compensation is important to us because the guy with his mortgage on the line doesn't go home at 6 o'clock," says Michael Carpenter, a GE executive vice president. "But not everyone wants to hock the house and mortgage their family for $3 million."

As Carpenter suggests, even in companies that are demanding more entrepreneurial behavior from all of their employees, some people simply aren't as daring as others and don't like the strain of taking their job home with them.

"Some of these people are running around with double diapers on trying to handle all this new risk," says Robert Istnick, a partner at Hewitt Associates, a Lincolnshire, Ill., consulting firm. "These people, quite frankly, are paid adequately by a flat salary. It's the guarantee that brings them to work every day, not the thrill of making sacrifices so they can get a chance at a long-term gain."

That poses a challenge for employers: How to make both those who like to avoid risks and those who like to take them strive for excellence on the company's behalf, satisfy their vastly different needs and do it all without further inflating the corporations' labor costs.

Increasingly, their solution is to replace the standard companywide pay and benefits plan with a multitude of new ones tailored to each of the companies' businesses and to individual contributions to the companies' fortunes.

So at Security Pacific Corp., for example, bankers' wages are mostly straight salary with a modest bonus awarded for superior performance, an arrangement typical for their industry. But Security Pacific employees involved in financing new businesses get a chance to share in the wealth of the ventures they fund.

"The country is caught on the beginning of a wave of companies starting to do this," says E. Webb Bassick IV, a partner at Hewitt Associates. "For many, it's a matter of survival."

Question of Fairness

This approach has the added advantage of stemming the drain of key employees to independent companies. Bankers Trust was losing its investment banking specialists to Wall Street, where they were getting a cut of each deal instead of the low bankers' wages that Bankers Trust paid for the same work. The merchant bank now has different pay scales for its deal makers and more traditional bankers and has slowed the talent outflow to a trickle.

The downside is the fairness question this approach raises.

"If suddenly you incentivize an individual to take great risks and give him huge rewards," says William Buster, an executive vice president at NCR, "then other people would say: 'Hey, I contribute just as much.' "

Calling the creative pay issue "one of the toughest we've faced," Buster says, "frankly, we don't know how to do it."

NCR isn't alone. Of 42 companies recently polled by New York University's Center for Entrepreneurial Studies, 75% said they don't reward entrepreneurial behavior any differently. All thought they should, but didn't because of resistance inside.

So, some companies turn their attention to other types of motivation, going to extraordinary lengths to recognize and reward excellence and inspire original thought.

When Daniel Dye, Security Pacific venture capitalist, tired of big city life in Los Angeles and the long commute between Santa Monica and Newport Beach, his boss gave him permission to work out of a country home in western Pennsylvania rather than lose him to another venture capital firm.

There is popcorn at 5 every night, beer fests on Fridays and hilarity on holidays for the employees in Edward Cheramy's small-business development unit at the Los Angeles office of Price Waterhouse, the big public accounting firm. The maverick partner, who organized the team four years ago when life as a bean counter lost its challenge, showed up one New Year's Eve in the garb of Baby New Year—diapers. And when the team exceeded Cheramy's first-year prediction of attracting two new clients a week, there were T-shirts all around, boasting "CPSers did it 107 times." The freewheeling atmosphere isn't just for fun. Only four years old, the unit already has a staff of over 100 and nearly 400 steady clients.

Most Imagination

But the award for most imagination in the line of motivating employees surely goes to Raychem.

When its top executives became concerned that their growth was slowing and their work force complacent, they hired a fleet of helicopters to land at a Raychem meeting place, take the managers hostage and spirit them away to a beach at Big Sur.

There, they were confronted with huge banners declaring such things as "Innovation" and "$1.7 Billion," their sales target for 1987. These weren't just fluttering in the breeze. They were attached to the backs of real camels and elephants.

"We needed to really get people thinking about taking risks," says Halperin, Raychem's president. "I think we got their attention."

Part 5

Restoring America's Competitive Edge

Creative Freedom Sustained at 3M

by Debra Whitefield

St. Paul, Minn.

Like so many Ponce de Leons, the titans of American industry were beating a path to Scotch tape maker 3M's door in quest of big business' version of the Fountain of Youth: The secret to rejuvenating American industry's aging, unwieldy and sleepy giants.

More than any other big U.S. company, 3M (more formally called Minnesota Mining & Manufacturing) had demonstrated how to be as agile as any company a fraction of its $7.7-billion size and 83 years while preserving one of the most consistent records of growth and profitability.

But in the midst of all this hero worship, 3M's chief entrepreneur, Chairman Lewis W. Lehr, received some disappointing news: The fountain was sputtering.

Despite its deep commitment to innovation and entrepreneurship, Lehr was told by a management consultant who had talked with hundreds of 3M employees that the company had erected some troublesome barriers to creative freedom.

The company's highly regarded laboratories remained bastions of innovation. But elsewhere in the organization, people felt inadequately rewarded for the high personal risk of trying something new, hampered by formalities and stymied by timid bosses.

Even 3M's famed "bootleg slack" policy was held up to some ridicule. Because 3M believes that people work hardest at projects dearest to them, it guarantees employees up to 15% of their work time to chase their dreams. But Lehr was hearing that this was only an empty promise to some employees outside the lab.

True to another 3M hallmark, the failures of lab workers were regularly forgiven. But 3M marketers and manufacturers complained about having far less latitude for mistakes and much less time in which to operate.

Lehr discovered the problems—and has ordered them straightened out—because he dared to ask whether 3M was as good as everyone else thought.

His conclusion: "We aren't that good. So let's be darned sure that we correct these things that we believe in."

3M's beliefs are written down as a corporate philosophy: "The first principle is the promotion of entrepreneurship and insistence upon freedom in the workplace to pursue innovative ideas."

The great lengths to which 3M and its workers will go to keep that commitment are well preserved in the 3M lore.

Failure Turned Successful

Two researchers were allowed to keep working on applications for an adhesive for six years, despite the fact that it flunked all of the conventional 3M stickiness tests. The inventor who finally came up with an application for that "adhesive that fails" was allowed to use the 3M-patented adhesive and company time to develop what started out as a

sticky notepaper to mark his place in hymnals at church—but evolved into the Post-It Note, 3M's most successful new product ever.

Another lab worker, experimenting with tiny glass beads that the company considered a mere novelty, was instructed to get back to his regular work. He did, but sneaked some time here and there and went on to win an Oscar for a projection system for movie makers. Today, those tiny beads also are found on reflective road and bridge safety signs the world over.

(Part of 3M's formula for nurturing entrepreneurship is fostering an atmosphere where people think they are getting away with something. 3M executives believe that legitimizing certain things they know entrepreneurs need to do their jobs would dash their resourcefulness and actually deter entrepreneurial spirit.)

Lehr himself was the most notorious master of end-running the system. The congenial 64-year-old Nebraska native with a homespun demeanor and propensity for reducing complex technical concepts to a school kid's level of comprehension is at once the consummate dreamer and spunky maverick.

"Lew thinks 20 years out while everyone else is thinking ahead six months," says 3M scientist Arthur Fry, inventor of the Post-It Note, for which Lehr put his career on the line.

But it was in the role of scrappy con artist that Lehr won his spurs at 3M. He bucked the system and built a fledgling medical-products venture into one of the company's biggest divisions.

When Lehr couldn't get permission to take more money from company coffers, he bootlegged funds from his buddies' budgets. When word leaked out that the ax was about to fall on his venture, he built up six months' of inventory, buying more time to overcome the internal opposition. And when the company's interest wavered again, he got the then-chairman's ear by offering to buy the business.

The company that started out just after the turn of the century with one product, sandpaper, and now makes and sells about 40,000 products, has long recognized some of the deterrents to innovation and entrepreneurship and has worked hard to eradicate them.

Too many rules and too little freedom, for instance.

The company's beliefs are written down as corporate philosophy: "The first principle is the promotion of entrepreneurship and insistence upon freedom in the workplace to pursue innovative ideas."

"If you put people in a pasture and you put a fence around them," says Lehr, "they become sheep. And how many patents have you seen assigned to sheep?" Recognizing that these deceptively simple things are as difficult to root out of an organization as crabgrass on a front lawn, 3M executives regularly force themselves into a critical review.

Asked for Criticism

So it was that when Gifford Pinchot III, a management consultant who bluntly admits to making his living helping companies emulate 3M, visited the company "to see us about what we were doing right," Lehr recalled recently, "we turned the tables on him and asked him to tell us what we were doing wrong."

Pinchot's four-month audit elicited comments from hundreds of 3M employees and these recommendations: Reduce bureaucracy. Improve opportunities for nontechnical employees to cross divisional boundaries, a hallmark of 3M technical personnel. Increase incentives and rewards. Enforce the 15% slack time commitment. Train more managers to be "innovation sponsors" who champion new products (Pinchot found there are fewer sponsors at 3M than 10 years ago, largely because of increased formality). Reduce the pressure to make a profit quickly and the high personal risk of trying something that might fail.

"Some people at 3M have forgotten this basic premise of forgiving mistakes that is so critical to 3M's heritage," Pinchot says.

The innovation audit had its roots in a much more intensive self-examination that propelled Lehr to a wrenching decision in 1981: Tamper with the very foundation of 3M's success as an innovator, its organizational structure.

The changes were an outgrowth of competition and the chairman's fears.

"I'm constantly concerned," Lehr says, "about running out of ideas. What's our next new product? Why can't I see it? Who's going to develop it?" One day about five years ago, "I began to wonder whether we were having effectiveness within our research program," something that is "very, very difficult to measure."

Task Force Organized

A task force was organized to ascertain whether "we are moving the way the world is moving, the way business is moving, where we will have to be 10, 20, 30 years from now. I wanted to know, do we have our scientific heads in the sand or were we really out looking for the things the world needed to know?"

Out of that study grew the recognition that 3M's scientific efforts weren't as effective as they could be, in part because of a problem with the company's vaunted organizational structure.

That structure was forged years before decentralization and big-company entrepreneurship became fashionable. 3M, declaring big is bad for responding to customers' needs, broke itself up into small divisions—each with enough people and sales potential to benefit from economies of scale but small enough that a manager could keep his arms around it.

Each division—a product development lab, really—works autonomously. To get the most from the organization's creative juices, each division—there are now about 40, three to four times more than most companies its size—does its own research and development, manufacturing and marketing.

In many organizations, that's as far as decentralization goes. But somebody at 3M had a brainstorm:

To really foster a sense of pride and ownership, why not let the divisions create what amounts to an even smaller company for developing new products? Give them some room to maneuver, let them break a few company rules and see what happens.

Development Unit

The 3M business development unit was born. Its members are responsible for seeing a product through from development to introduction.

The whole team is judged one way: Did the business succeed? If the engineer designs a standout gadget but the marketing people slip up, the whole team fails; not just the marketer. The engineer's problem becomes the marketer's problem becomes the manufacturer's problem.

With this approach, 3M thinks that products more closely resemble what the consumer can use instead of what the inventor fancied the world needed. Products hit the market quicker.

"The importance here is not just the organizational concept of breaking up into different units," says 3M's president for U.S. operations, Allen F. Jacobson. "It's the concept of building businesses based on solving customers' needs."

Partly because every division manager is judged as much on his new products as on the division's financial performance, 3M in each of the last 10 years has derived at least 25% of its sales from products that are no more than five years old. This year alone, Lehr says, 3M has developed 40% more products than last year.

Nor does 3M lose many people. Its employee turnover is among the lowest in U.S. industry and most 3M executives have never worked anywhere else. Even successful entrepreneurs stay, even though their pay is paltry compared to their counterparts at successful start-ups.

Judging from those measures, the 3M system works. So, why tamper with it? Too much duplication of research. No formal mechanism for communication among the product groups. And despite Lehr's reputation as a visionary, virtually no companywide strategic planning.

Organization Blamed

The fractured organization also got 3M in trouble in the market for communications products generically known as the office of the future. Many thought 3M would be a big player in the business of tying together copiers, word processors, facsimile machines and the like. When it tripped up, critics blamed the company's inattention to strategic planning and its organization, which inhibited communication across product lines.

Without tinkering with the new business venture format that gives 3M its entrepreneurial flair, the company formalized its strategic planning process, reorganized into four major sectors and parceled out ongoing research projects accordingly. Now, the divisions are responsible for product research extending five years out and central research has responsibility for esoteric testing and long-range research. For research looking out five to 20 years, 3M assigned each of the four sectors a new level of research.

Lehr says he is satisfied with the decision. "We put the fractures back together and wound up with four eggs instead of Humpty Dumpty."

But recognizing that he had added a layer of bureaucracy to the organization, something that makes entrepreneurship purists cringe, Lehr got a bad case of the jitters.

So in 1984, he commissioned another 3M task force and consultant Pinchot to "let the people who are now operating under this new system tell us whether they have or haven't lost the freedom to innovate."

That's how he learned of the barriers to innovation inside a company where innovation and entrepreneurship is gospel.

Lehr was troubled enough that he sent the task force back to work and mounted a two-year, companywide innovation-awareness campaign.

Giant signs bearing the word "innovation" and its dictionary definition are mounted on easels in the halls and libraries at 3M's headquarters, a campus-like sprawl of buildings joined by above-ground walkways. There are now black-tie awards dinners for sales and marketing people, never before recognized for their innovative efforts.

Managers at all levels have been reminded that employees in all disciplines at 3M must have the freedom to innovate. And in a company already highly regarded for its proliferation of creative awards for outstanding performance and sources of financial support for new ventures, 3M has established yet another known as Genesis.

Inadequate Funding

When the latest 3M task force surveyed employees, it found that one perceived barrier to innovation was inadequate funding of new ideas. To rekindle in its technical community a spark of innovation and creativity, the company has set aside $500,000 a year for people—in the tradition of 3M, usually a team rather than an individual—with good ideas who can't find budget support through regular channels.

