UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Productivity, Technology and Innovation
Washington, D.C. 20230
(202) 377-1984

22 JUN 1987

To:

From: Norman Latker
Director, Office of Federal Technology Management

Subject: Important Article on Superconductivity

The attached article reports that MIT's Technology Licensing Office has attracted U.S. capital for the first startup company around licensed superconductivity technology. The technology is an outgrowth of an NSF grant. This is a good example that the Administration's decentralized technology management policy is working well at MIT.

The article also discusses an interview with Dr. Chu from the University of Houston. As reported earlier Houston has filed patent applications on the Chu discoveries which are also the outgrowth of an NSF grant. Notwithstanding, Chu is quoted as saying, "Many venture capitalists and others have contacted me and members of my team, but we have never gotten to a serious stage because I have been too busy with lab work." Investigation indicates that Houston does not yet have a designated Technology Licensing Office set up to negotiate with the private sector, but officials are meeting to respond to this need.

If there are concerns about transfer of public sector superconductor technology, or for that matter any technology, the article suggests that a high priority be given to development of management at the laboratory level who can seriously entertain private sector offers of assistance. That is the intention of Section 1. (b)(1)(A) of the Executive Order 12591 which requires Federal agencies to delegate the authority to enter into cooperative agreements to the Directors of agency laboratories.

Attachment

neuromagnetometer monitors a patient's brain activity. The device, uilt by Biomagnetic Technologies, uses superconducting materials.

The Rich Promise Of Superconductors

By BARNABY J. FEDER

IN venture capital circles, where major scientific advances pump up investment activity the way adrenalin sets the human pulse racing, recent breakthroughs in the esoteric field of superconductivity are sparking visions of new riches.

"Superconductivity is extremely exciting," said Benjamin Rosen, chairman of the Sevin Rosen Management Company, one of the nation's most successful venture capital firms in the field of electronics. "It's one of those things we have been dreaming about."

Nevertheless, Mr. Rosen said, commercial applications of the new advances in superconductivity are "all too far off to be of real interest to us right now."

Other venture capitalists say they have already seen enough to begin gearing up to lead what is likely to be a multibillion-dollar wave of investment, even though there is more money available than places to put it.

"The plus of the new superconductivity discoveries is that the applications potential is mind-boggling," said Bob Daly, a partner at Boston-based TA Associates, a leading venture capital firm that said it was striving to get to know leading researchers in the field. "The minus is that the weekly announcements of new developments are making it hard to figure out where to invest."

Superconductivity — the state in which electric current passes through a material without resistance — was discovered in 1911. Until last year, however, it had been achieved only at temperatures so frigid that there was little practical use for it. Few investors gave it a second thought.

But early this spring researchers at an International Business Machines Corporation laboratory established that some ceramic-based materials become superconductive at temperatures above that of liquid nitrogen (-320.4 degrees Fahrenheit), a widely used and inexpensive industrial coolant.

It is still far from clear how durable these superconductors would be, what their magnetic characteristics are, or even exactly how they work. Nevertheless, venture capitalists are excited because superconductivity at such relatively high temperatures could have profound implications for the performance of everything from computer chips to electric utilities, and medical diagnosis to superfast trains.

At least one new company has already been formed. Tentatively named the American Superconducting Corporation, it will use seed money provided by American Research and Development of Boston and Rothschild Ventures Inc. of New York, two leading venture capital firms, to take the first steps toward developing a business based on the work of Gregory J. Yurek and John Vander Sande, two professors at the Massachusetts Institute of Technology.

Professors Yurek and Vander Sande disclosed at a Congressional hearing last week that they had developed a method to make the new superconductors out of metal, which would make them far easier to manufacture than the brittle, ceramic-based materials developed by other researchers.

Many venture capitalists compare today's superconductivity scene to the investment situation that evolved in 1973, following the news that researchers had discovered how to transfer genetic material from one living organism to another. Genetic engineering eventually attracted hundreds of entrepreneurs and billions of dollars of investment.

The venture capital community was much smaller in 1973 than it is today. This year, some 2,000 professional venture capitalists are managing a pool of more than $24 billion.

Venture capitalists are not the only ones with a stake in when and how investors will plunge into the superconductivity field. The United States is more reliant than any other industrial nation on the interplay between investors and entrepreneurs. Besides being the source of seed money and other early rounds of financing for many start-up companies, venture capitalists are also a major supplier of management expertise.

Government officials and industry leaders, including venture capitalists themselves, have been wondering aloud whether superconductivity is too important strategically to be left to the kind of laissez-faire growth that has dominated biotechnology.

"This is an unusual case where commitments have to be made rapidly and wisely for international competitive reasons," said George McKinney, the American Research partner who was reached by M.I.T.'s Technology Licensing Office when Professors Yurek and Vander Sande decided they wanted to commercialize their work. "Venture capitalists are looking for an aggressive commitment by the Government. The problem is going to be who will pay for the one-mile test cable when we think we can build a superconducting one."

