are not reasonably satisfied by the *contractor,* assignee, or their licensees;

(3) Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the *contractor,* assignee, or licensees; or

(4) Such action is necessary because the agreement required by paragraph i. of this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

k. Special Provisions for Contracts with Non-profit Organizations

If the *contractor* is a non-profit organization, it agrees that:

(1) Rights to a subject invention in the United States may not be assigned without the approval of the *Federal agency,* except where such assignment is made to an organization which has as one of its primary functions the management of inventions and which is not, itself, engaged in or does not hold a substantial interest in other organizations engaged in the manufacture or sale of products or the use of processes that might utilize the invention or be in competition with embodiments of the invention provided that such assignee will be subject to the same provisions as the *contractor*);

(2) The *contractor* may not grant exclusive licenses under United States patents or patent applications in subject inventions to persons other than small business firms for a period in excess of the earlier of:

(i) Five years from first commercial sale or use of the invention; or

(ii) Eight years from the date of the exclusive license excepting that time before regulatory agencies necessary to obtain premarket clearance, unless on a case-by-case basis, the Federal agency approves a longer exclusive license. If exclusive field of use licenses are granted, commercial sale or use in one field of use will not be deemed commercial sale or use as to other fields of use, and a first commercial sale or use with respect to a product of the invention will not be deemed to end the exclusive period to different subsequent products covered by the invention.

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(4) The balance of any royalties or income earned by the *contractor* with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions, will be utilized for the support of scientific research or education.

l. Communications

(Complete According to Instructions at Part 8.b. of this Circular).

[FR Doc. 82-4860 Filed 2-18-82; 8:45 am]
BILLING CODE 3110-01-M

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INSIDE: THE SCIENCE AGENCIES

WASH. POST 1/31/84

The Japanese are challenging the U.S. lead in yet another new technology—gene engineering—and that lead could vanish in the next few years if basic research isn't translated into commercial products, the congressional **Office of Technology Assessment** says in a new report.

"Biotechnology has, to date, been an American success story . . . ," said Rep. **Albert Gore Jr.** (D-Tenn.), who asked for the study. "It is imperative that we not let this advantage slip away from us, and we need to ensure that this industry is not crippled."

"U.S. efforts to commercialize biotechnology are currently the strongest in the world," said the 612-page report, citing the nation's well-developed base in the life sciences, entrepreneurial spirit and the availability of financing for high-risk ventures.

Last year, private industry spent more than $1 billion to research and develop methods of manipulating the genetic makeup of existing organisms, the technology office said.

The report said, however, that the U.S. lead may evaporate during the next decade if federal support of basic research continues to decline and if more funds are not provided to help turn laboratory successes into commercial products.

The report said that the United States has not followed through on its lead in basic research in gene engineering. It said that the technology to take gene engineering out of the lab and into the factory is complex and that not enough people here are trained to do that.

Instead of concentrating on basic research, the Japanese government has spent considerable amounts of money on industrial processes.

The report, written under the direction of the OTA's **Nanette Newell**, said the U.S. government spent about $511 million last year on basic research in biotechnology, but only about $6.4 million on applied research, such as funds to train students in commercial biological methods.

The Japanese government, on the other hand, spends a substantial proportion of its annual $60 million biotechnology budget on applied research, the report said. Specific numbers were not available for Japan, the OTA said, but the West German and British governments both spend up to 10 times more on commercial biotechnology research than does the United States.

The report suggested several options Congress could choose to try to boost the U.S. industry: funding the retraining of industrial workers, changing antitrust policy to allow companies to share workers and resources, restricting imports of biotechnology products, restricting the export of U.S. knowledge and equipment and giving federal aid to specific industries or technologies.

Gore said he would work in the House Science and Technology Committee to boost spending in the fiscal 1985 budget, but he declined to discuss specific amounts. He also called for Senate action on House-passed legislation to create a $425 million annual program of aid to states for math and science education.

The report was criticized by author **Jeremy Rifkin**, president of the Foundation for Economic Trends, which has questioned the scientific and ethical implications of practical applications of biotechnology. In a statement, Rifkin said the report "reflects a pro-industry bias" that gives "only brief consideration" to potential environmental risks.