Grappling with other barriers to innovation identified by 3M employees is proving harder.

Compensation, for example. "How do you adequately reward a typical intrapreneur (an entrepreneur inside a corporation, a word Pinchot takes credit for having coined) so he will go back and invent something else but not bankrupt the company in the process?" asks William E. Coyne, a group vice president in charge of 3M's health-care products and services.

Built Career Ladder

A better motivator than money, 3M believes, is career advancement and peer recognition. So, this summer, it established what is believed to be the nation's first career ladder for big company entrepreneurs.

To climb the ladder at most companies, entrepreneurs have to give up their love for inventing things or building a business from scratch and focus on managing people and running large operations. For those who remain entrepreneurs, there is no formal system for promotion. They lose out on the extra compensation and status afforded managers even though their contributions to the company's fortunes often are demonstrably greater.

3M created the new jobs of venture manager and venture director which combine responsibilities for both innovation and management. Entrepreneurs who demonstrate a gift for innovation and building new businesses are in line for promotion to one of those higher paying and more prestigious jobs—a job level their experience wouldn't normally justify. The better they perform, the riskier their next assignment and the higher up the ladder they climb.

3M also is concentrating more resources than ever in research and development. It has doubled its research and development investment over the past five years and plowed more dollars into R&D last year than it paid out in dividends to shareholders.

"For many companies, that's an easy place to cut when times get tough," says President Jacobson. "But we know that when you cut research you're selling your birthright."

Efforts in Entrepreneurship Often Meet With Failure

by Debra Whitefield

Despite the current vogue, consultants and academics who have studied corporate efforts in venturing and entrepreneurship say the record is disastrous.

Nearly every Fortune 500 company experimented with building small, risky businesses slightly off the company's beaten path during the 1960s and early 1970s and "most failed," says Zenas Block, associate director of New York University's Center for Entrepreneurial Studies. What's more, "the failures were large and expensive."

Why they fail is a question that keeps an entire industry of consultants employed. But the reasons fall broadly into two categories. Some corporations, consultants say, plunge ahead half-cocked without fully understanding what they're doing and why and what they can reasonably expect to achieve. Others, well-reasoned though their experiments, never strike a balance between too much and too little.

At either extreme, companies can fall victim to any number of traps: Insufficient commitment from the top, overly rigid financial controls, lax reviews, too many incentives to start a glamorous venture and too few to keep it going, too few rewards for the added risks that an entrepreneur takes on, too little communication from the top about the company's strategies and goals and, therefore, too many innovations that aren't good fits, too many management changes, too few management changes.

"It's scary," says McKinsey & Co.'s Los Angeles managing director, Robert Paulson, of the many pitfalls to successful corporate entrepreneuring. "The only reason to do it is when you have no other choice."

The right approach, says Yale management professor Rosabeth Moss Kanter, is to decentralize operations and broaden jobs to encourage employee initiative and creativity but to impose enough discipline to keep that initiative and creativity focused on the corporation's priorities.

For Baxter Travenol Senior Vice President Steven Lazarus, striking the proper balance between marketing and new-product design is the biggest challenge to his efforts at lighting an entrepreneurial fire under the health-care company. "My nightmare," he says, "is that we have two teams racing toward Grand Junction, Colo., to drive the Golden Spike—only one ends up in Durango."

Companies that lack a clear vision, Kanter warns, are in danger of carrying entrepreneurship too far and learning the wrong lessons from their mistakes and successes.

She tells of one company whose new-technology staff had never brought anything in on time or on budget. So company executives set up a skunkworks—a small team that works on a single project, often in secret, and operates outside the corporation's usual rules and red tape. The group's product came out on time and customers loved it. "So

the lesson the company learned," Kanter says, "was that you've got to start these kinds of things with a skunkworks, you have to end-run the system. They didn't learn the right lesson—that it was the system that was wrong."

Soup-maker Campbell is one that, having let the pendulum swing too far toward tight control, went too far in the opposite direction and now is trying to rein in its entrepreneurial excesses. Campbell for years squeezed every penny out of production costs and spent virtually nothing on marketing. It also was so concerned about being 100% right before it went forward with anything new that it almost never did. New products were a rarity.

By breaking up into 52 entrepreneurial units and refocusing on marketing and new-product development, Campbell pushed 392 new products into the market in five years. But in doing so, its cost controls and review system grew somewhat lax. When it rushed one juice product into market without a careful enough review, it discovered too late that its pricing and packaging were wrong. The mistake cost Campbell three months and an estimated $40 million to $50 million in lost sales.

Inexpensive Computers

Lack of discipline also got Digital Equipment Corp. into trouble. Early in the company's history, when it made fast, inexpensive computers, founder Kenneth H. Olsen broke up the company into small, autonomous units along product lines.

"It worked beautifully—entrepreneurial spirit in the traditional sense," he says. But before long, the company was running off in 35 directions and it became clear to Olsen that "we couldn't grow fast enough" to build all the products these units were producing. "We needed one strategy, one message. We had to be one company." A big company, he now believes, "can't act like 1,000 little companies."

Other companies go overboard in the other direction, forcing new ventures to meet the same rigid financial goals as more mature operations. When they fail to come in on time or budget, top management typically disbands the venture or tightens the controls still further. And yet, a recent NYU study of 10 start-ups found that none met sales and earnings goals for the first five years and, in fact, all missed the goals by at least 70%. "And still there persists a widespread insistence on the need for new-venture plans" says NYU's Block.

Some of the financial pressure comes from managers competing with the new ventures for the company's resources.

"It is easy for other managers in the more traditional lines of business to go to top management and make the argument 'you give us that cash and we'll give you a guaranteed return,' something the venture manager can't claim," says Mel Perel, senior management consultant at SRI International in Menlo Park, Calif. "That's a very, very hard argument to overcome in most organizations."

At one company where entrepreneurship is in vogue, the established businesses are tired of "being treated like step-children" and are now trying to reassert themselves, Kanter says. "That's a power play that in my experience few ventures can survive."

Throwing money at entrepreneurial ventures that don't first reach certain financial objectives can be just as devastating. "Traditionally, big companies who want to foster venturing take the approach of loading the cannon with money and blowing the money out," Block says.

That's what happened to Exxon's office-equipment venture. The oil giant had bank-rolled several high-tech start-ups in the early 1970s as protection against shrinking oil revenues and had promised them autonomy. But as the ventures' appetite for cash grew, so did Exxon's vision of building an information-systems empire. Exxon increased its control, threw money at the ventures, installed new managers thought better equipped to build the business and overwhelmed the unit with an overhead it couldn't carry. The last of the unit's assets were sold earlier this year.

"I used to think (big) corporations were unbeatable because they had so many resources," says Edward E. Lawler III, director of the University of Southern California's Center for Effective Organizations. "Instead, that's the problem. It has too many resources. I now think a large company is a bigger anchor to a venture than it is a help."

Other companies trip up by taking decentralization too far. "Some companies haven't decentralized, they've abdicated," says William Sommers, executive vice president at the management consulting firm Booz, Allen & Hamilton.

Approach Gains Favor

Kanter tells of a leading instrument manufacturer that reassigned to division managers practically all the jobs once handled by its staff, an approach gaining favor in America now. The divisions were ecstatic, but soon became so busy worrying about more immediate problems that no one was handling long-range planning and development of technology, both critical in the company's line of work.

Hewlett-Packard, another long-time practitioner of decentralization, recently centralized its marketing functions. Hewlett is organized into small units, each of which handles its own design, development, marketing and the like. But as the company's products became more complex and interrelated, it became evident that there was too little coordination between divisions and products. Customers began to complain about "all of these different divisions and entities coming at us," says Walter Pienkos, Hewlett-Packard's personnel manager.

The company had a major decision to make: Reorganize into large entities focused on complete business segments or keep the small units but establish a new layer of bureaucracy—a group marketing department—to focus on the market more broadly. Hewlett chose the latter approach.

"From a customer standpoint...and probably from a management standpoint, it would have been easier (to reorganize into big groups) because you could concentrate and direct all those resources more easily," Pienkos says. "On the other hand, we would have lost something that we find very valuable, and that is the entrepreneurial feeling of running your own business."

Maxwell wins approval to buy from Pergamon

BY CLAY HARRIS

MR ROBERT MAXWELL, despite a reputation as an iconoclast, has a keen eye for the neglected tradition overdue for revival.

Scheduling a shareholders' meeting of Maxwell Communication Corporation, the printing and publishing group, for New Year's Eve was a large step in this direction. On Thursday, however, Mr Maxwell, never a man for half measures, barred the press from the meeting.

At a briefing afterwards, Mr Maxwell said journalists had been excluded because the attendance of some 100 shareholders meant there was no room. He would not say how many were also MCC employees.

Mr Maxwell, however, had also clearly been angered by what he described as "misleading" and "ignorant and stupid comments" in some newspapers about possible institutional opposition to the deal on which shareholders were due to vote at the meeting. He read from photocopies of articles, with the offending phrases highlighted in blue.

Earlier, Mr John Egan, MCC group press adviser, had told journalists that security guards would remove them from the Mirror building in Holborn, London, if they did not leave.

It was a gesture worthy of the 1970s heyday of Mr Harry Hyams, who revelled in playing cat-and-mouse with the press eager to attend New Year's Eve closed meetings of his Oldham Estate property company.

By the time he faced the press, Mr Maxwell was a man vindicated. MCC's agreement to buy three electronic and book publishing companies from its majority shareholder, the Maxwell family-controlled Pergamon Group, for up to £100m, had been approved unanimously on a show of hands.

In the five-minute meeting, no shareholder had asked a question, much less questioned the wisdom of the deal, Mr Maxwell said.

Although a poll had not been called, he revealed that 1,577 shareholders speaking for 43m shares had submitted proxies in favour of the deal while 65 shareholders representing 2,037,752 shares had submitted proxies against.

The total number of proxies submitted represented only 7.4 per cent of MCC shares and 15.4 per cent of the independent minority of shareholders eligible to vote. Pergamon, and MCC directors associated with the Pergamon companies, did not vote.

The low level of participation shows that their example was voluntarily followed by some of the largest institutional investors. Mr John Holloran, MCC chief executive, said he had discussed the acquisition with about 30 large investors.

Despite his victory, Mr Maxwell gave short shrift to questions about the deal. Why, he was asked, had MCC shareholders not been given an independent accounting report on the three Pergamon subsidiaries?

"Because, Mr Genius, the Pergamon accountants are the same as the Maxwell Communications accountants, and they go by the name of Coopers & Lybrand," he thundered.

Mr Maxwell said a small US acquisition was imminent in the field of intellectual property rights, an area he sees as ripe for world-wide packaging and exploitation in the coming decade.

He also said MCC would be gaining a Paris stock market listing, as well as that previously announced for Frankfurt, in the next few weeks.

Negotiations to buy the New York Post from Mr Rupert Murdoch were proceeding, Mr Maxwell said. If they were successful, Mirror Group Newspapers would own the newspaper while MCC would print it under contract.

In a dig at his rival, Mr Maxwell contrasted Mr Murdoch's "debt-led" News Corporation with MCC's strong equity position. "The market crash is an excellent opportunity for Maxwell Communications," he said.

Managers of seven of the Mirror Group's eight pension funds had shifted 25 per cent of their portfolios from equities to gilts only two weeks before the October crash, Mr Maxwell said.

"The advice originally came from the chairman of the investment committee, and you're looking at him."

Waverley sticks by Gulliver buy-in

By Clay Harris

Waverley Cameron, the Scottish stationery group, has repeated its support for the buy-in by Mr James Gulliver despite an increased stake by a shareholder believed to oppose the deal.

Mr Gulliver, who is to step down in September as chairman of Argyll Group, owner of the Presto and Safeway supermarket chains, controls Sanda Investments, a company which would hold 64 per cent of Waverley Cameron after a proposed share issue.

Flavell Communications, which has signalled its opposition to the plan, has lifted its holding to 20.4 per cent, closer to the level at which it could be assured of blocking the plan. Sanda's solicitors are endeavouring to confirm whether Flavell intended to vote against the proposals.

Mr Kevin Doyle, who controls Flavell, said on New Year's Eve that resolution of the issue had been delayed by the holidays.

