IMMEDIATE ATTENTION

U.S. DEPARTMENT OF COMMERCE

February 28, 1984

To : Jack Williams, Lanse Felker, Norm Latker, and Mike Rubin

From: J. William Nelson, Room 4814B

Attached is a draft statement for Bruce's appearance next Tuesday at hearings re monitoring Japanese technological information.

It must go into the clearance process this p.m.!!

Please review it and make any observations, deletions, suggestions or corrections and get it back to me for a final synthesis by 4:30 p.m.

I would appreciate particularly the insertion of the correct S. or H.R. numbers for the legislation cited with blanks.

Attachment

Also, any editorial revisions to shorten it up will be gratefully received.

Reg. No. 9 file w/ presentations NTL

Corp 3/12/84

Reg. No. 9 Pl. make cc: of pg 5, 7, + 8 and send to Alex Latker, NTL

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U.S. Department of Commerce
Statement of
D. Bruce Merrifield, Assistant Secretary
for Productivity, Technology and Innovation
Before the Subcommittee
on Science, Research, and Technology
Committee on Science and Technology
U.S. House of Representatives

March 6, 1984

Mr. Chairman, I appreciate this opportunity to appear before the Subcommittee on Science, Research and Technology in connection with these important hearings on Japanese scientific and technical information, and on possible actions to increase U.S. industry's access to it. As you know from some of my previous appearances here, the application of all appropriate means to enhance the U.S. technological edge in global competition is of great concern to me. I congratulate you and the Subcommittee for exploring this avenue for possible progress.

I am accompanied today by Mr. David Shonyo, Acting Director of International Affairs for Productivity, Technology and Innovation's National Technical Information Service. Mr. Shonyo, who has a prepared statement of his own, will discuss NTIS's activities in seeking Japanese science and technology literature for U.S. consumers of it. Also with me is _____, of our International Trade Administration, who is prepared to answer questions on the $500,000 program Commerce and the National Science Foundation have decided to fund to evaluate Japanese technological strengths in various industries.

To set the stage for Mr. Shonyo's remarks, and perhaps lend some further focus to these hearings, I would like to make a few general observations.

First, I believe that it is extremely vital to establish improved procedures for monitoring worldwide industrial nation advances in technological innovation. This will be increasingly difficult, and will require the cooperative application of public and private sector resources. From the beginning of recorded history until today, about 90 percent of all scientific knowledge has been generated in the last 30 years. This pool will double again in the next 10 to 15 years. Ninety percent of all the scientists who have ever lived are living and working now and they will double again in that period. Technology explosions will occur in fields like electronics, communications, engineering, plastics, biogenetics, specialty chemicals, pharmaceuticals and so on. Advances will be so rapid that some products and processes will be rendered obsolete while in the final stages of development. Accordingly, we should recognize that a formidable challenge is presented in tracking and applying other nations, technology advances, particularly in a country like Japan where the language and writing system represent additional barriers.

Next, it will be increasingly necessary for us to utilize the fruits of Japan's and others' R&D in U.S. product development, because much of it will surpass our own frontiers of knowledge.

Although our long-term economic well-being depends heavily upon the high-technology industries continuing to make such contributions, American leadership in world technology is not necessarily assured even through the 1980's. Our dominance has already eroded in steel, automobiles, machine tools, and consumer electronics.

Ten years ago the United States, with only five percent of the world's population, was generating about seventy five percent of the world's technology. Now, the United States share is about fifty percent because of inroads made by countries like Japan. In another decade, it may approximate thirty percent. By 1981, Japanese R&D spending exceeded $26 billion annually--four times more than ten years prior to that. In contrast, civilian R&D for the United States in 1981 approximated $52 billion, putting Japan at close to parity with us on a per capita basis. It should also be noted that Japan spends relatively little on military R&D, while nearly 25 percent of the U.S. Government's R&D budget is defense-related. So, we can no longer afford to indulge ourselves in a myopic, "not invented here" reluctance to avail ourselves of Japan's superior know-how in some fields.

In addition, the international competitiveness of the United States in technologically intensive industries can be assessed in relation to the overall trade position of this country, particularly with regard to the significance of changes over time and the causes of those changes. The numbers speak for themselves. Although the U.S. overall trade balance in high technology products increased from 1962 through 1980, Japanese, German, and French balances also grew. While the U.S. surplus remained the largest, the relative growth in th Japanese surplus was the most rapid.

The dramatic change in the Japanese competitive position in high technology has also been indicated by its expanding bilateral balance with the Untied States in this area. From a deficit in these products in 1968, Japan moved to a surplus position vis-a-vis this country of nearly $3.0 billion in 1980. This surplus--about one seventh of Japan's global high technology trade surplus--was about equal to the U.S. combined surplus in these products with France and Germany.

The trade surplus generated in high technology products is significant for the Unted States. Nonetheless, it should be noted that a substantial portion of it has been due to only two industries: aircraft and computers.

I would like to turn now to those industries requiring our particular attention in terms of our competitive posture, and our need to acquire additional Japanese technolgical information.

Computer Hardware and Software. For the present, the United States retains leadership in computer hardware and software technology and production, but the Japanese have begun to close the gap in a variety of sectors. For example, Japanese producers now have products that match or exceed the capabilities of major U.S. producers in such sectors as large-scale processors and magnetic disk storage and printers. Japan's government-industry research efforts are focusing on software, in which the Japanese producers lag behind U.S. firms in most areas. Their efforts to close the software gap with the United States are bound to have a significant effect.

Japan's fifth generation computer project is a major attempt to establish the Japanese computer industry as the world leader by the 1990s. Although the project may not precisely meet its objectives, key advances will result, yielding commercially competitive products well before the end of this decade.

Beyond their major fifth generation R&D effort, the Japanese have a variety of other important computer projects, the results of which will substantially affect the U.S. computer industry commercially in the future. Their work in supercomputers is designed to place them ahead of U.S. suppliers, and even without this joint effort, their recent announcements suggest they may be reaching parity in this field.

Semiconductors. The United States no longer has the lead in several important areas of semiconductor technology. Japan has an emerging leadership role in metal-oxide semiconductor high-density computer memories. It now has well over 50 percent of the world market for the current state-of-the-art device. The Japanese also have strong capabilities in complementary metal-oxide semiconductor technology, favored for its low power, radiation-resistant characteristics. Japan also has an emerging semiconductor production equipment technology that will rival U.S. capabilities. The emphasis is on increasing the degree of automation of production facilities, as well as improving the ability to produce high density devices. The Japanese, West German, and French governments have subsidized a number of programs to assist their microelectronics industries, but the United States retains a firm lead in microprocessor technology.

Semiconductor Production Equipment. Competition from Japanese producers of semiconductor production equipment--wafer processing equipment, test equipment, and assembly equipment--has grown significantly in the last four years. From 1979 to 1983 Japan's share of the worldwide market more than doubled, from 14 to 32 percent, while the U.S. share dropped to 65 percent from 79 percent. The dramatic increases projected for semiconductor devices for 1984 and 1985, expected to result in new plant capacity, will provide Japanese semiconductor production equipment manufacturers opportunities for further market expansion.

Fiber Optics Systems. Fiber optics communications systems are the fastest growing transmission medium for the worldwide effort to convert to the integrated services digital network (ISDN). Conservative estimates predict the world market to reach almost $4 billion by 1988. The United States is the largest user of fiber optic systems with approximately 40 percent of the world total. The Japanese government has targeted fiber optics as an industry for rapid development and is subsidizing Japanese firms to encourage cooperative R&D. About 20 leading computer, telephone equipment, electric wire and cable, and electronic manufacturing companies have set up an Optoelectronics Industry Promotion Association (OIPA) for accelerating research and development of optoelectronic products and technologies.

MITI has backed this joint industry effort with an investment of 80 million. To get economies of scale and to move up on the learning curve, the Japanese have installed production capacity that is four or five times greater than domestic demand. Neither the U.S. Government nor the U.S. fiber optics industry can accept the Japanese drive to dominance in the world, and must develop strategies to participate in the Japanese market to maintain our competitiveness in the world arena.

Biotechnology. Although the United States has the lead in recombinant DNA and cell culture technologies, there are gaps in its process technology and the manpower available to meet future needs. Other nations are making substantial investments in the commercialization process in which the United States has no clear lead. Japan has an undisputed lead in fermentation processes, a critical segment for commercialization, and is aggressively seeking to build on its strengths. In a recent report, the Congressional Office of Technology Assessment concluded that the science base which supports innovations in biotechnology may be eroded if Federal funding for basic life science research continues to decline. After the United States, Japan has the most financing available for companies in the biotechnology field, and the Japanese have targeted biotechnology as a national priority.

Pharmaceuticals. American domination of world pharmaceutical markets has been steadily reduced over the past twenty years. In the antibiotics sector, Japanese manufacturers are the world leaders in new compounds, and seven of eleven new antibiotics developed in 1979 originated in Japanese laboratories. Expenditures by U.S.-owned companies for research at home and abroad have not matched the expansion of foreign-owned firms' research efforts. The U.S.-located share of world pharmaceutical research has fallen from about two-thirds in the early 1960's to just above one-third today with Japan, West Germany, and the United Kingdom maintaining higher growth rates.

Robotics. While the United States continues to lead in research and design, Japan has far surpassed it in robot production and use. According to a narrow U.S. definition of robots, which excludes simple mechanical devices, Japan currently has about three and a half times as many robots in use as the United States. Starting with technology licensed by U.S. firms, Japanese manufacturers have developed robots for a broad spectrum of applications. Over 70 percent of all robots used in Japan perform machine tool loading and assembly operations, compared with 21 percent in the United States. Japan's experience in this industry--which is expected to be a major growth market--will give it a significant advantage in penetrating the U.S. robotics market. Several U.S. firms have entered into licensing arrangements with foreign companies in an attempt to accelerate their own entry into this field.

Mr. Chairman, this is by no means an exahustive review of all the industries afected, but it does provide a barometer of the work we have cut out for us.

With this background, the next question is what do we do about it?

My two colleagues here are prepared to discuss some specifics in response to that question.

I would just like to add that U.S. company--regardless of resources--can profitable scan worldwide technology in its industry sector.

Foreign technical information is costly to gather and even more costly to screen and interpret in the context of specific neecs. Systematic and timely access to relevant information on foreigh technical developments is effectively beyond the reach of most U.S. firms.

Various schemes have been developed in other countries to overcome the economic factors which tend to limit the access of individual firms to foreign technical intelligence. In Japan, for example, groups of industrial firms have formed information-sharing clubs. Members share data they have acquired (often incidental to their main activities) on foreign technical developments. Such information may include market intelligence, debriefing reports from foreign visits and technical documents.

U.S. trade, professional and regional business associations would seem to be potential natural foci for informationsharing activities. However, the agenda of these groups usually d not include foreign technical information dissemination. Some form of activity along these lines would measurably improve access of U.S. industry to foreign technical information.

Whether such encouragement should come from the Goverment is a sensitive issue, but indirect encouragement could take the form of a panel of industry leaders, organized under Government auspices, to consider the issue of information sharing groups. The panel should be charged with making specific recommendations, and the Government should give assurances of making its best effort to comply with recommendations requiring Federal cooperation. An example of such cooperation might involve making available, to information sharing groups, foreign technical information collected by U.S. Govenment agencies.

One positive step the Government can take is to accelerate the rate at which Federally-owned or funded technology is diffused to the U.S. private sector for conversion into advanced products or processes. The Japanese have been past masters at exploitng the traditional dissemination lag in this arena by licensing U.S.-developed innovations when they are at a vulnerable, undercapitalized stage, and then subsidizing theie further development. To counter this, we should take greater pains to get the fruits of our own R&D Into U.S. Industry hands, before the Japanese or others have time to preempt our own firms.

We have taken some stps to accomplish this, as indicate in the Department's recent report to the Congress on the STevenson-Wydler Technology Innovation Act of 1980 (PL 96-480). For example, the transfer of Federally-funded technology to the private sector is being pursued through patent policy changes that "automatically" transfer new technology to the organizations that develop it and that have the incentive to commercialize it, rather than continuing the process of "warehousing" and licensing it at a later time. This policy extends to technolgocal innovations generate dby both contractors and by employees in Federal lboratories.

In addition, we are considering ways and means for heightening technology transfer, cooperative R&D, nad innovation through Federal agencies' Offices of Research and Technology Applications (ORTAs). For example, to the extent that they are not now empowered to do so, ORTAs could:

- enter into cooperative research projects with industry, universities and other non-profit organizations, including the use of limited partnerships;
- administer an incentive program for laboratory inventors, including royalty sharing, and
- grant patent licenses or assign future invention ownership rights to industry, university or other non-profit organizations in order to encourage cooperation in Federal laboratory reserch efforts.

These actions would complement an initiative already taken through the issuance of a Federal Laboratory Consortium memorandum of understanding, which is designed to facilitate the commercialization of Federally-funded technology.

As I noted at the outset, Mr. Chairman, it is important to inaugurate better systems for acquiring Japanese and other industrialized nations' technologiucal information. However, in this effort, I hope that the Congress will not be distracted from taking some measures that can enhance the innovation process here at home. Some examples of this include:

- investigating the advantages of extending the 25 percent R&D incremental tax credit to those that need it most, including start-up ventures;

- passing the Administration's proposed antitrust legislation ("The National Productivity and Innovation Act of 1983"--H.R. #*&*), removing barriers to cooperative R&D ventures and the procompetitive exercist of intellectual property rights

- passing legislation which increases intellectual property protection for software and microchips (H.R._____); and

- passing legislation to extend contractor ownership of Fedrally-funded inventions, as specified under P.L. 96-517, to Federally funded research and developemnt performers not now covered by that Act.

In this connection it is interesting to note that the President's Commission on Industrial Competitiveness (PCID) endorsed eight recommendations in February to encourage innovation and industrial competitiveness in R&D and in international trade. All of the foregoing were included among them. For our own part, the Department of Commerce and the Administration have made substantial progress in carrying out the intent of the Stevenson-Wydler Act to increase cooperative R&D, technology transfer and industrial innovaton. Our own strategy to do this focuses on the multi-faceted process of innovation itself rather than selected end-products of the process. Weak points in the innovation process have been identified, options for remedial action have been analyzed, and a series of initiatives have been undertaken. These initiatives can be categorized as removing barriers to innovation, providing incentives for private sector initiatives, and increasing awareness of these initiatives in non-interventionist ways. For the most part, this has involved specific use of modification of Government antitrust, patent, procurement, regulatory, R&D, and tax policies. We will continue to work with the Congress in obtaining concrete action in all these areas to create a healthy climate for private sector progress.

In conclusion, Mr. Chairman, given the worldwide technological race, it is not only desirable, but imperative that we become fully knowledgeable about the latest technology in Japan and elsewhere in the world. As long as our methods are legal and above board, I know of no economic or political reason why we should not. If we fail to do so, we would be forfeiting a perfectly legitimate strategy long utilized by our strongest competitors.