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INDUSTRIAL RESEARCH . . . A boom in industrial research has started, according to the **National Science Foundation**. Company-financed research is expected to increase by about 11 percent in fiscal 1984 to $48 billion, according to the NSF's **Science Resource Studies Office.**

In a survey of 76 companies in six major industries, five of the industries said they were planning double-digit increases in company-funded research. From 1982-84, two of the biggest increases came in machinery (17 percent) and chemicals (12 percent). The motor vehicle industry is lagging behind, with only a 2 percent average annual increase in constant dollars.

—Philip J. Hilts

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The revised procedure will allow University of Utah surgeons, directed by William C. DeVries, to select patients who are in less advanced stages of heart failure. Previously, the protocol called for waiting until the eighth week after a patient reaches what the American Heart Association designates as the fourth category of cardiomyopathy. One major difficulty in Clark's case was that his heart disease had caused considerable deterioration in other organ systems. Those complications were his immediate cause of death.

The revised protocol also has expanded the patient's informed consent form so that it now includes information gained from Clark's experiences. The new protocol removes any upper age limit for patients who undergo the experimental procedure, and it specifies that various nutritional and exercise regimes may be studied following the operation. In future implants, the synthetic heart valves will be made of solid titanium without the welds that caused problems in the model Clark received. Also, use of a portable support system during the postoperative period has been approved, potentially allowing future recipients to feel somewhat less encumbered during the recovery period than was Clark.

Two members of the review committee voted against the revised protocol, arguing that the next artificial heart recipients ought to be patients whose hearts have stopped suddenly and thus are not suffering from the multiple and potentially confounding complications seen in patients in the advanced stages of heart failure.

—JEFFREY L. FOX

companies are to make nuclear exports to China.

Negotiations have been proceeding for some time and there were rumors that an agreement might be announced during Zhao's visit. The most substantial development, however, was the comment by Zhao during a formal toast at the state dinner that China "will not engage in nuclear proliferation. We will not help other nations develop nuclear weapons." The NNPA requires that U.S. nuclear technology can be sold only to countries that agree not to export nuclear weapons technology or information. Zhao's remark appeared to remove that issue from contention. Nonproliferation advocates, however, have been pressing the Administration to conclude an agreement only if the Chinese will also insist on the placing of safeguards on any nuclear technology they export.

U.S. sources expect the Administration to push to complete negotiations to make it possible for the agreement to be signed on President Reagan's scheduled trip to Peking in April.

—JOHN WALSH

Europe Eyes U.S. Model on Joint Research Rules

The ten member states of the European Economic Community (EEC), taking a cue from the Reagan Administration's effort to boost technological innovation, are considering a proposal that joint research efforts between high-technology companies in Europe be exempted from the stiff antimonopoly rules contained in the Treaty of Rome, the agreement setting out the code of economic behavior on which the community is based.

In the past, such exemptions have been permitted in individual cases. Last month, for example, the Brussels-based commission of the EEC agreed to allow three West German companies to collaborate in a joint program of research and development on coal gasification. Similar exemptions have also been negotiated for microelectronics research projects carried out under the umbrella of the European Strategic Program for Research and Information Technology (*Science*, 6 Jan., p. 28).

The commission of the EEC, in a draft regulation which is currently being circulated for discussion and is expected to be adopted by the council of ministers within the next few months, is now proposing a blanket exemption for similar research efforts in these and other fields, ranging from textiles to pharmaceuticals.

Some conditions would remain. An exemption would not be allowed, for example, for research projects involving more than one of the three largest European companies in any particular field. Nor would it be permitted when the combined turnover of the companies sponsoring the research exceeded $400 million, an attempt to ensure that the major beneficiaries of the new competition rules are medium-sized companies.

As in the United States, commission officials hope that the main effect of the proposed regulation will be to provide psychological reassurance to research managers that joint research projects will not be subject to a legal challenge from Brussels. At the same time, however, the commission is going further than the Reagan Administration in proposing that the exemption be extended to cover the joint production of new technological products arising from the research.

—DAVID DICKSON

Battelle Predicts Rise in R & D Spending in 1984

Thanks chiefly to a surge in spending by private industry, expenditures on research and development in the United States will climb to $94.2 billion in 1984, according to a forecast by the Battelle Memorial Institute. That would be an 8.9 percent increase over 1983 levels, or a 3.7 percent rise after inflation is taken into account.

