File Tech. Transfer

U.S. science, technology apparently weakening

National Science Board report compiling several statistical indicators shows inflation, recession have hurt nation's R&D

A second report assessing the state of health of U.S. science and technology has been unveiled by the National Science Board, the National Science Foundation's policy-making group. In general, statistics presented in the report are rather sobering—particularly in the funding of R&D efforts—and can be interpreted to point to an erosion of U.S. science and technology.

Entitled "Science Indicators, 1974," the NSB report presents statistical indicators on international resources for R&D, technological invention and innovation, productivity and balance of trade, U.S. resources for R&D, basic research, industrial R&D and innovation, and science and engineering personnel. The goal of the report, NSB chairman Norman Hackerman says in a letter transmitting it to President Ford, "is a periodical series of indices of the strengths and weaknesses of science and technology in the U.S. and the changing character of that activity."

In submitting the report to Congress, President Ford says, "On balance, the data in this report and other evidence indicate that the nation's research and development enterprise continues to be productive and competitive." However, Ford points out, "The report also shows the unfortunate fact that inflation and the recent recession have affected adversely the level of effort and the resources that are devoted to the nation's R&D activities—much the same as other programs have been affected. Fortunately, we are making solid progress in correcting these problems and the prospects for the future are very good."

On balance, the report contains few, if any, surprises. And although NSB raises the caution flag about some of the indicators, they underscore and quantify important and sometimes unsettling trends in the health of U.S. R&D that have become increasingly apparent in recent years.

For example, in the section dealing with international indicators of science and technology, NSB points out that the proportion of the gross national product spent for R&D in the U.S. has declined steadily in the past decade, while growing substantially in the U.S.S.R., West Germany, and Japan. In 1973 the fraction of GNP directed to R&D was 2.4% in the U.S., compared to 3.1% for the U.S.S.R., 2.4% for West Germany, and 1.9% for Japan.

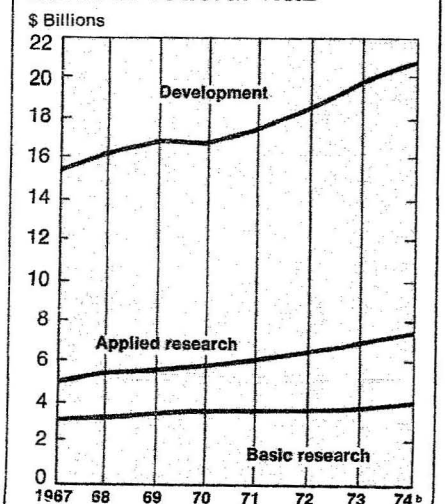
NSB observes that the U.S. was the largest producer of scientific literature sampled throughout the 1965–73 period in all fields except chemistry and mathematics, where the U.S. share was second to that of the U.S.S.R. However, in recent years U.S. research publications in engineering, physics, and chemistry have declined slightly in both absolute and relative terms. On the other hand, citation indices of U.S. scientific research equal or exceed those of other nations based on a 1973 survey, with the U.S. ranking highest in the areas of chemistry and physics.

In the area of innovation and patents, the NSB report notes that the U.S. had a favorable, but declining, "patent balance" between 1966 and 1973. The 30% decline, NSB says, was due primarily to increases in the number of patents awarded by the U.S. to Japanese and West German inventors, and to decreases in patents granted to U.S. inventors by Canada and the U.K. In a related indicator, NSB says the majority of a sample of major technological innovations of the past 20 years were produced by the U.S. However, the proportion of innovations of U.S. origin has declined from a high of 80% in the late 1950's to 55 to 60% since the mid-1960's. Certain other countries—particularly Japan and West Germany—have increased their share.

The section of the NSB report on resources for R&D recites, among other things, the well-known, but still sobering, fact that U.S. funding for R&D has not kept pace with inflation. Still, the starkness of the NSB compilation does underscore the fiscal erosion of the national R&D effort. For instance, federal funds for R&D increased in terms of current dollars in all but two years between 1960 and 1974, reaching nearly $17 billion in 1974 (the latest federal R&D budget considered in the NSB report). However, funding in terms of constant dollars peaked in 1966 and was down 19% in 1974 to less than $12 billion—the level of funding in 1963. R&D funds provided by industry rose more rapidly than those of the government during the 1960–74 period, reaching nearly $14 billion in current dollars in 1974. In terms of constant dollars, the highest level of funding was in 1973, which was 2% more than in 1974.

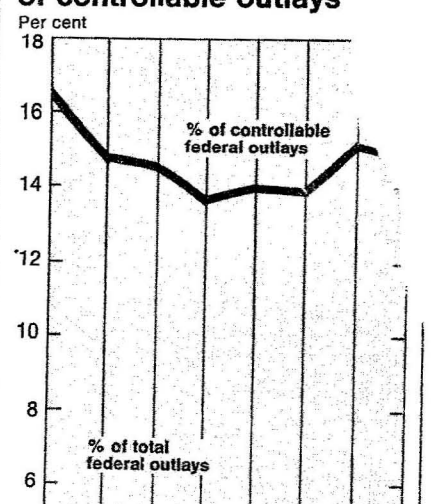
NSB finds that the proportion of R&D funds allocated to basic research, applied research, and development has remained nearly constant since 1965, with development receiving 64%, applied research 23%, and basic research

Development is biggest hunk of federal R&D



a Gross national product implicit price deflators used to convert current dollars to constant 1967 dollars. b Estimated. **Source:** National Science Foundation

R&D has steady per cer of controllable outlays



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13%. Further, NSB notes that R&D funds are a declining fraction of the total federal budget, dropping from a high of 13% in 1965 to 7% in 1974. As a fraction of the "relatively controllable" portion of the federal budget, R&D spending has changed little. For instance, it was 15% in 1974, compared to the 16% high in 1967 and the 14% low in 1970.

Federal funds for basic research increased each year between 1968 and 1974 (except for 1971) in terms of current dollars, but they declined 13% during the same period in terms of constant dollars, NSB says. The largest reductions in constant dollars were in the physical sciences, which declined about 25% between 1969 and 1974.

One key finding of the NSB report is that basic research increasingly contributes to technological innovation, at least as reflected by the growing number of citations to research in patents associated with major advances in technology. NSB notes that the frequency of such citations increased 17% between the fifties and the sixties at the same time citations to other patents declined almost 25%. Further, NSB observes that research performed in universities is most frequently cited as the origin of patented technological advances, accounting for 55% of cited research in recent years.

The NSB report restates the truism that "many of the results from basic research are not immediately incorporated into applied technologies." However, NSB says that the average time between publication date of cited research in patents and the date of patent application decreased from seven to six years from the first to the second half of the 1950–73 period. Surprisingly, during the 1970–73 period, NSB finds that the average time interval has shrunk to only three years, "suggesting an increasingly
utilization of research results in
n technology."
3's newly added chapter on indus-
&D and innovation notes that in-
l spending for R&D more than
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33% of the growth taking place
1971. Large increases in recent
rs came almost entirely from indus-
y's own funds, NSB says, adding that
ending for industrial R&D in terms of
rrent dollars totaled more than $22
llion in 1974. Adjusted for inflation,
SB says, industrial R&D spending in 1967 constant dollars totaled $15.2 billion in 1974, 11% less than in 1968–69, the years of highest funding, and about equal to funding in 1965.

NSB says that the reported goal of about 50% of all industrial R&D in 1974 was for improvement of existing products, compared with about 35% for developing new products, and 15% for new processes. In terms of patented inventions during the 1963–73 decade, NSB
ys that the most R&D-intensive in-
tries accounted for more than 67% of
atents granted during that decade, with the majority of patents going for inventions in six major product fields: machinery, fabricated metals, electrical equipment, chemicals, professional and scientific instruments, and communications equipment. Further, the most R&D-intensive industries produced the majority of a sample of major technological innovations during the two decades 1953–73. These industries accounted for 66% of the innovations, NSB says, followed by intermediate-level industries with 24%, and the least R&D-intensive industries with 10%.

The largest percentage of the sample of technological innovations produced during the 1953–73 period consisted of improvements in existing technology, 41%; major technological advances, 32%; and radical breakthroughs, 27%. NSB points out that the number of radical innovations declined 50% between the two periods 1953–59 and 1967–73, whereas those rated as major technological advances increased proportionately. NSB says that the most frequently cited sources of the underlying technology for the major innovations were basic and applied research, followed by transfer of technology from existing product lines of the innovating firm, licensing of patented technology, and the purchase of technical "know-how" from other firms. And NSB observes that basic research was more often involved in product innovations characterized as radical breakthroughs, 68%, than in those rated as major technological advances, 48%, or improvements in existing technology, 45%.

The section of the NSB report dealing with science and engineering personnel provides in large measure a compendium of rather well-known trends in employment and education. However, the statistics in the NSB report highlight an important and growing trend in academia. Namely, that in recent years the proportion of young doctoral faculty members in doctorate-level science and engineering departments has declined from about 42% in 1968 to about 28% in 1974. At the same time, median ages of faculty have increased from 41 to 44 years, and the proportion of faculty members with tenure has risen from 47% to 65%.

As for new scientists and engineers in the educational pipeline, the NSB report observes that the number of doctoral degrees awarded in science and engineering began to level off in 1971 and decreased for the first time in a decade to a 1974 level of about 18,000. NSB says the largest declines occurred in the number of physical science doctorates awarded and that science and engineering doctorates as a fraction of all doctorates declined from 64% in 1965 to 56% in 1974.

Copies of the report "Science Indicators, 1974" are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 038-000-00253-8. The price is $4.60. □

Scientists endorse NIH peer review setup

For the past month, a study team from the National Institutes of Health has been traveling across the country talking to scientists and others about NIH's peer review system for selecting research proposals to receive NIH funding. The team has heard testimony from more than 70 people and received letters from 1100 more, which is a very impressive response, according to opinion researchers.

A number of conclusions are coming from the survey. Most obvious: Scientists, in general, strongly endorse a peer review system like that at NIH. But also obvious is the fact that most think the system can be improved and many think they know how to go about it.

The survey is part of a massive self-evaluation of the whole grants review procedure that is taking place at NIH. Increasingly vocal criticism of the peer review process by scientists who believe they have been poorly served by it is the reason given for the study. Important, too, is concern at NIH that Congress may decide to take a careful look at its peer review system, much as Congress has examined the system at the National Science Foundation during the past year. "If we don't change the system, and change it for the better," says Dr. Mathilde Solowey, executive secretary of NIH's grants peer review study team, "it's likely to be changed by Congressional leaders who don't know it and are responding to the objections" of a very vocal but minor fraction of scientists.

NIH's 15-member peer review study team, organized last year, contains a cross section of those who deal with the grants program at NIH and includes women and members of minority races. Chaired by Dr. Ruth Kirschstein, director of the National Institute of General Medical Sciences, its evaluation also will include examination of the peer review system by those involved in it, both within NIH and participants on review committees.

So far, the survey of the scientific community hasn't turned up any widely felt problems that the committee was not already aware of. In fact, the concerns about peer review at NIH are generally the same as those for peer review at NSF that have been debated publicly for the past several months. But the survey is invaluable in assessing how widespread dissatisfactions are, Dr. Solowey explains.

For instance, analysis of the first 1000 letters to the committee shows that more than one third are concerned with the quality and the selection of people who serve on the study groups that initially evaluate research proposals for scientific excellence, the first step in NIH's two-phase review. 13% are worried about the degree of openness of the peer review system, some feeling that the system needs to be substant

The Russian Juggernaut: Racing to the Wrong Goal

THE INNOVATION DECISION IN SOVIET INDUSTRY. By Joseph S. Berliner. MIT Press. 561 pp. $35

By DANIEL YERGIN

LAST FEBRUARY, Soviet Premier Kosygin proudly announced to the 25th Communist Party Congress that the USSR had now surpassed any other country (read "United States") in the production of steel, oil, pig iron, coal, cement, tractors, cotton, wool, etc., etc. His litany was meant as proud proof of the Soviet economic achievement.

Unfortunately, the cunning of history is such that, as it turns out, the Russians are keeping score in the wrong game. The big question is no longer simply how much a country can produce, but rather, how it uses what it does produce and how effective it is at technological innovation.

And by those scores, the Soviet Union paradoxically is not doing so well. The Russian economy simply is not very good at innovation—that is, at the development and successful introduction of new products and processes. It is through innovation that modern industrial economies grow. New products also provide the incentives that encourage people to work harder. It is because of their problems in innovation that the Soviets have opened the door to Western businessmen. Certainly the Soviets can hold their own in the limited sphere of military technology. But when they want cars, they get Fiat to build them a plant; when they want soft drinks, they buy a factory from Pepsi and dicker with Coke.

Thus, the problem of innovation in the Soviet Union must be of central importance to any Westerner interested both in how the Soviet Union will develop in the future, and in prospects for Soviet-American relations. On this factor, in large part, hinges judgment on such major foreign policy ventures as the Jackson Amendment on emigration from the Soviet Union.