STANFORD UNIVERSITY
STANFORD, CALIFORNIA 94305

Area Code (415) 497-0651
Telex: 348402 STANFRD STNU

OFFICE OF
TECHNOLOGY LICENSING
105 Encina Hall

April 16, 1984

Ms. Darcia Bracken
Department of Commerce
14th and Constitution NW, Room 4816
Washington, DC 20230

Dear Darcia:

Attached is the information you requested about the "informal survey" that I made of 20 universities active in technology transfer. As you can see, I got 16 responses which wasn't too bad. One attachment is a copy of the letter I sent out to the universities and a sample response. The other attachment is my handwritten notes tabulating the responses.

Let me know if you have any questions, and please give my regards to Joe and Norm.

Very truly yours,

Niels J. Reimers
Director, Technology Licensing

Enclosures
NJR:kla

STANFORD UNIVERSITY
STANFORD, CALIFORNIA 94305

Area Code (415) 497-0651
Telex: 348402 STANFRD STNU

OFFICE OF
TECHNOLOGY LICENSING
105 Encina Hall

RECEIVED
APR 1 1 '83
PATENTS & LICENSES

April 6, 1983

Mr. Theodore C. Wood
Manager
Patents and Licensing
Cornell University
P.O. Box Dh, Day Hall
Ithica, NY 14853

TCW _____
[illegible] _____
SFC _____
RR _____
FILE HFR RETURN

Subject: Experience Under PL 96-517 (as Implemented by OFPP Circular A124 "Patents-Small Firms and Non-Profit Organizations, Effective Date 3/1/82")

Dear Ted:

This is an informal survey of about 20 universities active in technology transfer to gain some insight into the effect PL 96-517 may be having on our operations.

I hope you'll be able to respond within two weeks. If any questions will take a significant effort in order to prepare a response, please just skip the question. All respondents will get a summary of the survey results.

Thank you in advance for your cooperation.

Very truly yours,

Niels

Niels J. Reimers
Director, Technology Licensing

Enclosure
NJR:jm

PL 96-517 Survey

1. Number of disclosures

	1978	1979	1980	1981	1982
Number:	41	45	43	27	56

2. Administration

Extent PL 96-517 effected patent administration (as opposed to licensing) such as negotiation of patent clauses, petitions for release of rights, reporting, etc.

more admin | (no change) | some reduction | large reduction | (circle closest)

Estimated "full time equivalent" change 0
(Example: less 0.8 FTE)

Result of reduced (or increased) administrative FTE "person power."

Reduction in force or transfer? _____

Used to Increase licensing effort? _____

Other _____

3. Licensing

Change in licensing staff in FTE (post PL 96-157) 0
(Example: +1.5 FTE)

4. Industry Research Support

In your opinion, has the reduced prospect of "contamination" (through certainty of rights to government-supported research results) led to greater industry-university research collaborations? (Circle)

No | No opinion | (Probably) | Definitely | Other _____

Percent change in proportion of industry research support (to total research support) over last 5 years:

From 4.1 % in 1978 to 5.2 % in 1982.

5. Experience with Government Agency Exceptions

An agency "may" (A124, Paragraph 7.a.) exempt a Go Co or specific funding agreements from the standard A124 patent rights clause, which gives a first option to contractor.

If your institution manages a Go Co, has any agency exercised the exemption; i.e., continues to require petitions for release of rights?

No Go Co	(yes)	no	
1	X		Agency NSF

Number (if any) of funding agreements, by agency, for which exemption exercised.

NSF-1		
(Example: DOE-5)		

6. Government Research Laboratories

It has been postulated government research laboratories act to:

(a) reduce level of extramural funding, becoming "competitors" with university faculty/student researchers, particularly in energy research, and

(b) make it difficult to encourage industry to invest in development of promising scientific discoveries, particularly in energy, because of "competition" by these laboratories.

Your reaction to (a): don't know
("dont know," "more perceived than real," etc.)

Your reaction to (b): don't know

Any specifics? Yes No (Circle)

7. Post PL 96-517

Indicate if you see any intellectual property problems at the agency-university interface that could be improved.

Invention reporting obligations. We can usually determine if government has rights but can't identify each grant from each agency, particularly "Cooperative Research" grants.

PL 96-517 Survey

1. No. of Doctorates

	78	79	80	81	82	TOT.
Boston U	13	21	11	25	32	10
U. Wash	23	22	24	28	33	13
Iowa State	32	49	47	46	51	23
Iowa	28	17	25	29	31	13
Texas A & M	15	17	18	20	39	10
Mich State	16	9	12	12	19	6
Penn	12	43*	19	28	24	12
Wash. Univ	-	-	-		-	
UC System	134	219	214	235	308	1,1
Oregon State	22	26	17	26	28	11
Northwestern	11	21	14	14	17	7
SUNY	5	23	18	33	36	11
Virginia	56*	21	12	21	16	12
Stanford	55*	67	142	140 - 142		57
	455	557	573	657	776	3,0

* 2 unusual blips

Duke	0	0	41	32	44
Cornell	41	45	43	27	56
MIT					
Harvard					

5/3/6[illegible]

PL 96-517 Survey

2. Admin

More	No change	some reduction	large Reduction
1	𝍸 |||	𝍸 |	1

- FTE change + reason

- X FTE	reduced admin	less 0.5 FTE [illegible]
-0.2	"	
+0.5	increase licensing	
X	industry interaction	
X	negligible red.	
-0.1	reduced admin	
0.5	" (SU)	

3. Licensing

1		Independent Foundation does licensing
𝍸 𝍸		None
+1.0	||	Caveat - reflects all industry interaction
+0.5	1	
+2	1	Little to do w 96-517
2	1	SU - "

4. Industry Research

	No	No opinion	Prob.	Definitely	Other
"reduced contam., affected ind-univ."	1	1	𝍸 𝍸 |	||	

- % change industry support over last 5 years.

From	To	From	To	From	To		
1%	4%	4	5	0.58	2.55	4.1	5.2
3.01	5.12	1 wash	8 *	>1	>2		
2.6	4.0	6 oregon state	10	"pos. trend"			

* not safety 96-517

5. Gov. Agency Exceptions

UC	6	GoCos	DOE
SU	1		DOE
ISU	1		DOE
Cornell	1		NSF

6. Gov. Research Labs

(a) Competitor for research?

(b) " industry?

probably	don't know	More perceived than real	Definite	Minor
1 a+b	~~IIII~~ II a+b	1 (a)	II (a) 1 (b)	1 (a)

Specifics: Texas A+M
Iowa State

"Funds reduced as agencies transfer $ thru each other"

7. Post PL96-517

now OK

UC DOD hasn't impl. A124, waiting for DAR Council

SUNY "Problems re ownership of TRP"

Va Agency attitude "universities getting free ride"
GoCos which are non-weapon-related should have A124

Duke Standardize reporting - DHHS reports too much

Cornell Invention reporting - particularly multiple gov support

Regarding File w/ this NOL.

April 25, 1984

To: AIPLA Members, University/Industry Relations Committee

From: J. Ralph King, Chairman

The meeting of our Committee in Boston for the spring AIPLA meeting is shaping up as one of the best we have had. Our program in the Committee meeting will center around patent policy statements. This alone makes coming to the AIPLA meeting very worthwhile. However, in addition to this, both luncheon speakers at the meeting are speaking on topics relating to University/ Industry Relations that you will not want to miss.

First, with regard to our Committee meeting, Thomas R. Boland, Esquire of Vorys, Sater, Seymour and Pease of Washington, D.C., has put together an outstanding program on University patent policies. Our meeting is scheduled for Thursday, May 10, 1984, at 8:00 A.M. in Salon C and will last to approximately 10:00 A.M.. We will have a short business meeting before the program, and we hope that each of you will be there early to share in the ongoing work of the Committee. This is the time when we can discuss concerns of the members in our area of responsibility and also raise new areas of interest that can be developed for the remainder of the year.

The panel participants for the patent policy program assembled by Tom is outstanding. The three speakers, in addition to Tom, bring a wealth of experience to the program from a standpoint of research dealing with patent policies, as well as first-hand experience in developing and implementing those policies. Marvin C. Guthrie, Esquire has recently returned to Boston to become Director, Office of Technology Administration at Massachusetts General Hospital; Arthur A. Smith, Esquire is General Counsel of the Office of Sponsored Programs of Massachusetts Institute of Technology and George M. Gould, Esquire is Associate General Counsel of Hoffman-Laroche, Inc..

The speakers will focus their attention on the major areas of concern in existing patent policy statements and present a comparative review of the policies of selected universities. Among the issues that will be addressed by the panel are how to

best control publishing to assure no loss of patent rights, the ownership of patent rights between university/industry/researchers; the importance of faculty contracts with industry and how to best control outside activities, the transfer of tangible research property, such as biological cell lines, computer software and other high tech material and the enforcement of patent policies once established including in joint venture relationships.

An outstanding feature of the committee meeting will be a compilation booklet that will be passed out to each member in attendance. The booklet will include exemplary patent policy statements from several universities and should provide a good working resource for use in establishing or modifying other existing policies and/or interpretation of policies.

At the luncheon on the same day beginning at 12:30 P.M., arrangements have been made through the committee for an outstanding scientist/entrepreneur to give the entire membership an insight into the trials and tribulations of an university researcher in starting up and successfully operating a high tech company. Dr. William Hazeltine is Chief of Cancer Pharmacology at the Dana Farber Cancer Institute in Boston and is an Assistant Professor at the Harvard Medical School. The talk promises to be not only informative but also entertaining.

At the luncheon on Friday, May 11, 1984, we are privileged to have Norman J. Latker, Esquire of the Office of Assistant Secretary for Productivity, Technology and Innovation, U.S. Department of Commerce, speak to the membership. Many of you remember Norm has met with our committee in the past and is probably the most knowledgeable person inside government with respect to government sponsored patent rights. Norm will speak to the membership on "Federal Initiatives for Innovation". I believe you will find this event to also be an outstanding one and extremely helpful to you in better understanding the constantly evolving incentives, rights and obligations under federally sponsored programs. Incidentally, our University/Industry Committee is planning a program for the October meeting in Washington on this very subject during which we hope to cover it in more depth.

I look forward to seeing each of you in Boston on May 10!

Respectfully submitted,

J. Ralph King

J. Ralph King, Chairman

FEDERAL INITIATIVES FOR INNOVATION

by
Norman J. Latker
Federal Technology Management Policy

before the

American Intellectual Property Law Association

Boston, MA
May 11, 1984

MR. LATKER: Thank you very much, Bill.

I would like to tell you one of my favorite stories. I think I have told this a number of times; so some of you who have heard this: It relates to the state of communication or it illustrates sometimes the state of communication in Washington.

It starts with a Texas Ranger tracking a suspected bandido, bank robber, crossing over the border. He finally corners the bandit outside a small town and finds that he can't communicate with him. He doesn't speak English. So he takes him into the town and seeks out the village wiseman, who can translate, and the conversation goes something like this:

Ranger: Ask him his name.

Wiseman: What is your name?

Bandit: My name is Jose.

Wiseman: He says his name is Jose.

Ranger: Ask him if he robbed the bank.

Wiseman: Did you rob the bank?

Bandit: Yes.

Wiseman: Jose says that he robbed the bank.

Ranger: Ask him where the money is.

Wiseman: Where is the money?

Bandit: I won't tell.

Wiseman: Jose says that he won't tell.

At that point the Ranger pulls out his gun and points it at Jose's head and says, You tell him if he doesn't tell me where the money is, I'm going to blow his head off.

Wiseman: He says he's going to blow your head off if you don't tell him where the money is.

Bandit: The money is in a well in the center of the town.

Wiseman: Jose says he's not afraid to die.

(Laughter).

Sometimes messages in Washington get about as garbled.

I appreciate being invited here. I think it gives me a useful opportunity. Commerce is trying to do what industry and the private sector people want done. Unfortunately, we haven't seen many taking advantage of the present atmosphere for change. That is not meant to be a criticism. Possibly our initiatives are identified as long-range. I am convinced that they are going to be beneficial to virtually everybody in the audience, but won't necessarily provide immediate solutions.

One of Commerce's primary missions is to remove barriers and create incentives for the movement of inventions through the innovation process - from idea to the marketplace.

This mission is a response to a worldwide explosion of new technologies - foreign microelectronics, biogenetics, robotics, new materials, information sciences. All are creating stiff competition for U. S. products. Ten years ago the U. S.,

with five percent of the world's population, generated 70 percent of the world's technology; currently, we generate 50 percent, and by 1990 probably will generate only 30 percent. This is despite our increasing R&D budget, both federal and private. The pie is larger, but the other 95 percent of the world is increasingly involved in dividing it up. We are losing ground in steel, automobiles, machine tools, drugs based on fermentation processes, and consumer electronics.

Part of this competition is based on the advent of targeted industry strategies, which has been pioneered by the Japanese and which others are copying. The strategy works by targeting a technology, concentrating participants, limiting imports, directing government procurement, and emphasing R&D investment in manufacturing improvements. Goods are then exported at anticipated rather than current cost. This results in an increased market share. Then benefits from the increased market share result in costs slipping below prices.

This kind of managed economy is similar to industrial policies that some, are suggesting in Washington. It has never been acceptable to our entrepreneurial society. The government picking winners and losers has not been either successful or popular in the United States.

So how do we respond to the kind of competition that we are going to be confronted with now and in the foreseeable future?

Commerce is proposing a number of initiatives to counter the growing loss of U. S. markets. None of the

initiatives involve intrusion into the private sector's decision making process.

First, we are encouraging private sector use of research and development limited partnerships (RDLPs) as a means of increasing risk capital availability for development of new technology. The incentive for RDLPs is created by tax law writeoffs. We think that our encouragement has resulted in an identifiable increase of RDLPs through the country.

Second, we are supporting relaxation of antitrust laws to permit a consortium of industry to collaborate on R&D projects. Even prior to passage of the antitrust law -- we see consortia like Microelectronics and Computer Corporation (MCC) starting up in Austin, Texas. There are others starting up to do research in welding, biotechnology, etc.

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confirmed by the Japanese complaint that S. 2171, the Dole Bill, which gives title to federally funded inventions to contractors, is an attempt to restrict their access to our technology (which basically it is).

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S. 2171 is intended to create an owner, whom the Japanese will have to deal with and receive a license from. At this time much of federally funded technology is freely available. In response, to initiatives like S. 2171 the Japanese are turning their energies to their own basic research capability so that they can tap new ideas from their own people, rather than relying on the results of our federally funded research.

It is apparent that the magnitude of the federal research investment demands that we create policies that will generate a better delivery of products and processes to the commercial marketplace.

Further, it is important to look at this area because conditions that attach to the ownership of the results of federally funded research can affect the rights to the results of a collaborative project which also involves private funding. Federal funds and its conditions have a way of seeping into the entire R&D spectrum.

Our primary goal in commercializing the results of federally funded research is protecting the inventing organization's ability to manage and benefit from its inventions. Publication alone will not create the incentive for risk development necessary to commercialize most federally originated

technology. This fact makes the right to maintain an exclusive market or transfer exclusive rights in the invention to another organization an important component of the ability to manage.

Given the inventor's better understanding of his own technology, this management should occur at the level of the organization closest to the inventor and the technology. We hold this view not only in regard to industry contractors, but also universities, and federal laboratories.

