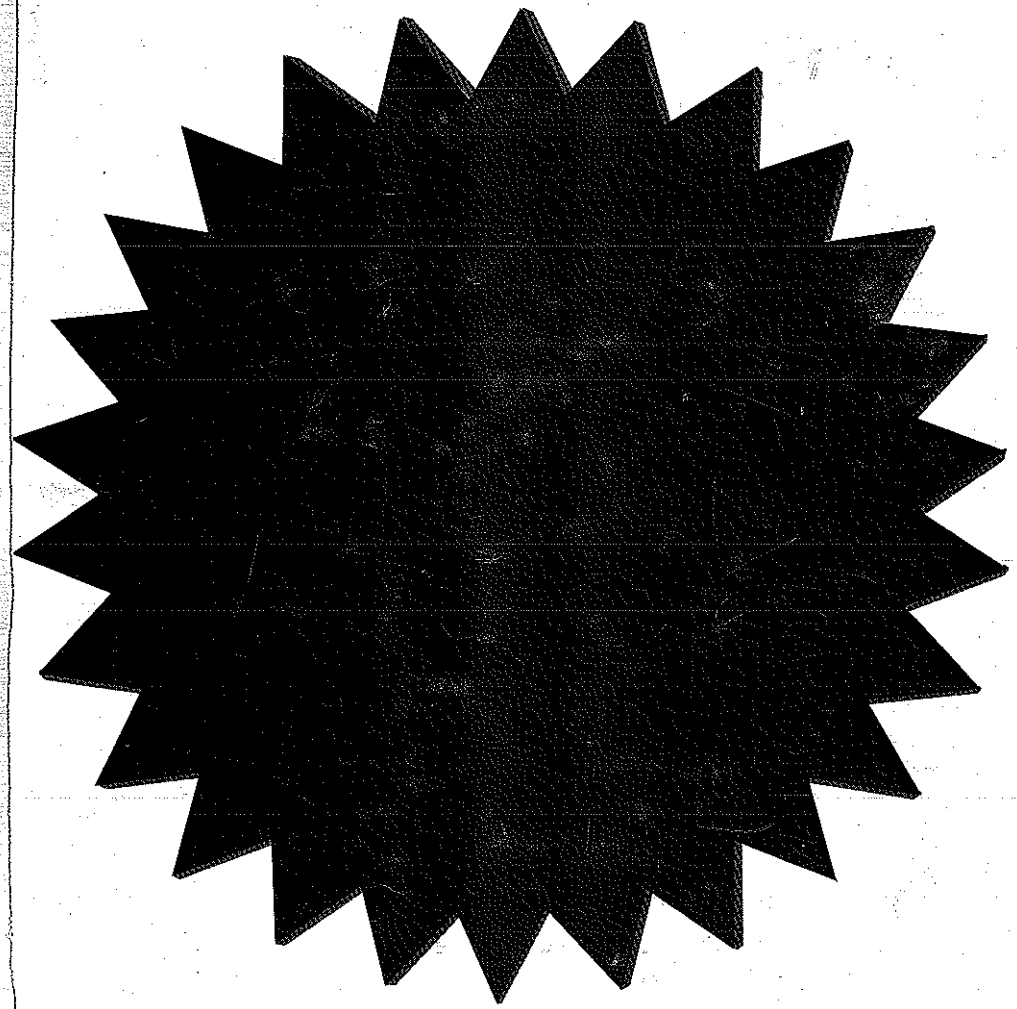
Patent Policy

Government, Academic, and Industry Concepts

Willard Marcy



ACS Symposium Series

81

Patent Policy

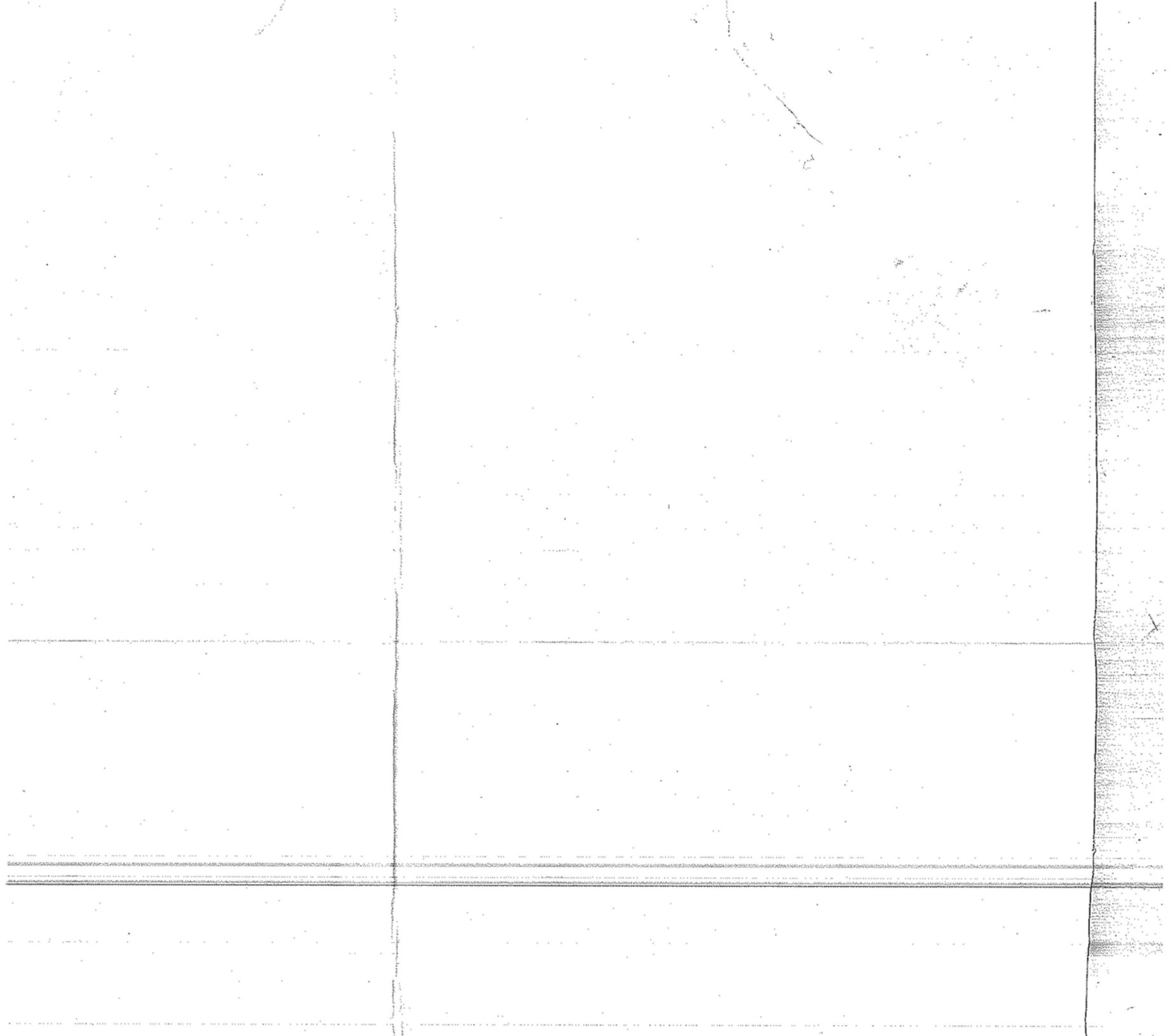
Government, Academic, and Industry Concepts

A symposium sponsored by the Division of Industrial and Engineering Chemistry of the American Chemical Society

Although patent policies control the use of patents, they are not seen as a hinderance. Rather, the development of these policies has promoted the transfer of technology, enhanced rewards to owners and to inventors, and minimized undesirable financial excesses.

These 13 chapters present historical insights along with an overview of the success of existing policies in providing a way to reward all of the parties at interest while safeguarding the public. Specific questions and answers concerning government, academic, and industry concepts are presented as well as approaches which may enhance the usefulness of the patent system in the future.

Specific government patent-policy topics include its development and present status, its tie in the administration, its connection with the Thorton Bill, and its impact in research and development contracts. Areas that are covered in detail are technology transfer, economic benefits for minority-run universities, educational and nonprofit scientific institutions, and the patent policy of the University of



Patent Policy

Government, Academic, and Industry Concepts

Willard Marcy, EDITOR
Research Corporation

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and Engineering Chemistry
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FOREWORD

The ACS SYMPOSIUM SERIES was founded in 1974 to provide a medium for publishing symposia quickly in book form. The format of the Series parallels that of the continuing ADVANCES IN CHEMISTRY SERIES except that in order to save time the papers are not typeset but are reproduced as they are submitted by the authors in camera-ready form. Papers are reviewed under the supervision of the Editors with the assistance of the Series Advisory Board and are selected to maintain the integrity of the symposia; however, verbatim reproductions of previously published papers are not accepted. Both reviews and reports of research are acceptable since symposia may embrace both types of presentation.

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PREFACE

The U.S. Constitution provided for the prompt establishment by Congress of a method for the protection of intellectual property. Through appropriate legislation, an early session of Congress satisfied this constitutional mandate, in part, by setting up a patent system to encourage the disclosure of inventions. Since its inception, the patent system has been a major support for the development of our economic system to its present strength.

Patents are property. They are tangible forms of intellectual ideas and concepts that can be bought, sold, leased, and, most important of all, used. Yet patents can be extremely valuable or completely worthless. They can be ahead of their time or obsolete before issuance. They can enhance competition or protect monopoly. They can produce financial return or plunge one into bankruptcy. They can improve the quality of life or produce harmful public effects.

Whether patents are beneficial or harmful depends on how they are used. The founding fathers of this country assumed patents would be used to benefit the populace. But human beings being human, sometimes patents have been used in a harmful fashion, thus giving rise to all sorts of counterproductive and usually inhibitory regulations and legislation.

To control the use of patents, a variety of patent policies has been devised in the 200-year life of this country. These policies have been developed to meet special situations; to achieve specific ends; to reflect different uses, goals, and objectives; to control financial excesses; to enhance rewards to patent owners and inventors; and to promote rapid and efficient technology transfer for public benefit.

In a broad sense, the subject—patent policy—is complicated, complex, and difficult to comprehend. This symposium was conceived to focus on various facets of different kinds of patent policies by providing historical insight into and tracing the evolution of a fairly broad spectrum of existing policies. Just how the present policies are working in meeting their goals—what is good and what is bad about them—is discussed by some authors. Other authors predict the future and discuss beneficial and constructive approaches which might be expected to enhance the usefulness of the patent system.

To obtain some semblance of logic and order for the symposium and to provide a measure of coherence in discussing patent policies, the subject is divided into three sections—those policies prevalent in government, those in the academic milieu, and those in industry. Each of these

spheres of activity has major differences in goals and objectives, in perceptions of the patent system, and in the means available for the use of patents.

Patent Policies in Government

For over 30 years Federal Government agencies have been operating under vastly different policies depending on the mission of the granting or contracting agency, on whether the agency policy is statutory or administrative, and on the administrative procedures developed for the efficient operation of the agency. Attempts have been made practically continuously over the past quarter century to devise a uniform Government patent policy. In the past 10 years these attempts have been vigorous and concentrated and have culminated in the introduction into the House of Representatives early in 1977 of a bill designed to bring order out of chaos. But this bill has encountered some strong opposition from congressional and other sources and was still pending at the time this symposium was held.

The first paper on government patent policy traces the historical development of the various presently used policies and gives insight into the philosophy guiding the use of patents by both mission-oriented and non-mission-oriented granting and contracting agencies. The rationale behind the Institutional Patent Agreements used by the Department of Health, Education, and Welfare and the National Science Foundation is discussed in the second paper. The remaining two papers provide in-depth analyses of the provisions in the previously mentioned Thorton–Teague bill which sets forth a proposed uniform government patent policy.

Patent Policies in Universities

Universities view patents quite differently from either industry or government. Faculty inventors are generally working on the scientific forefront and are interested in finding new ideas and concepts which then are published. Patents are of secondary importance, if considered at all. In addition, universities have no facilities, nor do they intend to develop them for manufacturing and marketing products. Since practically all university-held patents are licensed to third parties, patent policies in universities are quite different in many respects from either of the other two sectors.

The first two papers on university patent policies discuss their effectiveness in the development and administration of inventions arising at the University of Wisconsin and the University of California. Both institutions have been highly successful in bringing academic research results

to the marketplace. The third paper suggests that the use of effective patent policies can assist predominantly black institutions of higher education by providing financial support for research to complement theoretical studies, thus enhancing the education experience for students. Based on the experiences of a nonprofit invention assistance organization, the fourth paper lists the basic provisions that a university patent policy should contain.

Patent Policies in Industry

Patents are very valuable in industry, particularly the chemical industry, since they furnish the basis for new, profitable ventures and for the enhancement and protection of existing products, processes, and markets. It is interesting to note, however, that the use of patents and consequently the governing patent policies vary widely from industry to industry and from company to company. The papers from industry present four appreciably different approaches to the use of patents and suggest a method for improving the drafting of patent applications and their subsequent prosecution.

Two papers discuss the historical evolution and the present-day approach to the use of patents in specific companies: Gould, Inc. in the battery industry and Ford Motor Co. in the automobile industry. A broad overview of the patent policies used generally by a whole industry is the subject of two papers. The industries discussed are petroleum and pharmaceutical. The fifth paper makes a persuasive case for the use of patent liaison personnel to bridge the oft-occurring communication gap between the technical professional and the patent attorney.

Questions and Answers

Each session of the symposium was terminated by a question and answer period. These discussions were tape-recorded, edited, and are included at the ends of each section.

Acknowledgment

I must take this opportunity to express my appreciation to the Industrial and Engineering Chemistry Division of the American Chemical Society for inviting me to act as chairman of this symposium. My special thanks go to Stepben Weiner and Robert Stowe for their assistance during the organization of the program and its presentation.

The members of the American Chemical Society Committee on Patent Matters and Related Legislation have provided invaluable advice and moral support during the preparation for the symposium. All of the

Committee members, without exception, have served willingly and promptly as impartial reviewers of the papers.