It is to the question of innovation—or lack thereof—that Joseph Berliner turns his attention in *The Innovation Decision in Soviet Industry*. This is certainly one of the most important books about the Soviet Union in recent years, and deserves the attention not only of specialists but also of people interested in understanding this major dynamic in Soviet-American relations. It should and surely will become a classic of scholarship about the Soviet Union.

There are certain problems. MIT Press has done both author and reader a disservice with a $35 price tag. In addition, while the book has a lively writing style when compared to most economic literature, the general reader may still find it dense in parts, sometimes slow going, and somewhat too long. But the attention it demands is more than compensated by the deep insight it offers into how our major adversary functions.

Berliner's argument is that the very structure of the Soviet system creates major and often insurmountable barriers to real innovation.

"The study of innovation has not been neglected

force them to change their own ways. Research and development tends to be isolated from the firm.

Third, Berliner points to the "decision rules." These are the requirements of the economic plan, which constitute part of the "law of the land." The manager is forced to think in terms of a very short time horizon, and must always worry that he may not meet his mandated level of output (as measured by "profitability" and various other performance indicators). If he tries to bring in innovations, his production schedules will be interrupted, and he will fail to meet his assigned targets.

Finally, the incentives for a manager considering innovation are, at best, unclear. In the United States, engineers quit IBM to start their own firm because they believe that there is as good a chance that they will become millionaires as go bankrupt. No Soviet manager is going to become a millionaire or even a thousandaire—unless he happens to do his innovating on the black market. Otherwise, the rewards for innovation are accurately perceived as considerably less than the risks associated with innovation, even successful innovation.

A question jumps quickly to mind. How can one say that the Soviet Union cannot innovate and still look its space and military programs straight in the face? The "military-industrial complex" is isolated from the rest of the society, has highest priority, and works by different rules. It is not an economic system. Rather it is mission-oriented. "Build me a plane that flies at such a speed and with such a payload," says the Defense Minister—and it will be built if adequate resources are allocated. Moreover, the Soviet military programs does operate in a competitive environment with real felt fears for failure. The competitor, of course, is the United States. It does appear, even here however, that the Soviets must concentrate much more resources than the United States to achieve the same effect.

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Does it matter if innovation is difficult in the much larger civilian economy? The answer seems to be yes. Lack of innovation means a lack of growth. On a related point, it also means a lack of incentives in the form of goods in the shop windows that encourage workers to work. It does not mean that the Soviet Union will collapse. It can continue to hobble along unhappily producing ever more steel and oil—and suffering growth rates perhaps as low as Britain's.

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Handout for
Feb 18, 1972 Meeting
of Univ. Pat Policy
Ad Hoc Subcommittee

University Patent Marketing in a Developing Country

GIDEON SCHMUCKLER*

SUMMARY

AFTER SUMMARIZING CERTAIN ASPECTS of Israel's economy and the particular circumstances prevalent at its only technical university insofar as they pertain to inventions and patents, case histories of attempts to market some of them are described. Lessons to be learned from both the successful and the unsuccessful ones are summarized and a number of points listed that should be considered in any effort at patent marketing by an institution such as a technical university in a developing country.

* The author is Patents Coordinator with the Technion Research and Development Foundation in Haifa, Israel. He is at present serving with the Institute as a Student Research Assistant for 1967-68.

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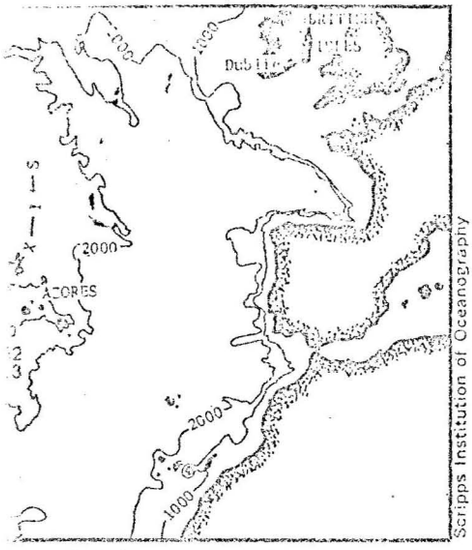

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The reentry technique was first tested three years ago during Leg 11 of the project; when its success was greeted with a pleased and lusty cheer from those aboard. It was first used operationally during Leg 14, on Christmas Day of 1971, and has since worked at water depths as great as 13,000 feet. But it was not until Leg 37 that it really began to show its true potential.

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Something very peculiar is happening to the American technological innovation process, at least to that part of it reflected in patent applications stemming from Federal research and development funds. According to a new report by the Federal Council for Science and Technology (FCST), the total number of patent applications resulting from public funding has decreased sharply and steadily since 1966 and the total number of invention disclosures (for which patent applications might or might not be made) has also declined steadily since 1968. The total number of these invention disclosures in 1972, the last year included in the study, was 9 percent less than the number registered a decade earlier. In the same period, patent applications for *all* inventions (not just those resulting from Government funding) rose.

No one has rushed forward with a comprehensive explanation for the sudden dropoff. Earlier in the decade, a rise of patent applications by Government employees and contractors paralleled rising R&D budgets. But when the budget bottomed out in 1971 and then rose some 7 percent in 1972, the descent of invention disclosures actually sharpened its rate of decline slightly. Even more puzzling, in 1971 the President issued a memorandum instituting a new policy permitting private industries, for the first time, to be granted exclusive rights to Government-held patents, under special circumstances. But the result, instead of an anticipated upswing in applications for such licenses, was the decade's first substantial downturn in that phase of national innovative activity.

Some industries have been disgruntled by moves in Congress to change patent laws to make results of work funded by the Government more widely available. "Under these circumstances," testified N. Bruce Hannay of Bell Laboratories, "the companies with the greatest competence to carry out the [resulting] program may be discouraged from participating." Sen. John L. McClellan (D-Ark.) told an interviewer recently he thought the problem centers on uncertaintly in what restrictions a patent owner may place on the licensing of his patents without violating antitrust statutes, and he called for clarification of the issue in upcoming legislation. On the one hand stands the public's right to benefit from publicly funded projects; on the other, a company's disincentive to produce an invention it will immediately have to give away.

The patent-granting procedure has come a long way since gadget-loving Thomas Jefferson (then Secretary of State) first reviewed all applications personally. More than three-quarters of patents now go to corporations, with those resulting directly from Government R&D representing about 3 percent of the total. Though the procedure is costly and time-consuming—involving about $225 in official fees, an average of $1,000 for a patent lawyer, and a two-year wait—these should not prove major impediments to big companies. A more serious threat, one industry patent expert told *Science News*, is the inability of companies to patent computer "software." Another industry source said this might cut down on new patents but could not account for the decline reported by FCST. Another blamed the shift to "systems" contract-

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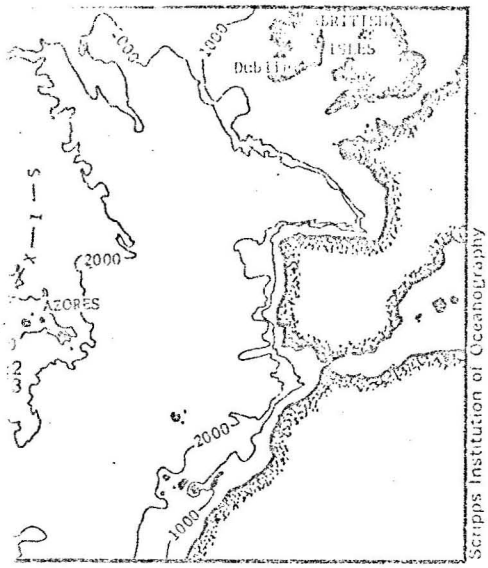
The problem is, no one is quite sure how funding stimulates inventiveness. If one divides total Federal R&D funding by the number of inventions, the "cost" per invention for the Department of Defense, NASA and the Atomic Energy Commission (which account for the bulk of patents) runs between one and two million dollars apiece. For agencies involved more in pure research such as HEW and NSF, the cost jumps to $8 million. Patent policy clearly needs more study, and probably new priorities. □

Vinyl chloride at molecular level

When the recent tragic deaths of 15 vinyl-chloride workers became public, people were alarmed. They worried about the 30,000 other vinyl chloride workers, and wondered if the ubiquitous polyvinyl chloride plastic products themselves could cause liver cancer (angiosarcoma) or other cancers. These plastics are present in almost every home, office and factory, primarily in the form of pipes and conduits, and floor and furniture coverings. When the questions came, scientists, industry and government alike were caught with their data down. They didn't and still don't have much information on what plastics in general and vinyl chloride in particular do to the physical and biological environments.

In an attempt to fill in some of these gaps and anticipate future health problems from plastics and plastics manufacturing, the National Institute of Environmental Health Sciences (NIEHS) conducted a conference this week at Pinehurst, N.C., with participants from the plastics and chemical industries, government agencies and universities. Emerging from the conference was a clearer picture of how vinyl chloride affects the human body and of the magnitude of the plastics problem. Vinyl chloride, it seems, is only one of many highly toxic, possibly carcinogenic substances to which chemical workers are exposed. The chemical and physical actions and interactions of polymer substances as they degrade and wear are just beginning to be understood.

Several researchers presented new findings on vinyl chloride. It appears that after vinyl chloride molecules (single molecules) enter the body they are attacked by an unknown [illegible] and break down into the chemical monochloroethylene oxide. Benjamin Van Buuren from the New York University Medical Center reports [illegible]



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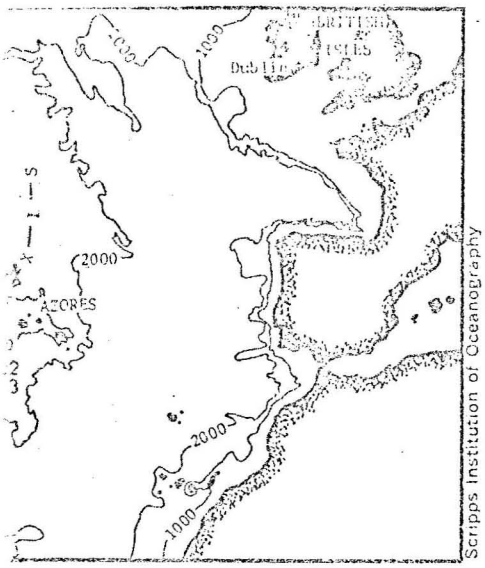

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Some industries have been disgruntled by moves in Congress to change patent laws to make results of work funded by the Government more widely available. "Under these circumstances," testified N. Bruce Hannay of Bell Laboratories, "the companies with the greatest competence to carry out the [resulting] program may be discouraged from participating." Sen. John L. McClellan (D-Ark.) told an interviewer recently he thought the problem centers on uncertainty in what restrictions a patent owner may place on the licensing of his patents without violating antitrust statutes, and he called for clarification of the issue in upcoming legislation. On the one hand stands the public's right to benefit from publicly funded projects; on the other, a company's disincentive to produce an invention it will immediately have to give away.

The patent-granting procedure has come a long way since gadget-loving Thomas Jefferson (then Secretary of State) first reviewed all applications personally. More than three-quarters of patents now go to corporations, with those resulting directly from Government R&D representing about 3 percent of the total. Though the procedure is costly and time-consuming—involving about $225 in official fees, an average of $1,000 for a patent lawyer, and a two-year wait—these should not prove major impediments to big companies. A more serious threat, one industry patent expert told SCIENCE NEWS, is the inability of companies to patent computer "software." Another industry source said this might cut down on new patents but could not account for the decline reported by FCST. Another blamed the shift to "systems" contracting [illegible] filter down as much R&D funds to their subcontractors.

The problem is, no one is quite sure how funding stimulates inventiveness. If one divides total Federal R&D funding by the number of inventions, the "cost" per invention for the Department of Defense, NASA and the Atomic Energy Commission (which account for the bulk of patents) runs between one and two million dollars apiece. For agencies involved more in pure research such as HEW and NSF, the cost jumps to $8 million. Patent policy clearly needs more study, and probably new priorities.

Vinyl chloride at molecular level

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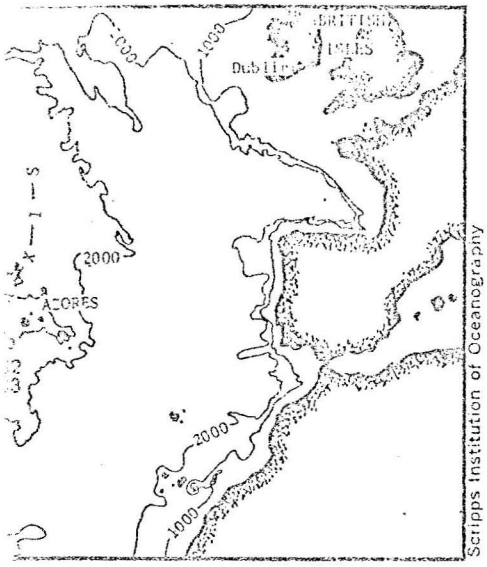
In an attempt to fill in some of these gaps and anticipate future health problems from plastics and plastics manufacturing, the National Institute of Environmental Health Sciences (NIEHS) conducted a conference this week at Pinehurst, N.C., with participants from the plastics and chemical industries, government agencies and universities. Emerging from the conference was a clearer picture of how vinyl chloride affects the human body and of the magnitude of the plastics problem. Vinyl chloride, it seems, is only one of many highly toxic, possibly carcinogenic substances to which chemical workers are exposed. The chemical and physical actions and interactions of polymer substances as they degrade and wear are just beginning to be understood.