This kind of management capability is of fundamental importance, not only as an incentive to the originating organization's continued involvement in further development of technology, but also because without a clear right to manage, the results cannot be used as the nucleus of a research and development limited partnership. To the extent that a federal contractor or a federal laboratory is precluded in establishing an exclusive position in inventive results which they can manage and transfer, they cannot use a research and development partnership to attract the capital necessary to continue its development.

Second, absent this kind of management, a federal contractor could not be part of a consortium made possible by relaxed antitrust laws. I would ask this question: Representing a private organization that was considering involvement in a consortium, would you agree to join with a federal contractor who has a responsibility to report the results of the consortium research to the Federal Government for its disposition? I think not. The entire investment of the consortium would be at risk if

someone in the arrangement had a responsibility to the Federal Government that was inconsistent with the consortium's agreement on disposing of the results of its research.

Finally, absent a case-by-case determination in Washington, there is no way that a federal laboratory can join in an R&D project at a State R&D center which calls for a predetermination of invention rights.

In short, unnecessary conditions on management of the results of federally funded research adds a possible disincentive to its ultimate use.

We are recommending policies that will enable the different performers of federal R&D (federal laboratories and contractors, whether industrial or university) to dispose of the results of collaborative research between themselves or other supporters without further involving Washington in the process.

I think you already know that P. L. 96-517 gives small business and nonprofit institutions the right to title to inventions resulting from their performance of federally funded research. As in the last Congress, the Department of Commerce is supporting S. 2171, which amends P. L. 96-517 so that all contractors, regardless of size, will have the same rights without discriminatory conditions.

As I have already suggested, clear ownership of patent rights in many instances is the key incentive to obtaining the necessary risk capital to bring an idea into the marketplace. Under P. L. 96-517, with its new incentives -- we are already observing large increases in invention reporting from HHS,

Agriculture, and the National Science Foundation, which are the primary agencies supporting university-based and nonprofit research.

We are also seeing a nationwide explosion of industry/university collaboration, which we believe is based on the universities' new ability to guarantee rights in future inventions.

In the meantime, until additional legislation such as S. 2171 passes, the government-wide policy will be to give to the fullest extent allowed by law all government contractors and grantees ownership of inventions arising from performance of federally funded R&D, subject to an agency license to use for mission purposes. This policy is represented in the February 18, 1983 President's Memorandum on Government Patent Policy. The Memo is implemented by Part 27 of the Federal Acquisition Regulation, which was published on March 30, in the Federal Register. The Memo and the FAR supersede previous presidential memorandums, which basically provided for agency discretion to dispose of government funded inventions in any manner that they chose. In practice, this resulted in most instances in government ownership and a government patent portfolio of 28,000 patents, of which less than four percent have been licensed. As you can see, the President's statement and its implementation in Part 27 probably represent one of the more significant changes in the Federal Acquisition Regulation.

In addition to mandating contractor ownership, the Memo also authorizes the agencies to waive any of the rights retained

by the government or the obligations of the performer if the agency determines that this is in the public interest or the contract involves a substantial contribution by the contractor to the work undertaken. So, an agency could, for example, waive its license to use for mission purposes, its reporting requirements, the march-in rights, et cetera, under the circumstances spelled out in the President's statement. I would add that this provision is also found in S. 2171.

Further, Part 27 directs the agencies to protect the confidentiality of invention disclosures submitted to the government in accord with 35 U. S. C. 205. We are hoping that the agencies will use the wide discretion that is given to them under 35 U. S. C. 205 to avoid the problems that arise under the fourth exemption of the Freedom of Information Act.

Last, the Memo provides that the principle of contractor ownership is applicable to all statutory programs, including those that provide specifically that inventions be made available to the public. This part of the Memo is aimed at reversing government ownership interpretations some agencies, such as Interior, the Environmental Protection Agency, et cetera, had placed on the so-called Long Amendments which were added to a number of appropriations bills during the 1960s by Senator Long.

Laws such as the Space Act, the Atomic and Nonnuclear Energy Act, which clearly require government ownership, are not altered by the President's Memorandum. However, S. 2171 intends to repeal these statutes and bring the entire government under

the principle of the President's Memorandum, as well as mandating it into law.

Let me briefly tell you what is in S. 2171. In addition to the contractor ownership principle, S. 2171 provides a management system that is intended to create uniformity by assuring that implementation of contractor responsibilities and government rights aren't splintered by agency regulations.

Second, there is a section that repeals all conflicting statutes which -- I have already mentioned NASA and DOE. There are about 18 others.

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As part of these arrangements, the laboratory would be permitted to grant patent licenses or assign future or existing ownership rights in any laboratory invention in which the government has a right of ownership.

As an incentive for involvement of laboratory inventions and the laboratory in the arrangement we are recommending that the inventor and the laboratory be able to share in royalties obtained through the licensing or the assignment of laboratory inventions. That is in addition to whatever can be negotiated as cost-sharing in the arrangement.

We envision that the laboratory share of the royalties will be used to fund additional mission-related R&D at the laboratory. Thank you. (Applause)

FEDERAL INITIATIVES FOR INNOVATION

by
Norman J. Latker
Federal Technology Management Policy

before the

American Intellectual Property Law Association

Boston, MA
May 11, 1984

MR. LATKER: Thank you very much, Bill.

I would like to tell you one of my favorite stories. I think I have told this a number of times; so some of you who have heard this: It relates to the state of communication or it illustrates sometimes the state of communication in Washington.

It starts with a Texas Ranger tracking a suspected bandido, bank robber, crossing over the border. He finally corners the bandit outside a small town and finds that he can't communicate with him. He doesn't speak English. So he takes him into the town and seeks out the village wiseman, who can translate, and the conversation goes something like this:

Ranger: Ask him his name.

Wiseman: What is your name?

Bandit: My name is Jose.

Wiseman: He says his name is Jose.

Ranger: Ask him if he robbed the bank.

Wiseman: Did you rob the bank?

Bandit: Yes.

Wiseman: Jose says that he robbed the bank.

Ranger: Ask him where the money is.

Wiseman: Where is the money?

Bandit: I won't tell.

Wiseman: Jose says that he won't tell.

At that point the Ranger pulls out his gun and points it at Jose's head and says, You tell him if he doesn't tell me where the money is, I'm going to blow his head off.

Wiseman: He says he's going to blow your head off if you don't tell him where the money is.

Bandit: The money is in a well in the center of the town.

Wiseman: Jose says he's not afraid to die.

(Laughter).

Sometimes messages in Washington get about as garbled.

I appreciate being invited here. I think it gives me a useful opportunity. Commerce is trying to do what industry and the private sector people want done. Unfortunately, we haven't seen many taking advantage of the present atmosphere for change. That is not meant to be a criticism. Possibly our initiatives are identified as long-range. I am convinced that they are going to be beneficial to virtually everybody in the audience, but won't necessarily provide immediate solutions.

One of Commerce's primary missions is to remove barriers and create incentives for the movement of inventions through the innovation process - from idea to the marketplace.

This mission is a response to a worldwide explosion of new technologies - foreign microelectronics, biogenetics, robotics, new materials, information sciences. All are creating stiff competition for U. S. products. Ten years ago the U. S.,

with five percent of the world's population, generated 70 percent of the world's technology; currently, we generate 50 percent, and by 1990 probably will generate only 30 percent. This is despite our increasing R&D budget, both federal and private. The pie is larger, but the other 95 percent of the world is increasingly involved in dividing it up. We are losing ground in steel, automobiles, machine tools, drugs based on fermentation processes, and consumer electronics.

Part of this competition is based on the advent of targeted industry strategies, which has been pioneered by the Japanese and which others are copying. The strategy works by targeting a technology, concentrating participants, limiting imports, directing government procurement, and emphasing R&D investment in manufacturing improvements. Goods are then exported at anticipated rather than current cost. This results in an increased market share. Then benefits from the increased market share result in costs slipping below prices.

This kind of managed economy is similar to industrial policies that some, are suggesting in Washington. It has never been acceptable to our entrepreneurial society. The government picking winners and losers has not been either successful or popular in the United States.

So how do we respond to the kind of competition that we are going to be confronted with now and in the foreseeable future?

Commerce is proposing a number of initiatives to counter the growing loss of U. S. markets. None of the

initiatives involve intrusion into the private sector's decision making process.

First, we are encouraging private sector use of research and development limited partnerships (RDLPs) as a means of increasing risk capital availability for development of new technology. The incentive for RDLPs is created by tax law writeoffs. We think that our encouragement has resulted in an identifiable increase of RDLPs through the country.

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Remarks to the

Federal Laboratory Consortium

Clarence J. Brown

Deputy Secretary

U. S. Department of Commerce

Alexandria, Virginia
May 15, 1984

Reg.
File w/
Speeches

FEDERAL LABORATORY CONSORTIUM

MAY 15, 1984

IT IS CLEAR THAT WE ARE IN THE MIDST OF AN ECONOMIC TRANSITION WHICH WILL REQUIRE SEGMENTS OF OUR OLDER CAPITAL-INTENSIVE INDUSTRIES TO MAKE MAJOR ADJUSTMENTS. AT THE SAME TIME, HOWEVER, THIS TRANSITION BRINGS NEW JOBS, GROWTH, AND INCREASED PROFITS.

DEPENDING ON OUR NATIONAL REACTION, HOWEVER, THE OVERALL RESULT CAN BE POSITIVE. NEW INVENTIONS CREATE AN ARRAY OF NEW BUSINESSES. CLEARLY, THE FEDERAL GOVERNMENT'S CONTRIBUTION COULD BE SIGNIFICANT. IT FUNDS OR PERFORMS ABOUT HALF OF ALL SIGNIFICANT R&D DONE IN THE COUNTRY AND ABOUT 70 PERCENT OF THE BASIC RESEARCH. ITS LABORATORIES EMPLOY ABOUT 1/6 OF THE COUNTRY'S R&D WORKERS. IT IS EVIDENT, HOWEVER, THAT COMMERCIAL PRODUCTS AND PROCESSES ARE NOT COMING FROM THIS FUNDING IN QUANTITIES THAT SHOULD BE EXPECTED.

THE ECONOMIC RECOVERY AND OUR LONG-TERM WELL-BEING HEAVILY DEPEND UPON HIGH TECHNOLOGY INDUSTRIES. BUT AMERICAN LEADERSHIP IN WORLD TECHNOLOGY IS NOT NECESSARILY ASSURED EVEN THROUGH THE 1980s. OUR DOMINANCE ALREADY IS ERODING IN STEEL, AUTOMOBILES, MACHINE TOOLS, AND CONSUMER ELECTRONICS.

PART OF THE REASON FOR THIS EROSION IS THAT OTHER NATIONS ARE EXPANDING THEIR TECHNOLOGICAL ACTIVITIES. TEN YEARS AGO THE UNITED STATES, WITH FIVE PERCENT OF THE WORLD'S POPULATION, GENERATED ABOUT 70 PERCENT OF THE WORLD'S TECHNOLOGY. TODAY, WE GENERATE ABOUT 50 PERCENT OF IT, AND BY 1990 WE MAY ONLY BE CONTRIBUTING 30 PERCENT, DESPITE THE FACT THAT AMERICA WILL BE DOING MORE R&D EVERY YEAR. WHILE THE PIE IS GETTING LARGER, THE OTHER 95 PERCENT OF THE WORLD WILL HAVE A LARGER SHARE OF IT.

RATHER THAN ACCEPTING MASS EXIT FROM SOME INDUSTRIES OR RAISING TRADE BARRIERS, THERE IS A THIRD CHOICE. WE CAN CONSIDER REMOVAL OF BARRIERS WHICH DISCOURAGE EXPORTS OF OUR PRODUCTS AND SERVICES; WE CAN BETTER MOBILIZE OUR OWN RESOURCES AND CAPABILITIES; WE CAN REMOVE BARRIERS TO INCREASED PRODUCTIVITY AND INNOVATION; AND WE CAN PROVIDE INCENTIVES FOR JOINT TECHNOLOGICAL EFFORTS. MEETING THE COMPETITIVE CHALLENGE THIS WAY MAKES FAR MORE SENSE THAN ISOLATION OR PROTECTIONISM.

EVEN THOUGH THE FEDERAL GOVERNMENT MUST FUND THE R&D NECESSARY FOR OUR NATIONAL DEFENSE AND FOR BASIC, LONG-TERM, HIGH-RISK NONDEFENSE RESEARCH, WE BELIEVE THAT FEDERAL SUPPORT FOR R&D DEMONSTRATIONS AND COMMERCIAL DEVELOPMENT SHOULD CONTINUE TO BE REDUCED. IT IS THE PRIVATE SECTOR'S RESPONSIBILITY TO FUND THE COMMERCIALIZATION OF NEW PRODUCTS AND PROCESSES EVEN IF FIRST CREATED WITH GOVERNMENT FUNDING. THE GOVERNMENT'S ROLE IS TO CREATE AN ENVIRONMENT CONDUCIVE TO THE INTRODUCTION OF NEW INVENTIONS TO THE MARKETPLACE.

THE ADMINISTRATION IS MAKING PROGRESS IN CREATING THIS ENVIRONMENT AND IN THE COMMERCIALIZATION OF GOVERNMENT FUNDED INVENTIONS. SOME OF OUR COMMERCE DEPARTMENT STAFF WILL BE ADDRESSING THIS IN GREATER DETAIL LATER IN YOUR PROGRAM.

LET ME BE MORE SPECIFIC ABOUT THE SIZE AND COMMITMENT OF THE FEDERAL R&D EXPENDITURE AND ITS POSSIBLE APPLICATION TO THE COMMERCIAL MARKETPLACE. IN 1985, TOTAL FEDERAL FUNDING FOR RESEARCH AND DEVELOPMENT, INCLUDING R&D FACILITIES, IS ESTIMATED AT $53 BILLION, AN INCREASE OF $6 BILLION OR 14 PERCENT ABOVE 1984. THE SUPPORT FOR BASIC RESEARCH, INCLUDED WITHIN THIS TOTAL, WILL JUMP BY 10 PERCENT, FROM $7.2 BILLION IN 1984 TO $7.9 BILLION IN 1985.

THE ADMINISTRATION BELIEVES THAT WE SHOULD INCREASE THE FOLLOWING AREAS:

- o THE R&D PROGRAMS OF THE DEPARTMENT OF DEFENSE,

- o BASIC RESEARCH WITH PARTICULAR EMPHASIS IN THE NATIONAL SCIENCE FOUNDATION BUDGET ON PROGRAMS TO STRENGTHEN ENGINEERING RESEARCH AND TRAINING,

- o EFFORTS TO ENHANCE THE PRODUCTIVITY OF U.S. SCIENTISTS THROUGH BETTER ACCESS TO ADVANCED COMPUTERS IN THE NSF AND THE DEPARTMENT OF ENERGY.

AMONG THE GOALS WE AIM TO ACHIEVE ARE MANY AFFECTING THE FEDERAL LABS. THESE GOALS INCLUDE THE SUPPORT OF RESEARCHERS IN SCIENCE AND ENGINEERING TO ASSURE WE WILL HAVE A HIGH-QUALITY SCIENTIFIC WORKFORCE: UPGRADING OF SCIENTIFIC INSTRUMENTATION AT UNIVERSITIES TO ENHANCE ACADEMIC RESEARCH AND THE TRANING OF FUTURE SCIENTISTS AND ENGINEERS: AND, ENCOURAGE INTERACTION AMONG SCIENTISTS IN INDUSTRY, UNIVERSITIES AND GOVERNMENT IN ORDER TO ADDRESS OUR MOST CHALLENGING PROBLEMS.