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But to whom will the Government make its commitments? Many of the early discoveries in high-temperature superconductivity have been made by researchers at I.B.M., A.T.&T. and other large companies. Venture capital experts believe that such large companies might lead the way in some capital-intensive applications, but they also see a major role for smaller companies and start-ups.

So far, however, there are few small companies involved with superconductivity to which venture capitalists or the Government can turn. Two companies backed by venture capital are currently marketing products using superconductors built with the "old" technology of cooling metals to well below minus 418 degrees Fahrenheit with liquid helium. They are Hypres Inc. of Elmsforld, N.Y., which makes an oscilloscope for high-speed signal measurement, and Biomagnetics Technologies Inc. of San Diego, which makes devices that measure magnetic fields and brain activity.

Nor are many of the independent researchers who are best known for the recent breakthroughs currently looking for venture support.

"Many venture capitalists and others have contacted me and members of my team, but we have never gotten to a serious stage because I have been too busy with lab work," said C. W. Chu, whose University of Houston research team has been among the foremost in the field.

Such conditions are trying for investors eager to get into the field.

"We may end up trying to create some opportunities instead of waiting," said James Pierce, a managing partner at Pierce Nordquist Partners, a Kirkland, Wash.-based venture fund. "We may come up with an idea and recruit people at universities to do it. You could hear something in the next three months."

Potential Applications of Superconductors

An estimated 15 percent of all electricity generated is wasted in overcoming electrical resistance in the wires that carry it from place to place. Thin superconducting wires would recapture that energy. And the use of superconducting wires would allow nuclear power plants to be built far away from population centers, increasing safety.

Storage of electricity in giant coils of superconducting material would allow power generated at night, when demand is low, to be stored until it is needed during peak daytime hours.

Smaller, faster computers could be built using superconducting wires to connect chips, allowing more power without dangerous overheating, and superconducting films might be used to make the chips themselves.

High-speed trains, with superconducting magnets on the bottom of the cars, would float on powerful magnetic fields over metal rails. Because they are not subject to friction, they could travel smoothly and quietly at speeds of 300 m.p.h. or more.

If a magnetic field can be created powerful enough to contain a fusion reaction as hot as the sun itself, power plants using safe and abundant hydrogen could, in theory, replace nuclear plants that use uranium.

Weapons designers are exploring the use of superconductors to make immensely powerful beams of destruction, and the Navy is studying how ship designs that use superconductors in the propulsion systems

Drawings by Javier Romero

7/21/87

GENERAL COUNSEL OF THE
UNITED STATES DEPARTMENT OF COMMERCE
Washington, D.C. 20230

Honorable James C. Miller III
Director, Office of Management
and Budget
Washington, D.C. 20503

Attention: Assistant Director for Legislative Reference

Dear Mr. Miller:

This letter is in response to your request for the views of this Department on H.R. 2916:

> "To amend the Act of March 3, 1901, and the Stevenson-Wydler Technology Innovation Act of 1980 to further United States technological leadership, and for other purposes."

For the reasons set forth in this letter, we do not object to enactment of H.R. 2916, "The Technology Competitiveness Act of 1987".

We find substantial merit to the changes the draft bill would bring about, including the modernization of the organic act of the National Bureau of Standards (NBS). We endorse the programs created in the bill to transfer information about federal expertise in science and technology to state and local public agencies and private firms. This would allow those firms to improve their own initiatives to make U.S. industry more competitive. However, we have some specific changes which should be of benefit. Our comments and concerns are set out below.

Title I: National Bureau of Standards: Renaming NBS the National Institute of Standards and Technology (NIST) and modernizing the organic act are consistent with the present and future capabilities of NBS. NIST, as envisioned by H.R. 2916, complements the Commerce Department objective of promoting the competitiveness of U.S. industry in the world economy by providing it with standards and measurement, and process design and control, which assist critical emerging technologies and product quality. We endorse these changes to the organic act.

Advanced Technology Foundation (Sec. 106) This concept is consistent with Executive Order 12591 of April 10, 1987, wherein the President directed that federal laboratories assist U.S.industry and universities in converting results of federal research into new products and processes, and in financing a

portion of these efforts through the formation of consortia. The authorization of appropriations conforms substantially to levels in the Concurrent Budget Resolution.

Moreover, the addition of the Advanced Technology Board and Foundation, which replaces the statutory visiting committee, enables the most eminent representatives of industry and universities to serve on the Board, on a rotating basis. This will allow NIST to beneift from the Board's broad range of experience on matters affecting generic research. The addition of the Board will also encourage input from industry and academic members at an appropriate organizational level, on an accelerated basis.

Title II: Federal Industrial Extension Act: This part of the bill has been changed from a grants program to a study by the Secretary of Commerce. The Secretary would determine whether federal action in the form of technical and financial assistance should in fact be undertaken in order to make state industrial extension programs more effective instruments of federal technology transfer. The provision caps any subsequent authorization at $16 million contingent on the Secretary's recommendation to Congress. Both the flexibility to authorize appropriations below the stated dollar level and the Secretary's discretion in the needs-determination and funding are decided improvements in this bill.