Several researchers presented new findings on vinyl chloride. It appears that after vinyl chloride monomers (single molecules) enter the body, they are attacked by an unknown enzyme and break down into the chemical monochloroethylene oxide. Benjamin J. Van Buuren from the New York University Medical Center reports that



ng 1,910-footer at site 332, near Rift.

Challenger pulls into a port, says one project official, the captain sometimes likes to wave off the assisting tugboats and glide laterally—and dramatically—over to the dock.) Once the cone is directly beneath the sonar transmitter on the drill string, the rim of the cone itself acts as a reflector, signalling its presence by showing up as a ring on the monitor screen. The bit slides in.

The reentry technique was first tested three years ago during Leg 11 of the project, when its success was greeted with a pleased and lusty cheer from those aboard. It was first used operationally during Leg 14, on Christmas Day of 1971, and has since worked at water depths as great as 13,000 feet. But it was not until Leg 37 that it really began to show its true potential.

To further evaluate the technique, next week one of the Famous submersibles, Woods Hole Oceanographic Institution's Alvin, is scheduled to visit one of the drill sites to see, for example, how far the cone sinks into the sediment with use. □

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General Background

THE FOLLOWING PAPER IS BASED on the writer's experiences as Patents Coordinator of Technion—Israel Institute of Technology, the only technical university in that country. The peculiar problems, and the solutions experimented with in order to cope with them, would appear to stem from this configuration of circumstances: a university in a small country, poor in natural resources and having a population the size of a large city split into three major urban areas. One of these urban areas comprises the city of Tel-Aviv with its five satellite towns housing two-fifths of the entire population. Since 1948, when the State was founded, the population has grown fourfold, to roughly two and one-half million. The main contributory cause to that growth has been large-scale immigration which, however, has tended to taper off in the past few years as the program of the voluntary liquidation of large Jewish communities in certain parts of the world is nearing completion. Both industrialization and agricultural development have made great strides in those 20 years, and strenuous efforts are continuing to integrate the still very heterogeneous population into an ethnic—as opposed to a religious—whole. The scarcity of natural resources and the vast demands of basic development and security have between them been responsible for the specific economic and political structure of the country, which is a cross between state-directed capitalism and outright "etatism." It is in this context, then, that the lonely efforts of a Patents Officer have to be viewed.

University Patent Policies

At an institution with the triple purpose of training engineers and scientists, conducting pure and applied research, and helping local industry to overcome its technological and related problems, patentable inventions are almost naturally regarded as a by-product. However, while it is universally accepted that the primary purpose of the scientist is to contribute to the progress of science and to disseminate his findings through their prompt publication, it is also recognized that in many cases the hardly less important purpose of applying the new knowledge arrived at by the theoretician requires the "enlightened selfishness" of the businessman. The patent system as such serves as a catalyst in bringing this about, and here it acquires its significance for an institution, such as a university, which on the face of it would have little to do with the art of making money that is called business.

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ISSUE TO BE RESOLVED:

Does the Federal Property and Administrative Services Act (40 USC) authorize the disposal of Government owned patents? And, if so, must patents be disposed of by public sale after advertising as generally required by the Act, or do patents fall within one of the sections which in certain circumstances allow property to be disposed of by negotiated sale?

CONCLUSION:

Both the language and the legislative history of the Federal Property and Administrative Services Act (40 USC) evidence that Government owned patents are included as property which can be disposed of under the Act. A strict construction of the language of section 484 (e)(5) - which in our opinion is in accord with the explanation of the section in the legislative history and in the Committee report - would relieve all Government-owned patents as a class of property from the general requirement for disposal by public sale of the Act, if the Administrator determines that negotiated disposal of Government patents at a fixed price will best serve the interests of the Government. However, regardless of the interpretation of section 484(e)(5); patents whose subject matter promotes the health, the safety, or the national security of the public, may be exempt under 40 USC(e)(3)(B) from the requirement of disposal by public sale.

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HISTORY OF THE INCLUSION OF PATENTS IN THE SURPLUS PROPERTY ACT OF 1944

The Surplus Property Act of 1944 was passed to authorize the disposal of Government property which had been purchased for the war effort and now was no longer needed or obsolete.

The Act contained a provision which required Agency heads to notify the Attorney General prior to the sale of certain types of property. Patents were positively listed among the types of property for which such notice was required. Accordingly, by negative implication it was clear, patents were surplus property which could be disposed of under the Surplus Property Act.

The inclusion of patents as disposable property under the Surplus Property Act of 1944 was consciously considered by the members of Congress. Originally, only the Senate bill S. 2065 required that the Attorney General be notified about the sale of patents prior to the transaction. The House's notification provision in H.R. 5125 listed all the same types of property as the Senate bill with the exception of patents. The conference compromise accepted the Senate rather than the House version of the notification provision as the final provision for the Act.

Further evidence of the conscious consideration to include patents as disposable property is noted from the following remarks made by Senator Stewart, during the Senate hearing on that bill:

"I know of no estimate of the value of this great variety of intangible property, including industrial techniques, processes, and inventions which have been developed in Government plants, at Government expense, or under Government sponsorship, or which have been vested in the Alien Property Custodian under the Trading With the Enemy Act. These, too, will become Government surplus and should be made available to industry in such a way as will best promote the public interest.

It is well remembered that during World War No. 1 there was a concentrated technical development incident to production for war equal to a far greater span of peacetime years. There is every evidence that our technical strides in the present conflect are even more spectacular. These new techniques constitute an important property and their disposal is a matter of concern, not merely to the individuals and corporations that may obtain them, but to our society as a whole. They are of peculiar interest to small business. They might become a fateful instrument in the hands of monopoly. Their distribution may be a determining factor in the character of our future economy.

The question of the Government's protection of this property against attempts to secure private patents thereon apparently must be considered with that of disposal, if the Government is to have this property to dispose of. Already there have been reports

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conflect are even more spectacular.

of private individuals securing patents on processes developed in Government plants, in the development of which they had no part. The War Production Chairman, Donald Nelson, recently said that this very thing had been giving him a great deal of concern, and that there had been no machinery set up to prevent it.

It appears that little if anything in the way of public policy has been determined with regard to this intangible property. This phase of the subject has had little investigation. In the interest of a socially sound distribution of war-surplus property and in the particular interest of small business disposition of this class of property should be fully studied and carefully planned.

Thus it is highly important that technical intangibles be included in the planning list. I should like to add that this class has also been included in the classification of property for the disposal of which the board must obtain specific clearance from the Attorney General. It is important an contribution which the Military Affairs Committee made to the bill." (Emphasis added)

90 Congressional Record 7251

HISTORY OF THE INCLUSION OF PATENTS IN THE FEDERAL PROPERTY AND ADMINISTRATIVE SERVICES ACT OF 1949

The Federal Property and Administrative Services Act of 1949 (40 USC) was passed to provide a more efficient system of management for Government property. In order to accomplish this goal Congress established a special agency and delegated to it; the power to purchase, the power to utilize, and the power to dispose of Government property. The disposal authority granted under the Federal Property and Administrative Services Act of 1949 approximated the authority given in the Surplus Property Act. The provision of the earlier act which called for notification of the Attorney General prior to the disposal of a patent, was incorporated into the later Act at 40 USC 207. So, again, by negative implication Government owned patents were disposable under 40 USC 203, "by sale, exchange, lease, permit, or transfer."

In 1958 the section of the '49 Act which called for notification of the Attorney General prior to the disposition of certain types of property was amended as 40 USC 488. Although certain property was deleted from the list of property for which notification of the Attorney General was required prior to disposal, patents were not so deleted. And as the Act presently stands patents are included in this notification section.

...ssable under

Since Congress delegated its Constitutional authority to dispose of surplus Government property, first in the Surplus Property Act of 1944 and later in the Federal Property and Administrative Services Act of '49, patents have been included as the type of property for which notification of the Attorney General prior to disposal was required. If Congress did not want patents included, it would have deleted patents in the later Act or one of the Amendments to the later Act. Clearly, Congress intended, and did include patents as property which could be disposed of under the '49 Act (40 USC).

NEGOTIATED SALES UNDER THE FEDERAL PROPERTY AND ADMINISTRATIVE SERVICES ACT OF 1949

The major purpose of the 1958 Amendment to the Federal Property and Administrative Services Act of 1949, based on S. 2224 was:

> "to prescribe the situations in which disposal of surplus Federal property ... must be accomplished by public advertising, and those in which disposals of such property may be accomplished by negotiation."

Congress intended that this amendment

> "would provide a "charter" in the field of surplus property disposal comparable to the one contained in title III of the Federal Property and Administrative Services Act of 1949 applicable to the procurement of property and services." Ibid

This Amendment established permanent authority to dispose of surplus property by negotiated sale in certain defined instances. Before its passage there had been a succession of temporary grants of such authority. Twice, in the nine years prior to the grant of permanent authority, the temporary authority lapsed. If the Administrator felt it was in the public interest to dispose of surplus property by negotiated sale, during the time when the temporary authority had lapsed, the Administrator would have to obtain special legislation authorizing him to negotiate a sale. Also, if the Administrator felt that disposal to a particular party was desirable and in the public interest, he would have to obtain special legislation enabling him to negotiate a sale with such party.

In order to remedy the problems created by having to periodically seek special legislation due to the inadequacies of the temporary authority, the General Services Administrator submitted a bill (S. 2224) which provided for

a permament authority for negotiated sales in certain situations. The proposed bill was submitted to the Committee on Government Operations. The Committee, having studied negotiated sales for a number of years felt that disposal by negotiated sale was, in the situations designated by the bill, in the public interest. Accordingly, the Committee after making slight alterations to the bill, passed it to Congress, who enacted it as 40 USC 484.

OPTIMUM RESULTS FROM PATENT DISPOSITION CAN ONLY BE ACHIEVED THROUGH NEGOTIATED DISPOSALS

For reasons which are discussed below, the authority to dispose of Government patents by negotiation is necessary to insure disposition of patents in a reasonable manner and to secure the rapid transfer of technology to the public market place.

A patent is a collection of rights, the right to make, the right to use, the right to sell, and the right to exclude others from using any of the aforementioned rights. A patent holder can assign all his rights to one person, or he can transfer a more limited right to one or more persons. Thereby the patent holder can license- a means for transferring rights- one person or several persons to make, use, and sell the invention under an infinite variety of conditions, or the patent holder can transfer the whole patent. The only practical method of sale, which will provide a vehicle whereby both the vendee and the vendor can consider and agree upon what combination of rights and conditions under the patent, they will respectively buy and sell, is a negotiated sale.

In order to be commercially useful, a substantial number of patented inventions licensed by the Government, need further development. Therefore, when licensing a patent, the Government must insure that the licensee has the qualifications necessary for developing the invention covered. If patents were licensed under the general disposal provision of this Act, which requires a public sale after advertising, patents would have to be licensed to the highest bidder regardless of whether such bidder was considered qualified to develop the patent. Again, negotiation is the only practical method of disposal which would allow the selection of a qualified licensee.

We believe that Congress intended to authorize the disposition of Government owned patented through negotiated sale in the Federal Property and Administrative Services Act. Evidence which supports this belief is set forth below:

A. The purpose of the '58 Amendment was to provide a charter in the field of disposal comparable to the one for procurement contained in Title III. And more specifically, as pointed out by Mr. Gæque during the Senate Hearings of the Committee on Government Operation, the purpose was to provide a permanent charter for negotiated sales, which would correspond to the authority for negotiated procurement in title III.

The procurement authority granted in Title III extended

> "to the General Services Administration the principles of the Armed Services Procurement Act of 1947, with appropriate modification principally designed to eliminate provisions applicable primarily to the military." S. Rept. No. 1158, 81 Cong., 1st Sess. (1949) p. 94

Title III adopted most of the sections of the Armed Services Procurement Act of 1947, including those which authorized procurement by negotiation, such as section (2)(c)(10). This section authorized procurement by negotiation of property and services for which it is impracticable to secure competition. According to the Senate Committee that reviewed this section of the Armed Services Procurement Act of 1974, patent coverage was listed as

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1947 ... appropriate modification

a reason making it impracticable to secure competition and justifying the procurement of the property or services through negotiation. Since under Title III patent coverage could be cited as a reason for negotiation, it could be concluded from Congress's stated intent, that there was to be a corresponding section in this amendment which involved patents as a justification for disposal of property through negotiation. This conclusion is not disturbed by the Comptroller General's interpretation of 10 USC 2304 (a)(10) (former section (2)(c)(10) of the Armed Services Protection Act) in 119 USPQ 187 (Oct. 6, 1958), requiring purchase from a low bidder whether or not the patent holder, since this opinion was given months after the '58 Amendment was enacted.