THE 1982 FEDERAL LABORATORY DIRECTORY PROVIDED BY THE NATIONAL BUREAU OF STANDARDS IDENTIFIES 388 NATIONAL LABS WITH A TOTAL OF 221,885 STAFF SPENDING NEARLY $35 BILLION. CLEARLY, WITH A NATIONAL RESOURCE OF SUCH SIZE WE HAVE AN OBLIGATION TO FIND ITS USE IN THE CIVILIAN SECTOR.

AS I NOTED, THE ADMINISTRATION HAS MAINTAINED ITS EMPHASIS ON DEFENSE R&D, WHICH HAS RISEN FROM 47 PERCENT OF TOTAL FEDERAL R&D FUNDING IN 1980 TO 70 PERCENT IN 1985. DOD FUNDING OF BASIC RESEARCH WILL INCREASE 15 PERCENT, FROM $815 MILLION IN 1984 TO $939 MILLION IN 1985. DOD RANKED FIRST IN RELATION TO ALL FEDERAL AGENCIES ON EXPENDITURE IN 1984 IN THE FIELDS OF ENVIRONMENTAL SCIENCE, MATHEMATICS AND COMPUTER SCIENCES, AND ENGINEERING. IT WAS A CLOSE SECOND IN PHYSICAL SCIENCE AND PSYCHOLOGY, AND IS THIRD IN LIFE SCIENCES. WITH SUCH A LARGE PERCENT OF THE TOTAL R&D BUDGET, 66 PERCENT IN 1984, IT SHOULD NOT BE SURPRISING THAT IT OUTSPENDS OR IS A CLOSE SECOND IN MOST SCIENTIFIC DISCIPLINES. WHY CAN'T THE CIVILIAN SECTOR USE THE SAME CAPABILITIES, TECHNIQUES AND MUCH OF THE EQUIPMENT IF MODIFIED TO FIT THEIR NEEDS?

I KNOW THERE IS QUESTION ON THE APPLICABILITY OF DEFENSE R&D IN THE CIVILIAN SECTOR. BUT ARE TRANSFER MECHANISMS USEFUL ONLY TO GET NEW TECHNOLOGIES OUT OF CIVILIAN AGENCIES INTO THE PRIVATE SECTOR AND NOT FROM DOD?

THE DOD PORTION OF THE FY 1985 R&D BUDGET INCLUDES SUPPORT FOR BASIC RESEARCH, ADVANCED TECHNOLOGY DEVELOPMENT, STRATEGIC COMMUNICATION SATELLITE DEVELOPMENT, INTELLIGENCE AND COMMUNICATIONS PROGRAMS, AND A PROGRAM MANAGEMENT AND SUPPORT FUNCTION. RESULTS FROM THESE PROGRAMS SHOULD HAVE POTENTIAL FOR CIVILIAN APPLICATION. SOME OF THESE INNOVATIONS COULD BE DIRECTLY APPLICABLE TO THE PROBLEMS OF OUR OLDER CAPITAL-INTENSIVE INDUSTRIES WHICH NEED TO FIND NEW TECHNOLOGY TO REDUCE MANUFACTURING COSTS AND TO EXTEND THE CAPABILITY OF EXISTING SYSTEMS.

AN EXAMPLE OF THE IMPORTANCE OF FINDING WAYS TO TRANSFER DEFENSE RELATED R&D INTO CIVILIAN USE LIES IN EXPENDITURES ON EDUCATION IN GENERAL AND EDUCATIONAL TECHNOLOGIES MORE SPECIFICALLY. THE AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT HAS ALREADY IDENTIFIED THE IMPORTANCE OF MILLIONS SPENT ANNUALLY BY THE DOD ON EDUCATIONAL R&D. IF WE CAN TRAIN AND RETRAIN MEN TO BE MORE EFFECTIVE MILITARY MEN, CAN'T WE USE THE SAME DEVELOPMENTS TO TRAIN AND RETRAIN A WORKFORCE INCREASINGLY THREATENED BY OBSOLETE SKILLS IN AN AGE OF RAPIDLY CHANGING TECHNOLOGY IN THE WORKPLACE?

I JOIN WITH THE FLC MEMBERS IN THEIR DESIRE TO SEE MORE EFFECTIVE TRANSFER OF FEDERALLY FUNDED R&D RESULTS INTO THE CIVILIAN SECTOR.

WE WANT TO SPEED UP YOUR ABILITY TO RESPOND TO PUBLIC NEEDS. SO, COMMERCE IS RECOMMENDING CLARIFICATION OF EACH LABORATORY'S AUTHORITY TO ENTER INTO COOPERATIVE RESEARCH AND DEVELOPMENT ARRANGEMENTS, WHICH ARE CONSISTENT WITH THE LABORATORY'S MISSION WITH UNITS OF STATE OR LOCAL GOVERNMENT, AND WITH INDUSTRIAL ORGANIZATIONS AND UNIVERSITIES. THESE ARRANGEMENTS WILL PROVIDE FOR ACCEPTANCE OF FUNDS, SERVICES AND PROPERTY AS NEEDED FOR COMPLETION OF THE R&D PROGRAM. IN ADDITION, IN ORDER TO ENCOURAGE THESE ARRANGEMENTS, WE ARE RECOMMENDING THAT THE LABORATORY BE PERMITED TO GRANT PATENT LICENSES OR ASSIGN OWNERSHIP RIGHTS IN ANY LABORATORY INVENTION IN WHICH THE GOVERNMENT HAS A RIGHT, OR FUTURE RIGHT, OF OWNERSHIP AS A CONDITION OF ANY ARRANGEMENT. .

TO CREATE AN INCENTIVE FOR THE INVOLVEMENT OF LABORATORY INVENTORS AND MANAGEMENT, WE CONSIDER IT NECESSARY THAT THE INVENTOR AND THE LABORATORY BE ABLE TO SHARE IN ROYALTIES OBTAINED THROUGH THE LICENSING OR ASSIGNMENT OF THE LABROATORY INVENTIONS. WE ENVISION THAT THE LABORATORY SHARE OF ROYALTIES WILL BE USED TO FUND ADDITIONAL MISSION RELATED R&D AT THE LABORATORY.

PICKING UP ON THE EXPERIENCE OF NASA AND SEVERAL OF THE DOE LABS, WE HAVE JUST DECIDED TO ALLOW PROPRIETARY WORK TO BE CONDUCTED BY U.S. INDUSTRY ON THE NATIONAL BUREAU OF STANDARD SITE.

NBS HAS A NUMBER OF UNIQUE FACILITIES WHERE PROPRIETARY WORK MIGHT BE OF INTEREST TO THE PRIVATE SECTOR. AN EXAMPLE IN THE MATERIALS SCIENCE AREA IS THE NBS REACTOR WHICH WE PLAN TO EQUIP WITH A COLD NEUTRON SOURCE. WE WILL MAKE PORTS ON THE COLD NEUTRON SOURCE AVAILABLE TO PRIVATE FIRMS FOR PROPRIETARY WORK IN EXCHANGE FOR THEIR EQUIPPING THE PORTS AND MAKING ONE THIRD OF THE TIME AVAILABLE TO OTHER RESEARCHERS. OPPORTUNITIES WILL ALSO BE PROVIDED FOR OTHER FIRMS TO CONDUCT INDIVIDUAL PROPRIETARY EXPERIMENTS.

I WOULD LIKE TO SHARE SOME THOUGHTS WITH YOU ON IMPLEMENTING A POLICY OF ALLOWING PROPRIETARY RESEARCH AT A FEDERAL FACILITY. IN FACT I WOULD LIKE TO RECOMMEND THAT YOU CONSIDER A SIMILAR POLICY AT YOUR FACILITIES.

- FIRST OF ALL, IDEAS ARE MUCH MORE LIKELY TO BE EXPLOITED IN OUR SOCIETY IF THEY ARE PROPRIETARY. THE EXCLUSIVE OPPORTUNITY TO REAP THE PROFITS JUSTIFIES THE INVESTMENT THAT THE RISK TAKER MUST MAKE.

- FULL COST RECOVERY IS CRITICAL -- IF INDUSTRY IS TO EXPLOIT AND HOPEFULLY MAKE A PROFIT ON THEIR DISCOVERIES, THEY SHOULD PAY WHATEVER INCREMENTAL COSTS ARE ASSOCIATED WITH THEIR USE OF A FACILITY.

- ACCESS HAS TO BE FAIR -- THE AVAILABILITY OF FACILITIES AND THE TERMS AND CONDITIONS OF ACCESS HAVE TO BE KNOWN TO ALL -- WE PLAN TO PUBLISH THIS INFORMATION IN THE COMMERCE BUSINESS DAILY AND THE FEDERAL REGISTER.

- WE SHOULD NOT COMPETE WITH THE PRIVATE SECTOR OR UNIVERSITIES -- THE FACILITIES SHOULD NOT BE GENERALLY AVAILABLE FROM OTHER SOURCES.

- WE MUST NOT LEARN PROPRIETARY INFORMATION -- UNDER THE FREEDOM OF INFORMATION ACT A DISTRICT JUDGE, NOT THE AGENCY HEAD, IS THE FINAL WORD ON WHETHER OR NOT WE MUST DISCLOSE INFORMATION KNOWN TO US -- THE ONLY COMPLETE GURANTEE THAT WE WILL NOT DISCLOSE PROPRIETARY INFORMATION IS NOT TO LET THE INFORMATION BE DISCLOSED TO US IN THE FIRST PLACE.

- WE SHOULD PUT IT IN WRITING -- THE TERMS AND CONDITIONS WILL VARY NOT ONLY FOR EACH FACILITY BUT PROBABLY BY THE DIVERSE PROPOSALS THAT INDIVIDUAL FIRMS WILL MAKE TO US. WHATEVER AGREEMENTS ARE REACHED SHOULD BE WRITTEN DOWN AND UNDERSTOOD BY ALL BEFORE WORK COMMENCES.

THE POTENTIAL BENEFITS TO THE U.S. ECONOMY OF PROPRIETARY WORK AT FEDERAL FACILITIES ARE LARGE. I PLAN TO IMPLEMENT SIMILAR PROPRIETARY RESEARCH POLICIES IN THE OTHER COMMERCE LABS AND I THINK THAT THIS IS A POLICY THAT OTHER FEDERAL LABS SHOULD CONSIDER.

Reg'n'g File w/ Presentations NSL

STATEMENT OF
D. BRUCE MERRIFIELD
ASSISTANT SECRETARY OF COMMERCE
FOR PRODUCTIVITY, TECHNOLOGY AND INNOVATION
BEFORE THE EDUCATION SUBCOMMITTEE
OF THE
SENATE COMMITTEE ON LABOR AND HUMAN RESOURCES

JUNE 28, 1984

on

S. 2561 THE TRAINING TECHNOLOGY TRANSFER ACT

Mr. Chairman and Members of the Subcommittee, I am pleased to have this opportunity to express my views on S. 2561, the Training Technology Transfer Act. The retraining of displaced workers and the workforce in general is an activity of the utmost importance to the Nation. The transfer of educational training programs already developed by the Federal Government to the private sector and to State and local governments for use in workforce training programs is extremely important. We defer to the Education Department on the specifics of this proposal to establish a new office in that agency.

We support the intent behind this legislation to stimulate the production and use of advanced training technologies in the private sector. However, we do not support enactment of S. 2561 for a number of reasons. Our principal concern is over the proliferation of federal agencies and offices concerned with and engaged in the activities addressed by S. 2561. In addition to the Department of Commerce, the Departments of

Defense, Education and Labor, and the National Occupational Information Coordinating Committee (NOICC) are all active, both formally and informally, in this area.

With regard to some substantive issues raised by the bill, it is well to step back and look at training requirements in more general terms. This decade will see the restructuring of U.S. industry, caused by three fundamental forces of change. These forces are:

(1) The technology explosion that has generated something like 90 percent of everything we know in the sciences in the last 30 years, and which will double our technical knowledge base again in the next ten or fifteen years. As a result, the life cycle of products and processes will continue to be compressed (3 to 5 years now in electronics, and a maximum of 5 to 10 years in most other industries). Moreover, any set of skills can be rendered obsolete in this same period of time;

(2) The strategies being adopted by some foreign countries to dominate world markets. These strategies, which involve a purposeful attempt through direct government-industry collaboration, to capture market share for specific products on a global basis will intensify world competition;

(3) The emergence of resource-rich lesser developed countries, which have traditionally exported only their raw resources, but that are now installing (or purchasing) turnkey value-added plants to multiply returns on their scarce resources and to capture market share in many basic industries.

These forces pose significant competitive challenges to both our more mature industries and our growing high technology industries. The rapid pace of technological change and foreign competition may well displace large numbers of our employees. Estimates range from half a million to a million workers per year or more. Also, the skill requirements of many remaining jobs will continue to change, and at a faster pace. Thus, the perennial problem of the mismatch of worker skills with the available employment opportunities is likely to continue. In today's world market, a skilled workforce is crucial to maintaining competitive industries.

We must recognize that the training and retraining of the workforce needs continuous and systematic attention, particularly for workers who are displaced through no fault of their own.

Recent experience has shown that advanced educational technology, which includes computer based instructional

programs, interactive video disc systems, computer programs for micro-computer training devices and audio-visual devices, and programmed learning kits, can increase productivity substantially. For example, the use of the computer-based teaching system called PLATO is reported to increase the rate of learning by 30% over traditional teaching methods. The application of advanced educational technology can sharply increase teaching productivity in terms of both shortened student learning time and greater retention levels.

Because of the preliminary successes of educational technology, the Department of Commerce initiated a taskforce on it, with membership from several federal agencies. The taskforce found, first, that there exists a conservatively estimated $2 billion immediate market for educational technology with a much greater future sales potential, and, second, that the market is highly fragmented because it is still in its infancy. Further, channels of communication among suppliers and users of educational technology do not exist to any great degree. The Department of Commerce is pursuing ways and means to bridge the communication gap between suppliers and users. We expect that the normal development of markets will help to close this gap.

In addition to the market problem, this Administration is concerned about the adequacy of incentives for the private sector to commercialize newly developed educational technology. Any legislation to foster the transfer of such technology should address this issue. Unfortunately, S. 2561 appears to be based on the assumption that private contractors will not be allowed to own patents, copyrights, or technical data that apply to the training technology they develop under its provisions. This runs counter to the Administration's efforts to permit private sector innovators to own the technology they develop under Federal contract.

The policy of allowing contractor ownership of the fruits of Government-sponsored research and development is a major response of this Adminstration to the need for generating incentives to promote technology development in all fields. The Federal agencies were instructed to carry out this policy, to the extent permitted by law, in the President's February 18, 1983 Memorandum on Government Patent Policy. Further, contractors ordinarily are permitted by Federal agencies to own, subject to a license in the government, technical data generated in the performance of Federally funded research. This policy is implemented by the standard rights in data provisions attached to the contracts.