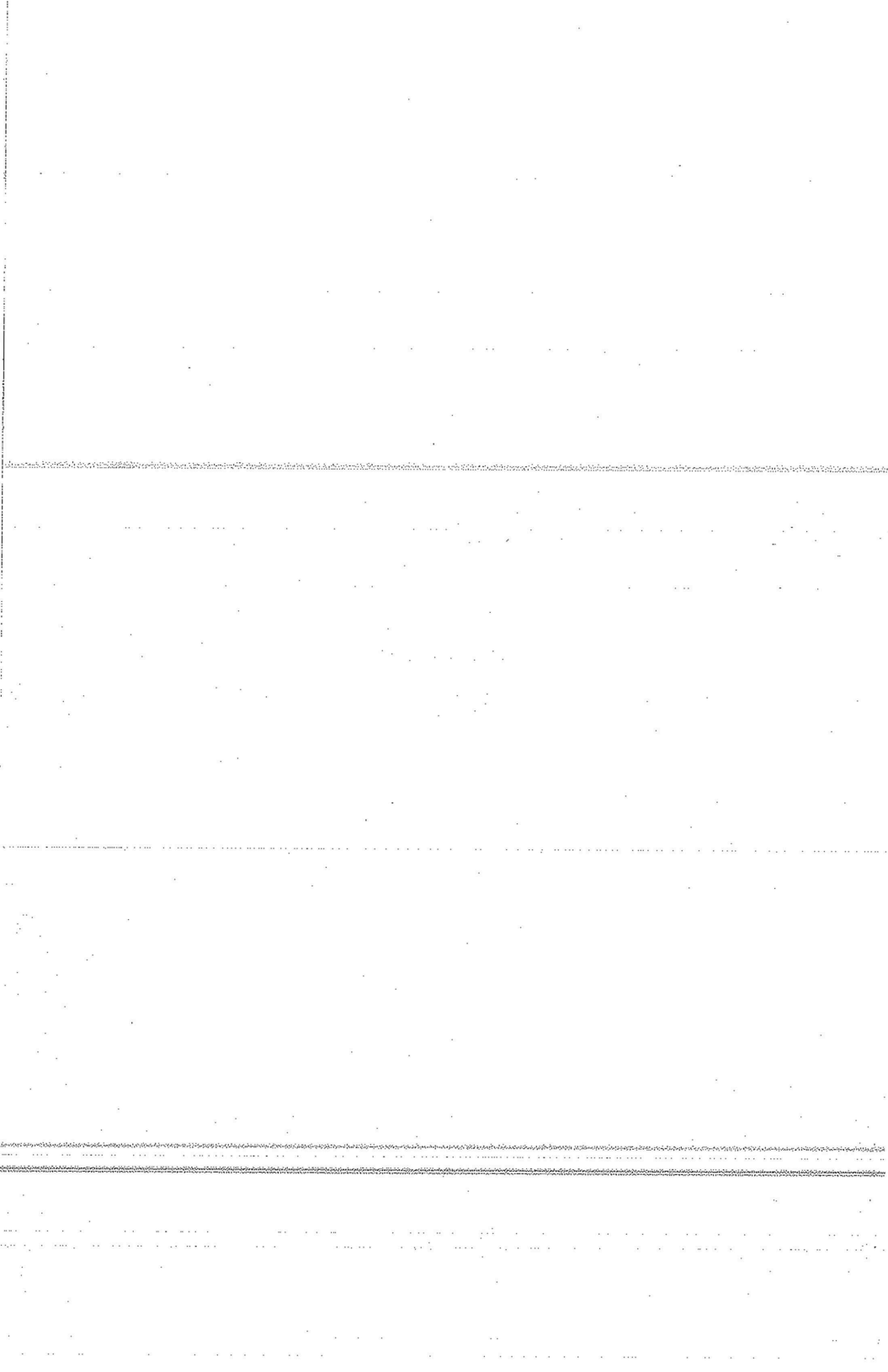
Both Kathryn Pannell and Nancy Van Dyke of my staff at Research Corporation have provided uncomplaining support in the typing and editing of the manuscripts and their organization into book form.

Finally I wish to express my appreciation to James S. Coles, President of Research Corporation, who, for the better part of a year has encouraged me to carry through this assignment and has not protested over the time I have devoted to the task.

Research Corporation
New York, New York
May 15, 1978

WILLARD MARCY

Government



Federal Patent Policy—Its Development and Present Status

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Government Patent Policy concerns the allocation of rights to inventions which have been either conceived or first actually reduced-to-practice under Government-sponsored research and development contracts or grants. The basic issue is whether the Government should acquire title (or exclusive rights) to the inventions resulting from Government-sponsored R & D work, commonly referred to as the "title policy," or allow the contractor to retain such rights with the Government acquiring merely a royalty-free license for Governmental purposes, commonly referred to as the "license policy." This has remained one of the oldest, most studied, debated, and unresolved policy issues in the Federal Government, having been under consideration by Congress, the Executive Branch, and the public for over 30 years. More specifically, over the last fifteen years there have been:

-- more than 30 Congressional reports and studies;
-- at least three study groups appointed by the Executive Branch of the Government;
-- a Congressional commission which considered this subject as one of their topics relating to procurement; and
-- 14 Congressional hearings, the latest being hearings held by Congressman Ray Thornton of the House Committee on Science and Technology in September 1976 and by Senator Gaylord Nelson of the Senate Select Committee on Small Business in December of 1977.

Prior to World War II, there was little interest in Government patent policy issue since most Government-sponsored research and development (R & D) was performed by Government employees in Government laboratories. Where R & D was contracted for, no established uniform patent policy was used by the Government agencies. During and after the war, with the continuing increase in Government-supported R & D being contracted to industry and universities, the agencies began to develop individual patent policies. Some agencies, notably those within the Department of Defense, developed a policy of acquiring a royalty-free license to resulting inventions for Governmental purposes, leaving the con-

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tractor with title--or what might otherwise be described as exclusive commercial rights. Other agencies, primarily those more oriented toward conducting research of interest to the public sector of our economy, such as the Departments of Agriculture and Interior, acquired title to resulting inventions. Some agencies simply ignored the existence of the issue, which had the effect of permitting the contractor to retain all rights to inventions with the Government obtaining a license or no rights at all.

The Issue Debated

Most arguments, positions and proposed solutions surrounding this issue initially took the form of either one extreme or the other--that the Government should always acquire title to resulting inventions, or should always acquire only a license for Government use. The title policy and the license policy advocates became entrenched early, with each side marshalling major studies to bolster its position. On the side supporting the license policy, there was the National Patent Planning Commission report (1). The Commission, created by President Franklin D. Roosevelt at the end of 1941, was to investigate patent abuses spotlighted by the Temporary National Economic Committee (2). The Commission recommended that the Government should not normally assert full ownership of patents, except in the public health or safety field. The Commission urged that patents should be avilable on an exclusive basis, as "It often happens,...particularly in new fields, that what is available for exploitation by everyone is undertaken by no one " (3).

The title policy advocates found support in the U. S. Attorney General's Report on Government Patent Practices and Policies (4). The report urged the establishment of a Government Patents Administrator to administer a uniform patent policy. The basic policy recommended was that all Government contracts for research and development should contain a requirement that the Government be entitled to all rights to inventions produced in the performance of the contract.

However, this report did recognize a need for exceptions in certain situations. Specifically, if the contractor prior to the contract had already made a substantial independent contribution and other qualified organizations were unavailable, or in the case of cooperative research projects, exceptions could be made. In such cases the contractor should grant the United States a nonexclusive royalty-free license to make, have made, use and dispose of any invention. In addition, the contractor was to agree to make adequate commercial use of these inventions within a designated period, or, if such use was not being made, to license all applicants at a reasonable royalty. The report also recommended royalty-free licensing or dedication of all Government-owned patents.

With these reports and positions, the debates began. The

title advocates supported their position with the argument that resulting inventions were no different from the end product which was produced under the research contract, i.e., the Government paid for the invention just as it paid for the end result. The Government should own it, for to do otherwise would be to give away Government propoerty.

The license advocates contended that the Government did not contract for the making of inventions but rather for R & D work performed in a particular technological area, or for specific hardware. The contractor was paid for the work whether or not an invention was made. If inventions did result, they were incidental to the performance of the contract. Further, it was argued that the Government does not totally pay for the R & D involved, since the contractor was selected to perform the research program because of his substantial amount of background knowledge, know-how and expertise, as well as having made substantial investment in the form of facilities and trained personnel.

It was also asserted that the license policy was the most effective policy since it provided the maximum use of the patent incentive and induced prospective contractors to bring their background knowledge and commercial experience to bear on Government tasks, thereby tending to reduce the cost of Government research. With a title policy, it was argued, the most competent contractors would refuse to perform R & D work for the Government, or even worse, if they did perform such work, a title policy would tend to induce contractors to isolate their commercial know-how and competence from their Governmental tasks.

On the other hand, title advocates argued that permitting the contractor to retain exclusive rights to inventions was tantamount to requiring the public to pay twice in order to utilize the invention; first, through the Government's support for R & D and, second, as a royalty charge in the commercial marketplace. Accordingly, this argument concluded that these inventions should be made freely available to the public, since broad-scale availability of such inventions would provide the public with a wider base of products and processes.

The counterargument of the license advocates is that when an invention is freely available to all, there is no incentive for anyone to use it since one of the primary inducements of the patent system is to encourage the investment of risk capital in the development and marketing of an invention. It was contended that no one would be willing to risk such an investment without at least a temporary degree of exclusivity as afforded by patent protection.

The title advocates also stated that permitting contractors to retain exclusive commercial rights tends to increase the concentration of economic power because the large corporations receive by far the greatest portion of the Government's funds for R & D. This was, in turn, countered by license advocates with the assertion that patent rights are much more critical to small

businesses than to large ones, and that a title policy would further reduce the ability of small corporations to compete. Accordingly, it was argued that a title policy, not a license policy, would tend to restrict competition.

And so the arguments went, each with its own justifications, philosophies, and individual case examples. Unfortunately, both of these extreme positions are oversimplified, only partially correct, and neither recognizes the many variables involved in the Government's R & D contracting processes.

Policies Developed by Congress

As the issues surrounding the proper allocation of rights to inventions resulting from Government-sponsored research and development began to draw more public attention, the Congress began to enact legislative guidance in this area. However, the guidance provided by Congress was no more consistent than that which had been developed by the agencies themselves.

For example, in some instances the Congress provided guidance to the entire research and development program of a Government agency. In other situations, guidance was provided only to a particular research and development program of an agency, or to a program which crossed agency lines. Generally, the guidance required, or was interpreted to require, the Government to take title to all inventions, or to inventions in a particular technical field, but less strict standards were also provided.

Examples of Congressional guidance to the entire program of an agency can be found in the Atomic Energy Act, in the National Aeronautics and Space Act, and in the National Science Foundation Act. Congress directed the Atomic Energy Commission to acquire all rights to inventions in the atomic energy field except when a determination was made to waive such rights. 42 U. S. C. 2182 states:

> "Any invention or discovery useful in the production or utilization of special nuclear material or atomic energy...shall be vested in, and be the property of, the Commission, except that the Commission may waive its claim...as the Commission may deem appropriate..."

The Congress told NASA, however, to acquire rights to all inventions, regardless of the field of technology involved, unless such rights were waived. The Space Act states (42 U. S. C. 2457 (a),(f)) that inventions become the:

> "exclusive property of the United States...unless the Administrator waives all or any part of the rights...(when he) determines that the interest of the United States will be served thereby."

However, the Congressional advice to the National Science Foundation was much different, in that Congress requested NSF (42 U. S. C. 1871(a)) to allocate rights to inventions:

> "...in a manner calculated to protect the public interest

and the equities of the individual or organization with which the contract or other arrangement is executed..."

Inconsistencies in legislative guidelines also existed where the guidelines were directed toward a particular research program. One of the earliest examples of Congressional guidance of this type was given to the Department of Agriculture in their research and development efforts under the Research and Marketing Act (7 U. S. C. 427(i)). This act stated that their research results should be:

"...available to the public through dedication, assignment to the Government, or such other means as the Secretary shall determine."

However, in the early 1960's, Congress switched to language which simply stated that research results should be made "...available to the general public." This language was inserted in the Coal Research Act (30 U.S.C. 666), the Helium Act Amendments (50 U.S.C. 167(b)) and in the Saline Water Conversion Act (42 U.S.C. 1954(b)). The Departments of Agriculture and Interior, to which these acts applied, interpreted this language as requiring the acquisition of title to resulting inventions in the Government, and merely providing license rights to the inventing contractor or to any others who requested them. This interpretation also encouraged these agencies to utilize a title policy in areas of research that were not covered by these acts.

In the mid 60's, after the issuance of President Kennedy's Memorandum and Statement of Government Patent Policy, The Congressional guidance fluctuated considerably. In the Water Resources Act, 42 U.S.C. 1961 c-3, research results were to be "...made freely and fully available to the general public," as opposed to merely "available to the public"--the language that was utilized prior to this time. In the Appalachian Regional Development Act, 40 U.S.C. 302(e), the word "fully" was eliminated, and the research results were to be "...made freely available to the general public." In the National Traffic and Motor Vehicle Safety Act, 15 U.S.C. 1395(c), Congress reverted back to the "freely and fully available" language but threw in the stipulation that these guidelines were to apply only where the Government's contribution was more than minimal. And finally, during this era, Congress reverted back to equitable guidelines of the type originally utilized in the National Science Foundation Act and first gave legislative recognition to the Presidential Statement of Government Patent Policy. In the Solid Waste Disposal Act, 42 U.S.C. 3253(c), research results:

"...will be made readily available on fair and equitable terms to industries utilizing...and furnishing...solid waste disposal (processes and equipment)...(and further that the Secretary of Interior and any other government agencies operating under the act)...would make use of, and adhere to, the Statement of Government Patent Policy which was promulgated by the President in his memorandum of October 10, 1963."

The Federal Fire Prevention and Control Act, 15 U. S. C. 2213(d), requires adherence to the revised 1971 Presidential Patent Policy Statement rather than the original 1963 Statement.

The Congress came full circle in 1969 by going back to the language "...be available to the general public" in the Federal Coal Mine Health and Safety Act, 30 U. S. C. 951(c), except that a degree of flexibility was added by the language "...with such exceptions and limitations, if any, as the Secretary (of HEW)... may find to be necessary in the public interest...." Similar language was used again in the Surface Mining Control and Reclamation Act of 1971, 30 U. S. C. 1201.

Presidential Patent Policy Statements

On October 10, 1963, President Kennedy issued the first Government-wide patent policy Memorandum for the heads of Executive Departments and Agencies (5). The Memorandum included a Statement of Government Patent Policy. The purpose of the Memorandum was to obtain a greater consistency in agency patent policy for those Government agencies whose policies were not controlled by statute and to minimize or eliminate the need for continued piecemeal legislation by Congress.

This first attempt to resolve this long-debated policy issue on a Government-wide basis had two main objectives: (1) a consistent, Government-wide patent policy, subject to statutory requirements, which would take into account the missions of respective agencies; and (2) common guidelines and principles for the allocation of invention rights in a manner that would best serve the public interest and, more specifically, in a manner that would:

(a) achieve expeditious development and commercial utilization of inventions developed under Government sponsorship;
(b) obtain the cooperation of industry in assisting the Government in its research and development efforts; and
(c) not contribute to the concentration of economic power or substantially interfere with free competition in commercial markets.

The satisfaction of public interest, however, is a difficult goal to achieve, primarily because the public consists of different groups whose interests are, in some instances, conflicting. Further, the objectives of achieving expeditious commercial utilization, obtaining the cooperation of private industry, and maintaining competition may be in conflict in any given situation because the greatest cooperation of industry would probably be a achieved by permitting contractors to retain title to resulting inventions, but this course of action may not best support competition. In addition, such action may or may not best achieve widespread commercial utilization of these inventions.

Accordingly, the acquisition of principal or exclusive patent rights by the Government, or a title policy, and the dedication or licensing of these inventions by the Government to the public

might best serve the public interest insofar as such a policy will promote widespread use of the inventions. On the other hand, a title policy may not support the public interest insofar as it might discourage the use of inventions which need further development, or would tend to discourage participation of those prospective contractors which have the greatest privately developed background and know-how in the area of interest to the Government.