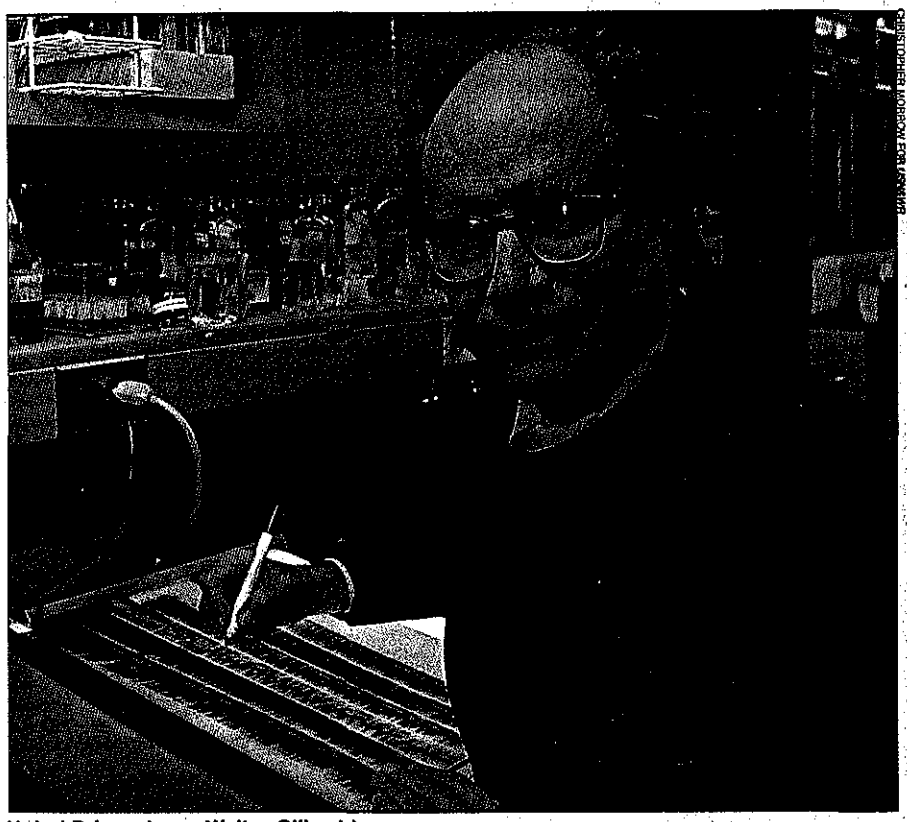
Waverley Cameron urged shareholders to support the proposal at a forthcoming egm, for which the date has not yet been set, and not to sell their shares. Mr Gulliver, newly appointed non-executive chairman, has not taken part in the delibera-

Reading the human blueprint

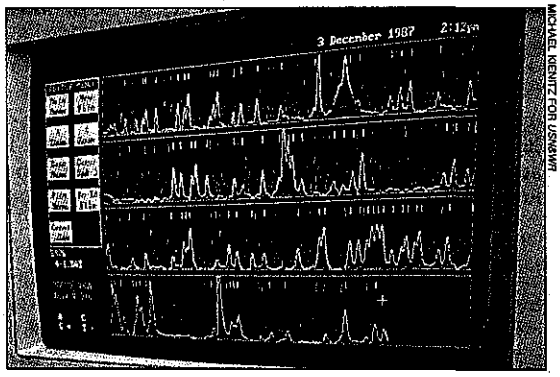
MEDICINE ■ The goal is to decipher every human gene. But some biologists wonder if it's worth the unprecedented cost

■ Physicists have their atom smashers. Astronomers have their telescopes. Now, it's biologists' turn at big science. Only this time the object under scrutiny will not be a distant star or an atom, but ourselves. The ambitious goal is to decipher the 3 billion individual ciphers that together form man's genetic code—what amounts to a complete chemical formula for a human being.

Called the human genome initiative, the scale and scope of the project are unprecedented in biology's history: It will take several decades to complete and could cost between $500 million and $3 billion. Proponents justify the hefty price tag by insisting that the project will guarantee United States leadership in the increasingly competitive pharmaceutical industry. They also point to its huge scientific dividends. By working out the precise functions of genes responsible for genetic diseases such as cystic fibrosis and Huntington's disease, scientists may be able to devise powerful new therapies. Eventually, this expedition into the core of human existence promises answers to some of the most profound questions in modern biology: How does a single fertilized egg grow into an organism as complex as a human baby? What genetic changes turn a healthy cell into a cancerous one? How do genes direct the aging process?



Nobel Prize-winner Walter Gilbert hopes to raise $8 million in private capital to do the job. Below: A partially deciphered gene. Colors show the identity of the gene's chemical subunits



MICHAEL KIENITZ FOR USN&WR

A genetic atlas

The first steps toward unraveling the entire human genetic code already have been taken. That is to determine the location of specific genes on the long strands of DNA that make up the 46 human chromosomes. Each gene, which directs the production of a single protein in the body, is made up of a chain of some 1,500 chemical subunits known as bases. It is the sequence of these bases that specifies the exact chemical structure of the protein. Structural materials that make up blood, muscle and skin, the hormones that course through the blood stream and the enzymes that drive each and every step of metabolism—all these substances are made of protein.

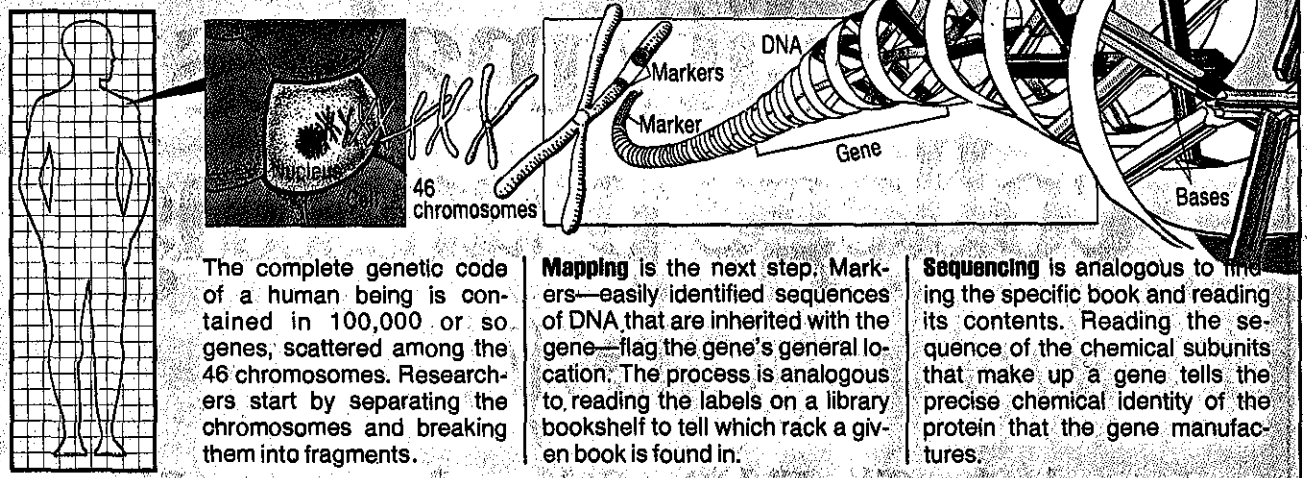
In the past few years, scientists have mapped the approximate locations of at least 400 of the 100,000 or so human genes. The first to be targeted for study are those associated with the 3,000 known hereditary disorders. By reading the sequence of bases in these defective genes, it will be possible to determine exactly why the gene either fails to function or produces a malformed protein. But that's just the beginning, for researchers are now discovering genes that influence the onset of a host of common diseases not usually thought of as hereditary, including heart disease, rheumatoid arthritis and Alzheimer's disease.

Disease fighters

In addition to genes associated with illness, the mapmakers are charting the locations of genes that produce immune proteins such as interferon that fight disease. But the majority of these immune chemicals still remain to be discovered and their genetic blueprints traced to specific chromosome locations. "We've only identified about 1 to 2 percent of all the body's proteins," says Leroy Hood, a molecular biologist at the California Institute of Technology. "Think what powerful [disease-fighting] tools lie ahead when we find the other 98 percent."

Determining the sequence of bases in a gene until recently has been a tedious process, requiring a painstaking chemical analysis to determine the identity of each and every base. Now, an automatic sequencer developed by Hood and colleague Lloyd Smith can "read" an entire gene in a day or so. The process entails tagging fragments of genes with fluorescent dyes, whose colors are then scanned by a laser beam and the information recorded by a computer. New sequencers promise

HOW RESEARCHERS UNRAVEL THE GENETIC CODE



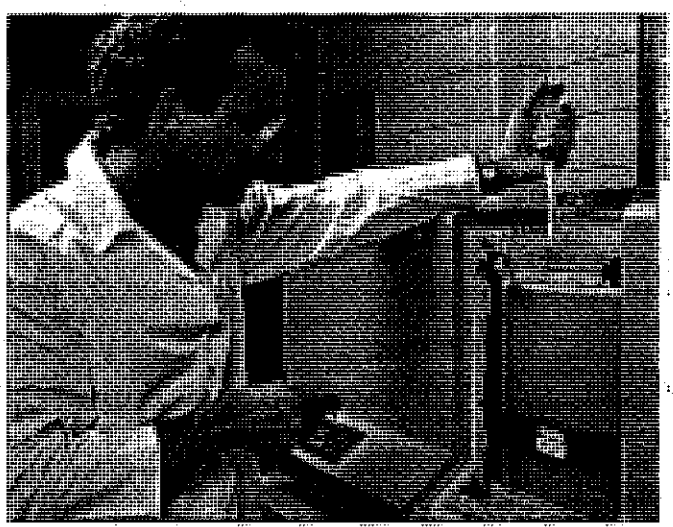
The complete genetic code of a human being is contained in 100,000 or so genes, scattered among the 46 chromosomes. Researchers start by separating the chromosomes and breaking them into fragments.

Mapping is the next step. Markers—easily identified sequences of DNA that are inherited with the gene—flag the gene's general location. The process is analogous to reading the labels on a library bookshelf to tell which rack a given book is found in.

Sequencing is analogous to finding the specific book and reading its contents. Reading the sequence of the chemical subunits that make up a gene tells the precise chemical identity of the protein that the gene manufactures.

to make the process 10 times faster.

But even assuming such advances, some researchers question whether the brute-force approach of sequencing the entire genome even makes sense. Only about 4 percent of all the DNA found in chromosomes actually contains genes—that is, sequences that direct the manufacture of proteins. The rest seem to be evolutionary driftwood—DNA cast off so long ago in our evolution that the sequences have mutated into total gibberish. Robert Weinberg of the Whitehead Institute at the Massachusetts Institute of Technology is one of several leading geneticists who cannot see the point in "wading through a sea of drivel to emerge dry-shod on a few tiny islands of information."



Lloyd Smith and his automatic gene sequencer

Another obstacle is a turf battle between the Department of Energy and the National Institutes of Health. DOE is advocating a Manhattan Project approach: A focused program that would develop advanced sequencers and computers in a crash effort to unravel man's entire genetic code. Although DOE would seem an unlikely government body to become involved in such an endeavor, the agency has gained considerable expertise in the field through studies of how genes are damaged by radiation.

Footing the bill

The National Institutes of Health, however, is already spending $300 million a year to study the genes of diverse life forms, including $100 million exclusively on human genes. And NIH prefers to fund smaller groups of researchers working in individual laboratories across the country, rather than managing a single megaproject.

With government plans still up in the air, at least one group is trying to raise capital to do the job privately. Nobel Prize-winning biochemist Walter Gilbert of Harvard University, a founder of Biogen, one of the pioneer biotech companies, is calling his new venture Genome Corporation. He even has plans to copyright human gene sequences—an unsettling thought to many researchers who would prefer to see the information remain in the public domain. Legal scholars point out, however, that copyright protection is only afforded to authors of original works. Says Susan Rosenfeld, a New York City attorney who specializes in legal issues related to genetics, "About the closest candidate in this case is God."

Gilbert isn't intimidated by the Almighty's competition. If he can't copyright his gene sequences, he will compile his genetic data into a commercial data bank and charge users a fee to gain access to the information through computer-phone links. That won't preclude scientists from gaining the data by other means. But many scientists may prefer the convenience of the data base, just as subscribers to data bases such as Nexus can save a trip to the library by scanning its files for newspaper articles.

As for raising the additional $8 million in venture capital needed to launch his company, perhaps Gilbert and other entrepreneurs could benefit from the advice of biologist David Tepfer of the Institut de la Recherche Agronomique in Versailles, France. In a letter to the British journal *Nature,* Tepfer arrives at a financing scheme after posing the obvious question: *Whose* genome should be sequenced first? After all, each individual's genes are somewhat different. Not to be swayed by nationalistic interests, Tepfer quickly rules out such candidates as Ronald Reagan, Margaret Thatcher and François Mitterrand. "My suggestion," he writes, "is that it go out to tender. Unfortunately, J. P. Getty and H. Hughes are dead, but there must be somebody who can afford to be sequenced." ■

by Kathleen McAuliffe

British Publisher Acquires Stake In Bell & Howell

Maxwell Communication Says It Wants to Pursue A Friendly Acquisition

By John Marcom Jr.
And Alex Kotlowitz
Staff Reporters of The Wall Street Journal

Maxwell Communication Corp. of Britain said it has acquired 2.3% of Bell & Howell Co. and wants to pursue a friendly takeover of the U.S. company.

Maxwell, controlled by flamboyant British media tycoon Robert Maxwell, is the third concern or group recently to acquire a stake in Skokie, Ill.-based Bell & Howell, a publishing and information concern. The Bell & Howell investment follows four acquisitions in recent days by the Oxford, England-based publishing and printing company, which thanks to a £630 million ($1.12 billion) share issue earlier this year has found itself able to pursue its aggressive expansion plans despite the stock market crash.

In a letter to Bell & Howell's chairman, Donald N. Frey, Mr. Maxwell said the company plans to make a Hart-Scott-Rodino filing to permit it to purchase more than 50% of Bell & Howell's stock. In response to the letter, a spokesman repeated the company's position that Bell & Howell wants to remain independent, and added that the letter took the company by surprise. Bell & Howell released details of the letter, but wouldn't make the entire text public.

Mr. Maxwell expressed surprise that Mr. Frey didn't first notify him about releasing the contents and said he was "miffed" that Bell & Howell didn't release the entire letter. Mr. Maxwell said the letter discussed the advantages of a merger of the two companies and noted that his company recently appointed Bell & Howell's microform publishing unit to distribute microform editions of its scientific journals—which Mr. Maxwell said he told Mr. Frey was an example of "the synergy between our two groups." The Maxwell chairman said in a telephone interview from Jerusalem, where he was traveling on business, "The selective release of the letter without consultation is rather surprising and strange."

Waiting for 'Considered Reply'

Mr. Maxwell said he would wait for "a considered reply" from Bell & Howell before making another move. A Bell & Howell spokesman said yesterday company officials "haven't discussed the possibility of a response." Mr. Maxwell noted Bell & Howell faces pressure from the two other investors. Since last month Macmillan Inc. has bought a 7.7% stake in the company and said it may seek control. More recently, an investor group including Robert M. Bass, a Fort Worth, Texas-based investor, raised its stake to 15.9%. In its initial Securities and Exchange Commission filing, the group said it held the shares for investment purposes. The other investors are "heading for control without paying a premium," Mr. Maxwell said. "We are prepared to pay a premium for control."