Accordingly, Mr. Chairman, although we support the intent of S. 2561, we consider it inconsistent with the Administration's technology transfer policies and with its desire to streamline and simplify the Federal government.

I will be happy to answer questions, Mr. Chairman.

06-03J02

October 2, 1984, 3:00 P.M.

SPEECH OF CLARENCE BROWN BEFORE THE LICENSING EXECUTIVES SOCITEY
WEST PALM BEACH, FLORIDA
OCTOBER 8, 1984

I appreciate the chance to meet with you after that good lunch, and discuss a few points of mutual interest to industry and Government. It seems like a different world down here, from the Washington of last week--the final week of the congressional term and less than five weeks before the election. Surely you will understand that in keeping with the season, some of my remarks may contain a trace of politics.

With your indulgence, I would like begin this talk with the Licensing Executive Society by exercising a little executive license. For a few minutes, let's have a candid discussion of how to get what I think you want and what the economy needs.

The Department of Commerce is committed to improving the patent laws and the way the Government manages the inventions it pays for. In a few minutes, I'll tell you what we have been up to this past session. But first, in both my present capacity and as a former Congressman, I have to tell you that obtaining good legislation in this field is not easy. Very important, but not easy.

"Intellectual property" has a doubly snobbish or elitist sound to it. Few people will ever share your understanding of how important it is to our daily lives. It just is not the sort of thing that legislators can point to with pride and expect to

bring in many votes. We face a similar problem in the executive branch.

So let me begin by pointing out that if good new legislation is ever to be passed, those of you who have a direct interest will have to help get it. You will have to come forward and explain, in relatively simple but persuasive language, to us and to Congress what you need. My Department has some pretty smart people in this field, but even those with business backgrounds cannot have a current business perspective.

Let me give you a concrete example of what is on my mind. In this past Congress, we tried to extend the present Government funded invention ownership rights of small business and nonprofit organizations to all R&D contractors. In the Senate, where the chances seemed the best, the bill was S. 2171. The bill also included a number of provisions for small businesses and nonprofit organizations. The Department of Commerce even had a stake in it. We all supported it.

Unfortunately, a Senator from my own industrial state of Ohio, but of the other party I hasten to add, was not able to see the essential wisdom behind the large business provisions. To make a long story short, he insisted that these provisions be removed. And so they were in order to move the bill out of committee. On the House side, there was resistance to these same provisions and the bill never did clear the full committee.

This says there is a story that has to be told simply and emphatically. If a business is going to invest and run risks to

develop new products based on the results of Federal research, the business must have the protection and incentives envisioned by the framers of the Constitution. The story also has to be told that at present, the Federal Government funds about half of the research and development and about seventy percent of all the basic research done in the country. In an era when the world economy is changing so fast, and new technologies are a prime cause of the change, the United States must make use of its Government funded technology as never before.

Ladies and gentlemen, this tale has not yet been told well enough. Commerce has tried and will continue to try, but we can't carry all the freight. We are partisans, not constituents.

In light of my Department's continuing pressure, the historic Department of Defense contractor ownership polices, and the President's Memorandum, some of you may ask whether your companies really need to spend chips in this area. It is a good question.

The best answer I can give you is that the innovation process takes a long time. Agreements made one year can be vital to the profitability of a venture many years later. As long as the Government continues to allocate invention rights through a mix of laws, an Executive Order, a Presidential Memorandum, Government-wide procurement regulations that some agencies can ignore, OMB grant regulations, GSA licensing regulations, and individual agency practices, there cannot be the consistency needed to do business in a business-like manner.

I guess this is an illustration of why the common phrase is a "business-like manner", not a "Government-like manner". Because with the present Government-like mix, you have little basis for predicting how future business will be conducted. There is not even assurance that agreements will stand as people come and go. The ancient Romans figured out that the only way bring order to property rights confusion is through clear laws. If predictability is of value to you, then that is why you should spend the chips.

My tale is not all gloom. We have had some success in the Congress just passed. As of Friday,----

(NOTE, TO BE COMPLETED ON FRIDAY WITH WHATEVER INFORMATION IS AVAILABLE FROM THE HILL ABOUT FEDERALLY-FUNDED INVENTION LEGISLATION.)

We also have some important assurances that Congress will include the management of inventions produced by the federal-operated laboratories in next year's legislative calander. I presented testimony on this before the Joint Economic Committee a few months ago, and have a personal interest in the problem. It should be important to you. We are striving to obtain the same sorts of authorities, incentives, and management capabilities in the Federal laboratories that the universities have developed as a result of P.L. 96-517. When these are in place, the doors to business/university/Federal laboratory collaboration will be open as they never have been before.

This will be an important advance. Many of the labs tend to

be equipment rich and equipment poor, while universities tend to be the opposite. Neither make products, so the results of their combined efforts will have to be used by industry before the public can benefit. From your standpoint, these collaborative efforts can provide your companies with an opportunity to paticipate in developing some of the most advanced technology in the world.

On other patent fronts, this Congress has given us: (NOTE--TO BE COMPLETED BY PTO)

All in all, from our standpoint, this is a pretty good record. But you are probably not satisfied and neither are we. I can assure you that the Department of Commerce will continue to work for the type of uniform Government patent policy that the country needs. But if you remember anything of what I have said, please remenber that Commerce can't do it alone. You, your companies, and the state and local governments where your companies do business represent the consitituents. You have to carry to carry the message too.

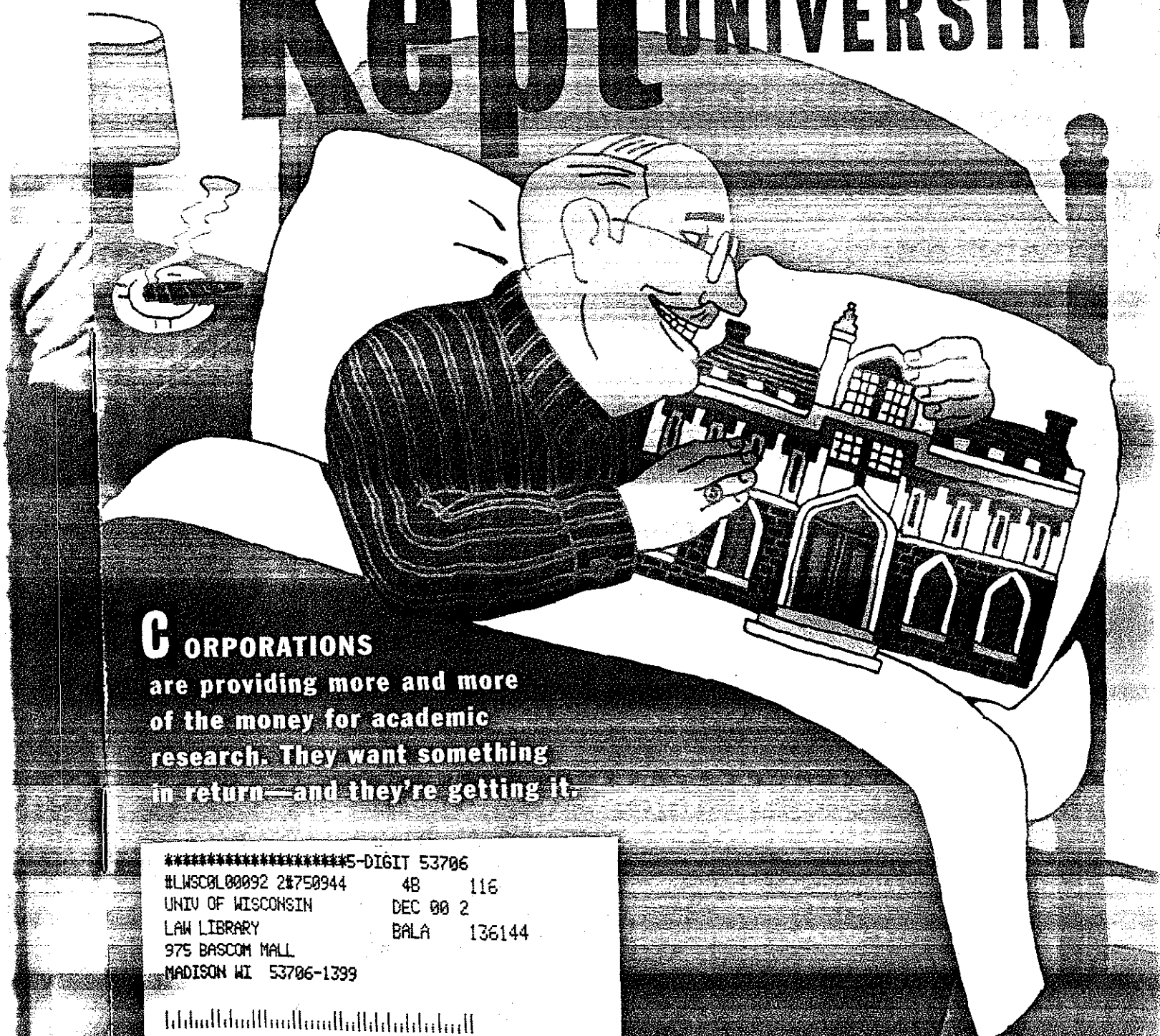
For: Part II

TRAVEL: AUSTRALIA IN MINIATURE / NEW FICTION BY TOVA REICH

The Atlantic Monthly

MARCH 2000

THE Kept UNIVERSITY



CORPORATIONS are providing more and more of the money for academic research. They want something in return—and they're getting it.

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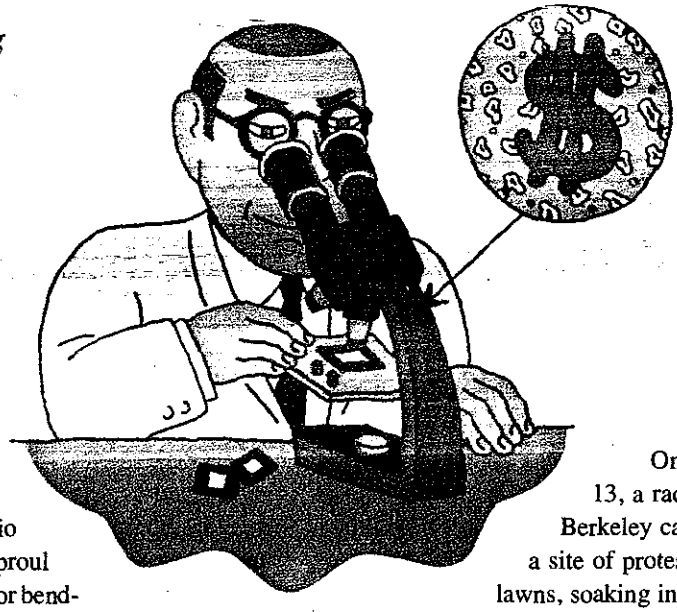
THE Kept UNIVERSITY

by EYAL PRESS and JENNIFER WASHBURN

Commercially sponsored research is putting at risk the paramount value of higher education—disinterested inquiry. Even more alarming, the authors argue, universities themselves are behaving more and more like for-profit companies



IN the fall of 1964 a twenty-one-year-old Berkeley undergraduate named Mario Savio climbed the steps of Sproul Hall and denounced his university for bending over backwards to "serve the need of American industry." Savio, the leader of the Berkeley Free Speech Movement, accused the university of functioning as "a factory that turns out a certain product needed by industry" rather than serving as the conscience and a critic of society. To the modern ear this sixties rhetoric may sound outdated. To many people in the academic world, however, Savio's words ring truer today than ever. Although our national conversation about higher education remains focused on issues of diversity and affirmative action, nothing provoked more debate on many college campuses last year than the growing ties between universities and business—and nowhere was the debate livelier than at Berkeley.

On the afternoon of April 13, a radiant day last spring, the Berkeley campus hardly looked like a site of protest. Students lay on green lawns, soaking in the sunshine. But inside Room 60 of Evans Hall, a concrete building on the northern edge of campus, the lights were dim and the atmosphere tense. There two dozen faculty members, many of them professors in the College of Natural Resources, had gathered to present the disquieting results of a newly released faculty survey.

The focus of the survey was a controversial agreement that Berkeley had signed in November of 1998 with Novartis, a Swiss pharmaceutical giant and producer of genetically engineered crops. Under the terms of the agreement Novartis will give Berkeley $25 million to fund basic research in the Department of Plant and Microbial Biology, one of four departments within the CNR.

Illustrations by Seymour Chwast

In exchange for the $25 million, Berkeley grants Novartis first right to negotiate licenses on roughly a third of the department's discoveries—including the results of research funded by state and federal sources as well as by Novartis. It also grants the company unprecedented representation—two of five seats—on the department's research committee, which determines how the money is spent.

That the university had the backing of a private company was hardly unusual. That a single corporation would be providing one third of the research budget of an entire department at a public university had sparked an uproar. Shortly after the agreement was signed, a newly formed graduate-student group, Students for Responsible Research, circulated a petition blasting the Novartis deal for standing "in direct conflict with our mission as a public university." *The Daily Californian*, Berkeley's student newspaper, published a five-part series on the growing privatization of the university, and a coalition of public-interest groups sent a letter to Berkeley's chancellor, Robert Berdahl, charging that the alliance "would disqualify a leading intellectual center from the ranks of institutions able to provide the kind of research—free from vested interest" that is the hallmark of academic life. Meanwhile, the College of Natural Resources, headed by Dean Gordon Rausser, sent a message to all professors urging them not to speak to the press and to direct any questions to the university's public-relations office. Many viewed this as a hush order.



Corporations not only sponsor a growing amount of research—they frequently dictate the terms under which it is conducted. Professors often own stock in companies that fund their work. And universities exhibit a markedly more commercial bent.

"We are here to discuss the position of the faculty," Ignacio Chapela, a professor of microbial ecology, announced as the April 13 meeting began. Chapela, who was then the chairman of the college's executive committee, a faculty governing body, snapped on an overhead projector to display the results of the survey, and declared that the Novartis deal had left the CNR "deeply divided." While 41 percent of the faculty respondents supported the Novartis agreement as signed, more than 50 percent believed that it would have a "negative" or "strongly negative" effect on academic freedom. Roughly half believed that the agreement would erode Berkeley's commitment to "public good research," and 60 percent feared that it would impede the free exchange of ideas among scientists within the college—one of Chapela's chief concerns.

"When I came to Berkeley," Chapela explained to us after the meeting, "the people who brought me here and who were my closest colleagues were largely in the Department of Plant and Microbial Biology. Now I know that anything I say to these people can be turned around and handed over to Novartis. So I just can't talk to them anymore. If I have a good idea, I'm not going to just give it away." Chapela, like many critics of the deal, is hardly a confirmed opponent of university-industry relations. Before coming to Berkeley, he told us, he spent three years in Switzerland working for none other than Novartis—then named Sandoz—and he continues to have a relationship with the company. "I'm not opposed to individual professors' serving as consultants to industry," he said. "If something goes wrong, it's their reputation that's at stake. But this is different. This deal institutionalizes the university's relationship with one company, whose interest is profit. Our role should be to serve the public good."