According to the usually reliable Battelle figures, industry will spend $48.8 billion, a 10.3 percent increase, and the federal government will spend $42.7 billion, a 7.8 percent rise. The increased federal outlays largely reflect the continuing defense buildup. The Department of Defense is expected to account for 64.5 percent of government R & D expenditures in 1984, up from 58.9 percent in 1983.

—COLIN NORMAN

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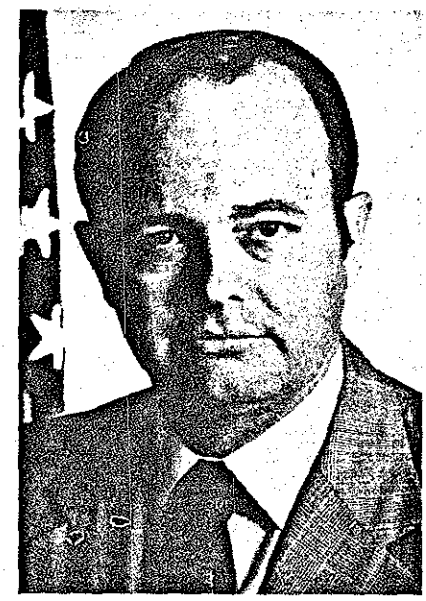
NSF's shadow director is powerful, controversial figure

To call N. Douglas Pewitt a shadow really doesn't describe the man. Pewitt can be a social charmer, but in his job as an assistant director for science policy at the White House Office of Science & Technology Policy, he is what might be called an ideological presence. "Pewitt thinks everyone left of Attila the Hun is a communist," says one who has worked with him. "He talks about leaving Washington but he is so power hungry that I doubt that he'll ever leave."

So feared is Pewitt that few sources would go on record in their comments on him. "He really is in a powerful position," comments one. "Anyone who is anyone in R&D in the Washington establishment has some reason why they wouldn't want to offend him. But he's managed to alienate himself from everyone in the Washington science community." So run the more extreme comments. It's true, too, that Pewitt wouldn't be around if he weren't effective.

Who is this Doug Pewitt? His official title is assistant director of general science, Office of Science & Technology Policy, executive office of the President. He was appointed to that job on Sept. 20, 1981, almost a year after Reagan was elected to office.

From 1979 to 1981, he worked in President Carter's Administration as deputy director of the Energy Department's office of energy research. Between 1976 and 1979 he was on the science budget staff of the Office of Management & Budget. Pewitt took collegiate training rather late in life, getting his Ph.D. in particle physics from Florida State University in 1974. He



spent the 1960s flying jets for the Navy. He currently is a commanding officer of Air Systems Program Unit 0366 in the Naval Reserve.

Pewitt undoubtedly has more than just the ear of his boss, George A. Keyworth II. When Pewitt came over from the energy department, he announced he would be deputy director of OSTP. His brashness upset Keyworth for a while. "But when it became clear to Keyworth that Pewitt saw the world in the same black and white terms," according to one source, "they began getting along." From all accounts, Pewitt is functioning as Keyworth's number two man, since Keyworth's current deputy, Ronald B. Frankum, is seen as over his head in the job.

The science education people at NSF have reason to fear Pewitt. None of them were consulted when NSF had to present its fiscal 1984 science education program to Congress. "The science education initiative was born at OSTP," says one source, "and was presented to NSF as a fait accompli."

What seems clear is that a lot of people in Washington will be happy to see Pewitt go if he keeps his promise of leaving town by August. He reportedly has told Keyworth that he doesn't intend to stay through another budget cycle. But many say he loves a sense of power, and he has it where he is now. "Pewitt has so much control at NSF," says one Pewitt detractor, "that Knapp won't put his tie on in the morning without consulting Doug."

Eloise Clark, NSF assistant director for biological, behavioral, and social sciences, thinks the criticisms are ridiculous. Although Pewitt has in the past disdained the social sciences, Clark doesn't believe he had anything to do with the initial Reagan budget cuts in this area and is in fact interested in learning more about social science.

"I think Pewitt is the kind of person who can work on a scientific issue on its own merits regardless of his personal politics," she says. And as for Pewitt's "controlling" Knapp, she defends Knapp. "I think Ed is a person who thinks independently and forms his own opinions. Furthermore, I think it's very natural that Knapp should be consulting frequently with Pewitt and OSTP."