B. Another section of Title III (41 USC 252 (11)) authorizes the procurement of research and development work by negotiation. Again, considering the purpose of the '58 Amendment as pointed out by Mr. Gasque, it would seem that Congress would provide for a corresponding section for disposal by negotiation of patented inventions in return for their further development. There is little difference between the Government licensing a patented invention to a party who will develop it to the point of commercial utility, and the Government procurement of that same development for a fee. The only difference here would lie in the consideration being offered by the Government - a license under a patent rather than a fee.

C. Since negotiation is the only practical method for disposition of Governemnt owned patents, the authority to dispose of patents by negotiation is necessary for the normal performance of agency duties. It would be logical to assume that Congress would authorize such for an orderly performance of agency duties.

D. When Senator Stewart addressed the issue of patent disposal during the Senate hearings on Senate Bill S.2065, he stressed the need for special treatment of disposal of this property. Obviously, no such special disposal provision was written into either the Surplus Property Act, or the first draft of the Federal Property and Administrative Services Act. Since patents were clearly property which could be disposed of under the Act, Congress must have been satisfied that, the general disposal language of the Acts adequately provided for the disposition of patents. This conclusion is supported by the fact that the Surplus Property Act of 1944 authorized negotiated disposal of substantially all surplus property without requiring special authority to do so. Further, the first draft of the Federal Property and Administrative Services Act also provided such a general authority, although only for a year.

In 1958, several years after the year long general authority granted in the Federal Property and Administrative Services Act lapsed, an Amendment was enacted which granted permanent authority to dispose of surplus property by negotiation in defined instances. Because the former Acts granted the authority to dispose of patents by negotiation, an inference can be drawn, that the '58 Amendment

of the Act only partially provided for the disposition of patents

was intended to provide the same authority as that granted in the earlier Act. This inference is buttressed by the following argument: Patents had always been included as property which was disposable under the Acts either by advertisement or through negotiation at the Administrator's discretion. Since patents were not specifically excluded in the '58 Amendment, patents can be presumed to be disposable by negotiation, as long as the circumstances surrounding the disposition comply with one of the instances for which disposal by negotiation is authorized.

EXAMINATION OF THE NEGOTIATION AUTHORITY IN THE ACT FOR A SECTION WHICH COULD SUPPORT A GOVERNMENT-WIDE PATENT LICENSING POLICY

The Act requires, in all but a few instances, that surplus property be disposed of by public sale after advertising. The exceptions to the public sale requirement, or the instances in which disposal by negotiated sales are authorized, were incorporated into the Act by Amendment in 1958 as 40 USC 484. These provisions were designed to provide for the instances in which the General Services Administrator found it beneficial to dispose of surplus property by negotiation.

To insure disposition of Government patents in a reasonable manner, under the Federal Property and Administrative Services Act, it is necessary to find a section which authorizes the disposal of Government patents by negotiated sale in the Act. And further, if uniformity is to be maintained for the disposal of all Government patents authority must be found in the Act which could support a Government-wide patent policy which would be equally applicable to all patent disposals for all Executive Departments and Agencies.

After examining each exception, as set forth as follows, to determine whether it was capable of supporting a Government-wide patent licensing policy as mentioned above, it was concluded for reasons which follow each exception section respectively, that only section (e)(5) could support such a policy.

484 (e)(3)

Disposals and contracts for disposal may be negotiated under regulations prescribed by the Administrator, without regard to paragraphs (1) and (2) of this subsection (the provisions for public sale) but subject to obtaining such competition as is feasible under the circumstances if: (parenthetical added)

(A) Necessary in the public interest during the period of national emergency declared by the President or the Congress, with respect to a particular lot or lots of personal property or, for a period not exceeding three months, property as determined by the Administrator;

Comment: A Government-wide patent policy cannot be based upon the limitation that a license may only be granted during a National emergency or for three months as determined by the Administrator.

(B) The public health,safety,or national security will thereby be promoted by a particular disposal of personal property;

Comment: A Government-wide patent policy cannot be limited to subject matter which is classified only in the health, safety, or national security areas, but a policy applicable to HEW, VA, and DOT, could be based upon this Section since substantially all the inventions of these agencies are in the area of health and safety.

From the following example, given during the Senate Committee hearings on S. 2224, it appears that an overriding concern of the drafters was, quick delivery of the health product.

"(B) If the public health, safety, or national security will thereby be promoted. There are three elements in there: Health, safety, and national security. We would like to cite an example of the public health aspect.

We had a case several years ago where specially designed equipment was manufactured for the Government to make

yellow fever vaccine during a period when no manufacturer could be found who would undertake manufacture of the vaccine.

The Government finally found one such company. If he could buy this Government equipment, he could be in production in 60 days: otherwise this production would start in about 6 months. Only a 90-day total inventory of yellow fever vaccine was available so that speed was important. If he brought new equipment then the Government-owned equipment would be worthless, since he was the only manufacturer would could use that equipment." Hearings before Senate Committee on S. 2224 (Federal Property and Records Management), 85th Cong., 1st Sess. (1957) p. 27.

From the following example, also given during the Senate Committee hearings, it seems that the drafters did not feel wide scale advertising was necessary in disposing under this section. The drafters believed that the Agency officials would know who was interested in the product, from experience the Agency officials had in the area.

"Mr. Tuttle, Yes sir. There are cases where a Government agency, such as in the medicine case, has such technical knowlege of a particular drug, who its suppliers are, who its manufacturers are, that it is a very simple matter to determine who is interested in buying this deteriorated drug and to determine that there is no use trying wide-advertising.

We must try to sell it to somebody who can handle it." (Id. at p. 21-22)

(C) Public exigency will not admit of the delay incident to advertising certain personal property;

Comment: From the legislative history of the Act this section is directed towards perishable whose value or usefulness rapidly diminishes. Patent property does not rapidly diminish in value or utility, therefore, patents are not property which could be disposed of under this section.

(D) The personal property involved is of a nature and quantity which, if disposed of under paragraphs (1) and (2) of this subsection, it would cause such an impact on an industry or industries as adversely to effect the national economy, and the estimated fair market value of such property other satisfactory terms disposal can be obtained by negotiation;

Comment: From the legislative history of the Act this section is directed towards the disposal of a large quantity of goods. A sound govern-wide-wide patent policy must require patents to be disposed of on a case by case basis, therefore this section could not support a Government-wide patent policy.

(E) The estimate fair market value of the property involved does not exceed $1,000;

Comment: A Government-wide patent licensing policy cannot be constrained by price limitations.

(F) Bid prices after advertising therefore are not reasonable (either as to all or some part of the property) or have not been independently arrived at in open competition;

Comment: A basic requirement of a Government-wide patent policy is that it enables negotiation from the inception of the disposal. Since this section allows negotiation only after an unsuccessful public sale has been conducted, it is not capable of supporting the aforementioned policy.

(G) With respect to real property only, the character or condition of the property or unusual circumstances make it impractical to advertise publicly for competitive bids and the fair market value of the property and other satisfactory terms of disposal can be obtained by negotiation;

Comment: Since this section authorized the negotiated disposal of real property only, patents, which are personal property could not be disposed of under this section

(H) The disposal will be to States, territories, possessions, political subdivisions thereof, or taxsupported agencies therein, and the estimated fair market value of the property and other satisfactory terms of disposal are obtained by negotiation;

Comment: A Government-wide patent cannot be restricted to the limited number of potential purchasing parties listed in this section especially in light of the fact that the parties listed here have little, if any, capability to bring the patented invention involved to the marketplace.

(I) Otherwise authorized by this Act;

Comment: There is no other section in this Act which authorizes the disposal of patents by negotiated sale.

484 (e)(4)

Disposals and contracts for disposal of surplus real and related personal property through contract realty brokers employed by the Administrator shall be made in the manner followed in similar commercial transactions under such regulations as may be prescribed by the Administrator: Provided, that such regulations shall require that wide public notice of availability of the property for disposal be given by the brokers.

Comment: This section authorized disposal of real property and related personeal property. Since patents are personal property they cannot be disposed of under this section.

484 (e)(5)

Negotiated sales of personal property at 'fixed prices' may be made by the Administrator either directly or through the use of disposal contractors without regard to the limitation set forth in paragraphs (1) and (2) of this subsection: Provided, that such sales shall be publicized to the extent consistent with the value and nature of the property involved, that the prices established shall reflect the estimated fair market value thereof, and that such sales shall be limited to those categories of personal property as to which the Administrator determines that such method of disposal will best serve the interests of the Government; (emphasis added)

Comment: The language of this section clearly authorized the Administrator to dispose of certain classes of personal property by negotiated sale, when he determines that in the interests of the Government this class of property should be so disposed. Therefore; if the Administrator determined that in the interests of the Government, patents, as a class of property, should be disposed of by negotiated sale; this section could support a Government-wide patent policy.

From an explanation appearing in the committee reports, section 484(e)(5) authorizes the Administrator to make a determination that a certain class of property should be disposed of by a negotiated sale, and it further authorizes the Administrator to exercise his discretion as to whether to dispose of the property himself or to dispose of the property through a disposal contractor. The authority, to hire a disposal contractor was suggested by the Hoover Commission as being necessary,

"that in certain selected, highly technical categories the Government ought to endeavor to use commercial concerns highly qualified in the marketing of such items." Hearings before Senate Committee on S. 2224 (Federal Property and Records Management), 85th Cong., 1st Sess. (1957), p. 27.

The following, is the only example cited in the Committee Reports as being within 484(e)(5):

"greater net revenues can be obtained by selling certain types of surplus personal property at fixed prices in advance of sale at current market levels with wide advertising of these fixed prices.(emphasis added)

Examples are complete aircraft having commercial value, aircraft engines, vehicles, and in some cases spare parts." (Ibid)

Considering the inordinate stress which was placed upon the authority to hire disposal contractors in the legislative history, and the purpose given for the hiring of these contractors, and the type of property listed in the above examples; we feel that this section was designed, primarily for the disposal of highly technical classes of personal property in which patents must surely be included. Based on the explanation of this section by Mr. Tuttle during the Senate Committee hearings (Ibid) we also feel that the Administrator is authorized to dispose of such property himself if he possesses the necessary expertise, or is authorized to employ disposal contractors if he does not possess the technical expertise required to make a proper disposal. This alternative discretion in the Administrator appears to be antipatory of the licensing function undertaken by NTIS. The Government would not undertake disposal of the highly technical class of personal

property to be covered by this section, before an expertise equal to that of the described disposal contractors was developed in the Government.

Before this section can be used there are two requirements which must be satisfied, the first is notice of sale, and the second is that the property disposed of, must be sold at a fixed price. Since the means for compliance with the first requirement is obvious, it need not be covered here. As to the second requirement of fixed price, there is no explanation of this term in the Legislative history. We have interpreted fixed price to mean the "best deal" for the Government, rather than maximum monetary return. This interpretation will allow the Administrator to fix the price of what is being sold in money, other consideration ~~or some combination of the two~~. This broad interpretation is necessary because there will be instances in which it is in the public interest, and therefore the "best deal" for the Government to fix consideration in terms rather than money. An example of such a situation usually occurs when the Government is to license a patent generated by a Research and Development Agency.

Patented inventions generated by these agencies in large measure require further testing and development before they are commercially useful. These inventions ordinarily represent a substantial improvement to the technology existing in the market place. It would therefore seem that the "best deal" for the public and the Government would be the rapid delivery of these inventions to the public at a reasonable cost.

If the Government charges large licensing fees, it could result in increasing the cost to the public of the invention, for the cost of the goods to the public will be figured by adding the cost of the license to the cost of the reduction to practice of the invention. Therefore, under these circumstances, the most important part of the "fixed price" is the plan of development which a licensee is willing to be committed to, rather than a money return to the Government.

We have not investigated section 484(e)(5) further because as previously mentioned section 484(e)(3)(B) authorizes the disposal by negotiated sale of patents in which HEW, VA, or DOT have a proprietary interest.

P.S. An amusing corollary to the above is that if you accept the argument used in Public Citizen, that the Departments must have statutory authority to dispose of future inventions, the above would support an argument that the Act provides such authority.

INSERT A

Therefore in accordance with the procedure presently required by the Act either the Administrator or,

"Any executive agency designated or authorized by the Administrator to dispose of surplus property (including patents) may do so by sale exchange, lease, permit or transfer, for cash, credit or other property, with or without warranty, and upon such other terms and conditions as the Administrator deems proper and it may execute such documents for the transfer of title or other interest and take such other action as it deems necessary or proper to dispose of such property under the provisions of this subchapter."