THE ACADEMIC-INDUSTRIAL COMPLEX

GORDON Rausser, the chief architect of the Novartis deal, believes that faculty concerns about the alliance reflect ignorance about both the Novartis deal and the changing economic realities of higher education. When we met with Rausser last year, in his spacious office in the ornate neoclassical Giannini Hall, he insisted that the deal, far from violating Berkeley's public mission, would help to perpetuate the university's status as a top-flight research institution. An economist who served on the President's Council of Economic Advisors in the 1980s and now operates a sideline consulting business, Rausser contends that Berkeley's value is "enhanced, not diminished, when we work creatively in collaboration with other institutions, including private companies." In a recent article in the Berkeley alumni magazine Rausser argues, "Without modern laboratory facilities and access to commercially developed proprietary databases . . . we can neither provide first-rate graduate education nor perform the fundamental research that is part of the University's mission."

Rausser's view is more and more the norm, as academic administrators throughout the country turn to the private sector for an increasing percentage of their research dollars, in part because public support for education has been dropping. Although the federal government still supplies most of the funding for academic research (it provided $14.3 billion, or 60 percent, in 1997, the latest year for which figures are available), the rate of growth in federal support has fallen steadily over the past twelve years, as the cost of doing research, particularly in the cutting-edge fields of computer engineering and molecular biology, has risen sharply. State spending has also declined. Berkeley Chancellor Robert Berdahl says that

California now supplies just 34 percent of Berkeley's overall budget, as compared with 50 percent twelve years ago, and he claims that other state universities have suffered similar cuts.

Meanwhile, corporate giving is on the rise, growing from $850 million in 1985 to $4.25 billion less than a decade later—and increasingly the money comes with strings attached. One marked trend is a boom in industry-endowed chairs. Kmart has endowed a chair in the management school at West Virginia University which requires its holder to spend up to thirty days a year training assistant store managers. Freeport McMoRan, a mining company embroiled in allegations of environmental misconduct in Indonesia, has created a chair in environmental studies at Tulane. In its series on privatization at Berkeley, *The Daily Californian* noted that buildings throughout the Haas School of Business were "plastered with corporate logos." One major contributor to the school is Don Fisher, the owner of The Gap, whose company also happens to be featured as a case study in an introductory business-administration course. Laura D'Andrea Tyson, formerly one of President Clinton's top economic advisers, is now officially known as the BankAmerica Dean of Haas.

In rushing to forge alliances with industry, universities are not just responding to economic necessity—they are also capitalizing on a change in federal law, implemented nearly two decades ago, that laid the foundation for today's academic-industrial complex. In 1980 concerns about declining U.S. productivity and rising competition from Japan propelled Congress to pass the Bayh-Dole Act, which for the first time allowed universities to patent the results of federally funded research. The goal of the legislation was to bring ideas out of the ivory tower and into the marketplace, by offering universities the opportunity to license campus-based inventions to U.S. companies, earning royalties in return. Both the government and the business world saw universities not merely as centers of learning and basic research but as sources of commercially valuable ideas, which is why the Business–Higher Education Forum, a coalition of corporate and academic leaders, and similar groups lobbied to tear down the walls separating universities from the marketplace. In the years since, Congress has passed numerous other laws to bolster university-industry ties, including generous tax breaks for corporations willing to invest in academic research.

The Bayh-Dole Act was from the beginning controversial. Some in Congress argued that granting private companies the rights to publicly funded research amounted to an enormous giveaway to corporations; others pronounced the act a visionary example of industrial policy that would help America compete in the fast-moving information age. What is undeniable is that Bayh-Dole has revolutionized university-industry relations. From 1980 to 1998 industry funding for academic research expanded at an annual rate of 8.1 percent, reaching $1.9 billion in 1997—nearly eight times the level of twenty years ago. Before Bayh-Dole, universities produced roughly 250 patents a year (many of which were never commercialized); in fiscal year 1998, however, universities generated more than 4,800 patent applications. University-industry collaborations, Rausser argues, have brought important new products—anti-AIDS treatments, cancer drugs—to market, and have spurred America's booming biotech and computing industries. "The University of California alone has issued over five hundred patents since Bayh-Dole," Rausser says.

This is a powerful argument, but a troubling one. In an age when ideas are central to the economy, universities will inevitably play a role in fostering growth. But should we allow commercial forces to determine the university's educational mission and academic ideals? In higher education today corporations not only sponsor a growing amount of research—they frequently dictate the terms under which it is conducted. Professors, their image as unbiased truth-seekers notwithstanding, often own stock in the companies that fund their work. And universities themselves are exhibiting a markedly more commercial bent. Most now operate technology-licensing offices to manage their patent portfolios, often guarding their intellectual property as aggressively as any business would. Schools with limited budgets are pouring money into commercially oriented fields of research, while downsizing humanities departments and curbing expenditures on teaching. Occasional reports on these developments, including a recent *60 Minutes* segment on corporate-sponsored research, have begun to surface beyond the university. But the larger picture has yet to be filled out. It is this: universities, once wary beneficiaries of corporate largesse, have become eager co-capitalists, embracing market values as never before.

SECRECY AND SCIENCE

In a classic paper published in 1942, the sociologist Robert K. Merton likened the culture of science more to the ideals of communism than to capitalism, because intellectual property was commonly shared and discoveries were freely exchanged. "The scientist's claim to 'his' intellectual 'property,'" Merton wrote, was "limited to that of recognition and esteem," and scientific knowledge was assumed to be a public good.

Today scientists who perform industry-sponsored research routinely sign agreements requiring them to keep both the methods and the results of their work secret for a certain period of time. From a company's point of view, confidentiality may be necessary to prevent potential competitors from pilfering ideas. But what constitutes a reasonable period of secrecy? The National Institutes of Health recommends that universities allow corporate sponsors to prohibit publication for no more than one or two months (the amount of time ordinarily necessary to apply for a patent), but lengthier delays are becoming standard. Berkeley's contract with Novartis, for example, allows the company to postpone publication for up to four months. A survey of 210 life-science companies, conducted in 1994 by researchers at Massachusetts General Hospital, found that 58 percent of those sponsoring academic research

require delays of more than six months before publication.

"One of the most basic tenets of science is that we share information in an open way," says Steven Rosenberg, of the National Cancer Institute, who is among the country's leading cancer researchers. "As biotech and pharmaceutical companies have become more involved in funding research, there's been a shift toward confidentiality that is severely inhibiting the interchange of information." A few years ago Rosenberg confronted this problem firsthand when he tried to obtain information on safe-dosage levels for a reagent he sought to use in a clinical trial involving an experimental cancer treatment. The company asked Rosenberg to sign a confidentiality agreement, and when he refused, they withheld the information. Rosenberg has become so alarmed about secrecy that he now urges all scientists and research institutions to reject confidentiality restrictions on principle. Few have heeded his call. A 1997 survey of 2,167 university scientists, which appeared in the *Journal of the American Medical Association*, revealed that nearly one in five had delayed publication for more than six months to protect proprietary information—and this was the number that *admitted* to delay. "The ethics of business and the ethics of science do not mix well," Rosenberg says. "This is the real dark side of science."

Nelson Kiang, a professor emeritus at the Massachusetts Institute of Technology and at Harvard, who recently organized an MIT conference on "Secrecy in Science," worries in particular that students, rather than learning proper scientific protocol, are being taught to accept the inhibiting power of money over science. "One hears of many students at MIT who complain about not being able to publish their theses in a timely fashion," Kiang says, "but when we tried to involve them in the conference, not a single one would come forward, and they actually asked us specifically not to be named. Of course, it's not surprising. They fear that if they come forward, they might get into trouble with their supervisors."

Worse than the problems of enforced secrecy and delay, however, is the possibility that behind closed doors some corporate sponsors are manipulating manuscripts before publication to serve their commercial interests. In the summer of 1996 four researchers working on a study of calcium channel blockers—frequently prescribed for high blood pressure—quit in protest after their sponsor, Sandoz, removed passages from a draft manuscript highlighting the drugs' potential dangers, which include stroke and heart failure. The researchers aired their concerns in a letter to the *Journal of the American Medical Association*: "We believed that the sponsor . . . was attempting to wield undue influence on the nature of the final paper. This effort was so oppressive that we felt it inhibited academic freedom." Such meddling, though generally difficult to document, may well be common. A study of major research centers in the field of engineering found that 35 percent would allow corporate sponsors to delete information from papers prior to publication.

This past May, at a meeting of the American Association of University Professors, in Boston, a group of academics gathered to discuss the growing corporate threat to academic freedom—and the apparent reluctance of universities to defend it. Among those present was David Kern, formerly the director of occupational medicine at Brown University's Memorial Hospital. In 1996, while serving as a consultant to Microfibres, a Rhode Island company that produces nylon flock, Kern discovered evidence of a serious new lung disease among the company's employees. Upon learning that he planned to publish his findings, the company threatened to sue, citing a confidentiality agreement that forbade Kern to expose "trade secrets." The information that Kern had gathered had come from tests on volunteers, and concerned not proprietary secrets but a serious threat to public health. Yet Brown University, too, tried to dissuade Kern from publishing, warning that the company might file suit. Outraged, Kern published anyway, and in 1997 the Centers for Disease Control officially recognized the new disease, flock worker's lung. Although Microfibres never did file suit, Kern's position at Brown was eliminated. "Universities should protect their faculty from any efforts to encroach on academic freedom," Kern says. "Unfortunately, with so much corporate money flooding into academia, that's not happening." At the AAUP conference several professors shared similar experiences, and these may only hint at the scope of the problem.

Mildred Cho, a senior research scholar at Stanford's Center for Biomedical Ethics, warns that for every David Kern who steps forward in such cases, an unknown number of researchers voluntarily toe the company line. "When you have so many scientists on boards of companies or doing sponsored research," Cho explains, "you start to wonder, How are these studies being designed? What kinds of research questions are being raised? What kinds aren't being raised?" In a 1996 study published in the *Annals of Internal Medicine*, Cho found that 98 percent of papers based on industry-sponsored research reflected favorably on the drugs being examined, as compared with 79 percent of papers based on research not funded by industry. More recently, an analysis published in the *Journal of the American Medical Association* found that studies of cancer drugs funded by pharmaceutical companies were roughly one eighth as likely to reach unfavorable conclusions as nonprofit-funded studies. Might the public begin to see academics less as stewards of truth than as hired hands?

Or worse than hired hands: interested parties. More and more, professors not only accept industry grants to perform research but also hold stock or have other financial ties to the companies funding them. In a study of 800 scientific papers published in a range of academic journals, Sheldon Krimsky, a professor of public policy at Tufts University and a leading authority on conflicts of interest, found that slightly more than *a third* of the authors had a significant financial interest in their reports. Michael McCarthy, an editor at the British medical journal *The Lancet*, says such links are now so common that he "often can't find anyone who doesn't have a financial

interest" in a drug or therapy the journal would like to review. Although Krimsky doesn't believe that the mere existence of such ties makes an academic study suspect, he advocates full disclosure. Yet in none of the nearly 300 studies in which Krimsky found a conflict of interest were readers informed about it.

The Securities and Exchange Commission has also detected this trend and is now investigating numerous academic researchers suspected of engaging in insider trading. In a case filed recently in Pennsylvania, the SEC charged Dale J. Lange, a Columbia University neurologist, with pocketing $26,000 in profits after Lange bought stock in a company that was about to release promising new findings concerning a drug to treat Lou Gehrig's disease. Lange expected the stock to soar because he had conducted the confidential clinical trials.

The growing concern about potential conflicts of interest has prompted some universities to forbid professors to perform sponsored research for companies in which they hold equity. The federal government is also taking steps. In 1996 the Public Health Service issued guidelines that require all academic researchers to report it to their schools if they have received payments of more than $10,000 from a company or if they hold at least five percent of its stock. At most universities, however, such information is kept private, which means that frequently neither journal editors nor academic peers know who has ties to industry and who hasn't.

More than a year before fen-phen, the appetite suppressant, was pulled off the market because it seemed to be implicated in a number of deaths, a group of researchers published a study in *The New England Journal of Medicine* warning that drugs like fen-phen could have potentially fatal side effects. But the same issue contained a commentary from two academic researchers that downplayed the health dangers of fen-phen. Both authors had served as paid consultants to the manufacturers and distributors of similar drugs—connections that were not mentioned. "I was outraged when I saw that," Stuart Rich, a professor at Rush Medical College, told the *Chronicle of Higher Education* when the ties were exposed. "The study was the only scientific study that said these diet pills kill people." Like universities, some journals have begun requiring academic contributors to disclose corporate financial ties. But in a study released last year Sheldon Krimsky and another researcher examined 62,000 articles and found that these ties were disclosed in only 0.5 percent of them.

Corporate underwriting of research is by no means confined to the medical sciences. In his book *The Heat Is On: The High Stakes Battle Over Earth's Threatened Climate* (1997), Ross Gelbspan documents how, over the past several years, fossil-fuel companies have bankrolled numerous academic studies that downplay the threat of global warming—distorting, Gelbspan argues, the public-policy debate. And last June controversy erupted at the University of Florida following the disclosure that Charles Thomas, a criminologist at the school who advised the state on prison policy, had pocketed $3 million in consulting fees from the private-prison industry, in which he also owned stock. (Thomas's views on private prisons are quoted frequently in *The Wall Street Journal* and *The New York Times*, and he has trumpeted the virtues of "full-scale privatization" in testimony before Congress.) "I'm really kind of astounded that the state university system would tolerate something like this," said a member of the state ethics commission, which slapped Thomas with a $20,000 fine.

SOME would argue that such relationships, far from being unseemly, are in keeping with the utilitarian strain that runs through the history of American higher education. Certainly, in comparison with their European counterparts, U.S. universities have always displayed a pragmatic bent. Whereas in Europe universities took pride in pursuing knowledge for its own sake and in remaining aloof from the outside world, in America educators from Thomas Jefferson to John Dewey have argued that universities ought to be engaged in the world, and that knowledge exists to be put to use. When Congress passed the Morrill Act, in 1862 (which gave rise to America's public land-grant universities, including Berkeley), it specifically instructed the states to establish schools that would teach "agriculture and the mechanical arts . . . in order to promote the liberal and practical education of the industrial classes," rather than the classical curriculum.



Traditionally, universities regarded proprietary claims as fundamentally at odds with their obligation to disseminate knowledge as broadly as possible. Today nearly every research university in the country has a technology-licensing office, and some have gone further.

Thus it is hardly surprising that, as the historian David Noble documents in his book *America by Design* (1977), the rapid growth of the U.S. industrial economy at the turn of the century coincided with a surge in university-industry collaboration. Engineering and chemical giants underwrote research in exchange for the services of academic scientists; universities established industrial-research centers to furnish corporations with personnel; some schools even went into business themselves, with the University of Minnesota operating its own mine and New York University running a macaroni factory. Such entanglements inspired the radical economist Thorstein Veblen to comment acerbically in 1908 that "business principles" were transforming higher education into "a

merchantable commodity, to be produced on a piece-rate plan, rated, bought, and sold by standard units, measured, counted and reduced to staple equivalence by impersonal, mechanical tests."