"I'd prefer to sit and talk with people in a rational fashion," comments another NSF source. "But if you can wade through [Pewitt's] rhetoric, you find him a thoughtful person. He talks to a lot of people about NSF and does get a lot of things done for us."

more than scientific—they mainly are political. So, many are trying to convince Knapp that he will still need a core of staffers attuned to the political subtleties of international science. "People are concluding that if we didn't have an international directorate, Knapp would have to create one," says one staffer. "You need brokers who can understand international politics as well as science. Knapp doesn't understand this yet. That's why it is taking so long to implement his concept."

Those at NSF interested in international programs but who aren't involved are happy with the new plan. Says one: "The international division has been passive for years in establishing a strategic rationale for exchange programs with other countries. They never look at research in the context of our own strategic needs, either in terms of science or the economy."

The job does seem formidable and will involve a lot of staff reshuffling. For example, Clark is worrying that her staff for biological, behavioral, and social sciences will have a hard time handling any large amount of new proposals stemming from NSF's initiative for support of research in small colleges. Whereas many small colleges don't have a physics department, almost every one has a biology department. Therefore, she believes her directorate could be inundated with proposals even though it has less money than the physics section. "So my staff is worried that it will have a lot more work to do because of that broadened constituency."

Seed Money From New SBA Program Nurturing Local Innovations

By Joseph Perkins
Washington Post Staff Writer

Gentronix Laboratories Inc., a small Rockville-based company, is one of a handful of high-tech firms working to develop the "biochip," a computer wafer a billion times more powerful than the silicon chip with infinite commercial potential.

And the advances Gentronix may make in the development of this innovative technology will be attributable not only to the firm's engineers, said its Chief Executive Officer John M. Wehrung, but to the federal government as well.

Gentronix is one of the first of several hundred firms to take advantage of a new federal program requiring agencies and departments to allocate a portion of their outside research and development budgets to small companies. The Rockville firm received $200,000 from the National Science Foundation last August, during the first year of the program, and those funds "enabled us to increase our revenue base and conduct research [we] otherwise wouldn't have done," said Wehrung.

Joseph A. Lahoud, president of Greenbriar Systems Inc. at Tysons Corner, believes the new "Small Business Innovative Research" program—created after Congress amended the Small Business Act two years ago, will usher in "almost another industrial revolution."

Lahoud's four-person company is using funds from the program to develop what it calls "acoustic emission monitoring" for use by the auto industry and other manufacturers. "We've had some troubles in our three years," he said. "I think our prospects are brighter because of the SBIR."

In accepting SBIR awards from the Nuclear Regulatory Commission and the National Science Foundation, International Associates Ltd., a 60-person District consulting firm specializing in energy supply, use and conservation, broke a longstanding company policy of eschewing participation in federal programs.

"We do not normally get involved in seeking funding from the government small business programs," said International Energy Associates President John E. Gray. "But this one seems to be a cleverly designed piece of work. I admire the concept and structure of the program."

Under the innovative research program, federal agencies with outside R&D budgets in excess of $100 million are required to set aside a certain percentage of those funds for small firms. Twelve agencies currently are participating in the program. The contribution was fixed at 0.2 percent for 1983, the first year of the program, and will increase yearly until it reaches 1.25 percent in 1988.

By then Gentronix, Greenbriar, International Energy Associates and other small

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Area Small Businesses Getting Slice of Agencies' R&D Pie

INNOVATORS, from page 1

high-tech firms will be competing for half a billion federal R&D dollars. Last year, the agencies partcipating in the SBIR program received close to 9,000 proposals, and 730 were selected to receive a total of about $45 million. About 3,000 projects should be funded annually by the program's fifth year, according to an SBA report to Congress on the program's first year.

Washington-area companies have garnered a healthy share of SBIR awards. Virginia ranked third in the nation with 46 awards, worth a total of $2.3 million. Maryland was right behind Virginia with 35 for a total $1.7 million. And with six awards totaling $239,315, the District ranked ahead of 16 states. The Washington area has done so well, said Richard J. Shane, acting administrator of the SBA's Office of Innovation, Research and Development, because "that's where all the 'Beltway Bandits' are."

