UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Productivity, Technology and Innovation
Washington, D.C. 20230
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22 JUN 1987

To:

From: Norman Latker NL
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

BUSINESS TECHNOLOGY

euromagnetometer monitors a patient's brain activity. The device, lt 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 on ones with a stake in when and how i vestors will plunge into the superco ductivity field. The United States more reliant than any other indu trial nation on the interplay betwe investors and entrepreneurs. Beside being the source of seed money an other early rounds of financing fo many start-up companies, ventur capitalists are also a major supplier o management expertise.

Government officials and industr leaders, including venture capitalist themselves, have been wonderin aloud whether superconductivity i too important strategically to be le to the kind of laissez-faire growt that has dominated biotechnology.

"This is an unusual case wher commitments have to be made rap idly and wisely for international com petitive reasons," said George Mc Kinney, the American Research part ner who was reached by M.I.T.' Technology Licensing Office whe Professors Yurek and Vander Sand decided they wanted to commercial ize their work. "Venture capitalist are looking for an aggressive com mitment by the Government. Th problem is going to be who will pa for the one-mile test cable when we think we can build a superconducting one."

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But to whom will the Governmen make its commitments? Many of the early discoveries in high-tempera ture 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.

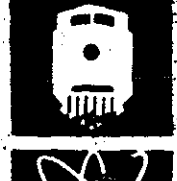
"We may end up trying to create some opportunities instead of waiting," said James Pierce, a managing partner at Pierce Nordquist Partners, a Kirkland, Wash.-based venture fund. "We may come up with an idea and recruit people at universities to do it. You could hear something in the next three months."

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 strong enough powerful enough to contain a fusion reaction as fast 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 new ship designs that use superconductors to the propulsion system.

Drawings by Javier Romero