In composite trading on the New York Stock Exchange Friday, Bell & Howell stock closed at $55.25, up 75 cents, giving the company an indicated value of $519 million.

The Bell & Howell spokesman who said the company was surprised by the letter, noted that Mr. Frey during the summer refused to take a phone call from Mr. Maxwell, an indication that Bell & Howell had hoped to discourage Maxwell from approaching the company again.

In the letter, Maxwell sought to assure Bell & Howell that its expression of interest was not being made "with any hostile intent," Bell & Howell said. Mr. Maxwell said, "We wish to avoid battles and join them only if we're forced to."

But Maxwell's letter may diminish Mr. Frey's hopes that the stock market's recent plunge might scare away any possible raiders because many sustained big losses in the market. Bell & Howell's shares traded as high as $71.125 in the week before the crash.

Not Deterred by Crash

Mr. Maxwell hasn't been deterred by the crash, although his company's share price has fallen 33% since Oct. 15 to 229 pence ($4.07) late Friday on London's stock exchange. The company said in September it had net cash and short-term investments of £400 million, following the July share issue. Mr. Maxwell controls Maxwell Communication, which recently changed its name from British Printing & Communication Corp., through Liechtenstein-based Pergamon Holding Foundation. The ultimate owners of the foundation, which also owns Britain's tabloid Daily Mirror, several other newspapers and investments in several television ventures, aren't known.

Mr. Maxwell has said frequently he wants Maxwell Communication's revenue to at least triple by 1990, from about £1 billion this year. In 1986 the company earned pretax profit of £80.3 million and net income of £60.3 million on sales of £461.7 million. Already a series of acquisitions have made the company the U.S.'s second-largest commercial printer. Bell & Howell's interests in textbooks and information services would "fit us like a glove," Mr. Maxwell said.

Bell & Howell could fulfill some of the ambitions frustrated earlier this year in Mr. Maxwell's unsuccessful $1.7 billion bid for Harcourt Brace Jovanovich Inc. Harcourt, an Orlando, Fla.-based company with big publishing interests, blocked the British publisher with a recapitalization plan.

Expansion in Recent Years

Mr. Maxwell has moved determinedly to expand in recent years. Last week alone, Maxwell Communication agreed to spend at least £170 million. It agreed to acquire for an amount that wasn't disclosed Alco Gravure Inc., a Rochelle Park, N.J.-based printer; agreed to pay £34.8 million for United Trade Press Holding Ltd., a British publisher of trade magazines; agreed to pay £4 million for 70% of Nimbus Records Ltd., a British maker of compact disks; and agreed to pay as much as £111 million for Pergamon Orbit Infoline, an electronic-publishing company held privately by Mr. Maxwell's Pergamon foundation. The company also disclosed a stake of just under 15% in De La Rue Co., a British high-security printing company.

In 1986, Bell & Howell earned $32.9 million, or $3.10 a share, on sales of $853.4 million.

Bell & Howell has been selling units to concentrate on its core businesses. During the summer, the company made its biggest divestituture, selling its 85% stake in Devry Inc., a technical-school operator, for about $147 million.

Citicorp Prepares Bid for Branch System Of Financial Corp. of America's Big Unit

By David B. Hilder
Staff Reporter of The Wall Street Journal

Citicorp, eager to expand its consumer banking presence in California, is preparing to bid for the retail branch system of American Savings & Loan Association, the main unit of troubled Financial Corp. of America, thrift industry officials said.

Citicorp's renewed interest in the 180 branches and 23 loan offices of American Savings stems from two factors, industry officials said: a greater likelihood that the Federal Reserve Board would approve such an acquisition under Chairman Alan Greenspan than under former chairman Paul Volcker; and the recent drop in interest rates, which reduces the losses that would have to be absorbed by Citicorp and the Federal Savings & Loan Insurance Corp.

Even if Citicorp and the Federal Home Loan Bank Board, which controls the FSLIC, can agree on terms and jointly lobby the Fed, the acquisition still would present substantial regulatory hurdles, thrift executives said. And the Bank Board still would have to deal with potential losses in Financial Corp.'s big portfolio of troubled real estate and its $18 billion holdings of mortgage-backed securities.

Alternative to Ford Bid

However, Citicorp's interest could provide the Bank Board with a serious alternative to a bid for American Savings submitted by Ford Motor Co.

In New York Stock Exchange composite trading Friday, Citicorp closed at $42.75, unchanged. Financial Corp. of America closed at $2.375, up 62.5 cents, while Ford closed at $75,625, down $2.875.

The Bank Board said Friday that its discussions with Dearborn, Mich.-based Ford are continuing, and said it also is holding discussions with Citicorp about American Savings. A Bank Board spokes-

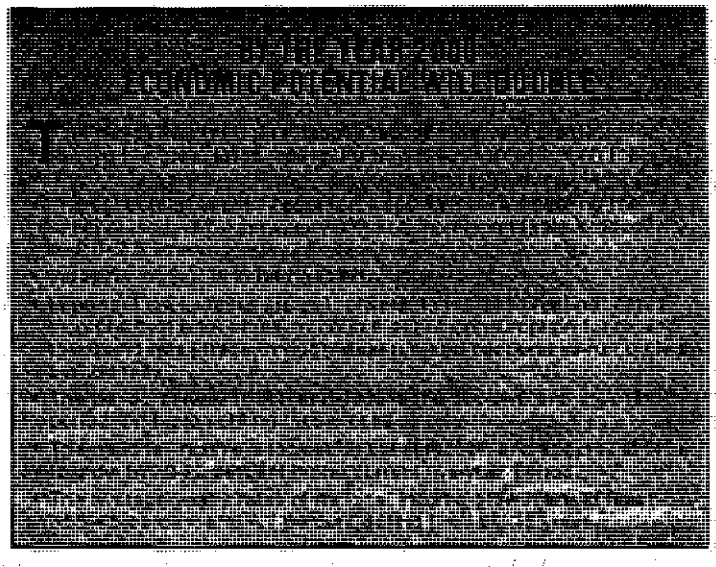
USSR

NEW THINKING FOR FOREIGN TRADE

Today, the program of radical qualitative changes in practically all spheres of the country's economic and social life is implemented by Soviet leadership: in the development of productive forces and production relations, in the radical democratization of the socio-political and humanitarian spheres, in the intensification of cultural and intellectual progress.

Among the most important are the changes in the economy, the formation of a new economic management mechanism. The national economy is undergoing a crucial technical reconstruction, including major structural changes. Priority is given to the development of machine building industries on the basis of the latest advances in science and technology. Through full-cost accounting and self-financing, the country has taken steps to improve the use of their commodity and monetary reserves. This has already produced some positive results. In 1986 the USSR attained the highest rates of national income and industrial output growth in this decade, surpassed the planned target for labor efficiency growth and reduced labor and material costs per unit of output more than planned. The rates of agricultural output growth were almost twice the average annual targets.

Major changes in foreign trade activities are being implemented.



RESTRUCTURING FOREIGN TRADE

More than 20 ministries and government departments and 76 industrial associations and enterprises have been granted the right to conduct import-export operations independently as of January 1, 1987 incorporating associations and firms operating on a profit-and-loss basis. In the future, more ministries, organizations and enterprises will be given direct access to foreign markets. Companies which do not immediately receive the right to conduct direct transactions abroad have been allowed to carry out import-export business through organizations having this right, by signing contracts with them.

The Foreign Trade Ministry remains an exclusive trader in raw materials, fuels, foods and some mechanical engineering products, which are goods of state importance. The State Committee for Foreign Economic Links, which supervises aid programs, is responsible for the building of enterprises and supervision over Soviet-assisted projects overseas.

Measures to give state firms wider freedom to do business with foreign countries do not mean that the state is abandoning its monopoly on foreign trade. Their material and financial resources will still belong to the state and their activities will be governed by Soviet economic laws and regulated by Soviet bodies of state authority.

A State Foreign Economic Commission under the USSR Council of Ministers will oversee all foreign trade, playing a watch-dog role to guarantee state interests.

THE REASONS WHY

Soviet foreign trade in 1986 topped 130 billion rubles, but its volume and particularly its methods still fall short of the current level of the country's industrial, scientific and technological potential. Soviet foreign trade management agrees with the need to increase the tempo of Soviet economic development.

For a long time all transactions abroad had been conducted by several state organizations and the Central Union of Consumer Societies. Until the mid-1980s, 90 percent of foreign trade had been in one way or another controlled by the Foreign Trade Ministry.

Until a certain period of time that arrangement of foreign trade had been seen as justified. But as the country's economic potential increased and its economic framework grew ever more complicated, the need arose to involve producers of exported goods and consumers of imported products in foreign trade deals.

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NEW MANAGERIAL PRACTICES

The restructuring of foreign trade has been facilitated by efforts to improve economic performance and increase the role of economic incentives. The reform focuses on increasing the responsibility of the firms involved by making them fully self-supporting and self-financing. Foreign exchange funds will be created to grant greater autonomy to such firms in deciding what they need to import, and to heighten economic incentives in developing exports. Enterprises will be expected to earn these funds on their own by exporting their goods and using the money for direct purchases of machinery, equipment and materials on foreign markets as well as purchases through foreign trade organizations. Companies can also apply to the Soviet Bank for Foreign Economic Activity for foreign currency credits. Those enterprises which fail to stand by their commitments to export the promised quantity of their goods will have to compensate the losses from their foreign currency funds.

FROM TRADE TO COOPERATION

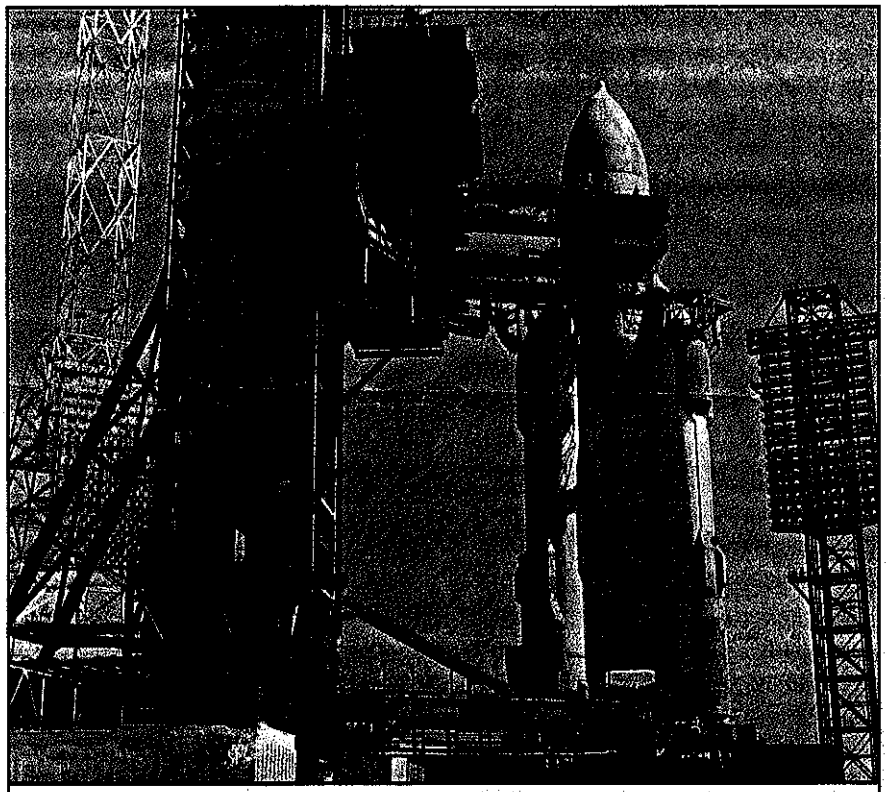
The foreign trade reform is widely linked to a drive to increase the volume and efficiency of import-export operations. Greater stress is placed on long-term and diversified economic contacts involving foreign partners' commodity sectors.

Deals with capitalist countries are to be based on time-tested methods (such as cooperation in production) as well as new forms of industrial cooperation. These include the launching of joint ventures in Soviet territory.

JOINT VENTURES

The initiative in establishing joint ventures may be taken either by the Soviet Union or by potential foreign partners. In the Soviet Union this right is open to various enterprises, associations, ministries and departments. Relevant talks are conducted by Soviet ministries and departments.

Joint enterprises allow for both imports and exports. But every enterprise is expected to make its exchange payments with earnings made abroad. To do so they are allowed direct access to external markets. Inside the USSR, their products are to be marketed and supplies bought through Soviet foreign trade organizations on a contract basis with payments in rubles and at agreed world-level prices. No targets are set for such enterprises. Technical and commercial policies and production outputs are determined independently.



One of the recent Soviet export offers is the commercial launchings of foreign satellites with Soviet carrier rockets which have a long record of efficient performance. The new Energy universal carrier rocket has passed tests with flying colors. With a 60-m height and a 2000-t launching weight it is capable of taking a payload of 100 tons to round-the-earth orbit.

OWNERSHIP

A foreign partner is entitled to have up to 49 percent of the authorized capital. Meanwhile, in order to avoid controversies, the parties are entitled to enumerate the topics which will require consensus decision only. Authorized capital stock is comprised of participants' contributions in the form of equipment and machines, technology, buildings, the rights to the land and industrial property, as well as money. Joint enterprises must pay for the land, water, minerals, woods and other natural resources. Depreciation is calculated according to Soviet rates but partners may opt for accelerated norms.