The President's Statement attempted to resolve these conflicts by recognizing that the arguments both for and against the title and license policies were correct in certain situations, and incorrect in others. It was based on the premise that no single policy could accommodate the differing missions of the Federal agencies, the diversity of Government contractors ranging from educational institutions to manufacturing organizations, or to the resulting inventions that will range from nuclear reactors to fertilizers.

Accordingly, the Statement took a flexible approach: identifying contracting situations where the public interest would best be served by the Government acquiring or reserving the right to acquire principal or exclusive rights to resulting inventions; and identifying other situations where such rights would best be left with the contractor. In addition, recognizing that the policy was based on a number of assumptions and limited factual information, the Statement underlined the need for flexibility and safeguards by specifying exceptions to the general rule and by reserving certain rights in the Government.

The 1963 Statement in Section 1(a) first identified four situations where the public interest would normally best be served through the Government's acquisition of principal or exclusive rights at the time of contracting. The first is where:

> "...a principal purpose of the contract is to create, develop, or improve products, processes, or methods which are intended for commercial use (or which are otherwise intended to be made available for use) by the general public at home or abroad, or which will be required for such use by governmental regulations..." (Section 1(a)(1))

Thus, this Statement recognized that many times agencies conduct R & D in response to the needs of a particular segment of the public and contract for development of products or processes to satisfy these needs. In these cases, the presumption was made that it would be in the best interest of the public to reserve to the Government the principal rights to any inventions which might cover or control the utilization of products or processes resulting from the contract.

The second situation is where:

> "...a principal purpose of the contract is for exploration into the fields which directly concern the public health or public welfare...." (Section 1(a) (2)

This is a generalized form of the first situation, the principal difference being that it is not who utilizes the end product of

the research that is important, but rather whether the field being explored under the contract is concerned with the public health or welfare. Here again, the presumption was that in research conducted in an area of primary public concern and where a market presumably exists for the research results, the Government should control, at least initially, the rights to resulting inventions.

The third situation for principal rights in the Government is where:

> "...the contract is in a field of science or technology in which there has been little significant experience outside of work funded by the Government, or where the Government has been the principal developer of the field, and the acquisition of exclusive rights at the time of contracting might confer on the contractor a preferred or dominant position..." (Section 1(a)(3))

This provision was to cover contracts in fields where the Government would contribute to, or actually create, a private monopolistic situation under Government funding if its contractor retained principal or exclusive rights. A good example of this situation was atomic energy. This field was virtually unexplored before the Government undertook to fund the major portion of the R & D in this field of technology. Also, this R & D effort was concentrated in a relatively few contractors for reasons of security and because of the large-scale development costs involved. To have allowed this small group of contractors, or any one of them individually, to obtain a dominant commercial position in this new field, based on their Government contracts, would have been grossly inequitable.

Atomic energy was about the only example which fitted this situation. It is questionable, however, whether this presumption would apply to all phases of atomic energy today because of the substantial amount of private funds presently being invested in this field for R & D by private parties.

The fourth and last situation is defined where:

> "...the services of the contractor are:
>
> (i) for the operation of a government-owned research or production facility; or
>
> (ii) coordinating and directing the work of others..."

This contracting situation was based primarily on equitable considerations. It was primarily intended to cover the Government-owned, contractor-operated (GOCO) facilities and the situation where the contractor is primarily involved in coordinating and managing the research and development work of other contractors. In either of these situations, the contractor contributes little towards the conception or development of the particular inventions involved.

After defining the four situations for the acquisition of exclusive or principal rights by the Government, the 1963 Statement declares that:

> "In exceptional circumstances, the contractor may acquire

> greater rights than a nonexclusive license at the time of contracting, where the head of the department or agency certifies that such action will best serve the public interest." (Section 1(a))

Under this provision the agency is authorized, at the time of contracting, to permit the contractor to retain exclusive rights to either all inventions or specifically identified inventions. No guidance was provided as to when an agency should make this finding, except when it would best serve the public interest. This criterion was generally considered applicable when an organization, deemed essential to the effort, refused to accept a contract unless it was permitted to retain exclusive patent rights in resulting inventions. This is most likely to occur when the prospective contractor has a very strong, privately developed, commercial position, and the advantages to be gained under the contract are not worth the possibility of jeopardizing its commercial position. Also, situations may arise when a prospective contractor has already expended a substantial amount of private funds toward the development of an invention to be developed under the contract, but has not yet actually reduced the concept to practice.

The 1963 Statement also provides that:

> "Greater rights may also be acquired by the contractor after the invention has been identified, where the invention...is not a primary object of the contract, provided the acquisition of such greater rights is consistent with the intent of this Section 1(a) and is a necessary incentive to call forth private risk capital and expense to bring the invention to the point of practical application." (Section 1(a))

This exception was designed to permit the Government to consider the allocation of rights to individual inventions after such inventions had been identified. This provision covered inventions which were not specifically related to the objectives of the contract and therefore the presumption of Section 1(a), of principal rights to the Government, needed to be reviewed. This review should consider the nature of the invention in relationship to the contract and the necessity to rely on private risk capital to develop the invention so it would be available to the public in the form of new products or processes.

After identifying, in Section 1(a), contracting situations in which the Government should have the first option to acquire title because of public interest or equitable considerations, the 1963 Statement defines those situations where the public interest would favor the presumption that the contractor should have the option to retain the exclusive or principal rights in the inventions resulting from the contract. The 1963 Statement defines, in Section 1(b), situations other than those defined in Section 1(a) as embracing the case:

> "...where the purpose of the contract is to build upon existing knowledge or technology to develop information, products

> processes or methods for use by the Government, and the work called for by the contract is in a field of technical competance...directly related to an area in which the contractor has an established nongovernmental commercial position..."

In such cases, the Statement concludes that the contractor should normally be allowed to acquire exclusive commercial rights. In these situations, the research is not intended for public use, does not directly concern the fields of health or welfare, and is not in a field which was principally developed by the Government. Further, it is not as likely that these inventions will be developed to the point of commercial application by the Government, since the agency involved would not have such a mission, and there is little likelihood that a present public demand will exist for these inventions in view of the purpose of the contract. This provision gives full recognition to the contractor's equitable and commercial background position, thereby encouraging participation by contractors and the application of privately developed knowledge to the contract tasks.

As in the case with Section 1(a), this section also has exceptions to the presumptions on which it is based. There will be instances where even though an invention is directly related to the contractor's commercial product line, the invention will not be exploited. To insure that such action does not adversely affect the public interest, the policy in Section 1(f) stipulates that the government should reserve the right to require the contractor to grant licenses to others on a nonexclusive royalty-free basis.

> "...unless the contractor...has taken effective steps within three years after a patent issues on the invention to bring the invention to the point of practical application or has made the invention available for licensing royalty-free or on terms that are reasonable in the circumstances..."

This section was to insure that these inventions would not be suppressed. If the contractor either does not commercialize the invention, or does not offer others the opportunity to do so, the Government could require the issuance of licenses to others.

The 1963 Statement also specifies in Section 1(g) that where a contractor retains principal or exclusive rights the Government should reserve the right to require the contractor to grant licenses to others either royalty-free or on reasonable terms:

> "...to the extent that the invention is required for public use by governmental regulations or as may be necessary to fulfill health needs, or for other public purposes stipulated in the contract."

These last two provisions (Sections 1(f) and 1(g)) have been referred to as the "march-in" rights.

The 1963 Statement finally provides in Section 1(c) that when a contracting situation does not fall within the presumptions set forth in either Sections 1(a) or 1(b), the allocation of rights to inventions should be decided on a case-by-case basis as they are

brought to the attention of the government agency. In this manner, all available factual information can be utilized in determining whether ownership by the Government or the contractor would best serve the public interest.

Several years after the 1963 Statement was issued, the Committee on Government Patent Policy of the Federal Council for Science and Technology (FCST) supported the most extensive study ever made on the government patent policy issue. The results of this study, conducted under contract by Harbridge House, Inc. is reported in a two-volume work published in 1968 (6).

As a result of the Harbridge House study and seven years of monitoring the agencies operating under the Presidential Policy criteria, the Committee on Government Patent Policy came to the following conclusions:

"The Committee on Government Patent Policy has concluded that rights to inventions made under Government contracts should be allocated in accordance with a flexible, government-wide policy which follows the basic principles and criteria of the October 1963 Presidential Policy Statement, as this Policy Statement is believed to provide the best overall balance of the interests of the public. The Presidential Policy was developed as a result of careful interagency study, and was based on the actual operating experiences of the federal departments and agencies over many years. In addition, the Federal Council has found, based on several years of operating experience, that the Presidential Policy has been effective in bringing about a greater degree of consistency in the patent policies and practices of the federal departments and agencies, and has provided a greater degree of protection of the public interest.

This conclusion is also generally supported by the finding of the Harbridge House study, which may be summarized as follows:

(1) The Harbridge House study results conclusively demonstrate that a single presumption of ownership of a patent is not in the public interest, applied either government-wide, to a single agency, or to a particular government program.

(2) The Harbridge House study results identify factors which when properly considered, can affect commercial utilization of government-sponsored inventions, participation of industry in government R&D programs, and competition in commercial markets. The most critical factors are:

-- the mission of the research sponsoring agency;
-- the purpose and nature of the contract;
-- the commercial applicability of and market potential for the invention;
-- the extent to which the invention was developed by the research sponsoring agency;
-- the promotional activities of the sponsoring agency;

-- the prior commercial experience of the contractor in the field of the invention;
-- the size of the contractor's privately financed R&D in the field of research;
-- the contractor's attitude towards and capability to commercially promote the invention; and
-- the size, nature and research orientation of the industry that will be using the invention commercially.

(3) The Harbridge House Study results and the operating experience of the government agencies indicate that the principles underlying the Presidential Policy, and, with minor exceptions, the criteria established by the Policy for allocating patent rights take into consideration the above listed factors in a manner which:

-- properly balances the Policy objectives of encouraging utilization of inventions, participation by industry, and commercial competition in the overall public interest;
-- provides the operational flexibility needed by the agencies to accomplish the objectives of their missions under differing contractual situations; and
-- within the differing mission constraints of the federal agencies, promotes consistent application of patent policies and practices in similar contracting situations."

In view of these conclusions, the Committee recommended the continuation of a flexible, government-wide patent policy following the basic principles and criteria of the 1963 Presidential Patent Policy Statement. More specifically, the Committee suggested that such a policy should be continued either by making minor modifications to the Presidential Patent Policy or by proposing legislation based on similar principles and criteria which would be applicable to all agencies. As a result of these suggestions, President Nixon reissued the Presidential Patent Policy Statement on August 23, 1971 (7). The new Statement made only minor changes in the one issued in 1963.

The ERDA Patent Policy

The patent policy provided to the Energy Research and Development Administration (ERDA, now merged into the Department of Energy) in Section 9 of the Federal Nonnuclear Energy Research and Development Act of 1974, 42 U.S.C. 5908, is the most comprehensive, most thoroughly debated patent policy ever passed by Congress (8). It represents a compromose position between the "title" and "license" advocates, and was so delicately balanced that in letters to Senator Jackson supporting the policy, Mr. Roy L. Ash, Director, OMB, stated:

"Thus, the resultant language strikes an extremely delicate balance between divergent preferences. Even minor changes

in the text of this document are likely to upset the balance to the extent that one or the other of the parties might be obliged to withdraw its support. In the spirit of reciprocity, therefore, the Administration must ask that its endorsement of this proposal be regarded as withdrawn in the event that any changes are made in the text of the agreed-upon language, notwithstanding the fact that such changes might be in the direction of the Administration's preference."

and Senators Hart and Long stated:

"We should note that the compromise contains many highly interrelated provisions and is quite delicately balanced. While a number of concepts and provisions are not quite what we would advance in a bill of our own, on balance we do believe a fair compromise on an extremely complex and controversial issue has been reached for purposes of S.1283."

Subsection 9(a) of the Act states that whenever an invention is made or conceived in the course of or under any contract of the Administration other than nuclear energy research and development pursuant to the Atomic Energy Act, and the Administrator of ERDA makes either of two determinations regarding the persons who made the invention, then title to such inventions shall be vested in the United States unless the Administrator waives all or any part of such rights in conformity with the provisions of Section 9.

Section 9(c) states that the Administrator may waive all or any part of the rights to any invention or class of inventions made or to be made under any contract with the Administration if he determines that the interests of the United States and the general public will best be served by such waiver. In making waiver determinations, the Administrator was directed to have the following objectives:

- -- making the benefits of the energy research, development, and demonstration program widely available to the public in the shortest practicable time
- -- promoting the commercial utilization of such inventions
- -- encouraging participation by private persons in the Administration's energy research, development, and demonstration program
- -- fostering competition and preventing undue market concentration or the creation or maintenance of other situations inconsistent with the antitrust laws.

The Conference Report makes two important points on this provision clear. First, it recognizes that in any single waiver situation, all four of these objectives may not be obtainable; i.e., in some situations participation may be more important than fostering competition, while in others the reverse might be true. The Conference Committee states that it expected that over the long run all four of these objectives would be obtainable.

Secondly, the Report makes clear that waiver decisions of the Administrator are not subject to a public hearing requirement.

Subsection 9(d) sets forth eleven specific factors which the Administrator is to consider in making waiver determinations at the time of contracting. These factors are based on the experience of AEC, NASA and other Federal agencies under the Presidential Patent Policy Statement. They concern considerations of:

-- the willingness of a contractor to participate
-- the necessity of a particular contractor's participation in attaining the purposes of the program
-- the contractor's background and commercial position
-- the contribution that the contractor has made or will make to commercialization of contract results
-- the purpose of the contract and the intended use of the contract results
-- the effect of the waiver on public health, safety and welfare, and its effect on competition
-- the extent to which Universities have a technology transfer capability.

Subsection 9(e) sets forth considerations similar to the considerations for advance waivers that must be taken into account in waiving rights to identified inventions made under ERDA contracts. Accordingly, ERDA had the authority to make both advance waivers at the time of contracting and case-by-case waivers after an invention is identified. The Administrator was provided with objectives to be achieved in making waiver determinations, and considerations to be reviewed in making such determinations, but Congress left with the Administrator the ultimate decision as how the considerations were to be applied in order to achieve the objectives. In this manner, ERDA was given the flexibility to utilize its waiver authority in each contracting situation in a manner which would best support the Government's interests, the interests of the general public, and best achieve ERDA's overall mission responsibilities.

Subsection 9(h) sets forth the terms and conditions applicable to waivers granted by ERDA. This subsection, in paragraphs 1-4, requires ERDA to retain an irrevocable, nonexclusive, paid-up license in any invention waived. The license normally extends to state and domestic municipal governments, and to foreign governments pursuant to treaty if the Administrator determines such foreign license is in the national interest. Under these provisions ERDA reserves the right to seek patent protection in any foreign country in which the waiver recipient does not elect to file patent applications. The waiver recipient or exclusive licensee is required to make periodic reports on the commercial use being made or intended to be made of the invention.

Paragraphs 5-7 of subsection 9(h) set forth "march-in" rights reserved to the Government under waivers. Paragraph 5 requires the waiver recipient to license others at reasonable royalties if the invention is required for use by Government regulation or is

necessary to fulfill health, safety, or energy needs. This is substantially the same right that is required under the Presidential Patent Policy Statement and preserves the right of the Government to require licensing in the event of some unexpected national need.