(40 USC 484(c) (parenthetical and emphasis added))

1A. Presidential Memorandum and Statement of Government Patent Policy of August 23, 1971.

1B. Presidential Memorandum and Statement of Government Patent Policy of October 10, 1963.

2. Armed Services Procurement Regulations, Chapter IX - Part 1

3. Postal Service Procurement Regulations, POD Form 2149A (April 1969) pages 3, 4, 5, 6

4. Department of Commerce Procurement Regulations, PD-GP-1 (11-70) pages 18 through 38

5. NASA Act of 1958 (PL 85-568), Section 305

6. NASA Procurement Regulations - Chapter IX

7. AEC Act of 1954 (PL 83-703) - Chapter 13

8. AEC Procurement Regulations - Section 9-9.5000 et seq.

9. NASA Waiver Regulations 14 CRF 1245.100 et seq.

10. FAA Procurement Regulations, Forms FAA P-3 (10/15/69) pages 10,11, and FAA P-5 (11/1/69) pages 8 and 9

11. Proposed DOT Procurement Regulations

12. CODSIA Letter dated May 14, 1971 to DOT re the Proposed DOT Procurement Regulations

13. Bureau of National Affairs Patent, Trademark & Copyright Journal dated 5-27-71, pages A-1, A-2 and A-3

14. CODSIA Letter dated May 10, 1971 to ASPR Committee re Patent Costs

15. Remarks of James E. Denny Before the Intellectual Property Rights Seminar, Smithsonian Institution, April 7, 1971

1973

erature, the general reader may still find it dense in parts, sometimes slow going, and somewhat too long. But the attention it demands is more than compensated by the deep insight it offers into how our major adversary functions.

Berliner's argument is that the very structure of the Soviet system creates major and often insurmountable barriers to real innovation.

"The study of innovation has not been neglected in the past," he writes, "but it has not been the main focus of interest of economists. It is now the main item on the agenda... It has become clear in a rather dramatic way that the capacity to generate technological change is a most important property of an economy that has economic growth as one of its goals.

Those who run the Soviet Union have very consciously put it at the top of their concerns. "We must create conditions," declared Party Secretary Brezhnev, "that will compel enterprises to produce the latest types of output, literally to chase after scientific and technical novelties, and not to shy away from them as the devil shies away from incense."

Such may be the wish, but not the result. Why? Despite a series of reforms, the structure of the Soviet economic system discourages innovation.

Berliner points to four characteristics of the system. The pricing system continues to be very rigid. It involves the setting of over 10 million separate prices, and is still essentially administered by the central planners. In addition, a great deal of effort must go into getting a new price approved—one factory in Siberia typically finds it needs approval from nine other organizations. It can take longer to get a price than to develop a new product.

Second, the would-be innovator is hampered by organizational problems. It is difficult to arrange to get raw materials needed for a new product. Customers do not like new products because they to be yes. Lack of innovation means a lack of growth. On a related point, it also means a lack of incentives in the form of goods in the shop windows that encourage workers to work. It does not mean that the Soviet Union will collapse. It can continue to hobble along unhappily producing ever more steel and oil—and suffering growth rates perhaps as low as Britain's.

Berliner has two basic suggestions for increasing the rate of successful and significant innovation in the Soviet Union. The first is to increase managerial incentives. Alas, income inequality at a certain point becomes ideologically unacceptable. Second, give the enterprises greater autonomy. But that is not politically feasible in the Soviet Union today. "The eggs have been put into two baskets: the corporation reform and the import of foreign technology," Berliner says. "They are likely to generate a marginal improvement in the quality and rate of innovation, but they do not confront fully the major structural obstacles to innovation."

Perhaps there is an additional important reason. "The theme that pervades the Soviet sources is that nobody cares very much about innovation," Berliner writes. But Berliner has deliberately decided to concentrate on the structural causes and has put aside cultural factors, and so he does not go very far to explore this theme. This is a pity. The economist Charles Kindleberger once investigated 19th-century British and French economic history in an effort to understand why British growth so outpaced French in that period. Finally, he decided that structural factors were insufficient explanation. In France, he concluded, there was an absence of demand for growth.

Perhaps while there is a demand for growth in modern Russia, there is an absence of true demand for innovation. For innovation also means that risk, uncertainty and failure must be a prominent part of the economic system. And for all concerned in the Soviet Union—from plant manager to central planner to party ideologue—those are conditions of danger, best banished from daily life. And so, as Berliner demonstrates, the innovation decision in the Soviet Union is characterized mainly by its absence. □

DANIEL YERGIN teaches at Harvard University and is the author of *The Shattered Peace*, a new history of the origins of the Cold War, to be published shortly.

K.
Pl. make copies
for members of
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To
Thomas Ferris
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NSF Patent Shift to Benefit Universities

The National Science Foundation is on the verge of announcing a major change in its patent policies that will allow qualifying institutions to be guaranteed in advance the royalties from faculty inventions that result from projects supported by NSF.

The new policy will also remove limitations previously imposed on the amount of royalties that could go to the individual inventor, thus opening the possibility that both the inventor and his institution can reap greater financial rewards from NSF-sponsored research.

The changes at NSF are generally in line with the thrust of recommendations mady by an interagency group operating under the Federal Council for Science and Technology (FCST). That group, known as the University Subcommittee on Patent Policy, has been studying ways to overcome barriers to technology transfer between the universities and industry.

According to Norman J. Latker, chief of HEW's patent branch and chairman of the subcommittee, the FCST group concluded it is "essential" that the government persuade universities to develop a management capability for transferring the inventions emerging from university research to those industrial concerns most likely to use the results. The inducement proposed by the subcommittee—and still under review within FCST—is that the government might, at the time it awards research funds, guarantee patent rights to any university that can demonstrate the requisite management capability.

That's essentially what NSF now proposes to do. Under a new policy that has been approved by the Foundation's policy-making National Science Board but has not yet been made public, NSF will be authorized to "enter into separate institutional agreements with academic or other nonprofit organizations which are capable of aggressively promoting the use of inventions and have competent patent counsel available and an active ongoing program of patent management." Such agreements may provide that all inventions made under NSF awards belong to the institution, subject to certain limitations, and they will require that the institution use any net royalty income "for the support of education or scientific research." The government will retain the right to use the invention without paying royalties.

Previously, the Foundation had generally determined patent rights on a "deferred determination" basis—that is, after an invention had emerged, NSF and the institution would negotiate over who owned the patent rights. Although NSF generally granted patent rights to most universities that requested them, the situation produced uncertainty in university and industry circles and is said to have hampered efforts to bring about closer collaboration between the two spheres.

The chief reason for the new policy, according to NSF counsel Charles F. Brown, is that the universities are generally in a better position than NSF to promote the use of their inventions. "We don't have the staff to sell licenses effectively," he told SGR. Moreover, since NSF's mission is to support research and education, Brown said, the Foundation considers it "socially desirable" for universities to be able to obtain income from

(Continued on page 5)

Some Academic Patent "Biggies"

Interviews with patent officials at major universities indicate that royalty income can be a valuable supplementary source of revenue. And, if a university is lucky enough to spawn what the trade calls a "biggie," the returns can be quite substantial.

Consider these winners in recent decades:

—A memory core used in computers, which was invented by MIT's Jay W. Forrester, will gross about $19 million in royalties by the time final payments are made in the near future. MIT will net about $14 million of that, with the rest going to Forrester, The Research Corporation and litigation costs.

—A semi-synthetic penicillin developed at MIT has netted the institute about $5 million to date (from gross royalties of $11 million) while a patent related to the synthesis of Vitamin A netted MIT $2.2 million (from gross royalties of $5 million) between 1950 and 1964.

—The Wisconsin Alumni Research Foundation netted about $8 million in royalties between 1928 and 1945 from an irradiation process for creating Vitamin D. The Foundation's total net royalties from all inventions between 1928 and 1972 were $12.9 million.

—Stanford has netted about $3.5 million since 1937 from royalties on the klystron, a microwave tube used in radar, communications, and missile tracking.

—The University of California, which has had no big hits, earned royalties of about $200,000 last year on its portfolio of some 100 inventions.

Other universities which have produced commercially profitable inventions include the Indiana University Foundation, which licensed the additive stannous flouride to Procter & Gamble for use in Crest toothpaste (insiders say the university made a naively bad deal with the company on that one); and the University of Florida, which is sharing in the royalties from Gatorade, a quick-energy drink.

Weinberg Rumored on Way Out as Oak Ridge Chief

Persistent reports that attempts are being made to oust Alvin M. Weinberg as director of the AEC's Oak Ridge National Laboratory gained credence recently when Weinberg acknowledged to SGR that he is currently on a leave of absence that is not entirely of his own choosing.

Weinberg, who is one of the most renowned scientist-administrators in the nation, announced unexpectedly on January 18 that he was taking a leave of absence on Feb. 1 that would last "several months" and would be devoted primarily to "writing and lecturing." That same day he left for a vacation in Florida.

The abrupt announcement surprised the Oak Ridge staff and led to rumors that the AEC was pressuring the Union Carbide Corp. Nuclear Division, which operates the laboratory under contract with the AEC, to remove Weinberg as director. The rumors increased when the AEC procrastinated in beginning negotiations toward extending its contract with Union Carbide beyond the June 30 expiration date of the current contract.

SGR queried Weinberg about the rumors late in April as he was in the midst of a lecture tour of several colleges in Virginia. "That's an interesting theory," he replied. "I guess I hadn't quite heard it."

Is he being pushed out? "I expect to be back at the laboratory sometime in the fall," he replied. "Beyond that, there is nothing more that I have to say."

What about his leave? Was that his idea? Or did someone force him to take it?

"A great deal of it was my idea," he replied.

Well, could he say who else's idea it was? "No," he replied. "There's really nothing more that I'm in a position to say."

Weinberg then suggested that SGR might direct its inquiries to such parties as the AEC or Union Carbide. A spokesman for Union Carbide's nuclear division said his management expected Weinberg to return in the fall. A spokesman for the AEC said he had "nothing to add" to Carbide's position. And Floyd L. Culler, who is serving as acting director of the laboratory in Weinberg's absence, said he expected Weinberg to return in the fall. Meanwhile, Alexander Hollaender, a distinguished colleague of Weinberg's, told us: "Rumors are flying around. That's about all I know of it."

Those who believe Weinberg is under pressure to leave cite two possible reasons for an ouster attempt. One is that Weinberg has been outspokenly critical of the AEC for its emphasis on the liquid metal fast breeder reactor at the expense of other breeder designs and for its handling of the safety issues concerning the emergency core cooling systems for light water reactors. The second reason is that Weinberg may not fit the AEC's new notion that its laboratory directors should be hard-nosed managers. In this sense, the Weinberg case may reflect the same forces which led to the dismissal of an incumbent director at Argonne National Laboratory last fall. (SGR, Vol. II, Nos. 15 and 17).

Weinberg has been the director at Oak Ridge since 1955. He is a member of the NAS and has gained a reputation for astute commentary on public policy issues involving science and technology. He is devoting his leave to extensive lecturing and the preparation of a book dealing with "Science and Trans-Science." "I'm working my ass off," he told SGR.

PATENTS *(Continued from page 3)*

patent royalties that can be applied to those purposes. Such income can be substantial (see box, page 3.)

Brown estimated that perhaps 30 to 40 institutions have the management capability to qualify under the new policy. Currently most universities either leave it up to faculty members to seek their own patents or contract with outside organizations, such as The Research Corporation, of New York, to handle patents and licensing. But many universities with large research volumes have set up special offices or related foundations which screen the faculty for patentable ideas and then aggressively try to sell those ideas to industry.

The second major change in NSF's patent policy was to remove a restriction that the individual inventor, who generally shares in the royalties with his institution, could receive only 15 percent of the gross royalties. Brown said the original reason for imposing the limitation was to keep investigators focused on basic research rather than concentrating on profits. But since NSF's basic research orientation has been "seriously eroded" by new applied programs, he said, "we figured it didn't make much difference" if the limitation was dropped. Brown noted that some schools, such as the University of California, award the inventor up to 50 percent, and thus manage to flush out a lot more ideas than would otherwise emerge.

A few other agencies already have policies similar to the impending policy at NSF. Latker said in a recent speech that both HEW and the Defense Department guarantee qualifying institutions a first option to administer inventions generated with government support. And he reported that NASA is "willing to entertain" requests for such institutional agreements. Those three agencies plus NSF, he noted, provide about $2 billion of the $3 billion in federal support for university research. As Latker expressed it, the concept "is here to stay and grow because it basically reflects a grass-roots desire."

Presentation of Norman J. Latker before National Congress on "The Availability of New Technology to Industry from American Universities and Technological Institutes" - Sponsored by Dr. Dvorkovitz & Associates in Cooperation with the Illinois Institute of Technology Research Institute - Chicago, Illinois - April 2-5, 1973

First, I'd like to express my delight in being able to attend and be a part of this conference. I believe Dr. Dvorkovitz should be congratulated for taking one of the first initiatives to move into a void that many have long felt must be filled.