MANAGEMENT

There are two echelons of management: the supervisory board, which consists of reprasentatives from both partners and is expected to make the strategic decisions (endorse the balance sheet of the enterprise, decide how to distribute profits and so on) and the executive direction to perform routine management. This body also consists of representatives from both partners. The exact functions of these two bodies and a division of labor between them have to be regulated by the partners involved. The legislation stipulates that the president and the executive director of the joint venture are to be Soviet citizens.

OPERATIONS

The joint venture has the freedom to operate on foreign markets under the general license from the Ministry of Foreign Trade. Within the country, a joint venture is expected to sell and to be supplied through the relevant Soviet foreign trade organizations on contractual prices to be paid in rubles. "Contractual" means negotiable and these prices may differ from the official domestic wholesale and retail prices, enabling joint ventures to compete with the domestic producers. This competition has been introduced intentionally with the aim to increase the efficiency and the quality of production.

BANKING

Of course, joint ventures will draw on their authorized funds and reserves to meet the requirements for current capital to carry out operations both with Soviet agents and their foreign counterparts. Should that fail to suffice, they may borrow from banks, either in rubles or foreign currency, using operating profits to repay the loans, as practiced throughout the world.

Loans in rubles are extended to enable producers to buy materials and primary commodities, auxiliary parts and services and other purposes. These loans are guaranteed by commodity and material reserves, production facilities under construction, manufactured products, documents of title, and mortgage on joint venture assets. Credits can also be backed by guarantees from the joint venture founders or banks.

Loans in rubles may be given for the

purposes of building new projects and buying Soviet technology essential for the upgrading and expansion of production, and are repaid from profits.

Joint enterprises may borrow from the USSR External Economy Bank or, with its authorization, from banks and firms in other countries in foreign currency and from the bank financing the joint venture in rubles. These banks are empowered to see that the funds they provide are used for the purposes stated and that they are guaranteed and repaid on time.

The USSR External Economy Bank's order of priorities with regard to lending in hard currency is determined by the need to manage the debts of the country as a whole. Unrestricted growth of the debts incurred by joint ventures might damage the reputation of the Soviet Union as a first-class borrower. Besides, this order of priorities is designed to ensure that they can borrow in hard currency on most favorable terms.

The cash assets of joint enterprises are transferred to their accounts accordingly at Gosbank and the USSR External Economy Bank, and are used as necessary. The accrued interest rate is fixed by the External Economy Bank in foreign currency, while Gosbank lays down terms and procedures in the case of accrued interest in rubles, the rate of which is expected to achieve 2% a year. While drawing interest on current accounts, producers must also be ready to pay the bank a commission for services.

Understandably, in the case of joint operations involving foreign currency, exchange rate differentials will be entered to the profit-and-loss accounts. This arrangement will call for insurance against currency risks. For the common types of such insurance to be applied, steps are being taken to introduce forward exchange rates of foreign currencies in relation to the ruble.

Joint enterprises are allowed to conduct export-import operations on their own using receipts from trade to cover all their currency expenditures. In short, commercial success depends on whether the imported products are of good quality and competitive. That brings creditor banks to consider a number of major issues of practical importance concerning the best ways of crediting the investment, production and commercial processes both in rubles and foreign currency.

In this context, Gosbank and other Soviet organizations and government departments concerned are working to find the optimal ways of crediting joint ventures, to identify sources of funding in rubles and foreign currency and to establish the appropriate normative framework. Considering the questions being raised during negotiations with Soviet and foreign partners, a detailed crediting and settlement procedure has been developed. Interest on loans extended to joint ventures is not expected to be higher than on those given to similar Soviet entities, i.e. 4-6 percent annual interest on credit for current operations and at least 3 percent on credit for investment with a repayment period of up to six years. Their size and repayment terms are set by agreement between client and creditor banking institution.

Soviet and foreign parties alike will always need banker's advice on various issues. Gosbank and the External Economy Bank are looking into this matter, and have negotiated it with more than 30 leading commercial banks, mostly Gosbank branches lending to potential foreign partners of Soviet ministries and government departments. As a result, Western banks have joined the effort to formulate common lending policies with respect to joint ventures.

"...All wanting to work with us in new, more favorable conditions will gain from the successful realization of the plans of restructuring in our country and the modernization of economy."

Mikhail Gorbachev

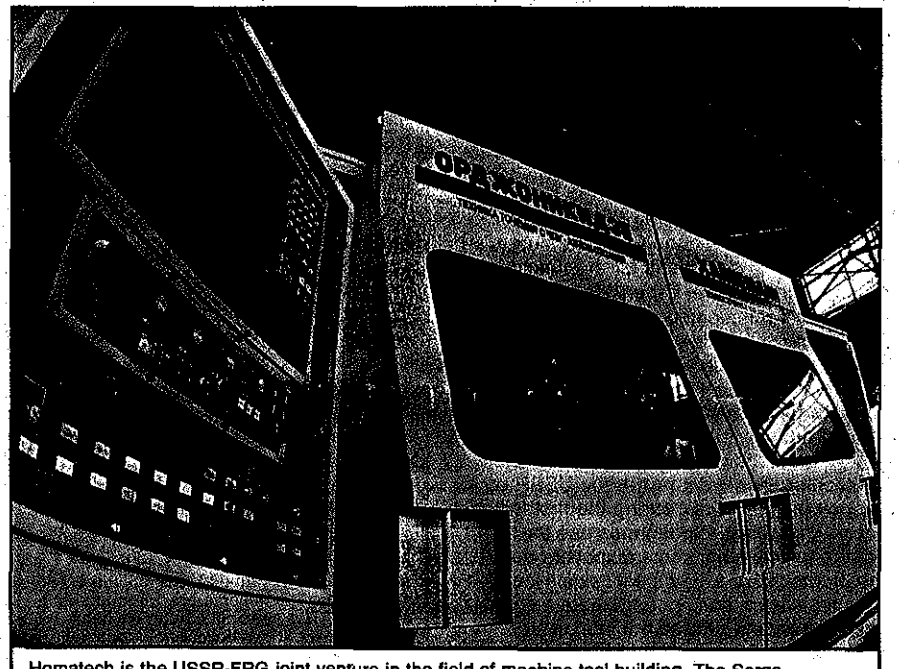
Protocol on cooperation with French, Finnish, Italian and West German banks are now in place. In particular, they call for the analysis of the performance rating and financial standing of the partners, the development of the best possible financing schemes, the analysis of the lending and currency risks involved in export-import operations, etc.

There are longer-term plans to explore the possibility and expediency of creating a specialist consulting or financial firm run jointly with the participation of several foreign banks to provide all the essential services in this area. If necessary, it may eventually be permitted to use some specific Western lending practices, such as leasing and factoring, as well as insure against currency risks.

TAXATION ASPECTS

The regulation of mutual relations in this sphere is exclusively the competence of the state. The taxes on the profit due to a foreign partner and transferred abroad have been introduced by the decree of the USSR Supreme Soviet of January 13, 1987. Unlike most of the countries where tax legislation is worked out in detail by legislative authorities, in the Soviet Union the right to set specific tax rates and taxation rules has been given to the Council of Ministers. This has been done quite consciously for imparting greater flexibility to this system.

A special procedure in relations with the budget has been introduced for joint ventures. A similar procedure has been established in all the Council for Mutual Economic Assistance (CMEA) member countries and in China. The system existing in the USSR cannot be used in this case due to its complexity. A new mechanism is needed. It is sufficiently simple and customary for future partners enabling a joint venture to operate within the framework of the Soviet economy on the principles of loss-and-profit accounting and self-financing. While tax codes of many countries are voluminous, the understanding of which is difficult not only for taxpayers but also for experts, Soviet



Homatech is the USSR-FRG joint venture in the field of machine-tool building. The Sergo Ordzhonikidze Works in Moscow and Heinemann Maschinen und Anlagenbay began working as partners in 1984. Three years of cooperation resulted in a new flexible production system, several new models of metal-cutting machine tools and basic legal documents for setting up a joint venture.

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legislation regarding joint ventures is brief and simple.

It is envisaged that a joint venture, as distinct from a Soviet enterprise, and this is very important, pays into the budget only a profits tax, which corresponds to foreign practice. The profit is a difference between the overall sum of incomes derived as a result of the activity of a joint venture, and the sum of expenses included into the cost of production or services.

In determining the regime of the taxation of joint ventures set up on Soviet territory foreign experience has been taken into account. In socialist countries (Hungary, Poland, Romania and China) the profits tax of joint ventures ranges from 20 to 50 percent. In European capitalist countries this rate varies from 35 to 56 percent. In the United States its upper limit is 34 percent and in Japan 43 percent.

Of course, the size of the tax alone—30 percent for joint ventures in the USSR—does not give the full scope of the income taxation level. The rules of determining the taxable profit are no less important and in some cases this is a decisive factor. The taxable profit is a difference between the balance profit and deductions into the reserve fund and other funds designed for the development of production, research and technology. This is another significant difference from the rules with respect to Soviet enterprises for which the balance profit is a basis in determining payments into the budget.

The reserve fund designed for covering possible losses and unforeseen expenses is annually replenished from the balance profit. Unlike in some other socialist countries, in the USSR partners are given the right to determine themselves which share of the profit is needed for this. The development of the production, science and technology fund must ensure normal conditions for the functioning of a joint venture. Other funds necessary for the functioning of a joint venture and for the social development of the personnel are possible. But they can be formed only after the state receives the share of the joint venture's profit in the form of a tax.

To create favorable conditions for their functioning, joint ventures in the USSR do not pay the profits tax during the first two years. The Ministry of Finance has the right to fully exempt some taxpayers from the profits tax or to reduce its size. However, legislation does not enumerate conditions depending on which a joint venture will get this privilege. A definite uncertainty in this issue may, in the opinion of foreign partners, cause some difficulties in planning the operation of a joint venture. But the ability of any economic unit to function



Rudolf Kröning, the president of Mineralöl-Roshstoff Handel GmbH (FRG) which is the party in joint USSR-FRG venture Petrokam producing petrochemicals: "Decisions are taken quite rapidly. The project was discussed and finalized in 10 months...About a half of production is to be sold in the USSR, the rest—delivered to the markets in the FRG and other countries."

in accordance to the principles of profit-and-loss accountability and self-financing means sufficient profitability and, hence, the ability to pay the tax into the budget. The aim of the tax privilege is primarily to render temporary financial support for a joint venture which is experiencing difficulty. At the same time, financial bodies should take into account all the circumstances which have compelled a joint venture to apply for a privilege and carefully consider each case.

There are also other tax privileges. The foreign participant in the joint venture



Franz Silbermeier, Director General and Chairman of the Board of Foit (Austria): "We've become participants in a joint enterprise aimed at providing engineering and design services and the manufacture of paper- and cardboard-making equipment. The Soviet side is represented by three founding members. The principal co-partner has a track record of over 15 years of industrial cooperation and we have a good idea of his capabilities. Both we and our Soviet colleagues have a lot of expertise and experience in the field. I'm sure the pooling of efforts is found to bring success.

from a country with which the Soviet Union has signed an agreement on the elimination of the double taxation of incomes and property may receive either a partial or full refund of the 20 percent tax on profits paid during the transfer of the profit abroad. This accord is very profitable for a foreign investor since most of the agreements provide for a mutual reduction in the tax rate when such incomes are transferred to another country.

The "certification system" widely used in international taxation practice will not be unusual for our future partners. According to this system the right to return a portion or the whole sum of the tax can be given to a foreign partner of a joint venture who will hand over to the USSR Ministry of Finance an appropriate document certified by a competent body of the partner country.

Joint ventures established in the USSR must be registered in the Ministry of Finance. As distinct from capitalist countries and some socialist states there are no charges during such registration.

PRICE-SETTING

The results of joint ventures' economic activity hinge on the prices for their output, cost of the land, mineral resources, buildings and installations. Therefore, the greater independence of their participants presupposes their high maneuverability in this sphere depending on concrete relations and benefits for the contracting parties. Prices are fixed by the producers and consumers who proceed from their economic accounting interests, with consideration of the world market prices.

Such contract prices are stipulated both when the goods made by the joint venture are marketed on the country's domestic market while the joint venture gets from the same market the equipment, parts, raw materials, fuel, energy, etc., and when the Soviet participant's contribution to the authorized fund is evaluated. The foreign partner's contribution is appraised in the same manner with its price calculated in rubles by the official exchange rate of the State Bank of the USSR on the day of signing the agreement to establish the joint venture or on any other agreed date. In the absence of world market prices the value of the contribution is determined through mutual agreement.

Buildings, installations, equipment and other material may be regarded as a contribution to the authorized capital. The same holds true for the right to use land, water and other mineral resources, as well as buildings, installations and equipment, or other properties (including those for inventions and methodology) and the use of the currencies of both joint venture participants.

The material values (the right to use them counted as contribution of the Soviet side to the authorized capital of the joint venture being set up) are appraised through agreement between participants on the basis of mutual benefit. The valuations in force in the USSR or the partner country may be accepted as fundamental.

Resources can be paid in one lump

sum or royalty. They are calculated for the whole period of functioning the joint venture and are considered as contribution to the authorized fund.

Such payments are transferred to the Soviet participants for the corresponding resources contributed as part of the money to the authorized capital from its part of profits or credits via local financial bodies according to the order established in the USSR. When more resources are needed for a functioning joint venture (for instance, if it is being expanded, if branches are set up, etc.) the payments are made by the venture on the conditions defined in the established agreement or on another agreed basis.

"Traditional methods check further rapid development of Soviet foreign economic activity...We shall be actively introducing new methods."

Vladimir Kamentsev, Deputy Chairman of the USSR Council of Ministers, Chairman of the State Foreign Economic Commission

Resources may be paid for in the price of land with deductions for cultivating farm land, comprehensive assessment of the territories as locations of future towns, rents, payments for water and for geological prospecting. On the other hand, fines are imposed for land abuse.

The rent for the land required by the joint venture is estimated separately for rural and for urban territories, depending on its quality and location.