Paragraph 6 provides the right of the Administrator to terminate a waiver, in whole or in part, if the waiver recipient is not taking, or within a reasonable time will not take, effective steps necessary to commercialize the invention. This right is provided to prevent suppression of the invention and to insure commercial availability.

Paragraph 7 of subsection 9(h) is perhaps the most important of the rights required by Congress to be reserved by ERDA upon the grant of a waiver. This provision permits the Administrator to require licensing, or to terminate a waiver, in whole or in part, if it is shown at a public hearing held no earlier than four years after the grant of a waiver or three years after the grant of an exclusive license that:

-- the waiver or license has tended to violate the antitrust laws, or
-- the contractor has not and is not expected to take effective steps to commercialize the invention.

Inasmuch as the antitrust and anticompetitive effects or a waiver or limited exclusive license are difficult or impossible to ascertain at the time that the waiver or license is granted, Congress did not require the Administrator to make positive findings on these issues at the time such a waiver or exclusive license was granted. However, paragraph 10 of subsection 9(d) required that the likely effect of a waiver on competition and market concentration must be considered at the time the waiver is requested. In order to insure that possible anti-competitive effects of waivers and licenses are reviewed at the appropriate time, paragraph 7 of subsection 9(h) provides for a hearing to determine whether anti-competitive effects have, in fact, resulted from the waiver or license and whether the invention is being commercialized. The hearing is initiated by the Administrator on his own motion, or upon request of any private persons, if appropriate. This provision provides an additional mechanism to raise important questions concerning earlier determinations of the Administrator, and in this manner the public interest may be protected.

Summary

The debate and search for solutions to the patent policy issue are as active as ever. Congress has been writing ERDA type patent policy, or making reference to the ERDA patent policy, into several bills, three of which have passed (9). At the close of the Ford administration, the FCST Committee on Government Patent Policy proposed a bill to provide a government-wide policy, abolishing all other legislative patent policies, which was based on

the experiences of various agencies and the recommendations of the Commission on Government Procurement in its final report of December, 1972. This proposed bill served as a basis for Congressman Thornton's H.R. 6249 on which hearings are planned later in 1978. The Thornton bill drew considerable attention, and fire, during the Nelson hearings in December, 1977. And finally, the whole issue is under study by OMB and the White House; with the R&D sponsoring agencies recently being asked their opinions regarding several possible approaches to this policy issue by OMB. Perhaps these present efforts will finally resolve this long debated issue, but I somehow believe that it will still be with us after we have solved our energy problem.

Abstract

Federal patent policy involves the allocation of rights to inventions made under research and development activities supported by the Federal Government. Developing such a policy involves complex legal, economic, and technical issues that can and do have strong influence on an agency's research and development programs and on the utilization of technologies resulting from those programs. What the proper policy should be has been debated emotionally for over 20 years, and is of concern to Congress, the Executive Branch and the private sector of the economy. Congress has enacted legislative guidance in a piecemeal and inconsistent fashion; applying some policies to particular agencies, some policies to fields of technology and other policies to individual R&D programs. The Presidential Patent Policy Statements of 1963 and 1971 attempted to bring some uniformity and consistency to this issue, but have been unsuccessful in accomplishing this end. The most flexible and comprehensive patent policy enacted by Cogress to date has been that used by the Department of Energy.

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7. 36 Fed. Reg. 16887 (1971).
8. The Conference Committee on S. 1283 in their report to both Houses pointed out that the basic structure of Section 9 was derived from the Space Act with some modifications derived from the Atomic Energy Act. Some of the detailed criteria of Section 9 were stated as being adopted primarily from NASA and AEC regulations, as well as from the Presidential Patent Policy Statement (H.R. Rep. No. 1563, 93d Cong., 2d. Sess. at 26).
9. 42 U.S.C. 3253(c) Supp. V; 15 U.S.C. 2511; Section 3, P.L. 94-316.

Biographic Notes

James E. Denny has served in various legal positions with five different Federal agencies over the past 20 years. At present he is Assistant General Counsel for Patents for the Department of Energy, and Chairman of the Executive Subcommittee of the Federal Council for Science and Technology Committee on Government Patent Policy. Mr. Denny has received a baccalaureate in electrical engineering from Johns Hopkins University and a Bachelor of Laws degree from George Washington University Law School.

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2

Government Patent Policy—Where Is It Headed on the Administrative Front?

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In the previous paper in this symposium, Mr. James E. Denny has described the history and evolution of Government patent policy, highlighting the various issues that have been debated through the years. He has also detailed the major provisions of the patent policy governing the Energy Research and Development Administration (ERDA), now Department of Energy, research and development activities. Mr. Norman Latker will speak in the following paper about the rationale behind Representative Thornton's currently pending bill which would establish a comprehensive legislative policy with a presumption in favor of contractors and grantees retaining title to inventions. And Professor John C. Stedman will tell you why he believes a policy with the opposite presumption should be established.

Therefore, though I am sorely tempted to discuss why the Thornton approach is justified, I have decided to cover another subject rather than repeat what others may say. In particular, I will try to bring you up to date on recent administrative developments in the area of patent policy and make some conjectures as to the way things are likely to progress assuming H.R. 8596 (the Thornton Bill) or other comprehensive legislation falls short of passage.

Let me emphasize a point, however, that should not be forgotten when one discusses patent policy. Typically discussions center around who should get title -- the Government or the contractor. However, all the Government people that I know who favor leaving title in the contractor or grantee do not take this position out of some love for contractors or grantees. They do so because they see this as the most practicable way to help ensure

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that rights in inventions made under Government sponsorship are distributed in a way that will maximize economic growth and jobs, innovation, competition, the U.S. position in world markets, and minimize administrative and contract costs. Patent policy, of course, is not the predominant factor that affects any of these objectives. It is but one factor of many.

But these are the objectives that must be considered and it is unfortunate when the discussion breaks down into slogans such as "giveaway" or "the public should own what it pays for" or, sometimes on the other side superficial arguments about "over-regulation" or "constitutional rights of inventors". All of these beg the real issues. My own opinion is that for a substantial number of inventions reported to the Government, in terms of the objectives I mentioned earlier, it really doesn't make much difference who gets the title. However, there is a significant proportion of cases in which I know it does make a difference and that positive results will occur if the contractor gets title or negative effects will occur if title remains with the Government. But since neither I nor anyone else that I have met who is involved in this business really has any means of identifying except by hindsight (and even then it is questionable) for which inventions it will make a difference if the Government takes title, I consider it a mistake to take title in any but the rare and obvious case. Moreover, it seems to me that most of the hypothetical harm to competition that it is alleged might occur if contractors keep title can be adequately dealt with through "march-in" provisions and/or the antitrust laws. I would note, also, that despite the thousands of cases in which contractors have retained title to inventions made under Government grants and contracts, I have yet to see a title-in-the-Government advocate point to an actual case where harm was done, let alone harm that could be attributed to the contractor being allowed to retain title.

As a further backdrop to my discussion of administrative developments, no one should be misled into believing that administrative changes to Government patent policy can, in the current climate, eliminate the need for a comprehensive statutory policy that is supportive of the administrative policies that the agencies might wish to pursue if given a free hand. To put this another way, if you listened carefully to what Mr. Denny said, it might have occurred to you that the primary feature of Government patent policy over the last twenty years has been the consistent enactment of piecemeal legislation with a title-in-the-Government orientation. Slowly but surely, the number of agencies and types of research subject to such legislation has grown. For the most part the efforts of the Committee on Government Patent Policy which in 1976 recommended a draft bill substantially similar to HR. 8596 was a reaction to the ERDA patent legislation. Many persons are concerned over the probability of further piecemeal legislation unless a comprehensive Congression-

ally mandated policy can be enacted. These fears, in my opinion, are well based. It might be noted, for instance, that the ERDA language was only a few months later incorporated by reference in legislation amending the Solid Waste Disposal Act, in that case replacing statutory language that directed the EPA to follow the President's Memorandum and Statement of Government Patent Policy. I think we can all expect that each time a new piece of R&D legislation comes up an attempt will be made to insert ERDA-type language in the bill. For various reasons such piecemeal efforts are much more successful than would be any attempt by title-in-the-Government advocates to secure the passage of a comprehensive Government-wide policy. Such an effort would meet with the united opposition of many agencies and interest groups, but the same is not true of piecemeal efforts.

However, it is now anyone's guess whether the Administration will or will not support the Thornton Bill (H.R. 8596). It is my personal opinion that, if it does not support H.R. 8596, in 15 years or so the only agencies that will not be subject to ERDA type legislation will be the Defense Department and possibly the National Science Foundation (NSF), if that agency has not in the meantime been merged into some super Science Department. If and when a super Science Department is formed, you can be assured that unless H.R. 8596 is enacted in the meantime such an agency will be made subject to ERDA-type legislation.

However, as we await the doomsday that I foresee in Government patent policy if comprehensive legislation is not passed, there are a few things happening on the administrative front that can give one heart. This is especially true with respect to recent developments in the area of Government patent policy vis-a-vis university research, and these will occupy most of the remainder of my discussion.

In 1975 the Interagency Committee on Government Patent Policy approved a report by its Ad Hoc Subcommittee on University Patent Policy which recommended that the agencies adopt the Institutional Patent Agreement (IPA) approach followed by NSF and The Department of Health, Education, and Welfare (DHEW) with respect to university and nonprofit organization research. The essence of this approach is that those universities that are determined to have effective invention identification and licensing programs may be given a standing agreement to elect rights in any inventions which they make under the sponsorship of the agency with whom they have the agreement.

As recommended in the report and as now followed in practice by DHEW and NSF, certain limitations are placed on the exercise of a university's rights under an IPA. Incidentally these same restrictions are normally inserted in NSF and DHEW case-by-case waivers. These include:

1. A bar on assignment of inventions to other than patent management organizations, except with the approval of the agency.

2. Limitations on the period of any exclusive licenses under U.S. patents, now normally the earlier of three years from first commercial sale or eight years from the date of license, whichever comes first.
3. A license to the Government and the usual so-called "march-in rights". Related to this both NSF and DHEW also require that any licensing agreements include a requirement that the licensee undertake reasonable efforts to commercialize the invention.

As a result of the report referred to earlier just last month amendments were proposed to the Federal Procurement Regulations (FPR) which would authorize agencies to enter into Institutional Patent Agreements with nonprofit organizations. (Editor's Note: The effective date of these amendments was later postponed pending further study by Congress.) The amendments include a model institutional patent agreement. Possibly the most significant change in the model agreement from current NSF and DHEW IPAs is the change from the three and eight year period for exclusive licenses to a five and eight year period. Moreover, the eight year period will be automatically tolled during any required premarket clearance proceedings. This would apply to drugs requiring FDA approval, and now, medical devices.

It is difficult to predict how many agencies will adopt the IPA approach if and when it has been officially authorized in the Federal Procurement Regulations. Its use is optional and not mandatory. I would venture a guess that probably only the Department of Commerce among the civilian agencies will issue IPAs. Earlier Department of Defense (DOD) officials indicated that they would adopt the approach once it was published in the FPR. That remains to be seen. It might be noted that until this is done, DOD's policies towards universities actually have taken a turn for the worse in the last few years. That is, up until a few years ago DOD had a list of universities with approved patent policies. Universities on that list automatically were given a title-in-the-contractor type clause if the contract fell under what is section 1(b) or (c) of the President's Patent Policy and all but a small percentage of DOD contracts do. For reasons never very clear, when the ASPR was amended a few years back to conform to the new FPR section on patents the list was abolished.

However, there is another section of the recent FPR amendment that is significant. The regulation contemplates the establishment of an interagency mechanism to identify universities with effective technology transfer programs. This list may be used by the agencies having IPA programs in lieu of individual agency reviews. Secondly, it might be used by agencies such as National Aeronautics and Space Agency (NASA) or DOE as a basis for granting deferred determination waivers on a more automatic basis to institutions on that list.

For example, the Department of Energy in a Report to the President and the Congress of the United States mandated under

subsection 9(n) of the Federal Nonnuclear Energy Research and Development Act of 1974 concluded that it did not have authority to enter into Institutional Patent Agreements under that Act. Instead, they seem to have interpreted the Act in a way that only allows them to grant a waiver to a University either at the time of contracting or after an invention is identified when in the words of subsection (d) (11) of Section 9 the "institution has a technology transfer capability and program, approved by the Administrator as being consistent with the applicable policies of this section".

The act also requires the Administrator to consider in connection with any deferred determination waiver

"(1) the extent to which such waiver is a reasonable and necessary incentive to call forth private risk capital for the development and commercialization of the invention, and

(2) the extent to which the plans, intentions, and ability of the contractor or inventor will obtain expeditious commercialization of such invention".

The report by ERDA indicates that the second condition may be considered as having been met if the (d) (11) consideration is met. And DOE has indicated that the list developed under the FPR amendment might be used by it for the purpose of satisfying the (d) (11) consideration.

NASA's intentions in this area are less clear. It seems to me, at least, that NASA has sufficient authority to issue class waivers under the Space Act so that it could adopt the IPA approach. On the other hand, they may, perhaps, use any list developed under the new FPR procedure as a basis for some sort of expedited procedure for waiver of identified inventions to universities on the list. All this, however, is pure speculation on my part and I do not believe NASA has actually committed itself to anything in this area either formally or informally.

There is, I think, one other item of major interest concerning administrative patent policies. The Office of Management and Budget (OMB) and various persons within the executive office of the President are now engaged in drafting a so-called "decision paper" on patent policy to be sent to the President. In a talk before the Government Patent Lawyers Association a representative from the Office of Federal Procurement Policy (OFPP) indicated that it would consider organizing an effort to revise the current regulations depending on what decision the President makes. For example, if the President indicates support for the Thornton Bill then pending actual passage of the bill, OFPP might seek liberalization of the current regulations. Conversely, if the President opts for title-in-the-Government, things might have to be rewritten in the opposite direction. I personally hope that any paper that goes to the President makes it clear that such an approach is totally unsuitable as a Government-wide policy. If the President decides to let things lie and stick with the status quo,

presumably the FPRs will stay as they are, although it is possible that the FPRs could be simplified and made more responsive to the needs of universities and small business without doing any violence to the current Presidential Statement of Government Patent Policy.

In summary, we are at a critical point in the development of Government Patent Policy. The President will presumably be making critical decisions in the upcoming months that may have important consequences on the future direction of Government patent policy whether he moves the Government in either of the two basic directions or whether he chooses to stay with the "status quo" and avoid the immediate controversy.

Abstract

We are at a critical point in the development of Government Patent Policy. There is a continuing real need for a comprehensive statutory government patent policy that is supportive of overall Government policies. This need cannot be fulfilled adequately by promulgating simple administrative regulations or piecemeal legislation. For the foreseeable future, in absence of comprehensive legislation, either the Institutional Patent Agreement approach with title-in-the-grantee orientation, or the approach taken in recent legislation of providing title -in-the-government with waiver-to-the-contractor privileges will prevail. The former arrangement is used at present by the Department of Health, Education and Welfare and the National Science Foundation. The latter policy is embodied in legislation which governs the Department of Energy.