It has been the opinion of a number of scientific authorities on technology transfer that industry is not fully capitalizing on the inventive output of universities and non-profit organizations (hereinafter referred to as "universities"). Early in 1972, the country's leading scientists had reported to the White House as an "urgent situation" ". . . continuing failure of industry, universities, and Government to cooperate in developing civilian technology in the way they produced defense, space, and atomic tools."

Today the principals are gathered here in a practical attempt to respond to such criticisms.

From the point of view of the Government and the public, the stakes are very high. The sheer magnitude of Government support of research and development at universities demands evidence of useful results if it is to be continued in the prevailing competition for the Federal dollar. In Fiscal Year 1970, approximately $3 billion of the $12 billion, or one quarter of that spent by the Government on research and development outside its own laboratories went in the form of grants and contracts to universities. DHEW's former

Assistant Secretary for Health and Scientific Affairs recently quoted an Office of Management and Budget official as stating:

> "You have got to find some way to justify the return the public is getting from the large investment which has been made in health over the recent years by the Federal Government. In this regard, no one else is at such an increasing disadvantage as is health in competing for scarce funds."

My own belief is that this indication for need for identifiable results will be part of OMB's review of all agency research programs. Please note my emphasis on the word "identifiable". I am not at all convinced that because inventive results are not readily identifiable as being generated with Government support that meaningful bases of scientific information upon which industry builds are not being generated. Notwithstanding, it appears evident that a better job of transfering technology from the universities can and should be accomplished.

Of course, in those situations where Government funds are involved in supporting university research, all three principals need to sharpen their performance.

Some of the Government's efforts in reviewing its part in the technology transfer problem is taking place in the University Subcommittee on Patent Policy, an interagency group ultimately responsible to the Federal Council for Science and Technology.

At the outset of its study, the Committee identified some

general premises from which it would be necessary to proceed:

First, a sympathetic and encouraging Federal climate is very important to technological progress. Thus, in cases where the requirement for university/industry relations is not met in a satisfactory manner, Government can have an important role to play as a catalyst or "impresario" in creating the framework within which regular contacts take place between university and industry.

Second, the University community and industry, left to their own initiatives, will probably be unable to generate this atmosphere. Private business, even though concerned with institutional barriers that preclude systems innovations, can't do much about it. They are responsible for outputs of their businesses, and must ordinarily work within the narrow confines of the companies' responsibilities to maximize profits and minimize risks for the firm.

Third, there appears to be an absolute need for industrial collaboration with universities if the results of Government-sponsored university research are to reach the marketplace. Of course this is true because much of the work performed under Government-sponsored grants and contracts at universities is basic, as opposed to applied, research. Inventions arising out of basic research involve at most compositions of matter with no clear utility, prototype devices, or processes which usually require much additional development. Universities themselves do not undertake the complete development of such inchoate inventions to bring them to the point of practical application, as development leading to commercial marketing is not ordinarily

within the scope of their missions. Further, financing of that type of development work that might be used by such institutions is not generally available from Government sources. Consequently, development in such cases will generally be accomplished only where industry has knowledge of them and has an incentive to utilize its risk capital to bring such inventions to the marketplace. Even in those fewer instances where the university has undertaken applied research, ultimately industrial aid will be required in bringing the invention to the marketplace. Since the public institution and the industrial concern are two different organizations not only physically separated, but often having different goals, it can be expected that collaborative development arrangements will be difficult to achieve.

Last, the difficulty of collaboration is compounded when those who now perform essential parts of a function refuse to modify their operations to meet the needs of the whole system. (I am not excluding the Federal Government as one of the principals who must modify its operations.) These vested interests constitute by far the most serious institutional barriers to socially important innovations. Ordinarily, the principals can't be ordered to collaborate. Nor will they do so unless they see something in it for themselves. <u>The problem is how to provide the means for inducing them to integrate voluntarily into a system that performs a socially desirable function.</u>

With these matters in mind, the University Subcommittee began its review of the university difficulty in transferring the results of its research to industry. The following were considered to be the primary reasons for at least the appearance of not achieving optimum results:

First, and thought to be the most important, was the conclusion that universities do not generally have an adequate management capability to facilitate the transfer of their inventive results to industrial concerns that might make use of them. Even those organizations having the right to transfer a degree of patent protection desired by industry may well fail to succeed in encouraging utilization if an adequate, organized effort to communicate these results is not made.

Most authorities do not believe that the mere existence of a body of research outputs and other technical knowledge is enough to result in significant industrial innovation.

It is felt that to transfer scientific or technical information into specific innovations requires a certain amount of organized effort.

In sum, a good communications system does not just happen accidentally; management must take deliberate, specific action to devise and keep open necessary communication channels. It must also give explicit attention to its goals.

Of course, today we have with us a number of universities who have generated the type of management capability discussed above,

Most authorities do not believe that the mere existence of

and every day the number of additional universities forming such management capabilities is increasing in response to the demonstrated need.

What other problems impede technology transfer?

Well, second, I would identify the "not-invented-here" syndrome. Industrial organizations have commercial positions in most areas of their research. Accordingly, there is an in-house incentive for such organizations to further develop the results of their research in order to improve their commercial position. This incentive stems from the organization's ability to continuously evaluate their research through all stages of its development. It is presumed that there will be a lesser incentive for industry to further develop the results of university research where such research will not be under its initial review or control. It was suggested that this bias toward investment in further development of its own ideas, rather than ideas from outside sources, might be lessened by early identification by industry of university investigators who may be working in their areas of interest.

Notwithstanding the "not-invented-here" syndrome, I would note that the Proceedings of the Conference on Technology Transfer and Innovation, sponsored by the National Science Foundation in 1967, noted that innovating companies depend on a relatively small number of professionals called "cosmopolites" to communicate

with outsiders and bring important new information into the firm. This information is in turn passed on to the rest of the staff, referred to as "locals". About one-half of the 560 innovations studie in the above-cited conference were based on technological information horizontally transferred to the firm. This, of course, confirms the importance of outside information and suggests the expanded use of "cosmopolites" and/or the use of outside organizations such as Dr. Dvorkovitz' or Research Corporation with or in lieu of inside "cosmopolites". One of the best examples of an inside "cosmopolite" group I'm familiar with is the University Relations Branch of Merck and Company.

Third, is the uncertainty over ownership of inventions made at universities that may be collaboratively developed or are generated through a collaborative relationship.

Some agencies of the Government have noted situations of industry refusal to collaborate with public institutions in bringing their inventions to the marketplace unless provided some patent protection as quid pro quo for additional investment and development required.

This was substantiated by the Harbridge House Study and the GAO Report on Medicinal Chemistry. Both of these studies indicated an industry-wide reluctance by pharmaceutical firms to test compositions of matter synthesized or isolated by Department

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made at universities that may be collaboratively developed or

of Health, Education, and Welfare grant-supported investigators due to DHEW's patent policy, which industry felt failed to take into consideration the large private investment before such compositions could be marketed as drugs. Although not as extensively documented, similar situations have occurred in the area of medical hardware devices.

The Harbridge House Study, when discussing university and non-profit institution inventions, indicated that:

> "In both cases, the inventions most frequently arise from basic research and require substantial private development before reaching the stage where they are commercially useful. Some measure of exclusive rights appear necessary to motivate licensees to invest in the work necessary to commercialize these inventions."

It follows from the experiences noted in university dealings with the pharmaceutical industry and medical device manufacturers that there probably is a reluctance to collaborate with universities in bringing high-risk inventions to the marketplace if some patent exclusivity is not first provided to the developer. In my opinion, this problem will be compounded by the passage of pending medical device legislation which would require evidence of clinical testing prior to marketing due to the added risk capital required for testing.

Fourth, is the problem of contamination. As used by industry and institution investigators, "contamination" means the potential compromise of rights in proprietary research resulting from exposure of an organization to ideas, compositions, and/or test results arising from Government-sponsored research. For example, an invention made at an institution under a Government-funded research program is looked into by a company doing parallel research. If the company incorporates into its research program some of the research findings of the institution and then develops a marketable product patentably distinct from the institution's invention, the company fears that the Government is in a position to assert claims to their product.

The above had the effect of persuading the Subcommittee that the Federal Government needed to act to create an atmosphere conducive to the transfer of inventive results from universities to industry.

To overcome the above barriers to technology transfer, it appeared essential to the Subcommittee that the Government persuade universities to provide a management capability within the institution that will serve as a focal point for receipt of the inventive results of institutional research for later dissemination by itself or other management organizations to those industrial concerns most likely to utilize such results. It was the conclusion of the Subcommittee that this might be accomplished by guaranteeing to universities at the time of funding patent rights in Government-supported inventions in return for establishment of a management

capability created to undertake transfer of the inventive results of university research. The guarantee of patent rights to the university carries with it the right to license commercial concerns, thus creating the incentive necessary for development in those situations where collaboration would not otherwise be accomplished and lessening or eliminating industry fear of contamination. Further, under such a policy, collaborative arrangements could be made wherein industry's participation is protected before it is even clear whether or not inventions will be made. Such prior arrangements should minimize the problem of the "not-invented-here" syndrome, since a collaborator would not be viewed as an "outsider".

As noted previously, the Subcommittee identified the problem as finding the means to induce voluntary integration into a system that results in technology transfer. We believe our recommendation provides such an inducement for all three of the parties involved through recognition of their equities.

First, the Government, as the representative of the public, would have created the atmosphere necessary to transfer the results of university research to the marketplace where the taxpayer may utilize it. Of course, such end products will increase the nation's potential to employ labor and raise the level of its exports. Further, industrial participation will increase the Government's ability to focus public funds on the kinds of research and development which have high, long-run social value, but could not be undertaken by

industry alone due to the risk involved and the initial poorly defined profit opportunities. Rights will be reserved under the policy to assure against individual abuse of the privileges retained by the university and industry.

Second, the university will be permitted to recover royalties through the licensing of their inventions. The policy requires that a substantial portion of royalty receipts be utilized for educational or research purposes, with a lesser portion available for distribution to inventors. Further, ownership in the university will permit the University to pursue or direct development of the invention as it deems appropriate.

And third, industry's investment can be protected through some exclusivity.

The basic recommendations of the Subcommittee are still under review. However, at the present time, the Department of Health, Education, and Welfare (DHEW) and the Department of Defense (DOD) have policies similar to that recommended, which guarantee selected institutions who have previously demonstrated a patent management capability and/or a patent policy considered in the public interest a first option to administer title to inventions generated with Department support, subject to conditions considered necessary in the public interest. The DOD policy extends only to inventions that are generated under grants and contracts that do not fall within the provisions of Section 1(a) of the President's Statement. DOD

grants and contracts with institutions that are identified as falling within Section 1(a) contain patent clauses that give the Government the first option to any inventions made in performance of the contract.

I have been advised that the National Science Foundation will within the next few weeks issue regulations which will substantially follow the recommendations of the Subcommittee. Further, I am advised by NASA that NASA regulations presently provide for Institutional Patent Agreements (IPA's) with universities NASA deems to have adequate patent management capabilities. I understand that both agencies are willing to entertain requests for IPA's.

I think it is important to note that the total amount of funds administered by the above four agencies for use in funding university research approximates $2 billion of the $3 billion noted above. The remaining $1 billion is administered by the remaining Executive agencies, the largest portion of which is $630 million being administered by A.E.C.

Although I cannot predict how each of the four above agencies will treat individual university requests for IPA's, I believe it fair to say that the concept of IPA's is here to stay and grow because it basically reflects a grass-roots desire which was amply demonstrated here today.

Before closing, I would like to pass to a slightly different topic. In the same report to the White House mentioned earlier, it was also noted as an "urgent situation" ". . . a still-growing 'technological gap' versus Japan and West Germany -- areas steadily

pulling ahead in exports of many high-technology products." I believe there is a growing body of evidence that some of the products generated by these countries are the outgrowth of university technology. It seems to me that the IPA program could be a partial response to this problem if it encourages the timely filing of both domestic and foreign patent applications. Of course, the filing of foreign patent applications is an expensive matter which could be resolved by a meaningful Patent Cooperation Treaty, which I encourage you to support whenever possible.

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April 2, 1973

Presentation of Norman J. Latker before National Congress on "The Availability of New Technology to Industry from American Universities and Technological Institutes" - Sponsored by Dr. Dvorkovitz & Associates in Cooperation with the Illinois Institute of Technology Research Institute - Chicago, Illinois - April 2-5, 1973

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From the point of view of the Government and the public, the stakes are very high. The sheer magnitude of Government support of research and development at universities demands evidence of useful results if it is to be continued in the prevailing competition for the Federal dollar. In Fiscal Year 1970, approximately $3 billion of the $12 billion, or one quarter of that spent by the Government on research and development outside its own laboratories went in the form of grants and contracts to universities. DHEW's former

Assistant Secretary for Health and Scientific Affairs recently quoted an Office of Management and Budget official as stating:

> "You have got to find some way to justify the return the public is getting from the large investment which has been made in health over the recent years by the Federal Government. In this regard, no one else is at such an increasing disadvantage as is health in competing for scarce funds."