The use of the coastal shelf and of the 200-mile economic zone of the USSR is seen as part of the Soviet side's contribution to the authorized fund, in accordance with the prices in force.

The evaluation of land, forests, water reservoirs and mineral deposits given to the joint venture by the Soviet side are not considered as part of its capital fund, and no amortization on them is charged.

The maintenance accounts of the buildings, installations and equipment temporarily used by joint ventures are settled through agreement on the basis of mutual benefit. In such cases the sides proceed from the principle in force in the USSR or the partner country for discounting the rates for renovation, and the rate of operating profit. Their cost is determined according to the calculations for a similar new construction in the participating countries (by the recoupment value).

The principle of price-setting is influenced by world market prices and takes into account the technical level and quality of the output of joint ventures in comparison with the qualities of the goods made by the world's best producers. It regulates prices based on output according to the world market prices and corresponding quality and technical levels. It also regulates contract prices on fuel, energy, raw materials, parts and other supplies shipped to the joint venture from the Soviet market through appropriate foreign trade organizations. This guarantees working conditions through the method of economic accountability.



The price of the goods produced by the joint venture is calculated according to the principles in force in the USSR. The expenditure for raw materials are included in the contract prices. Also included are salaries and wages of the Soviet citizens according to Soviet standards and the salaries of foreign specialists. Amortization deductions are made in accordance with the appropriate regulations for public organizations, if nothing else is envisaged by the constitutive documents.

The output prices must correspond to those of the marketing of the joint venture's goods with full economic accountability, self-financing and self-sufficiency.

As to differentiated currency coefficients, these are only used to evaluate the efficacy of the steps taken by Soviet associations, enterprises and organizations on foreign markets. The results of the export-import operations are reflected in their financial and economic accountability activities through the above.

DISPUTE SETTLEMENTS

It has been decided from the onset that the foreign partners should be guaranteed due process of law. Disputes may be settled either in the court or through arbitration—in the Soviet Union or in Third World countries. The choice is up to the partners.

SOCIAL CONDITIONS

Working conditions and salaries will be regulated by a collective agreement concluded between the administration and the trade union organization of a joint venture. Management may wish to invite foreign technicians. Working conditions and salaries for them are to be regulated by individual contracts. The residual part of their salary may be transferred abroad in foreign currency subject to income tax of 13 percent.

Soviet personnel salaries and wages in most cases will be at the level existing in the Soviet Union for this industry.

WIDE-RANGING GUARANTEES

A foreign partner is guaranteed protection of property (industrial and otherwise), free export of profits in foreign currency, and exemption from customs duties of goods and technology brought in as a contribution to authorized capital stock. The property of a foreign partner may not be confiscated or expropriated by an administrative order. Any actions concerning this property may be done only through the court or by arbitration. In case of liquidation, the foreign partner is entitled to transfer its contribution to the authorized capital of the enterprise back abroad at its balance value on the day of liquidation.

SERIOUS FEASIBILITY STUDIES ARE NEEDED

As with any new undertaking, problems can occur. Some seem to be quite solvable, provided the investment law is interpreted constructively. Thus, many foreign companies inquired if they could receive their share of profit in rubles and then spend it on the Soviet market to acquire the necessary goods. As lawyers say they could, foreign participants in joint ventures know they may have a fine chance to sell what they produce on the local market, ousting imported goods.

But some problems are quite complicated. There have been quite a few prospective partners who said they would like

USSR NEW THINKING FOR FOREIGN TRADE

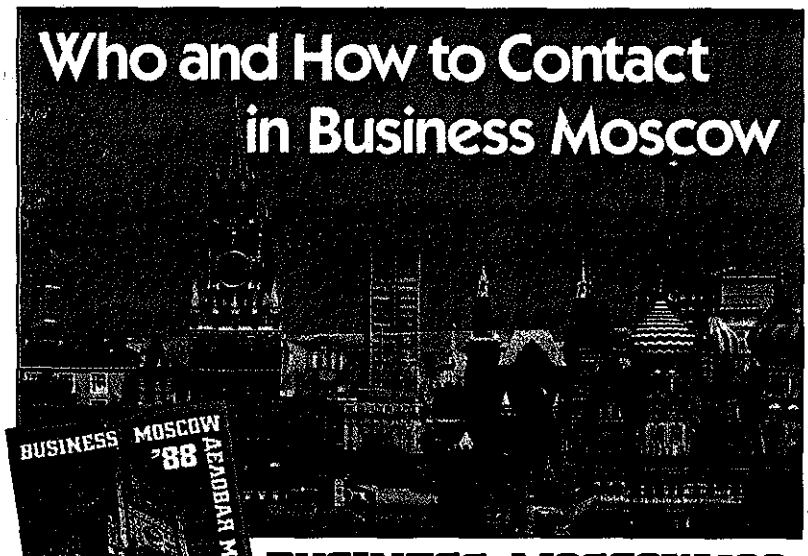
to borrow instead of giving their own money as a contribution to authorized capital. The question is what guarantees should be demanded by banks, if they lend money for big projects. It is a major issue which the Soviet Bank for Foreign Economics Activity and its foreign banks-correspondents are setting policy for at the present time.

Some countries and corporations say their interests in joint venture deals would be better ensured if the Soviet Union and other states involved signed official agreements to guarantee foreign investment and tax rebates. The Soviet Union is prepared to study these proposals on a reciprocal basis.

But the chief problem so far is that all feasibility reports on possible joint ventures remain inadequate and incomplete. Some offer very rough estimates, prompting doubts about profitability of the proposed projects. But if a project may prove unprofitable, there is certainly no point in building it.

So, while every application for joint ventures will be considered seriously, feasibility studies are needed to assure that the new business will be sound and able to handle the growing pressures of the international marketplace.

This Section was prepared by the Soviet Foreign Trade Advertising Agency Vneshtorgreklama (SOVERO).



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JOINT VENTURES: WHO ARE THE PIONEERS?

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Companies Turn Old Ideas Into Profits

Businesses are seeking novel ways to share innovations—and profits—internally

BY AL SENIA

FROM ITS corporate offices in Beverly Hills, Calif., Litton Industries sits atop a wildly diversified high-tech empire that encompasses more than 50 operating divisions around the globe. Litton manufactures everything from naval ships to metal-cutting machines to equipment used to find oil. With so much going on in so many places, one would think that Litton must be a conglomerate of divisions too diverse to go anywhere but their separate ways.

But officials at the $4.5-billion company are closer than one might suspect, thanks to a corporate policy that encourages the spread of ideas and innovations from one division to another. When Litton's Guidance and Control Systems Division developed a line of highly successful inertial navigation systems for jet fighters, it didn't just sit back and watch the profits roll in. The division hustled some experts over to another Litton group serving the commercial aerospace sector. That group adapted the guidance technology for civilian aircraft; the result has grown into a $200-million annual business.

Litton is one of a growing number of U.S. manufacturers who are discovering that new, money-making technologies often are best found in their own corporate backyards. By grafting technological capabilities from one division onto the products of another—or even creating a new business group around a product or process—companies are getting a much bigger bang from developments that otherwise might remain isolated in a single, limited market.

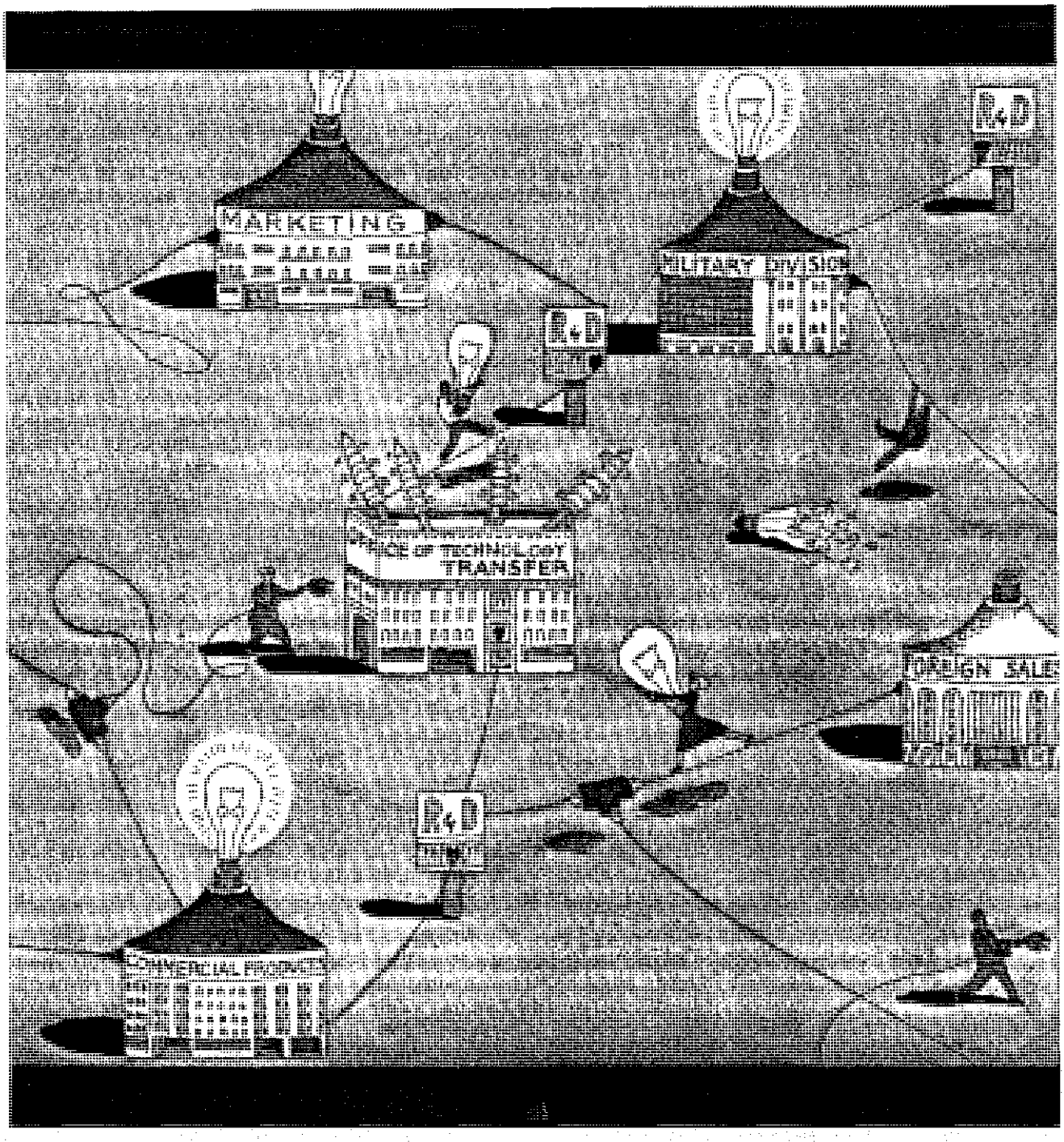
This concept, called technology transfer, is not new. Typically it is used by large, multifaceted companies that serve both military and commercial markets. Because modern military technology usually requires large research investments in products for which demand is often relatively low, technology traditionally flows from a company's military division to its commercial sector, which revises it to meet the needs of commercial markets.

Ever-increasing competitive pressures are making many U.S. companies much more aggressive in targeting key processes or products and providing the support necessary to spin off commercial successes.

"Technology transfer is certainly becoming more common within U.S. companies," observes Peter S. Glazer, vice president of advanced technology for consultant Arthur D. Little. "They've seen, for example, how successful Japanese companies have been at it."

Companies that have profited most from such exchanges generally foster cross-fertilization in two ways. First, they set up a corporate culture that encourages open communication among divisions. Second, they establish networks that provide a formal way for divisions to exchange technology.

The change to a more open corporate culture may be the more difficult of the two tactics, because it requires a



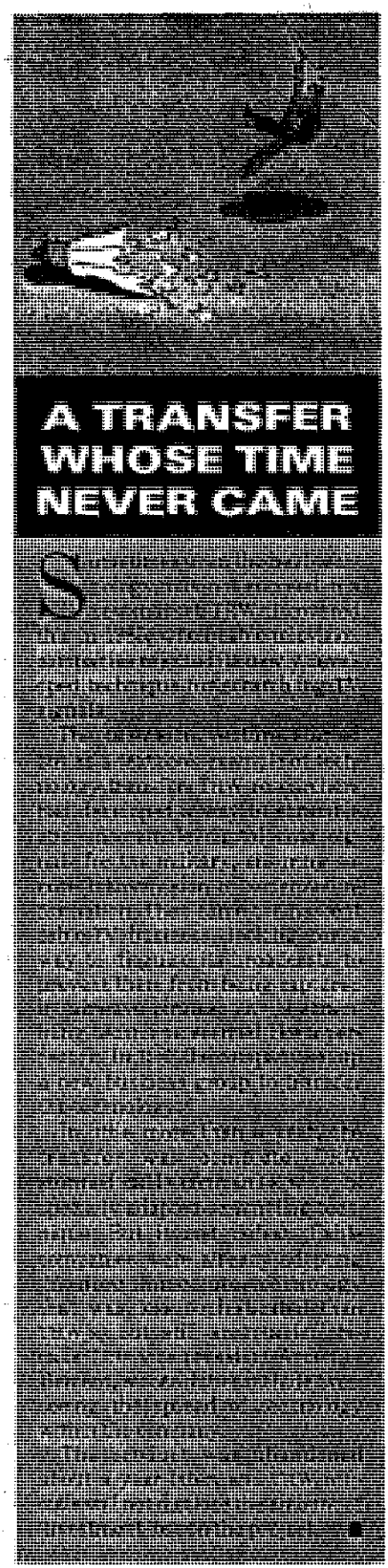
DEVIS GREBU

change in attitudes that have become entrenched. Unlike their Japanese counterparts, many U.S. companies have found it productive to pit divisions against one another. Progressive managers are realizing that this practice does not promote the exchange of ideas. "The successful companies have opened up communications much more," says Glazer.