Biographic Notes

As Assistant to the General Counsel, National Science Foundation for the past six years, Jesse E. Lasken, has participated in many conferences on federal grants and patent policies, and has served in various capacities on the Federal Council for Science and Technology Committee on Government Patent Policy. Mr. Lasken is a member of the District of Columbia Bar and the Federal Bar Association. His baccalaureate in the arts was awarded by the University of Michigan and he has received degrees in law from both the University of Michigan and George Washington University.

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Federal Patent Policy and H.R. 8596

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There is ample reason to believe that the present legislative framework and administrative policies governing the disposition of Government-funded inventions may be inhibiting their commercial development. Given the fact that the Government is responsible for more than half of the total United States investment in research and development, it is essential that these dollars be made to produce more than defense and space benefits. On the international side, policies that discourage investment by U. S. industry in Government-sponsored inventions meant to resolve social problems leaves the door open for foreign industry, especially if state-controlled or subsidized, to capitalize on these inventions to the detriment of American jobs and industry.

Representative Thornton, joined by 13 Congressmen, including the Chairman of the Committee on Science and Technology, has introduced H. R. 8596, which would establish a comprehensive Government-wide policy regulating the allocation of rights to inventions made by Government grantees, contractors, and employees, having as one of its main objectives maximizing utilization of such inventions. The bill also provides legal authority, now lacking in a number of Federal agencies, for the licensing of Government-owned patents.

Summary of H. R. 8596

Briefly, the major provisions of H. R. 8596 are:
Title I, which contains a statement of findings and purposes.
Title II, which provides an institutional framework through OSTP and its subcommittees to assure uniform implementation of the Act's provisions.

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Title III, Chapter 1, which would allow grantees and contractors the right to retain title to inventions subject to various limitations and conditions, including a case-by-case right of deviation in individual agencies where, for example, the Government is fully funding the development of a product or process to the point of commercial application.
Title III, Chapter 2, which is an effort to codify the criteria of Executive Order 10096 initially issued by President Truman allocating rights in inventions made by Federal employees in performance of official duties, and which also includes authority for such an incentive awards program covering inventions made by such employees.
Title IV, which provides all Federal agencies authority to license Federally-owned inventions. It also provides the Department of Commerce with certain additional authorities, so that a centralized Government licensing program could be undertaken, although participation in the Commerce program is left to agency discretion, and
Title V, which contains definitions, amendments and repealers of existing statutes.

In my opinion, the bill, except for Title III, Chapter 1, should not prove controversial, since most of its provisions embody precendents and conclusions that have been to some degree uniformly agreed upon.

Controversy over Title III, Chapter 1, seems inevitable, since it would supplant approximately 22 different statutory and administrative policies and procedures covering allocation of contractor and grantee inventions.

Genesis of H. R. 8596

H. R. 8596 is the culmination of years of discussion and agency operating experiences starting from the increased influx of Government research and development funds after World War II to the present 22 billion-dollar annual investment. The bill in part is an adaptation of a draft bill that was prepared in 1976 by an Interagency Committee on Government Patent Policy, which bill appears to have been partially inspired by the 1972 Report of the Commission on Government Procurement. The Commission, composed of public and private sector members, recommended that Government patent policy continue to be guided by the Presidential Memoranda of 1963 and 1971 on Government Patent Policy. However, the Commission also recommended legislation similar to H. R. 8596 in the event of unsatisfactory experience under the Presidential Memoranda.

Some problems under the Presidential Memoranda became apparent soon after issuance of the Commission report. First a Justice Department memorandum maintaining that disposition by the Executive Department of future inventions at the time of contracting constitutes disposition of property requiring statutory

authority, and lawsuits filed by Public Citizens, Inc., based on that thesis, directly challenged the constitutionality of parts of the Presidential Memoranda. In addition, the Congress has since instituted a number of new research and development programs through statutes having patent policy provisions inconsistent with the Presidential Memoranda. Notwithstanding the withdrawal of the Justice memorandum and dismissal of the Public Citizens' suits on procedural grounds, the probability and actuality of additional suits based on the same thesis and additional piecemeal legislation prompted the Committee on Government Patent Policy to develop the 1976 draft bill.

Patent Policy Alternatives

The most basic aspect of Government patent policy involving grantees and contractors is the type of patent clause that is included in any given grant or contract. Basically there are three types of clauses that might be used in any given situation:

(a) A provision giving the Government title to all contractor inventions.

(b) A provision providing for contractor retention of title, subject to whatever licenses and other rights it is agreed that the Government will obtain, or

(c) A provision that the Government will have the right to determine the disposition of rights in any inventions after they are identified (the "deferred determination" approach).

Debate over Government patent policy has centered on which types of clauses should be used in Government contracts and grants and under what circumstances.

For the most part Government agencies now use only the last two types of clauses, since even most so-called "Title in the Government" clauses provide to the contractor the right to request greater rights than a nonexclusive license after an invention has been made (unless otherwise precluded by statute).

Notwithstanding the number of outstanding statutes, most agencies, including major research and development agencies such as the Department of Defense and the Department of Health, Education, and Welfare have no statutory provisions regulating their policies and have been guided by the Presidential Memoranda. In fact, many of the agencies with statutes have generally been guided by these Memoranda to the extent that they are compatible with the statutes. However, the Presidential Memoranda only establish general guidelines as to when title in the Government, title in the Contractor, or deferred determination clauses should be used. They have not prevented the development of a maze of individual agency regulations and procedures, and have provided no guarantee that agencies would consider similar contracts to require similar clauses. H. R. 8596 has as one of its objectives the elimination of this current web of statutes and regulations.

Available Approaches for a Legislative Government Patent Policy

More important, H. R. 8596 has as its basic objective the development of a policy that will enhance economic growth by maximizing utilization of Government-supported inventions. The primary issue remains whether the approach taken in Title III, Chapter 1, of the bill will best accomplish that result.

It is anticipated that opponents of the bill will argue that allowing contractors to retain title is a "give-away," "anticompetitive," and provides contractors with a "windfall." Objective review of the subject has been difficult to achieve in the past, since opponents are wont to dispose of the issue through the catchwords cited above, and others such as "what the Government pays for it should own." Experience shows that there are few situations in which the Government funds inventions resulting from its programs to the point of practical application except for instances where the Government is the primary purchaser of the invention. Notwithstanding, it is not possible at this time to statistically conclude that the contractor's ultimate financial contribution to bringing an invention resulting from Government funding to the marketplace is in any given case significant in comparison to that of the Government. This leads to what is believed to be the most persuasive argument or approach available to opponents of the H. R....that disposition be made at the time of contracting on a case-by-case basis and/or deferred until identification of an invention.

Under such an approach it is contemplated that disposition, whether made at the time of contracting or after identification of the invention, will take into consideration the equities of the Government vis-a-vis the contractor in ultimately bringing the invention to the marketplace. However, since the equities of the parties at the time of contracting in a yet-to-be-made invention are virtually impossible to assess objectively, opponents of H. R. 8596 have indicated a clear predilection toward deferring determination of ownership until an invention has been made, so that disposition can be made on a stronger basis. Accordingly, it is believed that if uniformity is to be one of the prerequisites of a legislative Government patent policy, the choice appears to be realistically limited to the H. R. 8596 and deferred determination approaches. (As already noted, a "title in the Government" approach which does not take into consideration requests for greater rights in the contractor after an invention has been made and has been virtually abandoned by the major R & D agencies is not considered a means of maximizing utilization of Government-funded inventions, since it rejects the need for the patent incentive by the contractor in all situations.) Accordingly, the remainder of this presentation is limited to comparing H. R. 8596 and deferred determination approaches against the objectives sought by a legislative Government patent policy.

The Objectives of Government Patent Policy

There is general agreement that the primary objectives of Government patent policy should be to (1) promote further private development and utilization of Government-supported inventions, (2) ensure that the Government's interest in practicing inventions resulting from its support is protected, (3) ensure that patent rights in Government-owned inventions are not used for unfair, anticompetitive or suppressive purposes, (4) minimize the cost of administering patent policies through uniform principles, and (5) attract the best qualified contractors.

Comparison of the Deferred Determination and the "Title-in-the-Contractor" Approach Against the Objectives of Government Patent Policy

Objective (2) is satisfied equally by either approach, since the Government as a minimum will retain a royalty-free license, even if the contractor has title. Stated in other words, if the Government is the primary purchaser, it makes little difference who has title.

The fourth objective (minimizing administrative costs) is best met by the H. R. 8596 approach, since agency experience indicates that a great amount of Government and contractor time is required to process requests for rights made under deferred determination clauses. Indeed, a great hardship would be involved in shifting to a Government-wide deferred determination approach, unless this was accompanied by a significant increase in the patent and related support staffs of a number of agencies. For example, it is unlikely that DOD could expeditiously process each contractor request for patent rights under a deferred determination procedure with present staffing.

The fifth objective (attracting the best qualified contractors) seems best satisfied by H. R. 8596, since there is evidence that many firms with established commercial positions and which are not primarily engaged in Government contracting would be reluctant or refuse to undertake or compete for Government research and development contracts (or subcontracts) in the area of their established positions if the Government insisted upon the use of a deferred determination clause. It is not realistic to believe that such firms will jeopardize a privately established commercial position on the chance of ownership of a major improvement of such position made with Government funding. Refusal to participate in this situation will probably necessitate that the Government contract with a less qualified contractor or not contract at all.

To avoid this problem the policy would have to leave open the negotiation of other terms in cases which demand deviation from a deferred determination clause. However, this would necessarily increase the administrative costs of a deferred determination approach, since negotiation of special patent clauses at the

time of contracting is a time-consuming process. More important is the fact that no definitive criteria has ever been developed which would establish when such a deviation was justified.

This centers the debate on which approach best meets the objectives of promoting utilization of Government-funded inventions while guarding against abuse (objectives 1 and 3).

In general, opponents of H. R. 8596 argue that leaving first option to rights in inventions to contractors will not really ensure greater utilization and will lead to abuses, such as suppression, higher prices, and market concentration. Proponents argue that H. R. 8596 will maximize utilization of Government-funded inventions, that the potential abuses are more theoretical than real, and that in any case the bill's "march-in" provisions are available to rectify any abuses that might develop. They also argue that the issue of higher prices, to the extent it is true, assumes that the invention is commercialized, while under the deferred approach many fewer inventions will be commercialized. For those that are not, the issue of price is moot, and the public has been deprived of new or improved products.

Factors Affecting Utilization

A decision by any firm to invest in the development and marketing of a patentable invention is dependent on numerous factors, only one of which may be patent ownership. Obviously, patent rights will not be a factor in such decisions unless a commercial market is envisioned. But all other things being equal, the ownership of patent rights is a positive incentive for investment in commercialization. Ownership may well be the deciding factor on commitment of private capital, since studies have shown that the cost of bringing an invention from its initial conception or reduction to practice (which is as far as most Government inventions are funded by the Government) to the commercial market is approxmately 10 times the cost expended in first inventing it under a Government grant or contract. In many situations this additional investment will not be made if it is perceived that a competitor can avoid this initial investment and undersell the original developer.

Further, as a general proposition, the inventing organization is more likely to be interested than other organizations in commercializing an invention due to inherent ability to assess the merits of the invention from inception through early stages of development.

It is probably also better qualified, or at least as qualified as any other firm, to promote or undertake further technical development, since it may have know-how not necessarily available to other companies. It will also normally have an inventor and technical team willing to advocate that their idea be brought to fruition. Further, in the case of many commercial contractors a Government-funded invention may only be an improvement on exten-

sive contractor-owned technology, and, therefore, will not alone form a basis for a major new commercial line.

Can the Deferred-Determination Approach Minimize Monopoly Profits Without Inhibiting Utilization?

Because of the above circumstances, proponents of H. R. 8596 argue that there are strong reasons to permit the inventing contractor a first opportunity to retain title to its invention and commercialize it. Indeed, in the case of nonprofit organizations or smaller nonmanufacturing firms, it is believed unreasonable to expect any effort on their part in transferring the invention to concerns capable of marketing without the incentive of ownership. In fact, it is argued that there is little point in going through a deferred determination process if the Government's objective is to maximize utilization.

Deferred determination advocates would claim that the Government can make a better judgment after the invention is identified, denying exclusivity and all the abuses it may engender where they are not necessary. Implicit in this claim is the assumption that Government personnel will either be in a position (i) to determine if the existence of exclusive patent rights is needed as an incentive to further development, or (ii) to find a better qualified firm to commercialize the invention through a Government licensing effort after taking title to the invention.

As to whether exclusivity is needed as an incentive for private investment in an identified invention, it should be recognized that if the Government determines that exclusivity is not needed, but is wrong, no further development may take place. On the other hand, if the Government is right, consumers may save the hypothetical difference in price that would be charged by someone holding exclusive rights, as opposed to the price charged by someone who developed the product without exclusive rights. In any case, the public will presumably get an improved product or process which they find more beneficial than its previous alternative.

Moreover, for the Government to be right more often than not when making a deferred determination would require extensive technical, marketing, and economic studies of the firms, technology, industries, and market involved. The cost to taxpayers of such programs could be more than any savings they would produce for consumers. This appears to be the present situation, since in most deferred determination cases exlusivity has been deemed necessary, and the costly determination process has been engaged in simply to confirm this fact. This has been substantiated by the National Aeronautic and Space Administration, HEW and NSF (the three agencies which historically have made the largest number of deferred determinations) by the grant of over 90 percent of the requests for "greater rights" over a period spanning 10 years.

Similarly, the ability of Government personnel to decide after an invention is identified that utilization will best be promoted by the Government's taking title and offering the invention for licensing, assumes that commerical developers, other than the inventing contractor, can be found (presumably but not necessarily on a nonexclusive basis). There is really no effective means for Government personnel to ensure that other firms, whether licensed exclusively or nonexclusively, would do a better job of developing the invention than a willing contractor or a licensee of the contractor. One can be sure that in most cases the inventing organization will have little interest or incentive to transfer its know-how to another firm, possibly a competitor. Moreover, the very process of attempting to find alternative developers will simply serve to delay private investment and cool the interest of the inventing contractor. It will also force the Government into the expense of filing patent applications in order to assure that a patent is available if exclusive licensing is ultimately deemed necessary.

It is important also to emphasize that a deferred determination that is truly geared to resolve the questions that trouble opponents of the H. R. 8596 approach would be so costly, complex, and time-consuming as to discourage many contractors from requesting rights in the first instance, especially small businesses and universities. They may even neglect to report the invention under such circumstances. In all likelihood, without a request for rights to trigger the deferred determination process, most agencies will have little incentive to do anything with the disclosure and, in most cases, the invention will be practiced by no one, as seems to be the case with a very substantial portion of the 28,000 patented inventions now in the Government's patent portfolio. Indeed, under a deferred determination approach the agencies could be devoting so many resources to those cases where rights were reqested that they would have insufficient personnel or interest to study inventions and encourage development and marketing where rights were not requested. Thus, it appears that H. R. 8596 is more likely than alternate approaches to maximize the commercialization of Government-funded inventions.