My own belief is that this indication for need for identifiable results will be part of OMB's review of all agency research programs. Please note my emphasis on the word "identifiable". I am not at all convinced that because inventive results are not readily identifiable as being generated with Government support that meaningful bases of scientific information upon which industry builds are not being generated. Notwithstanding, it appears evident that a better job of transfering technology from the universities can and should be accomplished.

Of course, in those situations where Government funds are involved in supporting university research, all three principals need to sharpen their performance.

Some of the Government's efforts in reviewing its part in the technology transfer problem is taking place in the University Subcommittee on Patent Policy, an interagency group ultimately responsible to the Federal Council for Science and Technology.

At the outset of its study, the Committee identified some

general premises from which it would be necessary to proceed:

First, a sympathetic and encouraging Federal climate is very important to technological progress. Thus, in cases where the requirement for university/industry relations is not met in a satisfactory manner, Government can have an important role to play as a catalyst or "impresario" in creating the framework within which regular contacts take place between university and industry.

Second, the University community and industry, left to their own initiatives, will probably be unable to generate this atmosphere. Private business, even though concerned with institutional barriers that preclude systems innovations, can't do much about it. They are responsible for outputs of their businesses, and must ordinarily work within the narrow confines of the companies' responsibilities to maximize profits and minimize risks for the firm.

Third, there appears to be an absolute need for industrial collaboration with universities if the results of Government-sponsored university research are to reach the marketplace. Of course this is true because much of the work performed under Government-sponsored grants and contracts at universities is basic, as opposed to applied, research. Inventions arising out of basic research involve at most compositions of matter with no clear utility, prototype devices, or processes which usually require much additional development. Universities themselves do not undertake the complete development of such inchoate inventions to bring them to the point of practical application, as development leading to commercial marketing is not ordinarily

within the scope of their missions. Further, financing of that type of development work that might be used by such institutions is not generally available from Government sources. Consequently, development in such cases will generally be accomplished only where industry has knowledge of them and has an incentive to utilize its risk capital to bring such inventions to the marketplace. Even in those fewer instances where the university has undertaken applied research, ultimately industrial aid will be required in bringing the invention to the marketplace. Since the public institution and the industrial concern are two different organizations not only physically separated, but often having different goals, it can be expected that collaborative development arrangements will be difficult to achieve.

Last, the difficulty of collaboration is compounded when those who now perform essential parts of a function refuse to modify their operations to meet the needs of the whole system. (I am not excluding the Federal Government as one of the principals who must modify its operations.) These vested interests constitute by far the most serious institutional barriers to socially important innovations. Ordinarily, the principals can't be ordered to collaborate. Nor will they do so unless they see something in it for themselves. <u>The problem is how to provide the means for inducing them to integrate voluntarily into a system that performs a socially desirable function</u>.

With these matters in mind, the University Subcommittee began its review of the university difficulty in transferring the results of its research to industry. The following were considered to be the primary reasons for at least the appearance of not achieving optimum results:

First, and thought to be the most important, was the conclusion that universities do not generally have an adequate management capability to facilitate the transfer of their inventive results to industrial concerns that might make use of them. Even those organizations having the right to transfer a degree of patent protection desired by industry may well fail to succeed in encouraging utilization if an adequate, organized effort to communicate these results is not made.

Most authorities do not believe that the mere existence of a body of research outputs and other technical knowledge is enough to result in significant industrial innovation.

It is felt that to transfer scientific or technical information into specific innovations requires a certain amount of organized effort.

In sum, a good communications system does not just happen accidentally; management must take deliberate, specific action to devise and keep open necessary communication channels. It must also give explicit attention to its goals.

Of course, today we have with us a number of universities who have generated the type of management capability discussed above,

and every day the number of additional universities forming such management capabilities is increasing in response to the demonstrated need.

What other problems impede technology transfer?

Well, second, I would identify the "not-invented-here" syndrome. Industrial organizations have commercial positions in most areas of their research. Accordingly, there is an in-house incentive for such organizations to further develop the results of their research in order to improve their commercial position. This incentive stems from the organization's ability to continuously evaluate their research through all stages of its development. It is presumed that there will be a lesser incentive for industry to further develop the results of university research where such research will not be under its initial review or control. It was suggested that this bias toward investment in further development of its own ideas, rather than ideas from outside sources, might be lessened by early identification by industry of university investigators who may be working in their areas of interest.

Notwithstanding the "not-invented-here" syndrome, I would note that the Proceedings of the Conference on Technology Transfer and Innovation, sponsored by the National Science Foundation in 1967, noted that innovating companies depend on a relatively small number of professionals called "cosmopolites" to communicate

of Health, Education, and Welfare grant-supported investigators due to DHEW's patent policy, which industry felt failed to take into consideration the large private investment before such compositions could be marketed as drugs. Although not as extensively documented, similar situations have occurred in the area of medical hardware devices.

The Harbridge House Study, when discussing university and non-profit institution inventions, indicated that:

> "In both cases, the inventions most frequently arise from basic research and require substantial private development before reaching the stage where they are commercially useful. Some measure of exclusive rights appear necessary to motivate licensees to invest in the work necessary to commercialize these inventions."

It follows from the experiences noted in university dealings with the pharmaceutical industry and medical device manufacturers that there probably is a reluctance to collaborate with universities in bringing high-risk inventions to the marketplace if some patent exclusivity is not first provided to the developer. In my opinion, this problem will be compounded by the passage of pending medical device legislation which would require evidence of clinical testing prior to marketing due to the added risk capital required for testing.

Fourth, is the problem of contamination. As used by industry and institution investigators, "contamination" means the potential compromise of rights in proprietary research resulting from exposure of an organization to ideas, compositions, and/or test results arising from Government-sponsored research. For example, an invention made at an institution under a Government-funded research program is looked into by a company doing parallel research. If the company incorporates into its research program some of the research findings of the institution and then develops a marketable product patentably distinct from the institution's invention, the company fears that the Government is in a position to assert claims to their product.

The above had the effect of persuading the Subcommittee that the Federal Government needed to act to create an atmosphere conducive to the transfer of inventive results from universities to industry.

To overcome the above barriers to technology transfer, it appeared essential to the Subcommittee that the Government persuade universities to provide a management capability within the institution that will serve as a focal point for receipt of the inventive results of institutional research for later dissemination by itself or other management organizations to those industrial concerns most likely to utilize such results. It was the conclusion of the Subcommittee that this might be accomplished by guaranteeing to universities at the time of funding patent rights in Government-supported inventions in return for establishment of a management

capability created to undertake transfer of the inventive results of university research. The guarantee of patent rights to the university carries with it the right to license commercial concerns, thus creating the incentive necessary for development in those situations where collaboration would not otherwise be accomplished and lessening or eliminating industry fear of contamination. Further, under such a policy, collaborative arrangements could be made wherein industry's participation is protected before it is even clear whether or not inventions will be made. Such prior arrangements should minimize the problem of the "not-invented-here" syndrome, since a collaborator would not be viewed as an "outsider".

As noted previously, the Subcommittee identified the problem as finding the means to induce voluntary integration into a system that results in technology transfer. We believe our recommendation provides such an inducement for all three of the parties involved through recognition of their equities.

First, the Government, as the representative of the public, would have created the atmosphere necessary to transfer the results of university research to the marketplace where the taxpayer may utilize it. Of course, such end products will increase the nation's potential to employ labor and raise the level of its exports. Further, industrial participation will increase the Government's ability to focus public funds on the kinds of research and development which have high, long-run social value, but could not be undertaken by

industry alone due to the risk involved and the initial poorly defined profit opportunities. Rights will be reserved under the policy to assure against individual abuse of the privileges retained by the university and industry.

Second, the university will be permitted to recover royalties through the licensing of their inventions. The policy requires that a substantial portion of royalty receipts be utilized for educational or research purposes, with a lesser portion available for distribution to inventors. Further, ownership in the university will permit the University to pursue or direct development of the invention as it deems appropriate.

And third, industry's investment can be protected through some exclusivity.

The basic recommendations of the Subcommittee are still under review. However, at the present time, the Department of Health, Education, and Welfare (DHEW) and the Department of Defense (DOD) have policies similar to that recommended, which guarantee selected institutions who have previously demonstrated a patent management capability and/or a patent policy considered in the public interest a first option to administer title to inventions generated with Department support, subject to conditions considered necessary in the public interest. The DOD policy extends only to inventions that are generated under grants and contracts that do not fall within the provisions of Section 1(a) of the President's Statement. DOD

grants and contracts with institutions that are identified as falling within Section 1(a) contain patent clauses that give the Government the first option to any inventions made in performance of the contract.

I have been advised that the National Science Foundation will within the next few weeks issue regulations which will substantially follow the recommendations of the Subcommittee. Further, I am advised by NASA that NASA regulations presently provide for Institutional Patent Agreements (IPA's) with universities NASA deems to have adequate patent management capabilities. I understand that both agencies are willing to entertain requests for IPA's.

I think it is important to note that the total amount of funds administered by the above four agencies for use in funding university research approximates $2 billion of the $3 billion noted above. The remaining $1 billion is administered by the remaining Executive agencies, the largest portion of which is $630 million being administered by A.E.C.

Although I cannot predict how each of the four above agencies will treat individual university requests for IPA's, I believe it fair to say that the concept of IPA's is here to stay and grow because it basically reflects a grass-roots desire which was amply demonstrated here today.

Before closing, I would like to pass to a slightly different topic. In the same report to the White House mentioned earlier, it was also noted as an "urgent situation" ". . . a still-growing 'technological gap' versus Japan and West Germany -- areas steadily

pulling ahead in exports of many high-technology products." I believe there is a growing body of evidence that some of the products generated by these countries are the outgrowth of university technology. It seems to me that the IPA program could be a partial response to this problem if it encourages the timely filing of both domestic and foreign patent applications. Of course, the filing of foreign patent applications is an expensive matter which could be resolved by a meaningful Patent Cooperation Treaty, which I encourage you to support whenever possible.

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April 2, 1973

1974

Presentation of Norman J. Latker
at Conference on Technology Transfer -
University Opportunities and Responsibilities
Case Western Reserve University - October 15, 1974

Anything identified as opinion, of course, in no way represents Administration or Department of Health, Education, and Welfare policy.

On the eve of this country's bicentennial anniversary, I think it appropriate to revisit the Constitution and its framers to refresh our memories on the birth of the intellectual property clause.

As we all know, the Constitution was drafted in the context of a struggle with a government which had abused its obligations to defend the rights of its citizens. Thus, it was no accident that the salient portion of the Constitution drafted for the purpose of protecting your liberties made the Government the servant and protector and not the master of your individual rights.

Thus, the fifth amendment of the Bill of Rights provides that:

> "No person shall . . . deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation."

It appears that the absence of any one of the three words, "life" -- "liberty" -- or "property" could have the effect of negating the other two. This seems especially true if you were not guaranteed the right of "property" under the conditions specified, since private "property"

... the purpose of protecting your liberties

is a necessity if you are to have control of your "life" and "liberty". I might add inferentially that it is contended by some that the free enterprise system is dependent on/or sprang from these words, since without the protection of private property from arbitrary intrusion, that system could not exist. Certainly the words distinguish our society from the various forms of the world's collectivist societies.

Now, we all know that the word "property", even at the time of the framing of the Constitution, included "intellectual property". But notwithstanding the generic protection of property in the fifth amendment, the framers chose to be even more explicit about this specific category of property, and provided this language in Article I, Section 8:

> "The Congress shall have power to . . . promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writing and discoveries."

Why -- this special handling of this category of property?

There was no recorded debate in the Convention on September 5, 1787, when Article I, Section 8, was presented, and it was approved unanimously. That the products of the mind should prospectively receive legal protection, even from a centralized Government to be formed, was a principle upon which no one disagreed, probably due to some positive prior experience and examination. Within the eighteenth-century context of natural laws or rights, intellectual property had received affirmative expression not only in English and Commonwealth laws, but in the Declaration of

Independence, which provided that "All men are endowed by their Creator with certain unalienable rights", and "that to secure these rights, governments are instituted among men . . .".

Madison, the chief architect of the Constitution, did not end his interest in intellectual property with the Constitutional Convention. He made the following illuminating statements in support of the prospective Federal authority to award patents and copyrights:

In the Federalist on January 23, 1788:

> "The utility of this power will scarcely be questioned. The copyright of authors has been solemnly adjudged, in Great Britain, to be a right of common law. The right to useful inventions seems with equal reason to belong to the inventors. The public good fully coincides in both cases with the claims of individuals. The States cannot separately make effectual provision for either of the cases, and most of them have anticipated the decision of this point by laws passed at the instance of Congress."