One way to promote such a culture is to show employees that the company is committed to cross-fertilization. For example, TRW, through its Technology Transfer Awards Program, bestows gold, silver, and bronze medals as well as cash grants from $2,500 to $10,000 for projects that improve profitability, productivity, or product quality.

A technology-transfer network, because it is more tangible, is easier to institute and manage than employee attitudes. TRW recently established a computerized technology index that lists key personnel and their technological capabilities. This index tells company engineers and researchers what technological resources are available within TRW, and—important in a company of 86,000 employees—where to find the experts.

Texas Instruments, which also is recognized as an industry leader in technology transfer, has linked senior technical managers and engineers from its half-dozen business groups in its Corpo-



A TRANSFER WHOSE TIME NEVER CAME

rate Engineering Council. Further, the company singles out technologies for transfer to new areas, assigning a team of experts to move the process along. Current targets include a program to move static random-access memory (SRAM) chips from the company's semiconductor division to its defense electronics group. Another team will develop commercial gallium-arsenide microchips for the semiconductor group, based on expertise acquired in the company's defense group.

Texas Instruments' network operates on other levels as well. The company publishes a technical journal six times a year for its employees. Each division has a technical coordinator, who serves as a gateway through which outside developments may enter. Also, the top 500 company researchers prepare "interest profiles" for a computer database, much like TRW's technology index. "Employees are expected to make their information available to their colleagues as appropriate," says Michael Lockard, chairman of the Corporate Engineering Council.

None of this appears stupendously innovative, Lockard concedes. But taken together, he says, it makes a big difference.

At other companies, the right formula has yet to surface. Even though the concept sounds simple, successful transfer of technology isn't necessarily easy, as General Motors, among others, has learned.

The automotive giant has been sitting on a treasure trove of innovation since its 1985 purchase of California-based Hughes Aircraft, a defense company heavily oriented toward research and development. Although some analysts warned from the start that widely diverse corporate cultures could pose problems, the Hughes acquisition was generally expected to set the stage for major technology transfers between the aerospace and automotive sectors. GM chairman Roger Smith pledged that Hughes would help the automaker remain competitive by applying "its expertise to GM's manufacturing needs at our 152 plants nationwide." He also predicted that the Hughes association would redefine "the basic car or truck from a mechanical product that includes a few electrical subsystems to one with major electromechanical and electronic elements."

Such advances have yet to materialize. Both GM and Hughes have been bogged down by quality concerns and competitive battles in their respective industries. As predicted, the two corporate cultures have been difficult to mesh. Critics also contend that technology transfer at GM is not the high priority it has been at other companies, such as Texas Instruments or TRW. It certainly has not been made as highly visible to employees, they say.

Nevertheless, Mounir M. Kamal, technical director of mechanical, electrical, and electronic engineering for GM Research Labs, still has high expectations for the Hughes/GM association. Within one to three years, he says, Hughes' expertise in missile-control sensors will probably be put to work in producing advanced anti-skid braking systems for cars. Similar sensor technology is expected to make its way from Hughes into GM shock absorbers and other components that will control a car's movement for better comfort and handling. Technological expertise may flow in the other direction as well; advanced structural techniques to control noise in GM cars may soon be applied to aircraft.

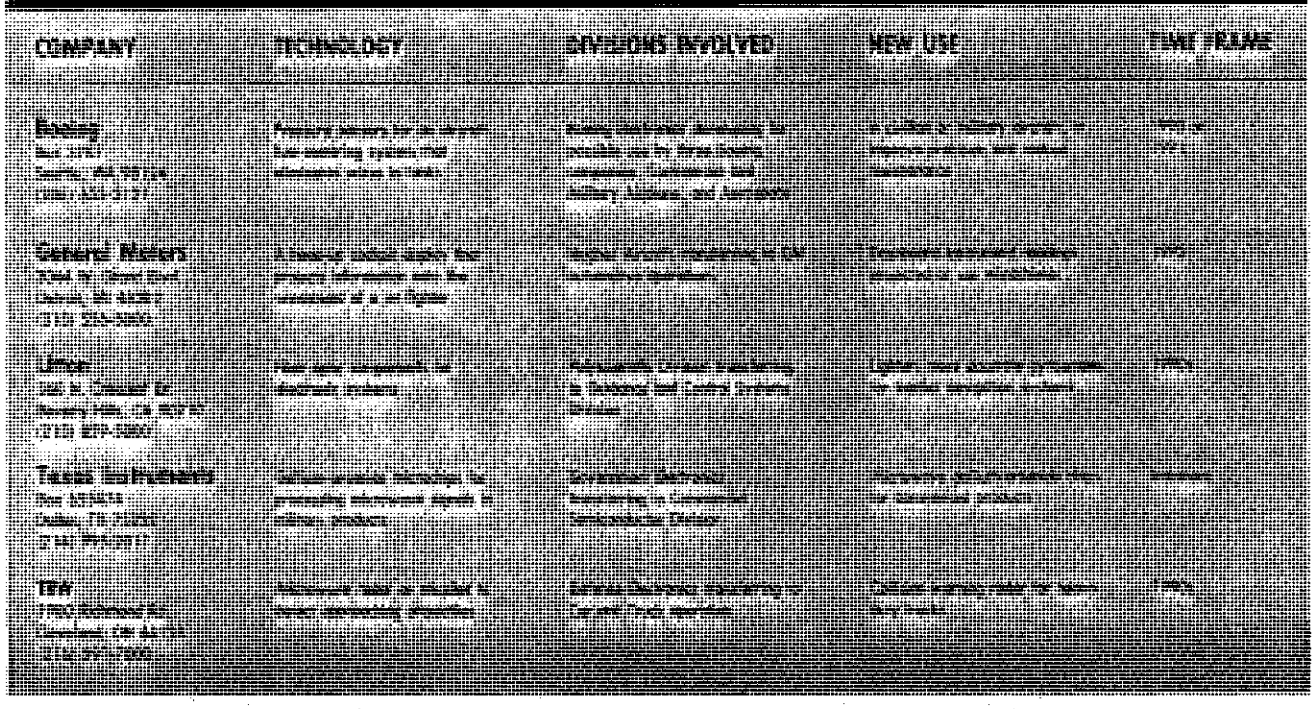
One thing the company has learned about transfers is the need for patience. "Success is not a simple occurrence," says Kamal. "What a research lab may produce and what a customer needs is often not the right item at the first crack. Success really depends upon the ability of the researcher to look at the market and redesign, reiterate, and reform the product."

Patience and determination were behind one of the most successful technology transfers at TRW, which resulted in the RedaRed oil-well electric cable made by the company's Lawrence Cable division. The product evolved from efforts to halt cable corrosion in deep oil wells, where high temperatures and chemicals destroyed the rubber jacket on wires in the company's submergible oil pumps.

TRW's Electronics and Defense Sector had already begun researching synthetic rubber for missiles, tanks, and airplanes. Jon Martin, the sector's expert in rubber technology, took on the oil project in 1975. He visited oil fields, ran lab experiments, and developed a solution: jacket the oil cables with a rubber compound called EPDM.

Oil-industry experts debunked the solution, claiming that, under high tem-

FIVE TECHNOLOGIES RIPE FOR THE PICKING



peratures, a cable treated with EPDM would swell and burst its protective armor. Resistance was so strong that no company would agree to test the material in a well.

So Martin devised his own test, using pressure vessels that simulated conditions in an oil well. Not only did EPDM succeed, but RedaRed cables have become the industry standard. "They have gained the major share of the oil-well cable market," says Arden L. Bement, the TRW vice president who oversees innovation exchanges.

Despite difficulties, technology transfers continue to yield highly profitable new businesses or even new divisions. For example, recent cross-fertilizations at TRW include the development of a commercial business in large-scale integrated circuits. The electronic systems group originally developed the technology for use in defense-industry signal-processing. "Now we're selling to both commercial and government markets," says Bement. "The entire business was spawned from a technology transfer from one group. Now it's a self-standing company division."

Technology for Texas Instruments' digital signal processors, first developed to meet stringent military specifications in the military-products group, was transferred to the semiconductor group, where it yielded a successful commercial line. Though related, the military and commercial products differ in their operating temperature ranges, voltage requirements, and packaging.

■

Despite difficulties, technology transfers continue to yield highly profitable new businesses or even new divisions.

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"The successful transfer required a tightly coupled organization," explains Robert Veal, Texas Instruments' manager of military components. "There had to be close cooperation between the design people, the commercial business, and the military group that initially developed the product."

For companies that have experienced the payoffs of technology transfer, such close cooperation is becoming standard business practice. For example, Litton's Guidance and Control Systems Division—which passed its inertial navigation system to a commercial products division—is now getting assistance from another Litton sibling. Fiber-optics expertise on loan from the polyscientific division is being harnessed to create the next-generation gyroscope, which is expected to weigh less and be more accurate than the laser-based gyroscopes now in use. Because these new gyroscopes are part of the inertial navigation system sold to the military, they will probably make their way to the company's commercial navigation business as well.

This may be a glorified version of hanging around the office water cooler, but companies that promote such communication among departments are finding it pays off in new profits. ■

Al Senia is a freelance writer who specializes in the aerospace industry, science, and technology.

N.Y. Times 1/7/89

Can Milken Sell Bonds For Soviet?

By JAMES STERNGOLD

Is there a market for ruble-denominated junk bonds? Is the Soviet Union ready for Michael Milken, the head of the junk-bond department at Drexel Burnham Lambert Inc.?

Those questions may be answered soon. Last month, Mr. Milken met Mikhail S. Gorbachev, the Soviet leader, during his visit to Washington for the meeting with President Reagan. He may also be heading to the Soviet Union next month to pursue business opportunities.

Ventures With Soviet

Mr. Milken said yesterday that he was among a group of American business executives who met with Mr. Gorbachev. He then met with other Soviet officials, and he proposed several ideas for involving Drexel in Soviet enterprises, including ventures in medical technology and in underwriting commodity-backed bonds.

Neither Mr. Milken nor Drexel disclosed last month's meeting with Soviet officials, the news of which was reported yesterday by a Wall Street official. "That was supposed to be a secret," Mr. Milken said later yesterday in confirming the meeting.

Mr. Milken all-but-singlehandedly created the $150 billion market for high-yielding, low-quality junk bonds, an enormously influential and profit-

Continued on Page D18

Can Drexel's Milken Sell Junk Bonds for Russians?

Continued From First Business Page

able force on Wall Street.

He and Drexel are also the subjects of an insider-trading investigation involving the firm's relationship to Ivan F. Boesky, the former takeover-stock speculator, as well as Drexel's involvement in several takeovers. Drexel has denied any wrongdoing and has not been charged.

Details of Meeting

Mr. Milken said that senior Soviet officials told the American executives during last month's meeting that they were concerned about the decline in Soviet exports to the United States. They were interested, he said, in suggestions for improving their export sales.

Mr. Milken said that he attended the meeting with Dr. Armand Hammer, the chairman and chief executive of the Occidental Petroleum Corporation who is a Drexel client. Dr. Hammer has had a close association with the Soviet Union for decades.

"My feeling was that they could use their scientific knowledge," Mr. Milken said, "particularly in the area of medicine." He said that the Soviet Union had developed some advanced techniques for treating eye diseases and cancer that could become profitable enterprises.

Praise for Soviet Scientists

He said he suggested that Soviet scientific enterprises form ventures with American medical companies to profit from this technology.

"Soviet scientists could see how they could create value from their activities," Mr. Milken said. "The scientific community has such stature there that, if they got involved, it would be very positive for both countries."

The Soviet ministers seemed receptive to his suggestion, Mr. Milken said, and a group of Drexel officials plans to visit the Soviet Union for five days in early February. Mr. Milken said he might be part of the group.

Mr. Milken said he had also proposed that the Soviet Union, a resource-rich nation, consider issuing bonds backed by such commodities as gold or oil. Drexel has underwritten such bonds for American companies.

ROBERT J. SAMUELSON

Closing the Innovation Gap

By now, the VCR story is familiar. It's an unsettling tale of an innovation gap between U.S. and Japanese companies. Americans developed the basic technology of the VCR, but Japanese companies commercialized it. They now dominate an immense market: In 1987, Americans bought an estimated 12 million VCRs.

The videocassette recorder was no freak accident. Anyone who thinks it was will be disappointed by a new study from economist Edwin Mansfield of the University of Pennsylvania. Innovation isn't inventing; it's converting technology and new ideas into viable products. Mansfield finds that Japanese companies do this faster and less expensively—at least 10 to 20 percent less expensively—than similar U.S. companies.

Why? Americans haven't become unimaginative. Our basic research—the quest for knowledge for its own sake—is still acknowledged to be the world's best. The climate for new entrepreneurial companies is inviting; indeed, these companies generate many new products. Nor is low spending on research and development to blame; our R&D spending exceeds the combined total of Japan and West Germany. The problem lies mainly with large companies, which do most of the R&D.

For many, innovation creates a Catch-22. Engineers and scientists prefer to work on major breakthroughs, which are exciting and challenging. But corporate executives are leery of the huge investments and risks associated with entirely new projects. A standoff results. Improving existing technologies and products suffers from low status. But big

See SAMUELSON, F2, Col. 5

W. Post 12-30-87

ROBERT J. SAMUELSON

Ending the Innovation Gap

SAMUELSON, From F1

new projects get bogged down in corporate politics and bureaucratic planning.

The VCR story illustrates what goes wrong. The U.S. firm that invented the videotape recorder, Ampex, specialized in expensive machines for broadcasters. It had little interest in developing a product for a mass consumer market. Meanwhile, RCA and CBS attempted to perfect entirely new technologies that would allow viewers to play prerecorded programs on their televisions.