Other Concerns of Deferred Determination Advocates

In addition to the concern over higher profits, advocates of the deferred determination approach have generally voiced two other concerns. First, they express the fear that some contractors will take advantage of patent rights to suppress the utilization of an invention. Such fears have been expressed throughout the years, but no case of such suppression has ever been documented, despite the thousands of instances in which Government contractors have retained title to inventions. Further, H. R. 8596 includes so-called "march-in" provisions that would remedy

any such abuse.

Finally, proponents of deferred determinations argue title-in-the-contractor may lead to dominance of an industry by a contractor. Studies indicate that most contractors normally license their patent technologies and that, in any event, alternative technologies are generally available. No example of such dominance has ever been given. It is also questionable whether the Government could identify the possibility of such dominance during the deferred determination process.

A strong argument can be made that allowing contractors to retain patent rights will tend to promote competition in an industry, whereas a deferred determination approach where the Government normally retained title and either dedicated the invention to the public or licensed the invention on a nonexclusive basis approach would do otherwise. The proposition that title-in-the-contractor can lead to dominance is very much dependent on the assumption of a competitive marketplace in which all concerns start with equal capacities. In fact, many industries are currently oligarchical in structure and do not fit the model of pure competition. When this is the case, the retention of rights in the Government and a policy of nonexclusive dedication or licensing tends to serve the interests of the dominant firms for whom patent rights are not normally a major factor in maintaining dominance. Rather, control of resources, extensive marketing and distribution systems, and superior financial resources are more important factors in maintaining dominance and preventing entry of new firms. It is important to note that such firms may well be foreign-based and dominant through subsidization by their governments, making the inadequacies of a policy of the Government's normally acquiring title even more pronounced. Certainly the Government should not be conducting research and development and permitting the results to enure to the benefit of foreign countries to the detriment of our own economy.

On the other hand, smaller firms in an industry must of necessity rely on a proprietary position in new innovations and products in order to protect their investment in both domestic and foreign markets. Thus, patent rights tend to be a much more significant factor affecting their investment decisions. They may need the exclusivity of patent rights to offset the probability that a successful innovation will lead to copying by a dominant firm which would soon undercut their market through marketing, financial, and other commercial techniques. Accordingly, the deferred determination approach in which title normally is retained by the Government may, in fact, be anticompetitive, since it encourages the status quo by discouraging innovation.

Congressman Thornton has provided an unprecedented forum for resolution of one of the country's least understood but important problems. While giving the patent bar the opportunity to educate the public on the essential part the patent system plays in the economic life of a country pledged to individual freedom and the

right of individuals to contribute to its society, we have an opportunity we cannot afford to lose to parochial interests.

Abstract

Representative Thornton introduced H.R. 8596 in 1977 which would establish a uniform Government policy regarding the allocation of rights to inventions made by Government grantees, contractors, and employees. In addition, the bill provides general legal authority for the licensing of Government-owned patents. The ultimate objective of this bill is to promote and maximize the commercialization and utilization of inventions and technology which result from Government-supported research. There is considerable interest in this bill, both within the Government and in the private sector. A review of the present situation reveals some constraints on the range of options available in formulating a uniform Government patent policy which would eliminate the current maze of statutory and administrative policies, forms, and clauses.

Biographic Notes

Norman J. Latker, Patent Counsel for the Department of Health, Education, and Welfare, is responsible for administration of the Department patent program, which handles patents, inventions and other forms of intellectual property resulting from the Department's $2 billion annual research and development program. He has previously served on the staff of the Judge Advocate of the Air Force Systems Command and as chief patent advisor at the Detroit Arsenal of the Army Ordinance Tank Automotive Command. Mr. Latker currently is Chairman of the Subcommittee on University Patent Policy of the Subcommittee on Intellectual Property of the Federal Council for Science, Engineering and Technology. Both his baccalaureate in science and doctorate in law were awarded by the University of Illinois.

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Patent Policy in Government Research and Development Contracting

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The argument about Government patent policy has been going on for years and will probably go on for years more. It gives us something lively to talk about--and durable, because solutions always seem to be around the corner. The subject has so many ramifications, implications and complications that one can scarcely even list them, to say nothing of discussing them in a brief paper.

For the purposes of the present discussion and in the interests of brevity, I make, for the sake of argument, certain assumptions: (1) that research and development contracted for by the Government is crucial to our welfare (if it is not, we should be taking a hard look at the billions the Government spends in this area); (2) that the possibility of owning patents that stem from such R & D does--sometimes, if not always--provide an added incentive to invent and to innovate; (3) that the proposition, "the Government paid for it, the Government should get the patents," while logical enough and undoubtedly valid in many instances, is unduly simplistic, standing alone, in terms of what is in the best public interest; (4) that denial of patent rights to the contractor may, in an undetermined number of close cases, cause a contractor to refuse the contract or demand a higher price; (5) that denial of exclusive rights to a potential innovator, whether the R & D contractor or someone else, may (again, in close cases) result in non-innovation; (6) that the public interest may (I emphasize the word "may") warrant leaving patents with the R & D contractor if (I emphasize the word "if") failure to do so has undesirable results, in the form of reducing the incentive to invent or innovate, that exceed the benefits of retaining title in the Government.

The first and most crucial problem, I think we can agree, is to determine the respective "costs" and "benefits" of leaving patent rights with the contractor, reserving only a license in the Government (referred to as "license policy"), as compared to retaining title in the Government (referred to as "title policy"). The main costs of leaving patents with the contractor

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are those that we usually associate with the possession of such monopoly power as patents may provide: denial to others of the right to use the invention, possible higher prices to ultimate consumers, and advantages vis a vis competitors resulting in competitive imbalance. Secondarily (and considerably more speculative), such action can result in a lessening of future R & D by blocking others from engaging in such activity or reducing the pressure on the contractor himself to do so. The benefits that flow from the license policy are that it may give the contractor greater incentive to do the best possible job of inventing, incentive to innovate and market, incentive to supplement his Government R & D with R & D of his own, a greater willingness to take the contract or take it at a lower price and, finally, a minimizing of the "transaction costs" imposed upon both parties, but especially upon the Government. I use the term "transaction costs" in a very broad sense. I include the burdens of delay, protracted negotiation, uncertainty, and controversy as to what the respective rights are, as well as the additional burdens of supervision, inspection, and review that may fall upon the Government in the absence of the self-operating incentives for the contractor to cooperate and do his best--incentives that presumably attend adoption of the "license" policy.

The "costs" and "benefits" of Government retention of patent rights are, of course, substantially a mirror image of those I have just enumerated. The Government, as representative of the public, benefits from the competition that results if all are free to use the invention--assuming they do use it--and from such additional independent research as both the contractor and others may engage in. The costs may take the form of poorer performance per R & D dollar spent by the Government, as a result of those best qualified refusing to take the contract (at least at the agreed-upon price), less enthusiasm for doing a good job, short-changing the Government through non-disclosure of results, unwillingness to risk commercialization of the invention, and so on. They also may involve higher "transaction costs" of the sort previously mentioned.

It is easy enough to tick off the various ways in which this or that approach may have plus or minus effects. But a mere recounting of the possibilities makes two things painfully apparent. One, the extent of the cost or benefit becomes an extremely "iffy" matter--most of all at the stage when one has no clear picture of what may result. Two, as a corollary, it may be that the best course to follow lies somewhere between the two extremes of "title" policy and "license" policy.

A closer look at the realities will underline the great variations that may exist as between one invention-innovation situation and another: (1) A given new product or process may be easy and inexpensive both to invent and to innovate. In this situation, little help from the Government, whether in the form of patent protection or otherwise, is presumably needed since private enterprise should be quite able to handle the situation;

(2) As to another product or process, invention may be easy and inexpensive, but innovation may be difficult and expensive. Here, as in the first situation, the patent system is likely to have little relevance (except as patentable inventions may arise later) since by definition the patent law applies only to inventions that are difficult to make, not to difficult innovations. Consequently, such support as Government may provide, if it is to provide any at all, must take the form of some sort of subsidy, in-house development, assistance and advice, or other non-patent aid; (3) Still another product or process may be difficult and expensive to invent, but its introduction into the market may be easy and inexpensive. The invention of an 80-mile-per-gallon carburetor comes to mind. Here, some incentive or aid, whether through patent rights or Government funds may be needed to bring the invention into being, but not to induce innovation once the invention has been made; (4) Finally, a product or process may be difficult and expensive at both the invention and innovation stages. Here, some kind of incentive support, Governmental or otherwise, may be needed at both stages. Government support need not necessarily take the form of patent rights. At the invention stage it can, and usually does, consist of monetary support. At the innovation stage, it can consist of other direct forms of aid: monetary, expert advice and assistance, development facilities, and so on. More indirectly, know-how, headstart advantages, staff maintenance and improvement, or the prospect of obtaining supplemental patents on later inventions stemming from the innovative effort--all having their roots in the R & D contract--may be sufficient to induce the contractor to take the "innovation" risks. Granted that these alternatives exist, the award of patent protection covering the original invention does remain as one way to provide incentive to undertake an innovation that might otherwise not occur.

The foregoing underlines the great variety of possible situations. In short, the "incentive" role that patents may play in the innovation process, as distinguished from the invention process, may range from very great to nothing at all.

Nor is the "incentive stimulus" role the only imponderable. A given patent may have an entirely different significance in the hands of contractor X than in the hands of contractor Y. If X is a small entrepreneur with little else to protect him from powerful competitors, the patent may have salutary effects in terms of both improving (rather than distorting) the balance of competition and providing incentives to others to invent around. If Y is a large, dominant concern, award of patent rights may result in further distortion of an already unbalanced competitive situation and can even provide a disincentive to further invention--both on the part of Y because he is already well-insulated against competition and on the part of others who find Y's advantages too great to overcome.

Beyond the competitive imponderables, there is, of course,

the fact that patents themselves vary tremendously in terms of their impact upon the competitive structure. Some are pop-guns, competitively speaking; some are block-busters.

Given the realities of these variations, the difficulties in many cases (indeed, the impossibility in some instances) of evaluating accurately the costs and benefits of either granting or not granting exclusive patent rights to the contractor, become apparent. They become all the more apparent, of course, when such evaluations must be made, as they often must, at a time when the subject inventions have not even been made and when one can only speculate upon what the business structure, the position of various entities in that structure, and the competitive practices will be in the years to come--the years in which the impact of the patents will be felt.

Recognition of these uncertainties, brings us to the next major question. With a high degree of variability from one case to the next, and with a high degree of speculation as to the extent of a given cost or benefit, how are we to ascertain whether the costs and benefits of given alternatives have been accurately determined? If we do err, how shall we correct those errors? What I am asking is this: How can this highly uncertain, highly variable, highly volatile program best be administered in the public interest?

There may be no good answer to these questions. In close cases--and it is close cases that must concern us--it may be that nobody is in a position to make a really accurate prognosis in terms of what is best. This reality does, however, suggest the approach that it would seem wise to take. In view of the possibility that a given decision may prove unwise because of expectations that do not materialize, unanticipated changes of circumstance, or for other reason, any program that is adopted for dealing with this situation should be flexible and adjustable. But flexibility and adjustability, alone, are not enough. Incentive must also exist to make those adjustments when occasion demands. Where a given decision is disadvantageous to the contractor, one may reasonably expect him, in his own self-interest, to try to get it changed. It is less certain that a Government agency will take the necessary steps to correct a decision that proves adverse to the public interest. With some exceptions, Government agencies tend toward inertia with respect to previously-made decisions, unless someone is breathing down their necks--especially where the action called for is secondary to their primary responsibilities, as is the case with an R & D agency's administration of patent rights. The tendency not to correct the situation is the greater, of course, if the need for revision is not clearly perceived or if corrective action will require affirmative steps by the agency. An undesirable arrangement is more likely to continue, for instance, if it is the subject of a 10-year contract with a right to terminate after 5 years.

Recognition of the significance of the human element in the administration of this patent-allocation program, brings us to a third basic question. Is the agency that sponsors the R & D and negotiates the contract the best one to deal with these broader problems involving the allocation of patent rights? There are grounds for suggesting that it is not. Granted that it is well qualified to evaluate the technological performance of the contractor and the technological relationship of what he does to what others have done or are doing, it does not necessarily follow that it is best qualified to evaluate the marketing, entrepreneurial and competitive results that may flow from a given course of action--and these, after all, are the crucial factors that must control decisions regarding patents. Competency in these matters is especially open to question in the case of a "mission-oriented" agency--and it is they who are responsible for most of the Government-supported R & D contracts. Even the "public-service-oriented" agencies, however, may suffer from a lack of balance because of their understandable emphasis upon their immediate fields of interest. Furthermore, as a result of constant exposure to the views of those with whom it deals, any agency runs the risk of developing an unconscious bias in the direction of the contractor's point of view, in the same way that regulatory agencies do with respect to those whom they regulate. Finally, a given contractor's willingness to contract, to contract at a given price, or to perform satisfactorily, may well be influenced by whether or not he will be awarded patent rights. This being so, the contracting agency finds itself in an uncomfortable "conflict of interest" position, where it will be tempted to trade off the patent rights--the cost of which falls upon outsiders--in order to get a better deal, greater effort and more cooperation from the contractor--benefits that accrue directly to the agency.

A fourth point to consider, and a very troublesome one it is, is the matter of transaction costs. Entanglements, protractions, supervision, uncertainties, and delays can attend the entire process we are talking about, from the earliest negotiations to the final completion of the contract, and even beyond. These are costly to everyone--the contractor, the Government, and the public alike. These costs may take many forms: wrangling over the dollar costs of the contract; argument whether a given invention was made under or outside of the contract; whether the contractor has put forth his best effort in performing; whether he has disclosed everything he should; whether patent protection is necessary to induce innovation; whether equity and competitive considerations warrant giving him exclusive rights and, if so, to what extent; uncertainty and indecision as to what he may keep for himself and what he must turn over to the Government; and so on. These are troublesome and difficult matters and the urge to minimize or avoid them is understandable. This urge, as much as anything, may lie back of

the approach in H. R. 8596, introduced by Representative Thornton in 1977, to the allocation of patent rights. One can applaud efforts to eliminate or minimize these costs--would that Government generally might concern itself more with such things. The question is whether we end up paying too high a price, or a higher price than necessary, for such results.

I have talked generalities and principles long enough. Let me turn to the specifics. A responsible program in this area calls for the following:

(1) Careful evaluation to determine whether an award of patents is needed to induce "invention."

(2) A similar evaluation with respect to encouraging "innovation."

(3) Evaluation of the effects of given courses of conduct upon the competitive situation.

(4) A careful balancing of these three factors, in "cost-and-benefit analysis" terms, to determine whether a given course of conduct is (a) worth what it costs or (b) could be modified to reduce the cost and increase the benefits.

Needless to say, evaluations like these, to be successful, require competency, broad understanding, good judgment, lack of bias, and a reasonable measure of courage, aggressiveness, imagination and foresight. This is a tall order.

Additionally, such a program requires:

(5) A sufficiently flexible procedure so that errors can be corrected or programs modified in response to changed circumstances.

(6) A determined effort to minimize transaction costs by eliminating uncertainties, delays, time-consuming and burdensome procedures, unnecessary supervision and review, red-tape, and the like.