World War II, however, ushered in an era of public support for higher education. The role of university scientists in the Manhattan Project and other wartime initiatives—such as the development of penicillin and streptomycin—convinced public officials that academics were uniquely capable of undertaking crucial research initiatives. As corporations slowed their funding of academic research, public money filled the role: from 1953 to 1968 public support grew by 12 to 14 percent annually. Whereas funding for scientific research from all sources totaled $31 million in 1940, federal funding alone reached $3 billion in 1979, much of it dispensed by the National Institutes of Health and other new agencies. This influx of federal dollars reflected a growing appreciation for the basic, undirected research that universities perform. "New products and new processes do not appear full-grown," Vannevar Bush, President Franklin Roosevelt's chief science adviser, declared in 1944. "They are founded on new principles and new conceptions, which in turn are painstakingly developed by research in the purest realms of science."

The Bayh-Dole Act changed this, and not simply by creating incentives for corporations to invest in academic research. What is ultimately most striking about today's academic-industrial complex is not that large amounts of private capital are flowing into universities. It is that universities themselves are beginning to look and behave like for-profit companies.

THE UNIVERSITY AS BUSINESS

THE Office of Technology Licensing at Stanford University occupies the third floor of a drab concrete building located just off the main loop that circles the palm-studded Palo Alto campus. This unprepossessing spot is the hub of a commercial enterprise that is the envy of universities across the country. The OTL's mission is to commercialize discoveries made by professors and to manage Stanford's growing patent portfolio. In the main lobby, encased in handsome wooden frames along the walls, are displays highlighting the various patents and products the office has recently helped bring to market. One describes a valve that creates high-resolution images on the surface of a silicon chip, another a new case-management system for heart failure that the university is hoping to license to the nation's hospitals.

"We're receiving about two hundred and fifty invention disclosures a year, roughly one in four of which is patented," says Jon Sandelin, a senior associate at the OTL. Sandelin says that Stanford earned $61 million from its technology-transfer activity last year—a success he credits to creating the right entrepreneurial environment. "You have to understand—initially the department chairmen and school deans weren't thrilled by having this new activity that was diverting the attention of their faculty away from teaching and research," he explains. "So how do you offset that? You make them stakeholders—you make them beneficiaries."

Once professors and their departments learned that they could earn a cut from inventions, Sandelin says, they became more enthusiastic about bringing their ideas to the OTL. To reinforce the message, the OTL conducts aggressive outreach, organizing lunches with department heads; publishing a newsletter, *Brainstorm*, that touts the latest faculty discoveries; and dangling incentives in front of would-be inventors. In 1990 Stanford established a Research Incentive Fund to help professors convert academic concepts into "prototype products." "Got an idea for the next great whatchmacallit but don't have the funds to move from hypothesis to thesis?" a recent issue of *Brainstorm* asks. "This fund might just be your answer."

Traditionally, universities regarded patents as being outside their orbit, generally believing that proprietary claims were fundamentally at odds with their obligation to disseminate knowledge as broadly as possible. Today nearly every research university in the country has a technology-licensing office, and some have gone further. Johns Hopkins Medical School, for example, has established an internal venture-capital fund to bankroll commercially promising lines of research. The University of Chicago, renowned for its classical tradition, has created an affiliated non-profit, the ARCH Development Corporation, whose mission, in part, is to launch start-up companies based on faculty innovations. The dean of Chicago's medical school, Glenn D. Steele Jr., recently removed many faculty department heads and bluntly told *Business Week* that he plans to begin "insinuating the place . . . with entrepreneurial people"—a clear statement that commercial acumen is becoming an important qualification for new faculty.

SURPRISINGLY, two decades after Bayh-Dole was passed, no independent assessments of its economic impact have been made. But the Association of University Technology Managers, a consortium of over 300 universities and research institutions that engage in technology transfer, does publish an annual statistical survey of its members. In 1998 alone, the AUTM reports, 364 start-up companies were formed on the basis of a license to an academic invention, bringing the total since 1980 to 2,578. The group estimates that overall, university technology-transfer activities generated $34 billion that year, supporting 280,000 American jobs.

"There's clearly a kind of ferment going on at U.S. universities," says Lita Nelsen, the director of technology licensing at MIT. "When I went to MIT as an undergraduate, in 1964, the Kendall Square area was a bunch of vacant lots with a greasy old diner, and that was it. Now if you look out my window, it's brick high-rise buildings filled with little start-up companies—everything from Lotus down the street, to Neurometrics across the alley, to Biogen and Sapient. The old mills with broken

windows have been refurbished into high-tech incubators." The clustering of computer-engineering and biotech firms around academic-research centers in Silicon Valley; Austin, Texas; Route 128 in Massachusetts; and the Research Triangle, in North Carolina, derives in large measure from the synergy between universities and industry that Bayh-Dole has fostered.

No sector of the economy better illustrates the potential benefits of this synergy than biotechnology, a multibillion-dollar industry that grew out of university research labs. Garry Nolan, an assistant professor of molecular pharmacology at Stanford, epitomizes the new generation of professor-entrepreneurs. A few years ago Nolan founded Rigel, a biotech firm based in San Francisco that has pioneered a promising new method for identifying the proteins involved in asthma, allergies, immune disorders, and other health problems. "We've already attracted a hundred and fifty million dollars in investment from various drug companies interested in our work," Nolan says. "There's almost no greater and more immediate feedback than when you find a commercial entity interested in what you're doing."

Walter Powell, a sociologist at the University of Arizona who has tracked the growth of the biotech industry worldwide, believes that the close links between universities and industry are a principal reason why U.S. firms now dominate the biotech market—a lesson America's competitors are taking to heart. "You're seeing other countries moving in the same direction," Powell says, pointing out that the University of Munich has been involved in spinning off at least five private companies in Germany in the last two years alone. Lita Nelsen says her office at MIT has been overrun with visitors from other countries, including Japan, which recently passed its own version of the Bayh-Dole Act.

The surprising twist, however, is that although university licensing offices are churning out patents, most of these offices are themselves barely breaking even. "Everybody was waiting for a hundred million dollars a year out of their technology-transfer offices," Nelsen says. "The reality is that hardly any schools earn anywhere near that." Although some academic achievements—such as the discovery of recombinant DNA and the development of the hepatitis B vaccine (developed jointly at the University of California and the University of Washington)—have generated millions, most have not, and Nelsen says it is impossible to predict which will be lucrative.

Far from restraining universities, however, the difficulty of turning a profit seems to have made them more aggressive. A growing number of schools, for example, are buying equity stakes in the very companies that stand to profit from their faculties' research—a practice that both raises the potential for conflict of interest and is financially risky. In the 1980s and early 1990s Boston University poured $85 million (nearly a fifth of its endowment) into Seragen, a biotech firm specializing in cancer research, which several BU professors had founded. Convinced that the company would generate windfall profits, BU President John Silber also personally invested heavily in Seragen and persuaded numerous professors and trustees to do likewise. But from 1991 to 1997 Seragen lost almost $150 million. The university, which at one point owned 91 percent of the company's stock, was accused of egregiously mismanaging the school's endowment to prop up the company and to protect the trustees' investments.

Might such a cautionary tale dissuade other universities from going down the same road? To the contrary: the University of California recently established a policy allowing it to acquire equity stakes in start-ups and now owns shares in thirty companies committed to developing UC technologies. Stanford took a similar step in 1994.



Jesse Reynolds, a leading member of Students for Responsible Research, commented on a major drug-company deal with Berkeley: "When the best state agricultural college in the country makes this kind of leap, the world is bound to follow. I really fear that."

Meanwhile, universities are devising increasingly creative—and controversial—ways to raise their royalty earnings. Michigan State University, for example, recently took the unusual step of applying for a new, slightly altered patent on a widely prescribed cancer drug, cisplatin, that was patented by the university in 1979. Filing twice on the same invention is prohibited, but MSU's original patent, which along with its analog, carboplatin, generated $160 million in royalties, was about to expire. Thus the slight alteration. The move may have been good for MSU's bottom line, but did it serve the public interest? MSU's action prevented four generic-drug manufacturers from marketing a cheaper version of cisplatin, and these companies are now suing MSU—all of which prompted Barnett Rosenberg, the drug's developer and a now-retired professor, to complain that his work has "led to the creation of a lot of selfish, money-hungry university personnel."

Stanford has advanced beyond mere patenting. The university recently invested more than $1 million to develop its own brand-name product, Sondius-XG, a sound-synthesis technology that it will market in conjunction with Yamaha. Why? Because unlike patents, which expire after twenty years, brands generate revenue forever. Mary Watanabe, who works with Jon Sandelin at the Office of Technology Licensing, let slip during an interview that the university is also considering launching a "Stanford company." She declined to divulge details.

If these activities appear to be out of keeping with the university's nonprofit educational mission, that's because they are. In a provocative 1996 article in the *University of Pennsylvania Law Review*, Peter Blumberg, then a law student, argued that technology-transfer activity at universities is so far removed from the university's public mission that it "could be treated as unrelated business income for tax purposes." Universities, Blumberg writes, "enjoy their tax exemption because of a belief that they are producing research that no other market actor would produce absent a public subsidy; basic research, publishable research, research that educates students and . . . is usable by the whole society."

In their zeal to maximize revenue, many schools are not only raising questions about their nonprofit status—they are getting into some embarrassing skirmishes with their own students and professors over the rights to potentially lucrative ideas. In the most extraordinary case to date Petr Taborsky, a student at the University of South Florida, wound up on the chain gang of a maximum-security state prison after colliding with his university over the rights to a discovery he made as an undergraduate. Taborsky had been working as a research assistant on a project sponsored by the Florida Progress Corporation, a local holding company. At the end of the sponsored research period, Taborsky claims, he received permission from Robert Carnahan, a dean in the College of Engineering, to begin work on his own experiments, following a different approach, which he hoped to use as the basis for a master's thesis. But as soon as Taborsky made his research breakthrough, which had obvious commercial utility as a way to remove ammonia from wastewater, Florida Progress and USF both laid claim to his discovery. The university filed criminal charges against Taborsky and spent more than ten times the amount of the original research grant on outside legal counsel alone. In 1990 a jury found Taborsky guilty of stealing university property, and the State of Florida required him to begin serving his sentence on a chain gang in 1996. But the case became an embarrassing media spectacle, and Governor Lawton Chiles soon intervened to offer Taborsky clemency, which Taborsky, on principle, refused.



The proliferation of ownership claims threatens also to impede economic growth. One expert warns that if current trends continue, "creators will be prevented from creating," as the public domain is "converted into a fallow landscape of walled private plots."

Why would a state university go to such lengths? To protect future investments, of course. As Seth Shulman argues in *Owning the Future*, a new book about intellectual property in the information age, the Taborsky case "underscores what can happen when universities, beholden to industry for an increasing share of research dollars, let financial concerns overshadow the notion of research as a shared intellectual pursuit."

Today it is common for universities to pay exorbitant legal fees to defend their intellectual property. According to the Association of University Technology Managers annual report, dozens of major universities—Brandeis, West Virginia, Tufts, and Miami among them—actually spent more on legal fees in fiscal year 1997 than they earned from all licensing and patenting activity that year. A growing number of disputes pit universities against their own faculty members. In 1996 a jury awarded $2.3 million to two professors, Jerome Singer and Lawrence Crooks, who filed suit against the University of California for shortchanging them on royalties resulting from their pathbreaking research on magnetic resonance imaging, a widely utilized medical test known as the MRI. An appeals court found that the university improperly sheltered revenue by dramatically discounting the patents it licensed to manufacturers in exchange for more than $20 million in research funding.

Is this where the Bayh-Dole Act was supposed to lead? Two summers ago a working group at the National Institutes of Health issued a report to the NIH director, Harold Varmus, warning that changes in the way universities guard their intellectual property are endangering the free exchange of basic research tools—such as gene sequences and reagents—that are crucial to all research. The NIH found that the terms universities impose on their research tools, through their technology-licensing offices, "present just about every type of clause that universities cite as problematic in the [contracts] . . . they receive from industry." These include requirements that universities be allowed to review manuscripts prior to publication and provisions extending their ownership claims to any future discoveries deriving from use of their research materials. Universities, the NIH charges, "have no duty to return value to shareholders, and their principal obligation under the Bayh-Dole Act is to promote utilization, not to maximize financial returns. It hardly seems consistent with the purposes of the Bayh-Dole Act to impose proprietary restrictions on research tools that would be widely utilized if freely disseminated. Technology transfer need not be a revenue source to be successful." Ironically, the proliferation of ownership claims threatens not only to stifle the free exchange of ideas but also to impede economic growth. James Boyle, an expert on intellectual-property law at American University, warns that if current trends continue, "creators will be prevented from creating," as the public domain is "converted into a fallow landscape of walled private plots."

CONTROLLING THE RESEARCH AGENDA

IMMEDIATELY after the April faculty meeting at Berkeley several members of Students for Responsible Research gathered in an outdoor courtyard at La Burrita, a pub just off campus, to air their concerns about the Novartis deal—and to let off steam. "This place has some of the cheapest pitchers around," said Jesse Reynolds, one of the group's leaders, as glasses were poured and beers were passed around a long picnic table.

Unlike the student radicals of the sixties, these students never intended to lock horns with the university establishment. Reynolds, who studies California water resources, says he's relatively new to student politics—and to politics altogether. "I'm generally one of those people who gripe a lot and do nothing," he explained. "But when the best state agricultural college in the country makes this kind of leap, the world is bound to follow. I really fear that."

David Quist, a second-year graduate student in environmental science, laughed as he told a story illustrating the culture that now permeates the university. The previous October, Quist said, at a town-hall meeting where the Novartis deal was first made public, Dean Gordon Rausser invited concerned students to examine the contract for themselves. "So the next day I came to his office," Quist recalled. "I was given some materials and sat down to take notes. But as soon as an administrator saw me, she said, 'Oh, no, you can't do that.'" Quist's notes were confiscated and held at the dean's office for several months.

Wilhelm Gruissem, a professor in the Department of Plant and Microbial Biology who helped to negotiate the Novartis deal, insists that the negotiations were as open as possible without divulging the company's proprietary secrets. But even students within the department felt shut out. In December of 1998 twenty-three graduate students sent a letter to the faculty complaining that their views had never been solicited and that they had been "forced to rely on rumors and supposition throughout the negotiation process."

What most concerns the Students for Responsible Research is that as university-industry ties grow more intimate, less commercially oriented areas of science will languish. "Let's say you're a graduate student interested in sustainable agriculture or biological control or some other area that is not commercial," Reynolds explained. "My guess is you're not going to come to Berkeley, or you'll at least think twice about it."

Donald Dahlsten, the associate dean of the College of Natural Resources, shares this concern. "Molecular biology and genetic engineering have clearly risen as the preferred approach to solving our problems, and that's where the resources are going," Dahlsten says. "New buildings have gone up, and these departments are expanding, while the organismic areas of science—which emphasize a more ecological approach—are being downsized." Dahlsten once chaired Berkeley's world-renowned Division of Biological Control. Today that division, along with the Department of Plant Pathology and more than half of all faculty positions in entomology, are gone—in part, many professors believe, because there are no profits in such work. "You can't patent the natural organisms and ecological understanding used in biological control," Andy Gutierrez, a Berkeley entomologist, explains. "However, if you look at public benefit, that division provided billions of dollars annually to the state of California and the world." In one project Gutierrez worked on, he helped to halt the spread of a pest that threatened to destroy the cassava crop, a food staple for 200 million people in West Africa.