Title IV: Clearinghouse on State and Local Initiatives: The Clearinghouse is intended to assist state initiatives designed to increase U.S. competitiveness through productivity enhancement and through innovation. Providing information and encouragement of state initiatives on productivity, technology and innovation through the Clearinghouse is a useful concept. We do not object to authorization of appropriations at the stated level. However, the purposes of the program would be far better served if the Clearinghouse were placed in the Office of the Secretary, rather than the Office of Productivity, Technology and Innovation, to better utilize the diverse scientific and technical resources of the entire Department.

Title VI: Metric Usage: The bill directs all federal agencies to try to use the metric system for business related activities, such as grants and procurement, by 1992. We have no objection to the provision since the bill states conversion shall be effected to the extent practical without inefficiency and as long as U.S. firms are not denied market opportunity.

Title VII: (Sec. 701): Distribution of Royalties under the Stevenson-Wydler Act: The effect of this proposed amendment is unclear. The amendment should be clarified to ensure that the patent owning agency retains discretion either to approve or disapprove of this type of cost pooling once it decides to use a licensing entity such as NTIS.

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Agencies must also retain control over the filing of foreign patents rather than having this important and costly decision made for them by their licensing agency. Because foreign filing costs will be deducted from royalty income, there must be agreement between the client agency and any federal agency acting as its licensing agent to avoid possible conflicts.

In summary, we find H.R. 2916 to be a reasonable and restrained response to competitiveness initiatives in the Concurrent Budget Resolution. While the bill does authorize $10.5 million not in the President's FY 1988 budget proposal, this comes at a time when the need to foster technology competitiveness has risen dramatically. Enactment of this legislation will enable federal laboratories, under this effective management structure, to contribute information at all appropriate stages and levels so that grassroots efforts by private industry, states and universities may benefit fully from federal laboratory input. This bill is also commendable because it moderates the much higher authorization of appropriations found in S. 907, its Senate counterpart, which the Senate passed as part of H.R. 3, the omnibus trade bill, on July 21. You should be aware that earlier drafts of this bill contained very much higher authorization of appropriations in all titles than does the present draft.

For the foregoing reasons, we do not object to the enactment of H.R. 2916, although we suggest changes in Title IV and clarification of Sec. 701, as set out above, to benefit the bill considerably.

Sincerely,

Douglas A. Riggs

THE WHITE HOUSE

WASHINGTON

August 11, 1987

MEMORNADUM FOR MICHAEL DARBY
WILLIAM GRAHAM
WILLIAM MARTIN
BRUCE MERRIFIELD

FROM: EUGENE McALLISTER EM

SUBJECT: Superconductivity Act

The President's Superconductivity Initiative has been drafted by the Department of Justice and is currently working its way through the OMB legislative clearance process. We will want to get this bill up to the Hill when the Congress returns in September. This note is to ask for your suggestions and ideas on how we can help ensure passage on a fast track.

Some of you may have seen recent editorials and op-eds criticizing the President's initiative, in particular the FOIA reform provision. I think that it is important in planning a strategy for the President's bill that we anticipate this criticism and rebut it either by clarifying what it is the Administration is trying to achieve through the particular reform or providing a real example of why the reform is needed.

I would appreciate from you all, in particular, suggested rationales for the three provisions of the President's Initiative, or suggested talking points, e.g. on the Freedom of Information Act reform. In addition, I would appreciate any anecdotes or examples on why these reforms are being proposed, e.g. instances where Federal agencies have been forced to release commercially valuable technical data or information through FOIA. These should be examples we can use.

I realize that some of you may be out of the office over the month of August, but if you could provide me with some feedback over the next week, I would appreciate it.

Thank you very much.

HR 2916

Comments on Turner's bill (attached)

CEA

Recommends veto because it constitutes industrial policy -
- Advanced Technology Foundation technical assistance for technology demonstration projects is a private sector function.

- Office of Extension Services to aid industrial planning policies of state govts. - no appropriate federal role

- Superconductivity Commission - federal govt. has funded basic research. Private sector initiatives constitute successful approach and should not be supplanted.

DEFENSE

Generally: opposes bill as unwarranted Govt interference in private sector commercialization activities.

Would duplicate existing initiatives to coordinate R&D activities in superconductivity and semiconductors, and to share plans and results with industry.

National Advisory Commission is unnecessary.

Clearinghouse on State/local initiative parallels NTIS and FLC responsibilities.

Sec. 602 - FLC formula confusing and faulty. DoD recommends it set a fixed amt. for NBS to bill other agencies based on funding levels of their labs.

TREASURY

(oppose)

Title II - Federal Industrial Extension Act - unnecessary because of Federal Tech. transfer efforts underway.

Title III - Superconductivity Commission - unnecessary bec. other Federal action soon to be announced.

Title IV - clearinghouse for State/local Initiatives - report on federal assistance to states is unnecessary.

Title V - Semiconductor Advisory Committee - unnecessary because of other studies; also EPC is considering.

Sec. 604 - patent rights extension - support.

NSF

Oppose, especially superconductivity.

NASA

support if amended to eliminate Institutes and FLC set-aside.

STATE

(nob) (State should be on Superconductors Commission)

GSA

no comment

SBA

no objection.