By contrast, the Japanese tinkered with the basic Ampex technology. In 1965, Sony introduced a videotape machine for consumers. Other companies followed. Many of these early machines were flops. But from them, the Japanese learned what features were necessary for success. "The American companies had the projects in the industrial labs. They spent years and years and tons of money without ever putting anything on the market," says James Lardner, author of "Fast Forward," a history of the VCR.

As Lardner points out, the Japanese didn't simply copy the U.S. technology. Many of their changes involved crucial improvements that made VCRs smaller, more reliable and less expensive. When RCA finally marketed its VideoDisc technology in 1981, it was too little, too late. The company ultimately abandoned the product at a total loss of more than $500 million.

Mansfield's study suggests that the VCR episode isn't unique. The study covered 30 firms in each country, and not all the news is bad for Americans. In some industries, notably chemicals, there are few differences between American and Japanese companies. And companies in both countries do equally well at introducing products based primarily on their own research.

The great Japanese strength lies in developing products from existing technologies. Like the VCR, these products often aren't copies; they involve major refinements. Japanese costs are about 50 percent lower and introduction times 30 percent shorter. Much of the Japanese advantage stems from less spending on marketing studies designed to discover what consumers want.

One obvious need is for U.S. companies to pay more attention to foreign technology. When U.S. industries enjoyed global leadership, they ignored developments abroad. To do that now is suicidal; there are too many good ideas elsewhere. Yet, bad habits linger. In 1983, only 10 percent of large U.S. machinery manufacturers spent as much monitoring international technology as did the average Japanese machinery firm.

Watching foreign markets for new ideas usually requires being there, either through exports or local production. It's a mistake to think that only big companies can manage this. A study by the American Business Conference—a group of medium-sized firms—found that many member companies had gone overseas in the first years of their businesses. Innovation also transcends high-technology. Dunkin' Donuts introduced small kiosk-type stores in the United States only after discovering them abroad.

The greatest need, though, is for U.S. companies to become less compartmentalized. Products succeed when there's a sharing of information and enthusiasm across the boundaries of corporate fiefdoms. RCA's VideoDisc failed in part because the company's industrial laboratory, where the machine was developed, and the rest of the company were suspicious of each other.

"In too many corporations any business opportunity that originates in the laboratory is automatically suspect. Researchers . . . are believed to be incapable of sound commercial judgment," writes Margaret Graham of Boston University in "RCA & the VideoDisc." "Often the negative stereotypes cut both ways. Until recently, the engineer who 'dirtied his hands' working in a plant could not possibly be a high-class engineer."

At the Japanese electronics companies, there is more cooperation and informality. American companies often use marketing studies for political purposes: to settle disputes over which products should be developed. The Japanese recognize that these studies can be time consuming, expensive make-work. The best way to find out whether a product will succeed is to try to sell it. People don't know what they want until it exists.

The innovation gap mostly reflects bad management. American companies ache for great innovations, but recoil at the risks. Marketing studies are supposed to resolve the contradiction by predicting the unpredictable. In practice, they're a formula for spending more on innovation and getting less.

Oakland Tribune
October 12, 1987

'Delta' project seeks to improve marketing of UC research

By Eric Newton and Paul Grabowicz
The Tribune

Every day, Roger Ditzel says, one of the University of California's 30,000 researchers invents something.

"We can't keep up," says Ditzel, who runs the UC patent office. "We have the world's biggest portfolio of new technology, and it keeps getting bigger."

Biotechnology has buried his office in heaps of gene-spliced discoveries.

"We have a six-month backlog," Ditzel says. "We have 20 people in the office ... soon, we'll have 25. When I came here 10 years ago, there were two."

To better harness biotech, UC may set up the Delta Corp., a public-private technology transfer center where inventions could be reviewed, registered and rented out.

A task force of senior UC officals pondering the "Delta model" hope it will:

- Spin off more patents from biotech discoveries.
- Bring in more private money and allow the university to recruit more researchers.
- Help the nation regain its competitive edge.

A strong economy will help UC fill its annual multi-billion-dollar budget needs.

But other educators say private business and public science are like oil and water — useful apart, useless together.

They say "academic capitalism" is risky. Publicly funded researchers could be asked to keep trade secrets. Tenure might be based on bankable inventions. Companies may "buy" campus labs, taking money away from basic research.

But patent director Ditzel thinks a technology transfer center may be a useful tool. Many scientists share that view.

"Technology transfer hasn't come easily," says John Hearst, UC-Berkeley chemistry professor. "I don't have a lot of time to devote to it; I'm not here to get rich. It could be made easier."

Ditzel welcomes tools to simplify his tasks. UC last year looked into 300 new discoveries, obtained 69 patents and arranged 450 license agreements, he says.

"You used to have three branches of patent art: mechanical, electrical and chemical," he says. "Biotechnology has created a Fourth Estate. Everyone had to learn it."

"Biotechnology doesn't fit with the existing patent process," agrees UC Vice President Ron Brady, head of the Delta study. "You don't buy a box of recombinant DNA in the store, you buy a product made with the recombinant procedure."

Biotech pushed UC royalties up by 60 percent from 1985 to 1986. Of $5.4 million collected last year, biotech brought $1.7 million.

The patent office backlog has irritated researchers, Ditzel acknowledges. UC this year allowed campuses to open their own patent offices, and agreed to give them a share of patent profits.

Some officials think stronger measures are needed — hence the Delta Corp.

Brady and special assistant Rebecca De Kalb, a real estate lawyer, have toured other technology transfer centers, and hope to organize a statewide group this fall to study the Delta proposal.

Brady says Delta "is only a concept, one of the vehicles we're studying," but he admits it has been discussed with Bay Area politicians and business leaders.

UC will not reveal Delta's structure, but industry documents obtained by The Tribune describe it as a kind of catalog store for biotechnology.

The documents say Delta would develop directories of scientific discoveries, hold confer-

'Biotechnology doesn't fit with the existing patent process. You don't buy a box of recombinant DNA in the store, you buy a product made with the recombinant procedure.'

—UC Vice President Ron Brady

ences to showcase research and poll business to determine its interests.

Its "initial objective" would be to sell UC-Berkeley and UCSF research to industry through the patent office, but it "could easily be expanded to draw from other campuses."

The documents say UC also may build a special research center wherever it puts Delta.

Such a center might attract more federal research funds from the National Science Foundation, which has targeted millions for new result-oriented research centers.

The idea is so politically popular that Bay Area developers and lawmakers are throwing land and building-fund deals at UC as though Delta were a super sports stadium.

But such ties to business worry some educators.

"The university's basic mission might be jeopardized," says Arthur Caplan, director of the center for biomedical ethics at the University of Minnesota.

Caplan sees danger in companies wanting professors to keep research secret, in professors awarded tenure because they invented marketable products, in money-hungry labs "being bought" by business.

Brady, meanwhile, worries about keeping good scientists:

"Say a scientist discovers something, and wants a couple of years to hone it. He can go to work for a big company, and lose his independence. Or he can start his own company ... Either way, the university loses him. We're trying to find a way to keep that guy, have a research center where he can do his thing for a year or two until he is ready to go back to basic research."

Or he may never go back.

"Biologists used to scoff at individuals who were doing it for money," says UC-Berkeley microbiology professor Leon Wofsy. "Now, if you don't get involved with companies, they say you're second-rate.

"Research has been fundamentally sustained by the public since World War II. We hear now that all things should be handled by the marketplace ... where competition means cutting corners and taking shortcuts ... Is that how we should treat one of the most important discoveries in our lifetime?"

Brady says UC "isn't going to change all around" to accommodate a new technology transfer system.

"We have our publication rules, our consulting rules. We won't do anything drastic."

Some say the debate overshadows UC's record.

"We already have substantial capacity to work with business," says UC public policy specialist Belle Cole. "The state's agricultural success is credited to the university's research."

"I never had any problems on the university end," says UC-Berkeley's Steve Lindow, designer of a bacteria that fights frost. "The delays came on every other level."

R&D Management Digest

NEWS & LITERATURE:
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Lowell H. Hattery, Editor Ralph I. Cole, Technical Advisor
Jacques G. Richardson, European Correspondent

INVENTION PAYMENTS OFFERED RESEARCHERS AND INSTITUTIONS

Research Corporation Technologies (RCT), a new organization formed by the long-established, monprofit Research Corporation, is offering research institutions and their inventors $5,000 bonus payments for inventions that meet its acceptance criteria. Known as Project Acceptance Payments, the bonus payments are to encourage early identification and disclosure of potentially useful discoveries. They are in addition to other invention-produced income, the major share of which is returned to the originating institutions and their inventors by RCT.

RCT describes its role:

> RCT furnishes technology transfer, development and commercialization services to many universities, colleges, medical research organizations and other institutions. Its purposes are to identify new products developed in the course of research; help develop and transfer them to industry; maximize income for originating institutions and inventors, and to improve the competitiveness of local and national economies.

As described in a September 25 letter to university and other administrators by Bernd Weinberg, RCT director of institutional relations, Project Acceptance Payments will be paid for inventions received between July 1, 1987 and January 31, 1989 and subsequently accepted for patenting and development. Stressed by Dr. Weinberg is these payments are in addition to royalties and other income that can be anticipated from successful projects.

In addition to identifying inventions with market possibilities, RCT patents them in the U.S. and other countries; funds developmental research, and formulates commercialization strategies. Depending on the technology and its maturity, it may be licensed to an established firm, or developed by a start-up company, a joint venture or other business entity.

Also announced by RCT is the availability of developmental research funding to bring emerging inventions closer to the point of practical application. The corporation is prepared to make investments for applied research of the type--data collection, prototype development, etc.--normally done by inventors at their own institutions. At later stages, RCT may invest--itself or with others --to help create commercial products and processes, to license them to establish firms, or to set up partnerships or corporations to bring them to market.

Invention disclosures received by RCT are evaluated by a staff of scientists, engineers, marketing and patent law experts who utilize worldwide data resources for relevant business and industry statistics, and information on competing products or processes. Looked-for characteristics include novelty, usefulness and "nonobviousness"--all required for patentability--and good economic potential. Patenting, development and commercialization activities are funded by RCT, which recovers its costs from a share of invention income.

RCT's working capital comes from a program-related investment by Research Corporation, a science advancement foundation with 75 years of experience in technology transfer between nonprofit institutions and industry. RCT assumes the foundation's patent portfolio and responsibility for carrying out its invention

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administration agreements with over 300 institutions. It also absorbs and enlarges the foundation's technology transfer staff of scientists and engineers, and legal and marketing experts.

RCT makes very clear that it "has not been formed for profit, and no part of its net earnings are distributable to any individual or entity other than a qualified research organization."

The corporation's headquarters is located at 6840 East Broadway Blvd., Tucson, AZ 85710; telephone (602) 296-6400. RCT also maintains an East Coast office at 44 South Bayles Avenue, Port Washington, NY 11050; telephone (516) 944-5120.

NEWS

HOW TO FORECAST FROM PATENT DATA

A personal computer software that permits the use of patent data to forecast technology developments and perform competitive analysis is available from Battelle--Columbus.

The Battelle announcement states that the software, called PARENTS-PC, can be used to track large quantities of patent data to find specific trends. With PATENTS-PC corporate managers can, according to Battelle:

- o facilitate early detection of technical innovation and new product development;
- o conduct competitive analyses of research and development efforts by company name; and
- o perform technological portfolio analysis as a factor in decisions to license or acquire technological capabilities.

The package includes software on a personal computer diskette that can be copied onto a hard disk; a sample database diskette; a user's guide and reference manual; two hours of telephone consulting time with Battelle software experts; a maintenance contract for one year providing updates of the software with any changes made during this period; and registration costs for up to two attendees to a PATENTS-PC user group meeting. The license fee for this package costs $7,500 for the first installation.

Battelle's software is intended for an IBM or 100 percent IBM-compatible personal computer with a hard disk and 640K memory. It also is compatible with several video monitors (Hercules, CGA, or EGA). Presently, it utilizes two databases: US PATENT and the World Patent Index. Additionally, patent data can be collected and entered manually without relying on database vendors.

For more information, contact: Edward J. Hinton, Battelle, 505 King Avenue, Columbus, OH 43201-2693; telephone (614) 424-4439; or Dr. Stephen Millett, telephone (614) 424-5335.

ISDN: A NEW, INTERACTIVE AND INTEGRATED ELECTRONIC DATA TRANSFER SYSTEM

Scientists, engineers, patent searchers and others concerned with information transfer will be interested in the new telecommunication potential in ISDN--integrated service digital networks. ISDN was the theme for nine days in October at Telecom 87, the huge quadrennial exhibition and conference forum staged in Geneva by the United Nations' International Telecommunication Union (ITU).

ISDN, called by ITU "a revolution on the move," combines in a single integrated circuit the transmission of video and sound, graphics and other images, videotext and digital data. The classical transmission of telegraphy, Telex and the human voice has depended on analog systems, whereas the single-channel ISDN will digitalize all forms of information--telephone and Telex, TV, data-bank access, electronic bulletin boards and message centers, facsimile, teleconferencing--and move the data at 64 kilobits/sec.

Readers who missed ISDN demonstrations at Geneva will be able to catch up during Communications 88 in Birmingham, Great Britain (contact Industrial & Trade Fairs Ltd, Radcliffe House, Blenheim Court, Solihull B91 2BG, U.K., tel: +44 21 705-6707) or at ITU COM 89 in Geneva (contact ITU/ITU-COM Secretariat, Place des Nations, 1211 Geneve 20 Switzerland, tel: +41 22 99-52-44). Respective dates of these telecommunication trade-shows are 10-13 May 1988 and 3-9 October 1989.

--From our European correspondent--