Gordon Rausser counters that far from draining resources from other areas, the Novartis deal will benefit the college as a whole, because a quarter of the money will be spent outside the Department of Plant and Microbial Biology. "I'm sitting here with three science buildings that were built in the 1920s, thirties, and forties," Rausser says. "I can't get those buildings modernized for first-rate research without resources."

Chris Scott, who until recently oversaw industry collaborations at Stanford's medical school, describes another reason that working with the private sector is essential. Scott points out that for the past several years industry researchers have consistently been ranked among the most frequently cited scientific authors, making academic isolation intellectually deleterious. But Scott, too, recognizes the danger of allowing market criteria to dictate the paths of scientific inquiry. "Show me an industry-sponsored research project on schistomiasis—a liver parasite that afflicts people in the Third World—or malaria or river blindness or dengue fever," Scott says. All these diseases primarily afflict people in developing nations who can't afford to pay high prices for medicine, he says, so all have been dropped from the pharmaceutical industry's docket. Mildred Cho, of Stanford's Center for Biomedical Ethics, agrees, pointing to vaccine research as another neglected area. "Public-health services simply can't afford to pay high prices," Cho says. "If research is market-driven, it raises potential problems not only for the research agenda but for public health."

As the research agendas of universities and corporations merge, there is one other danger: namely, that universities will cease to serve as places where independent critical thought is nurtured. Anne Kapuscinski, a visiting professor from the University of Minnesota who studies genetically engineered organisms, and other scholars we met with at Berkeley fear that raising questions about the safety of genetically altered crops—a principal research focus of Novartis—may prove difficult if more and more agricultural colleges turn to corporations to finance their research. Concerns about genetic engineering are mounting, Kapuscinski notes. A study published last May in *Nature* found that the toxins dispersed from the pollen of Bt (*Bacillus thuringiensis*) corn, a Novartis product, can kill nonpest insects, including the monarch butterfly—a problem with potentially enormous ecological implications. Such dangers prompted the Food and Drug Administration to convene a series of public hearings last November on geneti-

cally altered crops, whose use has provoked huge demonstrations in Europe and elsewhere. Ignacio Chapela, of the College of Natural Resources' executive committee, believes that the most important thing Novartis stands to gain from the alliance is legitimacy. "The sheer value of having the logo of the University of California next to the logo of Novartis is immensely valuable to the company right now," he says.

Maybe so—but the plan may end up backfiring. At last year's graduation ceremony, in a graphic display of dissent, a student speaker placed the blue-and-orange Novartis logo directly above Berkeley's, while a hundred students in the audience mockingly donned graduation caps emblazoned with the Novartis logo—hardly the public exposure the company sought.

DOWNSIZING THE HUMANITIES

THE students at Berkeley were not the only ones protesting the growing corporate influence on university research last spring. In March of 1998 students at dozens of schools, including the University of Wisconsin, Harvard, and Cornell, held a series of teach-ins on the subject. At George Mason University, a state school in Fairfax County, Virginia, another graduation protest erupted as hundreds of students attached bright pink buttons bearing the slogan "Stop Dis-Engaging Our Future" to their caps and gowns. The buttons, which were distributed by Students for Quality Education, were a pointed reference to a recent George Mason mission statement, "Engaging the Future," which calls for increasing investment in information technology and tightening relations between the university and northern Virginia's booming technology industry.

In 1998 James S. Gilmore, the governor of Virginia, promised to increase state funds for GMU by as much as $25 million a year provided that the university better serve the region's high-tech businesses. GMU's president, Alan G. Merten, a computer scientist and a former dean of the business school at Cornell, hardly needed urging. "We must accept that we have a new mandate, and a new reason for being in existence," he announced at the World Congress on Information Technology, a gathering of industry executives hosted by GMU in the summer of 1998. "The mandate is to be *networked*." By year's end Merten had added degree programs in information technology and computer science, poured money into the 125-acre Prince William campus, whose focus is biosciences, bioinformatics, biotechnology, and computer and information technology, and suggested that all students would be trained to pass a "technology literacy" test. Amid this whirlwind of change, however, other areas fared less well. Degree programs in classics, German, Russian, and several other humanities departments were eliminated.

In defending the changes, Merten speaks as a realist—and, it's impossible not to notice, as someone versed in the language of the business world. "There was a time when universities weren't held accountable for much—people just threw money at them," he says. Today "people with money are more likely to give you money if you have restructured and repositioned yourself, got rid of stuff that you don't need to have. They take a very dim view of giving you money to run an inefficient organization." The process of making GMU more efficient was, he concedes, "a little bloody at times," but there was a logic to it. "We have a commitment to produce people who are employable in today's technology work force," he says. Students at GMU are "good consumers" who want degrees in areas where there are robust job opportunities, and the university has an obligation to cater to that demand.



Initially the department chairmen and school deans weren't thrilled by having this new activity that was diverting the attention of their faculty away from teaching and research," says one university official. "So how do you offset that? You make them stakeholders."

But should meeting the demand come at the expense of providing a well-rounded education? In response to GMU's cuts in the humanities 1,700 students signed a petition of protest. In addition, 180 professors in the College of Arts and Sciences sent a letter to President Merten arguing that although training students for the job market was a legitimate goal, "precisely in the face of such an emphasis on jobs and technology, it is more necessary than ever to educate students beyond technological proficiency." Kevin Avruch, a GMU anthropologist who signed the letter, explains, "A university should teach people to read and write and think critically. And my guess is that, ironically, that's what corporations really want as well. If they need to teach them Lotus, they can do that after they graduate."

Perhaps—but what happened at GMU is clearly part of a national trend. In 1995 the Board of Regents in Ohio assessed how the state's education dollars should be spent. The verdict? Eliminate funding for eight doctoral programs in history. James Engell, a professor at Harvard who has chaired that school's steering committees on degree programs in both history and literature, and Anthony Dangerfield, a former Dartmouth English professor, recently concluded a two-year national study of the state of the humanities. From 1970 to 1994, they found, the number of bachelor's degrees conferred in English, foreign languages, philosophy, and religion all declined, while there was a five- to ten-fold increase in degrees in computer and informa-

tion sciences. The elite top quarter of Ph.D. programs in English have twenty-nine fewer students per program than they had in 1975. Meanwhile, humanities professors on average earn substantially less than their counterparts in other fields, and the gap has widened over the past twenty years.

"Test what you will—majors, salaries, graduate programs . . . the results come back the same," Engell and Dangerfield write in a lengthy recent article in the Harvard alumni magazine. "Since the late 1960s the humanities have been neglected, downgraded, and forced to retrench, all as other areas of higher education have grown in numbers, wealth, and influence." The authors trace this to what they call the new "Market-Model University," in which subjects that make money, study money, or attract money are given priority.

Even small liberal-arts colleges are responding to market demand. At the Claremont Colleges, in southern California, a cluster of schools that includes Pomona and Harvey Mudd, a new graduate institute has been launched that features "a curriculum focused on the needs of the industrial sector," a faculty without tenure, and an educational mandate to train students for "professional careers in emerging fields at the intersection of life sciences and engineering."

Surprisingly, such developments have received little attention. Since the early 1980s American culture has obsessively debated the content of the Western canon—whether Shakespeare or Toni Morrison, European history or African history, should be taught to undergraduates. In the decades to come a more pressing question may be whether undergraduates are taught any meaningful literature or history at all. Kevin Avruch says that the recent restructuring at GMU brought home that lesson. "It actually united professors on the left and the right," he says. "This faculty is often characterized as overly liberal, but we discovered that in at least one sense most of us are tremendously conservative: we share a nineteenth-century view that our job is to educate well-rounded citizens."

THEHIGHERLEARNING.COM

WHILE humanities professors at some schools are battling to save their departments from being eliminated, others are discovering, much to their surprise, that university administrators have taken a sudden interest in their course material because of its potential for being marketed online. Seemingly overnight the computer revolution has transformed "courseware" into a valuable piece of "content" that can be packaged and sold on the Internet, and online-education companies are racing to collaborate with academic institutions to exploit this burgeoning market.

Berkeley recently signed a deal with America Online, the University of Colorado has teamed up with Real Education, and the Western Governors' Association has founded a "virtual university" linking more than thirty schools in twenty-two states. Michael Milken, the convicted junk-bond trader, is investing heavily in an Internet education company known as UNext.com, which recently signed deals with Columbia University and the University of Chicago.

In a time of budget shortfalls and dwindling public support for education, university administrators and politicians see online education as a way to expand on the cheap. "Just building campuses is a very expensive proposition," says E. Jeffrey Livingston, the associate commissioner for the Utah System of Higher Education. "Governors see [the virtual university] as a way to not spend as much money in the future, to meet growth." "Distance learning" is also seen as a promising new teaching tool and as a way to reach nontraditional education markets, such as part-timers and foreign students.

A growing number of professors, however, fear that electronic education is destined to transform teaching into little more than a commodity. Before a university can sell courseware online, it must first control the rights, and that means, in essence, usurping copyright from the creators of the courses—the faculty. "This is going to be one of the most important battlegrounds of the future," predicts Edward Condren, a professor of medieval literature at the University of California at Los Angeles. In June of 1994 UCLA's extension program—the largest continuing-higher-education program in the country—signed a deal granting exclusive control (including copyright) over the production and distribution of its electronic courses to OnlineLearning.net (then called The Home Education Network). Despite UCLA's much-vaunted faculty-governance structure, Condren says, there was no prior faculty consultation, and the academic senate had to wait until February of 1998 before it was permitted to see any version of the contract. "This is a public institution," Condren says angrily, "and a contract was entered into without any public announcement that bids were being sought."

In addition to being a renowned Chaucer scholar, Condren is an authority on intellectual-property law. For the past twenty-five years he has served as an expert witness in a number of high-profile court cases, and he testified for the winning side in Falwell *v.* Flynt. "In my opinion," he says, "the UCLA extension program in its electronic offerings is operating illegally. It does not have the copyright assignment from the faculty who own the rights to the courses." Indeed, professors have historically been considered the intellectual "authors," and thus the copyright holders, of their work, says David Noble, a historian at York University, in Toronto, where faculty members recently waged a successful battle to protect their copyrights from challenge. The Bayh-Dole Act allows universities to patent the intellectual discoveries of their faculty members and to share in the royalties, but controlling copyright is radically different, Condren says, because "it would undermine the legal protection that enables faculty to freely express their views without fear of censorship or appropriation of their ideas."

Professors also fear that universities will use distance learning not to enhance education but to eliminate teaching positions. It's a legitimate concern. The New School for Social Research, in New York City, now hires unemployed Ph.D.s to

design online courses, pays them a flat fee, and then requires them to sign away copyright so that the school can assign the course as they see fit. Educause, a consortium of over 1,600 academic institutions and more than a hundred and fifty corporations, in 1994 launched a National Learning Infrastructure Initiative that produced a detailed study of what professors do, breaking down which discrete teaching functions can be automated or outsourced for "productivity enhancement." William Massy and Robert Zemsky, education scholars based at Stanford and the University of Pennsylvania respectively, argue in a recent Educause paper that universities need information technology to control their budgets. "With labor accounting for seventy percent or more of current operating cost," they assert, "there is simply no other way."

The future the professors fear has already arrived. David Noble, citing figures from the U.S. National Center for Educational Statistics, notes that even before the computer revolution, while spending on instruction declined by 9.5 percent at public universities from 1976 to 1994, expenditures on research increased by 21 percent. The American Association of University Professors, examining changes in the academic work force, notes that from 1975 to 1995 the share of full-time faculty positions declined while the use of part-time faculty more than doubled. "In the end students were paying more for their classes and getting less," Noble argues in a recent paper, "Digital Diploma Mills," that links the growth in online learning to the increasingly commercial focus of universities. At least some students seem to agree. In May of 1996, at the University of Utah, Jeff Casper and Heather Fortuna were elected president and vice-president of the student body after running under the slogan "Get Real" and campaigning against the virtual university. "I took a class in one of my majors where the bulk of the instruction was done through computer," Fortuna explained, "and it was the most tedious thing that I ever had to deal with. I learned very little in comparison with the experiences I've had inside the classroom."

"IT has been the fate of American higher education to develop in a pre-eminently businesslike culture," the historian Richard Hofstadter wrote in 1952. Through the years, Hofstadter acknowledged, America's universities had fostered the nation's technological and economic development. But too often, he lamented, higher education in America was judged on purely pragmatic grounds. "Education is justified apologetically as a useful instrument in attaining *other* ends: it is good for business or professional careers," he wrote. "Rarely, however, does anyone presume to say that it is good for man."

Some would argue that Hofstadter's vision of higher education is an unaffordable luxury. In today's information age ideas have become prized commodities. Still, even on the utilitarian grounds that traditionalists like Hofstadter would scorn, preserving the distinction between higher education and business is vitally important.

For if commercial criteria are allowed to prevail, schools not only risk shrinking their educational mission—they risk ceasing to be centers of technological innovation as well. Paul Berg, a Nobel Prize–winning biochemist we met with at Stanford, tells a story that dramatically illustrates why. Berg, seventy-three, is a seminal figure in the biotech revolution, having laid the groundwork for splicing DNA to make hybrid molecules. (Stanley Cohen and Herbert Boyer built on Berg's work to create the first recombinant DNA clone.) His discovery propelled the billion-dollar industry that is now hailed as a model of university-industry relations. But Berg points to an underlying irony. "The biotech revolution itself would not have happened had the whole thing been left up to industry," he says. "Venture-capital people steered clear of anything that didn't have obvious commercial value or short-term impact. They didn't fund the basic research that made biotechnology possible." Berg recalls that shortly after his own pathbreaking discovery he gave a seminar at the Merck pharmaceutical company, where he met a young scientist who had been pursuing the same idea. When this scientist encountered some obstacles after six or seven months, Merck prevented him from continuing to work on the project. "Even though Merck was widely championed for its support of research, they wouldn't let him go beyond a certain point," Berg says, "and that is just one of the limitations of corporate research."

The freedom of universities from market constraints is precisely what allowed them in the past to nurture the kind of open-ended basic research that led to some of the most important (and least expected) discoveries in history. Today, as the line between basic and applied science dissolves, as professors are encouraged to think more and more like entrepreneurs, a question arises: Will the Paul Bergs of the future have the freedom to explore ideas that have no obvious and immediate commercial value? Only, it seems, if universities cling to their traditional ideals and maintain a degree of independence from the marketplace. This will not be easy in an age of dwindling public support for higher education. But the nation's top-flight universities can lead the way by collectively establishing new guidelines designed to preserve academic freedom in all their interactions with industry. These could include forbidding professors from having direct financial ties to the companies sponsoring their research; banning universities themselves from investing in these companies; prohibiting publication delays of more than thirty to sixty days and any other editorial constraints; and minimizing proprietary restrictions on basic research tools. In addition, universities could do more to make the case for preserving public support for higher education while refusing to tailor either the research agenda or the curriculum to the needs of industry. "The best reason for supporting the college and the university," Hofstadter wrote, "lies not in the services they can perform, vital though such services may be, but in the values they represent. The ultimate criterion of the place of higher learning in America will be the extent to which it is esteemed not as a necessary instrument of external ends, but as an end in itself."