In a letter to Thomas Jefferson on October 17, 1788, he made a more important insight:

> "With regard to monopolies, they are justly classed among the greatest nuisances in Government, but is it clear that as encouragements to literary works and ingenious discoveries they are not too valuable to

> be wholly renounced? [These two sentences appear to be an attempt by Madison to distinguish between past monopolies of commodities granted as personal favors and the suggested monopoly for novel intellectual property.] Would it not suffice to reserve in all cases a right to the public to abolish the privilege at a price to be specified in the grant of it? [This appears to be the first reference to Government "march-in" rights!] Monopolies are sacrifices of the many to the few. Where the power is in the few, it is natural for them to sacrifice the many to their own partialities and corruptions. Where the power, as with us, is in the many, not in the few, the danger cannot be very great that the few will be thus favored. It is much more to be dreaded that the few will be unnecessarily sacrificed to the many." (Parenthetical sentences and emphasis added.)

In this statement, and especially the last sentence, the answer to the need for specific protection of intellectual property, notwithstanding its generic inclusion in the fifth amendment, seems apparent. First, the use of the term "monopolies" suggests that Madison knew that the nature of an individual piece of intellectual property is such that it could be useful to all people and at the same time be susceptible of ownership by one person, while on the other hand, diversity of ownership of all other categories of property precluded the possibility

of monopoly. The strong possible argument against an indefinite monopolization of valuable intellectual property and its end product under only the fifth amendment and his recognition that "The States cannot . . . make effectual provision", suggests that Madison knew that the rights of the creative few would be in danger without clarification in the Constitution. Thus, a compromise was struck under which intellectual property was to be owned for only a limited term in exchange for the creator's right to exclude. It was under these circumstances that intellectual property -- that property which makes possible the use of all other property -- obtained special consideration in the Constitution.

There is little that I've presented that appears to be subject to question. Even those who have difficulty with the intellectual property clause do not advocate its repeal. Their argument has not been directed against the Government's responsibility for protection of private property and the special reward promised by the intellectual property clause, but erosion of the concept through convincing of an immediate need to limit the reward in the "public interest" or because of public involvement in the difficult delivery process which intellectual property must move through before reaching the public in useable form. These arguments, used in inappropriate situations, are probably what Madison considered "to be dreaded".

As we discussed on previous occasions, since the inception of the patent system, this country has moved from a rural to a highly industrialized nation. In the process, resources and creators flowed into highly sophisticated industrial research organizations. Such creators were

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from those who have difficulty

required to assign their creative rights to the organization without any added compensation over and above their salaries. As I noted on that occasion in greater elaboration, this arrangement was tolerated by society and confirmed in the courts as to private organizations and their employees.

When the 17 billion dollars of Federal funds began flowing into research some twenty-five-or-so years ago, through the funding of the Federal Government's contract and grant system, the simplistic policy that "What the Government (or public) pays for (or even partially pays for), it should own" was applied in practice to the total inventive result of some Government funded research programs. This was really an extension of the already developed and accepted concept applied to private industry, discussed above, that an employer (here, the Federal Goverment) can take assignment from an employee (in this case, the Government's grantees or contractors).

As I indicated previously, I thought utilizing this concept in all Government contracting situations to be poor policy,as it did not maximize delivery of inventive results to the public, or protect the equities of all the parties involved, in my experience or that of others. This was explicitly pointed out to DHEW by the GAO in its 1968 Report to the Congress on "Problem Areas Affecting Usefulness of Results of Government-Sponsored Research in Medicinal Chemistry", which provided;

> "On the basis of our observations, we proposed that the Department direct its efforts toward timely determination of rights to potentially patentable

discussed above, that an employer there, the Federal Government, can

> inventions in order to reduce uncertainties as to the status of invention rights. We proposed also that the Department clarify the intended use of Institutional Patent Agreements, of which only limited use has been made, but which appeared be a useful device for assigning ownership rights while protecting the public interest."

After my review of the Constitution, I believe that the legal basis for this finds some support.

Now, the primary argument of advocates of a Government-title policy without reservation maintain that those Government research programs utilizing a Government-license policy result in an "unjustified windfall" in the contractor. Notwithstanding the fact that no Government research program really utilizes a Government-license policy without reservation, consistency would lead one to the belief that a Government-title policy without reservation results in an "unjustified windfall" in the Government. If there really were such a "windfall" in the Government, the policy would be constitutionally suspect, since there is a suggestion that "private property" is being "taken for public use without just compensation", since the chain of title, as provided by Article I, Section 8, must start with the inventor, and proceeds to the Government only through contractual assignment.

In truth, "just compensation" for future inventions generated under Government contracts cannot possibly be determined at the time of contracting, no matter what patent clauses are used, and any equitable

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in the contract. Notwithstanding the fact that no

policy in which the Government wished to retain exclusive rights would have to be based on compensating the owner of the exclusive rights at a time when its commercial value could be assessed. Compensation would ordinarily be in excess of the contract price, unless the invention were the specific object of the contract, which ordinarily is not the case. In fact in the area of grant research it is by definition never the case. (I would point out that anyone supporting a Government-title policy without reservation at the time of contracting would need to establish that all future inventions were the specific object of their contracts; otherwise, the Government would be the recipient of a "windfall".)

Now, I consider it nonproductive to belabor the arguments supporting the two extremes of possible Government patent policy. I have chosen to fault the one extreme not for the purpose of supporting the other, but merely because it is the former that has become the more vocal. Unfortunately, when one extreme surfaces and the other remains silent, the Government policies that sit in the middle become pressured to give ground to the vocal extreme. Since as you all know, DHEW patent policy already sits in a middle ground, we cannot responsibly move without abandoning the protection of some of the equities of the parties involved. But, unfortunately, this type of resistance provides to the extremist the argument that we, in turn, are extremist in our position.

Now, of all the variant policies one finds under the President's Statement of Patent Policy, which in itself provides the framework within

which reasonable men can find a middle ground, I believe DHEW's to be the most acceptable. It emerged from the crucible of debate with the clear recognition of the Government's obligation to protect the equities of all the parties, including the general public.

DHEW has two methods of making disposition of invention rights. Its standard policy is to defer determination until the invention is identified. We never take title at the time of contract, thus obviating any possible claim of unjust enrichment. In the majority of cases in which the inventing organization seeks to retain the exclusive rights to an identified invention they have made, we grant the request, subject to the kind of conditions Madison discussed. Thus, there is a requirement that if the organization chooses to license its rights, it first determines whether nonexclusive licensing will result in obtaining further development funds. If exclusive licensing appears necessary on the basis of market conditions, then we limit such licensing to five years from first commercial sale or eight years from the license, whichever occurs first. You all know that there are other "march-in" conditions that needn't be detailed here. If the organization itself chooses to develop the invention, the limitation on its exclusive position parallels that which it could give to a licensee. The grant of a request is nearly always based on the fact that further risk capital is necessary to develop and bring the invention to the marketplace and the Department does not intend to provide these funds, ordinarily because such funds have not been appropriated. This is equivalent to a decision that the invention was not the specific object of the contract,

and we do not wish to pay "just compensation" over and above the contract in order to maintain full rights in the invention. The decision to retain rights in an identified invention in the instances where this has been done was based on a finding that there was an intention to contribute the additional funding necessary to bring the invention to the marketplace. This is tantamount to a decision that the invention was the specific object of the contract and, therefore, the contract price plus the additional investment is "just compensation" for the taking.

Further, in our Institutional Patent Agreement program, under which grantees with patent management capabilities are afforded a first option to any invention made under their grant, an objective decision was made by the Department that because of the basic nature of the research supported, any invention that evolved could not be the specific object of the grant and would always require further development which we would not support. Thus, in this situation, we basically decided that "just compensation" over and above the grant would always be required in order to maintain full rights in the Government, and that we did not wish to make such payment. I would add that the decision to permit the first option in the institution is conditioned, on the same limiting conditions utilized under our deferred determination policy.

Now, in practice, what has happened since the 1968 GAO Report? The statistics we have collected can be considered to be only approximate in that they were accumulated very rapidly through our files and with conversations with the parties in interest. The statistics are

on the low side, as not all the interested parties could provide information to us within the time frame necessary, and most that gave us statistics were conservative when they felt figures could not be readily verified.

First, in regard to the GAO comments on Department performance, I would note, that since January 1,1969, the Department has entered into 41 new Institutional Patent Agreements, bringing the total number to 56. Second, in regard to determinations under our deferred determination policy, average processing time is running between 15 and 20 weeks from time of receipt of a petition to final determination. This compares to a situation in 1968 when petitions basically were not processed.

Now, in regard to rights dispositions, our files indicate that 167 patent applications were filed since 1968 by institutions who chose to exercise their first option to invention rights under their Institutional Patent Agreement. Under the 167 patent applications filed, the universities have negotiated 29 nonexclusive licenses and 43 exclusive licenses. In addition, seven options to license have been negotiated. Seventeen joint-funding arrangements with commercial organizations, involving only the possibility of rights to future inventions, have been made. I consider this an important statistic since it indicates a willingness to make arrangements prior to the time that inventions have been made on the basis that the institution has the flexibility of providing to the concern some invention rights if an invention should evolve from the jointly funded effort. The institution gains this ability to negoti-

applications were filed since 1968 by institutions who chose to exercise

ate by virtue of its Institutional Patent Agreement. We are advised that on the basis of all the agreements noted, approximately 24 million dollars of risk capital was committed to the development or making of inventions evolving with DHEW support.

Under our deferred determination policy, it was determined that since July 1, 1968, 178 petitions has been reviewed. Of these 178, 162 petitions were granted. Under the 162 petitions granted, the institutions involved and responding have to date granted 15 nonexclusive licenses and 35 exclusive licenses. These licenses have generated a commitment of risk capital of approximately 53 million dollars. One of the petitions granted involved a burn ointment discovered at a university, which was patented for the university by Research Corporation, licensed to a pharmaceutical company, clinically tested under the direction of the company, and cleared by the Food and Drug Administration on the company's initiative. The drug is now commercially available.

To my knowledge, this is the only drug outside the Cancer Chemotherapy Program which was initially discovered with Department support and has reached the marketplace through the investment of risk capital from the drug industry. We are aware of at least five other drugs outside Cancer Chemotherapy at various states of development which were discovered with Department support and are now being developed with private support under licenses made possible under our deferred determination policy. (I cannot at this time advise whether the licenses granted under inventions retained under IPA's involve any drug development situations, but it is presumed they do.) These numbers compare to zero situations at the time of the GAO Report.

The approximately 75 million dollars committed to development of Department initiated inventions, although on the face appearing to be insignificant in comparison to the one-and-a-half billion dollars yearly devoted to research and development at DHEW, is in fact substantial when compared to the 100 million dollars devoted to directed research with profit-making organizations in 1973 and to lesser amounts in preceding years. The comparison to the 100 million dollars is deemed more realistic, since the 75 million dollars committed is substantially all for development purposes (directed research).

Much more significant than the figures involved is the information being provided by members of our audience which indicates that in the last two years industrial organizations have been actively pursuing university research, which I believe to be clearly the result of the audience's active solicitation of collaborative arrangements, which, in turn, was partly motivated by the flexibility provided by our patent policy. Thus, while the GAO Report indicated that in many instances investigators formerly could not reach the point of conclusive failure with their innovations, that pathway appears to be open, along with the hope of successful utilization.

In light of the above, I believe Mr. Madison would be pleased that DHEW had not "wholly renounced" monopolies as "encouragements to literary works and ingenious discoveries".

In times of stress, other countries have abandoned, to their ultimate regret, commitments to individual rights for what was claimed to be the immediate "public interest". The concept of individual rights and the intent to protect them stems from the natural law understanding that rational individual thought leads to survival of all, while collectivism leads to ultimate abuse of such rights.

We are asked now by some to "wholly renounce" the intellectual property clause on the basis of that portion of Government research funds commingled with those of the private sector in order to complete the arduous task of bringing an idea from the lab to a finished product in the marketplace. There are too few who understand that to do so could ultimately mean the liquidation of the private ownership of all intellectual property other than that kept secret, or the fractionalization of all collaborative effort involving Government funding. As the man said, "The price of liberty [and property] is eternal vigilance".

NJLatker:dyw:cam - 10/18/74

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Dear Mr. Latker —
To receive cc's of speech only.

Copies of NJL's speech 2/1/74 in Chicago
sent 2/12/74 to:

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Inst. directors
Dr. Jacobs
Dr. Leventhal
Dr. Mitchell
Dr. Edwards
Mr. Rhinelander
Mr. St. John Barrett
Mr. Hiller
Dr. Sabin - NCI (Fr. Dietrick)
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Mr. James D. Currie
✓ ~~Dr.~~ Jessica Tuchman - House Subc. on Environment — Comm. on Ins. & Fn. Off's
✓ Dr. Dworkovitz (DoHEW)
✓ Cong. John E. Moss (Cal.)
✓ Mr. Mulcahey (PMA)

Dear Dr. Johnson *

I believe your tak. your valuable time to read the attached w benefit us both.

Thank you

Norm Latker
DHEW

* Dr. Betsey Archer-Johnson