Only companies with 500 or fewer employes are eligible to compete for SBIR awards. The average award-winning firm has about 50 employes, the SBA reported. And last year, firms with 10 or fewer employes, such as Greenbriar, won more than a third of all awards.

There are two funding "phases" in the program. In the first, victorious proposal writers receive awards of up to $50,000, with which they are to demonstrate in a six-month period the technical merit and feasibility of their innovations. In the second phase, firms that successfully complete the first phase are awarded up to $500,000 over two years to develop their innovations further. Generally, phase-two awards go to firms that can prove the market potential of their innovations. The ultimate goal is to persuade venture capitalists to invest in the firm's work.

The two-tiered awards amount to "start-up capital" for small firms with good ideas, said Shane. "Essentially, for $50,000, you're buying one man's time for six months," he said. "He sorts the problem out and proves the practicality [of his innovation] in a verbal form." After six months, "he goes back to technical review and says, 'It looks like this . . . thing has a possibility to work.' "

At that point, Shane said, the SBA might decide to award phase-two funding. "Let's [say we] fund him $500,000 for two years. $500,000 will not bring a product to the market. What it will do is give you enough for a working model. Now venture capitalists will look at it and say, 'That's a good idea. Our experience tells us that we'd like to put in $3 million to get this son-of-a-gun off the ground and bring it to the market.' "

To ensure that firms eligible for the program are aware of it and "to mobilize the private sector" to make use of the innovations developed by these firms, a group of business people formed the Small Business High Technology Institute after the bill's enactment two years ago. The nonprofit institute is headed by former SBA chief counsel for advocacy Milton D. Stewart. "Most of us who are interested in the SBIR program are interested in how our country is doing," Stewart said. "We will do what we can to make this program succeed."



By Larry Morris—The Washington Post

Greenbriar President Joseph A. Lahoud

Before the program was created, small high-tech firms had voiced their disgruntlement with the federal government's distribution of outside research and development funds. In 1982, for example, the government spent about $40 billion on R&D. More than 95 percent of the outside allocations were made to big businesses, laboratories, universities and nonprofit organizations, according to a report by the House Small Business Committee.

The federal procurement process was "almost to the bitter exclusion of small businesses," said Shane. The government's treatment of small businesses looks even more injudicious, he said, when viewed alongside reports attributing nearly half of the major American innovations made in the last 30 years to small businesses such as Gentronix and Greenbriar.

"Small businesses are much more capable, much more practical in bringing things to fruition," said Shane. "Universities are large businesses. And nonprofits may be very well founded, and very exciting technically, but they are a little on the esoteric side. Everytime they come up with a new technology, they take 10 years, 20 years perhaps, to make it [usable], whereas hard work-oriented small firms will take two to five years.

"Alexander Graham Bell and Thomas Edison wouldn't qualify to teach in a university today," Shane asserted, adding that he hopes such inventors will be discovered through the innovative research program. "We think there are a million good ideas out there. If we hit big—say two out of 100 . . . it's got tremendous payoffs."

Gentronix thinks it may be on the verge of "hitting big," according to Wehrung, who says the company's biochip will be "a billionfold more powerful than the silicon-based or gallium arsenide systems" currently produced by computer manufacturers.

Greenbriar also is working on a project with great commercial potential, Lahoud said. The firm received about $50,000 from the Department of Energy to develop a technology that better detects defects in nuclear steam generator tubing. The same technology that Greenbriar is using to test nuclear generators—signal processing—may be used for other industrial purposes as well, Lahoud said.

Recently, Greenbriar contracted with a major auto maker to develop a signal-processing device that could test welding on autos done by robots. Because there currently is no way to ensure welding strength, auto makers must make twice as many welds as necessary to make sure a sufficient number of welds hold. By using a device that can distinguish good welds from bad, auto makers can save considerable time and millions of dollars, Lahoud said.

Greenbriar has therefore developed instruments that measure the electrical impulses of the robotic welder. After processing the "signals" from the welder, the device is able to delineate good "wiggles" from bad. Now, the object of the game, said Lahoud, is to perfect the instrument and make it small enough to fit inside the welding machine.