Some of these criteria work against each other. "Flexibility" and "certainty" may be mutually inconsistent. Careful review and protection of the right to be heard may result in more, rather than less, delay and burdensome procedure. Denial of patent rights may necessitate closer supervision to assure that the contractor does his best. And so on. Here, again, trade-offs may become necessary. The important thing is to avoid trading one's birthright for a mess of pottage.

I am afraid I cannot put off any longer talking about the Thornton bill. How do H. R. 6249 and its successor H. R. 8596 stack up in terms of these criteria? I will assume a working knowledge of this bill's provisions and will concentrate on the "title versus license" issue in contractor cases (sections 311 to 316).

The Thornton bill does, indeed, have some attractive features:

(1) It provides an express authorization from Congress to assign patent rights to private entities in appropriate cases--

an authorization that has heretofore been lacking, a lack which has given rise to a legal controversy that is still not definitively settled (cf. Kaplan v. Corcoran, 545 F.2d 1073, 192 USPQ 129, 7th Circuit, 1976).

(2) It provides, in form at least, for a flexibility that enables the agency to tailor its action, both at the outset and at later stages, to fit the significant public interest considerations we have been talking about: incentive to invent, incentive to innovate, and due concern for competitive effects.

(3) It greatly reduces immediate transaction costs (a) by acquiescing in the contractor's claim to title, thereby avoiding controversy, delay and uncertainty, (b) by subjecting the agency's acts (at least, those favorable to the contractor) to almost no procedural or review requirements, and (c) by lessening the need for close supervision and inspection of the contractor's performance (including disclosure) through the simple device of relying upon his self-interest--a justifiable reliance, it would seem, since he is able to retain almost all the benefits resulting from his performance.

(4) All in all, the bill provides incentive for the contractor to perform to his best ability and the further incentive to develop and market the inventions that he comes up with--in short, to pursue with vigor and haste the journey from the drawing board to the drawing room. It all adds up to "more bangs per buck," short-term at least. Whether the long-range effect is salutary, is another question.

Let me look, now, at the shortcomings.

(1) In leaving patent rights with the contractor simply for the asking, the Thornton bill dispenses at the outset with the need for any serious consideration of the costs and benefits. There are persuasive reasons why the Government should not surrender lightly or casually the patent rights resulting from its R & D contracts. Patents do constitute a monopoly of sorts, albeit a limited one. In an economic society dedicated to free enterprise and to reliance mainly upon competition, in lieu of resorting to other forms of control, any monopoly factor can have a disrupting effect. To permit contractor retention of the patents without any inquiry into the effect of this upon competition, or any exploration of whether such action is necessary to induce the contractor to take the contract to do a proper job of inventing and disclosing (both of which he is obligated to do, anyway) or to commercialize the invention (which he is not obligated to do) simply does not seem to square with the demands of public interest and responsible administration.

(2) Nor are the provisions in the bill that are designed to keep the contractor's exclusivity within bounds likely to do so. The provisions for compulsory licensing where antitrust, health and welfare, or regulatory requirements would otherwise be threatened, and the provisions for more general compulsory licensing after several years have elapsed seem seriously

deficient. For one thing, any interference with the contractor's exclusivity is subject to procedural limitations that could substantially delay or prevent action (in contrast to the initial award to the contractor which is largely pro forma.) As for the more general licensing, it cannot be imposed at all until 7 or 10 years, or longer, have passed. Beyond these, the decision whether or not to require licensing rests with the R & D agency that made the contract--an authority that may remain largely unused to the extent that an agency is sympathetic, as many are, to the principle of leaving all commercial rights with the contractor. In such agencies, the supposedly flexible administration contemplated by the bill thus becomes highly inflexible in favor of the contractor, and is rendered all the more so by provisions in section 315 (a) and (d) which permit deviation from the requirements set forth in the chapter. In short, many provisions in the bill push the agencies, especially those already predisposed in that direction, to leave all rights with the contractor and not thereafter to tamper with them.

(3) Still another factor pushes in this same direction: Once the contractor receives title, as he does automatically, it takes affirmative action on the agency's part to open the patent up for use by others. As I have mentioned previously, if it is up to the Government to take the initiative to correct a situation it created, the situation may simply remain uncorrected.

(4) Finally, one may seriously question whether the structure contemplated by the bill holds out much hope for the genuinely competent and unbiased administration that is essential if the public interest is to be adequately served. Many agencies--especially the mission-oriented ones--may have little understanding and feel for the broader aspects of innovation, competitive structure, monopoly threat, and so on, however expert they may be in the technological aspects of their subjects. Furthermore, those who made the original decisions may be quite unenthusiastic about deciding later that they misjudged the situation. And finally, given a possible long-standing relationship with the contractor and possible future relationship with him--a situation that may be aggravated in some cases by the "revolving door" phenomenon--one cannot ignore the possibility of unconscious bias, however dedicated and conscientious the administrator may be. These considerations, taken with the well-known lack of sympathy in many Government agencies for anything that smacks of the "title" policy, leave one doubtful as to how meaningful the safeguards in the Thornton bill might prove to be.

I can summarize my rather pessimistic views of the bill as follows: Its enactment would probably (1) put increased pressure on all R & D agencies to leave patent rights with the contractors and discourage them from thereafter interfering with those exclusive rights except in the most egregious and outrageous cases; (2) harden the so-called "license" agencies' opposition to Governmental retention of patents--all the more so since they would

now have Congressional blessing for their views; (3) put road blocks and procedural burdens in the way of those agencies that favor the "title" policy and even those that follow a more modified "title with waiver" policy. These pressures could, it is true, lead to a high degree of uniformity, but a uniformity based upon abdication--a consummation not devoutly to be wished.

With close to two-thirds of the R & D done today supported by Government funds, and the overwhelming share of R & D contracts, in dollar terms, going to large and already powerful concerns, I suggest that this is not the kind of law that should be enacted, in the absence of much clearer evidence than we now have that it is really necessary in the public interest.

What, then, do we need? I dislike ending on a negative note, so let me suggest the following:

(1) We should not throw out the Thornton bill entirely. It does have its good points.

(2) We should retain its express Congressional authorization and the flexibility that enables one to deal, not only with black and white cases, but also with the gray, in-between cases.

(3) We should shift the burden of proof to the contractor to show cause why he should be awarded exclusive rights.

(4) To the extent that exclusive rights are found to be warranted, we should follow the practice of granting exclusive licenses (tailoring the license to the needs of the situation), and avoid outright assignment. It may not be easy to evict a tenant, but it is a lot easier than it is to foreclose a mortgage. Furthermore, recognition that, as owner, the Government will perforce become a party to any infringement suit may give some pause to those administrators inclined to be over-generous in their dealings with contractors.

(5) An independent Government Board of Review should be provided--preferably in an already-existing agency--to review all exclusive grants. Such a body should be competent, expert, and above all, unbiased. Possibly, the set-up might include an "ombudsman," so to speak, to present the case, whatever it may be, against the grant of exclusive rights. (The contractor, presumably, would be quite competent to present his own case in favor of such rights.)

(6) I hope you will not charge me with unbelievable naivete and inconsistency if I make one final suggestion: every step possible, consistent with responsible administration and concern for due process, should be taken to eliminate, insofar as it can be done, the red tape, procedural entanglements and delays that too often characterize too many of our Governmental activities. Public and private interests can be safeguarded, I firmly believe, without bogging down in practices that make a mockery of the whole procedure--provided there is a genuine will to achieve that objective.

Abstract

Sharp differences exist in the motivation underlying Government-supported invention and innovation (I&I) as compared to private enterprise I&I. Private enterprise generally seeks high return to compensate for higher risk. Government operates on a non-profit basis. The patent system, although workable in the private sector, has little relevance to Government-supported R&D unless needed to induce both R&D contractors to perform better and innovators to put inventions to use. Thus, Government must consider who is best qualified to undertake its R&D; who should exploit it; how to motivate both inventors and innovators; and how to keep costs to a minimum. How to obtain a proper balance of these sometimes-conflicting objectives are discussed.

Biographic Notes

John C. Stedman is an Emeritus Professor of Law at the University of Wisconsin where he has taught for the past 43 years. His specialties are intellectual and industrial property, trade regulations and antitrust law. Professor Stedman is admitted to practice in Wisconsin, Minnesota and before the United States Supreme Court. His long career has included assignments for both the Executive and Legislative Branches of the U.S. Government. He has served on many committees and advisory boards of various law associations and has published widely in both professional and lay journals. Professor Stedman's degrees are from the University of Wisconsin and Columbia University.

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Panel Discussion

COMMENT: As a patent attorney and general counsel, my advice to management has been something like this: If sales are less than $5 million annually there is little likelihood of competition by others and you do not need patent protection; if sales are between $10 million and $15 million, you may need patent protection; but if sales are over $20 million to $25 million, you will have competition and you might as well forego obtaining patent protection. To me, that is the real world. It is not a situation where patents give one a monopoly that is impregnable, a situation where an exclusive license is the only basis, or major basis on which a new product decision is made. This situation is in contrast to what appears to be the strong feeling in Washington, D.C. based on unreal economic theory.

MR. LASKEN: I don't disagree. Many of us in government recognize that in some cases patents do not make a difference and in others they do. My own opinion is that judging whether title to an invention should be retained by the government or waived to a contractor or grantee will be difficult, if not impossible. Any impartial board set up to make such judgments may well spend 20 years, as in antitrust cases, just trying to determine what the relevant market is, let alone who should have the rights. In my opinion existing studies show that, on the average, patenting is going to help more than hurt, and, therefore, patenting should be undertaken.

On another point, Professor Stedman says in his paper that there is no way to correct errors of judgment if the procedure outlined in the Thornton bill (H.R.8596) becomes law. In fact, however, the march-in rights are intended as the means to correct errors. It is not envisioned that the government agency would be the one to initiate the process, but that a competitor will complain that he cannot get a license, or that the patent assignee is otherwise interfering with the competitor's business. The fact that an actual march-in has not yet occurred may indicate that no great evils exist. Of course, if the government

keeps title, then there isn't any way to correct the errors, because nobody knows whether an invention remained undeveloped because people gave up on it.

PROF. STEDMAN: I agree with both gentlemen. This is one of the difficulties - the situation may be entirely different in one case from another. Of course it is difficult to make a decision. What I suggest is that another agency not identified with the contracting agency may be in a better position to make an unbiased decision.

On the matter of march-in rights I fully agree that the Thornton bill provides the basis for appropriate action when an agency is eager to exercise such action. The difficulty I find with the Thornton bill is the possible lack of interest by an agency such as the Department of Defense, for example, in what may happen in the civilian area, when the main interest of the agency may be fighting or preparing for war. The Thornton bill does not require an agency to move if it doesn't feel like moving; it still remains the responsibility of the contracting agency to take the initiative. The agency may respond to complaints from the public, however.

MR. LASKEN: I can't disagree with having a board for determining when march-ins are necessary. The bill in draft form developed by the Commission on Government Procurement recommended such a board, and the bill proposed by the Committee on Government Patent Policy envisioned some sort of central decision-making group on march-in rights. Professor Stedman seems to imply this board would also decide who gets rights at the time of contracting, which is impossible.

PROF. STEDMAN: There may have been an exaggeration of the difficulty involved in the actions of a board. Most of the cases considered by the board would need no action since both the government and the contractor probably will agree that no inventions of particular interest have arisen or are expected to arise. There would be only a relatively small number of marginal cases where the issue would be a close one, but it is those close cases that I am concerned about.

MR. DENNY: I'd like to point to several statistics and data, instead of concerns, which I think back up everything you say. If you pick round numbers, out of a thousand inventions, a hundred are worth patenting or are patented, and out of those, ten are worth using, and out of those two will get used. Of the approximately 8,000 invention disclosures per year evaluated by the government, I would prefer to concentrate on the 80 that are worthwhile. The Harbridge House study, the largest, most complex study that has ever been done on government patent policy, reports no government funded patent of all those assigned

to contractors had more than two people interested in undertaking further development during a two-year period. The Justice Department, wishing to probe further, searched for a "horror case". The worst one that could be found involved a small company in a small industry. The invention was synthetic process for developing quartz crystal which could be made to undersell natural crystal. The company alleged that it was going to license others but the prospective licensees complained that the royalties required were too large and made them non-competitive. The result was that the competitors all used it anyway. The patent owner sued for infringement, but a few years later it was found that all of the competitors were licensed. We should depend on that interested second company to identify and to flag something that it is interested in; then the government's defensive machinery can and should take effect.

The last statistic is that while march-in rights have been in all government contracts since 1965, no one has asked us to use them yet.

COMMENT: I would like to comment on the alleged concern that the possession of an exclusive patent position by the contractor would serve as a disincentive to research either by other parties or by the patent owner himself. It would be a great help if we realize that the benefit of a patent system does not arise because patented technology becomes available to the public only 17 years after the patent is granted. In the great majority of cases the patented technology is obsolete by then. The benefit of a patent system arises because somebody has a temporary exclusivity. Fierce competition finds it necessary to devise and invent ways around that exclusivity to stay competitive. As to whether or not this will discourage further research on the patent owner's part, I think anyone who has been involved in research knows that the best way to get bypassed in the marketplace is to make an innovation and then not improve it. Soon you will find yourself sitting behind and looking forward at the ones who have invented around your technology.

PROF. STEDMAN: I think this whole matter of incentive and disincentive and monopoly in response to monopoly is a pretty subtle question. Let me use the analogy of a track meet. If I am running in a track meet and there is someone breathing down my neck, then I will run faster. If I am running in a track meet and a second person is a hundred feet behind me as we go down down the final stretch, I am likely to run slower. Having an advantage sometimes has a very useful effect, but, at other times, it may be enervating. I agree that inventing around a patented invention represents a positive incentive encouraging competition. But, it is also true that, if a company is already very powerful, competition can be discouraged if this power is increased, for example, by strengthening an already strong patent position.

QUESTION: Clause 9 (h) of the Energy Research and Development Administration legislation seems to imply the application of antitrust laws to patent matters. This provision seems rather vague and indefinite. Are there any cases or comments on record which define this more exactly?

MR. DENNY: It is a little vague. It is partially defined in a conference report where specific reference is made to phrases from both the Sherman and the Clayton Acts and the case law behind these acts. The phrases themselves are only as precise as they usually are in such legislation; they are intended to be a body of law. Fuzziness in interpretation arises where there is an intent to violate the antitrust laws rather than an obvious full-fledged violation. While no case has arisen yet, we would attempt to remedy a violation by requiring the licensing of companies. In most industries this is done anyway. Thus the provision is there really for the theoretical harm that those in Congress believe may result. I don't ever expect the provision will be used.

QUESTION: Have you had enough case histories so far to be able to judge whether the Department of Energy (DOE) waiver procedure is operating satisfactorily? Do you feel modifications may be needed as a result of your experience?

MR. DENNY: The DOE policy is probably the best piece of legislation that Congress has ever passed. Modifications are not expected in the immediate future. The main problem in administering the patent clauses is the number of people required to make it work. We are working overtime, and, even then, it sometimes takes two years to make decisions. In some cases we have been told that having to wait such a long period has caused some contractors to invest their funds in other ventures. If you apply the procedure defined in the legislation to the 30,000 plus contracts and grants granted every year by the Federal Government and the 8,000 inventions disclosures that come in, it will present insurmountable administrative problems to the government.