"We don't think we're too far away from significant growth," Lahoud said. "A year ago [before Greenbriar received two SBIR awards], I couldn't have said this. We've gone beyond the stage of having an idea in our head and a drawing on a piece of paper. We've actually done something."

Still another Washington-area firm, Advanced Technology Laboratories, believes it is close to developing a commercially salable innovation. The four-person Gaithersburg firm, which has received two SBIR awards, expects to receive a patent on a device that has the potential to greatly enhance computer memory, said Vice President Marc A. Friedlander.

The company is developing a computer part that will render the floppy disc obsolete, Friedlander said. The storage device will be no bigger than discs such as the IBM 3380—which boasts one of the largest memories available—but will have 50,000 times their capacity.

The capacity is so great, Friedlander said, because the storage device has a "photon echo memory," which stores information in three dimensions instead of the current two dimensions.

"These are high-risk, high-payoff activities," said Friedlander. Without the impetus of SBIR requirements, he added, "I really think none of the agencies we dealt with would have invested in this."

In an effort to increase the likelihood that SBIR-derived innovations will reach the market, the SBA has developed a computerized system to match program participants and potential investors. The system, which takes into account "capital technical interests, dollar thresholds, geographical considerations and time-frame elements," is expected to become fully operational this summer.

As might be expected, the innovative research program is not without its problems, said Shane. The one that concerns him most is the oversubscription of "worthy proposals." During the program's first year, about 700 proposals were deemed "worthy but not funded" by the SBA. That problem should be alleviated with the increase in federal R&D dollars earmarked for the program, he said.

Another problem some of the smaller firms mention is the length of time between phase-one and phase-two funding. Advanced Technology, which derives most of its revenue from the SBIR program, has been inactive since early March, when its phase-one award ran out, Friedlander said. He proposes that phase-two companies receive "interim funding" while they await their full award.

Apart from those areas of concern, the SBIR program has gotten good reviews, Shane said. "We still receive about two to three hundred pieces of correspondence a week," he said. "That's good proof of the pudding."

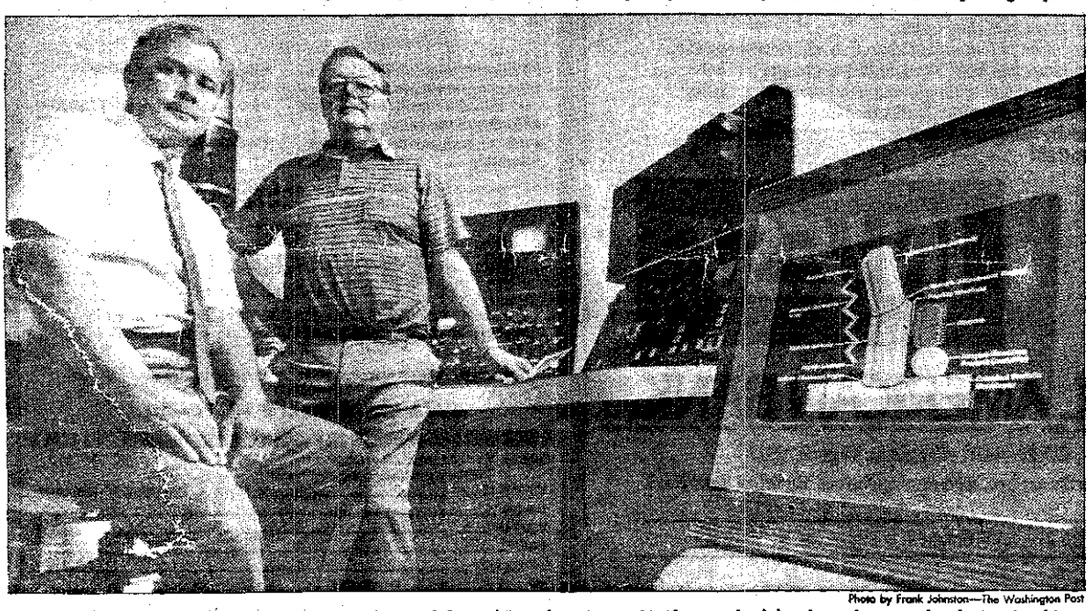


Photo by Frank Johnston—The Washington Post

Gentronix Chief Executive Officer John M. Wehrung, left, and President James McAlear at the lab where they are developing biochips.