QUESTION AND COMMENT: If this is the best piece of legislation, might it not be modified, as Professor Stedman has suggested, to make no assignments but rather give licenses? If you do not "give away" the government rights, certain senators will be happier; more importantly you would have to specify conditions for march-in rights. We have been told that no one in 13 years has asked for march-in rights, so that remedy does not seem to be a very effective method to assure competitive commercialization. However, if you retain title, you can grant a license for a limited period. If the licensee does not perform, he will lose

his rights. This seems to me to make more sense than giving an assignment with the proviso that the government can march-in and take it away later on. It's a question of who's controlling the ship.

MR. DENNY: I think we have to keep the red tape down. Why should I bother to take back a right from you that you're not using and that no one else wants to use either? I would prefer to wait until a second potential licensee is found.

MR. LASKEN: Another difficulty might arise if a second company wanted to obtain a sublicense from the first company, but didn't like the first company's terms, and would try to negotiate a better deal. If this happened often, the administrative machinery would quickly bog down due to multiple negotiations.

Another thing to note is that large commercial contractors are not the only people getting government R&D money. If you consider only the money that is being used for research and development programs, not for production, about 30% goes to universities. Another 5% to 6% or so goes to small business. I don't know what amount may be sub-contracted by the larger firms to small businesses, but I doubt it's very much in the R&D field. Of the remaining 65% I expect a good portion goes to firms that aren't classified as small business under the SBA Act, but are certainly not large in the sense of having a significant share of some commercial market. So I doubt seriously whether anywhere near half of the R&D money is going to large dominant firms. Of that a lot is going to the aerospace industry where cross-licensing is prevalent, and it doesn't matter who owns the patents anyway, since the large aerospace companies will dominate, no matter what happens.

PROF. STEDMAN: So it wouldn't make any difference if you had no patents.

MR. LASKEN: Yes, it would, because the subcontractors would object and the Department of Defense or NASA would have to negotiate every time one of the large companies wanted to subcontract to small companies. Without the title-in-government clause, the subcontractors would object whether it mattered or not. In my experience, the only things contractors ever seem to argue about strongly, besides how much money they will get, are technical data and patents. I just want to emphasize that government contracting is not completely dominated by large firms, and most of those firms will be dominant no matter what.

MR. DENNY: The statement was made in the recent Nelson subcommittee hearings that march-in rights haven't been used, and, therefore, are not effective. I maintain that's just not so. The march-in rights are there to take care of theoretical abuses

that are non-existent. And you can't cure a non-existent abuse. The march-in rights are there because Congress thinks industry suppressess invention, and that industry does not license under reasonable terms. They also believe that patents are monopolies. Very few, if any patents rise to that "dignity". The abuses just haven't been there.

There were three hours of hearing on patent policy on Energy Research and Development Administration (ERDA) patent legislation. A sixth of that time was devoted to a committee discussion of a carburetor which oil companies supposedly bought up because it was said to allow one to get 80 miles to a gallon of gas. The Congressional committee members believed it. These march-in rights are the final legislation to try to correct imagined abuses of that kind. It seems unlikely that these rights will ever be used. The Harbridge House in its study some years ago, looked for abuses and couldn't find any. They studied whether industrial companies freely license one another and the answer was yes, with some rare exceptions where alternative products were available. What conerns me is that Congress passes this type of legislation and does not appear to recognize the need for a large staff to carry it out. Right now I have fifty attorneys at headquarters and in the field but cannot handle the present workload expeditiously. The Thornton bill should correct this difficulty.

PROF. STEDMAN: How patents should be handled with universities are grantees or contractors is very different from the handling of patents when private corporations which are in competition are involved. If the University of Wisconsin is assigned some patents, this would not upset its competion with Stanford, for example.

Another thing concerns me, however, and that is that a great many privately owned, privately developed patents have been improperly used. We know that from the large number of antitrust cases, most of them extremely serious, based upon improper use of patents. In contrast to that, the assignees who get government patents appear to be knights in shining armor.

With $26 billion spent annually on research and development by the government there are only perhaps 15 or 20 patents that have been of any significance. Basically, since patents give the owner an advantage over his competitors, I find it hard to understand why there seems to be no one who cares. To me it suggests that there is some question about the program leading to the patents, or perhaps that patents do not make any difference.

MR. BREMER: A distinction should be drawn between basic, applied and developmental research, since I think a lack of distinction is at the base of some of these problems. Admittedly, an easy definition is not possible. But there are distinctions. "Blue sky" basic research is practiced today only at universities.

Since inventions resulting from basic research are embryonic in nature, they require tremendous amounts of money for development and they should be treated differently from inventions arising from the other two types of research.

It is also significant to note that over half of the $26 billion R&D budget is spent by defense agencies. The university sector share is about $3 billion per year. Half of that is administered by HEW and NSF. These facts should be understood by Congress in considering legislation relating to patent rights ownership, but often are not.

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University

University Technology Transfer—Publish and Perish

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Science and law are both ancient and influential forces in the shaping of any society. While the laws of science are inviolable, the laws of humanity can be broken. Applied sensibly and in concordance with each other, these laws can solve many of humanity's problems; applied thoughtlessly and selfishly, they can be destructive of each other and perhaps of humanity.

The patent system constitutes a sensible melding of science and law, a melding which serves to protect that most fragile of assets--intellectual property as embodied in patents. As Chief Judge Markey of the Court of Customs and Patent Appeals said, "No institution has done so much for so many, with so little public and judicial understanding, as has the American patent system."

With that preface, this paper will describe some of the things that have been accomplished under that system by the Wisconsin Alumni Research Foundation (WARF) and how the system is operating today with the Federal government the major source of financial support for university research and development.

An Historical Perspective

In the early 1920's, Dr. Harry Steenbock, a professor in the Biochemistry Department at the University of Wisconsin, found that exposure of certain foods, oils, or pharmaceuticals to ultraviolet radiation imparted antirachitic properties to the substances. He applied for a patent on this discovery and offered to assign the resulting patent to the University. Dr. Steenbock's objectives were: "To develop a plan for making use of patentable ideas of various members of the faculty that would protect the individual taking out the patent, insure its proper use, and at the same time bring financial help to the institution and in this way further the University's research support."

In rejecting this offer, the Board of Regents of the University stated that it could not "be expected to allot money for a patent application when it is not certain that it will

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receive something for such an expenditure." The State Attorney General felt that, since the University had no power to defend patents, University ownership of patents would be of questionable value.

A plan was proposed to organize a non-profit corporation, the necessary capital of which was to be furnished by alumni and friends of the University, and whose management was to be in the hands of trustees. Subsequently, a corporate charter setting up WARF was filed on November 14, 1925, with capital furnished by nine alumni, each of whom contributed $100.00. The new organization was expected to provide the mechanism for accomplishing Dr. Steenbock's objectives.

WARF was the first foundation formed in connection with an educational institution which was independent of faculty and Regent control and without any endowment, other than the Steenbock patent. WARF was organized for and was to be operated exclusively for the benefit of the University of Wisconsin and, therefore, considers that its patent management program is an obligation to the University of Wisconsin faculty, staff and students. This obligation is expressed in the WARF charter which states that WARF is to promote, encourage and aid scientific investigations and research at the University; and to provide means whereby any scientific discoveries and inventions that may result may be developed for public use in a manner such that funds could be obtained for use in stimulating further research at the University.

Assignment of inventions made in the course of research or development utilizing University facilities to the University or to WARF has never been required, even when WARF grants have supported research leading to such inventions. Thus, inventions which have been brought to WARF were brought by the inventors on a voluntary basis.

Early in its history, WARF adopted a policy, still existing today, of returning to inventors 15% of the net proceeds received. The remaining 85% of the net proceeds becomes a part of WARF's annual research grant to the University.

Recognizing the compelling need for academic researchers to publish their results promptly, WARF does not ask for delay in publication, even of those inventions recognized as having potential patentability and licensability. This policy may result in the "loss" of some inventions, that is, it will be impossible to file an appropriate patent application before a publication bar date occurs. Even though such publication will disclose the invention to others in an acceptable and conventional manner, because of the absence of patent protection, the invention may never be developed for the benefit of the public. This is the first example of the "publish and perish" syndrome associated with the transfer of university-generated technology.

Although organized as a separate corporate entity and although active solicitation of inventions from the University

is not practiced, WARF's presence on the campus is real, and its relationship with the University and its faculty is not only financial- and service-oriented but is also very personal.

What has been accomplished under WARF's "hands-off" policy coupled with its patent management policy?

The Steenbock patent was, fortunately, a "winner", ultimately returning about eight million dollars in new royalties. This income provided the seed money from which substantial additional assets were generated. Royalties from a number of additional patents continue to make a significant contribution to WARF's total income. Since a large percentage of this income has been used to support further research at the University, the program of transferring technology utilizing the patent system can be considered successful. In the first fifty years of WARF's existence, grants totaling over $79,000,000 have been made. In the years since 1973-74, the annual contribution has been in excess of $4,000,000.

During this fifty year period, out of a total of 62 inventions licensed to about 650 licensees, about 400 being under the Steenbock patents, 43 inventions have produced some royalty income. Of these 43 income-producing inventions, 14 have produced between $10,000 and $100,000 each, 9 have produced between $100,000 and $1,000,000 each, and 4 have produced in excess of $1,000,000 each.

The 43 income-producing inventions resulted from the evaluation of 1,702 invention disclosures. A total of 415 United States patent applications were filed and 270 United States patents were issued, representing about 195 licensable areas of technology. One out of about every 40 invention disclosures considered for patenting and administration thus ultimately produced income.

It is interesting to consider the effect that the licensing of those 43 income-producing inventions has had on the country's economy. By estimating the sales which the various licensees would have had to have made to generate the royalty income received, it is estimated that four of the inventions, collectively, account for about $1,500 million in sales; nine inventions, collectively, account for about $80 million in sales; nineteen, collectively, account for about $20 million in sales; and eight, collectively, account for about $1.5 million in sales.

These sales include substantial royalties from foreign sources thus favorably affecting foreign trade balances. In fact, a number of WARF inventions have produced income from foreign sources far exceeding that obtained in the United States.

Even more importantly, although more difficult to assess, to what extent has the public benefitted from this transfer of technology from the University of Wisconsin?

Numbered among those inventions which reached the marketplace are:

Warfarin rodenticides, which, widely used, have saved

millions of dollars by controlling rodent populations;

Warfarin anticoagulant drugs, which are credited with extending and saving countless human lives;

A dextrose-urea preparation, which is used to reduce intracranial pressure in cases of trauma and surgery;

New spark sources for spectroscopic measurements, which permit more complete and accurate diagnoses of metal samples;

An ion-vacuum pump for obtaining extremely high vacuum;

and, of course,

The Steenbock process for fortifying foods with Vitamin D, resulting in the elimination of rickets as a childhood disease; and now,

Vitamin D derivatives, which give promise for prophylactic and curative treatments for diseases involving calcium-phosphorus imbalance in mammals.

A Current Assessment

During the early history of our country, very little technical development work was done with United States government support and, therefore, the question of the government owning a patent never arose. Gradually, Federal agencies began to support development work leading to inventions in Federal laboratories using full-time government employees. As a result the recurring problem arose of what to do with inventions resulting from such work--inventions which, if made by private parties, would have become the subject of patent applications.

This situation changed rapidly during and after World War II when the technological requirements imposed by more and more sophisticated military requirements, as well as by the increasing complexity of support services, showed that sufficient resources did not exist within the government to handle all the scientific projects necessary to win the war effort. The necessity to use the best technical resources available, regardless of location, spawned a proliferation of government-sponsored and -funded research and development contracts. The proper disposition of rights to patents resulting from this work was as important then as now, but was never seriously considered as a major problem because of the exigencies of wartime needs.

After World War II the necessity for maintaining continued technological superiority, at least for national defense, required continued public support for scientific research. This support was not limited to the military, as hundreds of millions of dollars were appropriated by the government in the area of

medical research beginning in the 1950's. Since the government could not do all the necessary work in its own facilities, qualified private companies, universities and non-profit organizations were sought out to perform many of the programs under contractual arrangements. The same old problem of ownership of patent rights existed in every one of the contracts.

Since no single or overriding government-wide patent policy existed, each governmental agency has developed its own policy. At one extreme, some agencies advocated a "title" policy; at the opposite extreme other agencies advocated a "license" policy. The policies of still other agencies range between these two extremes.

Governmental agencies operating under the "title" policy acquire title to all contract-generated inventions and patents issuing on them, including inventions which were only incidental to the major purpose of the contract, and then dedicate them to the public through publication, or by offering, on request, a non-exclusive, royalty-free license under any patents obtained. The argument is that all these inventions, including the incidental inventions, should be acquired because they had been "paid for" by the government and should, therefore, be owned by the government.

Agencies which adopt the "license policy" permit the contractors to take and keep title to inventions and patents arising under the contract, while a royalty-free license is reserved to the government to practice the invention for all governmental purposes. The theory which these agencies apply is that inventions and patents are only incidental to the specific research or products contracted for and that equity requires nothing more than a royalty-free right to be vested in the government to use the inventions for its own purposes.

Other theories and contentions made by the advocates of the two policies, each in support of their own position, tended to polarize the two groups so that ultimate compromise seems difficult, if not impossible.

This was the situation which prevailed into the 1960's. Even where the government agencies had the right to waive title to a contractor or grantee, it was almost never done. The result was that fewer and fewer inventions generated from university research were reported, since the various governmental agencies asserted the right of patent ownership, even where the federal funds involved in making an invention were a fraction of the total funds expended. As a consequence, inventors at universities were no longer free to dispose of their inventions as they saw fit, because the obligations which the universities and the investigators had to assume under government-financed grants or contracts took precedence.

At this point, let us consider the situation that pertains when the government does take ownership of a patent. The idea of the government owning a patent is, in a sense, an anomaly.

The patent system was created as an incentive to invent, develop and exploit new technology - paraphrasing the Constitution - to promote science and useful arts for the public benefit. When the government owns a patent with the contention that the invention covered by a patent should be freely available to all, much the same as if a disclosure of the invention had been published, the patent system cannot operate in the manner in which it was intended. The incentive inherent in the right to exclude others conferred on a private owner of a patent as an inducement to develop the invention is simply not available.

Finally, in 1963, a Presidential memorandum was issued setting forth guidelines for a more uniform government patent policy. After stating that inventions resulting from government contracts and grants were a valuable national resource, the guidelines affirmed that government patent policy should stimulate the use of such resources to meet government needs while at the same time serving the public interest and recognizing the equities of the contractor or grantee. These guidelines were used by a number of government agencies to revise their policies. Notably the Department of Health, Education, and Welfare (DHEW), and the National Science Foundation (NSF) developed general agreements, Institutional Patent Agreements (IPA), which allowed universities to retain patent rights subject to certain restrictions.

Since these two agencies furnish a large share of the federal support dollars to the University of Wisconsin, the University entered into IPAs with DHEW in 1968 and NSF in 1973. Under these agreements, the University, or WARF as the designee of the University, may take title to any invention made using DHEW or NSF funds. The use of the IPAs is highly significant, for of the $3 billion spent at the universities on research and development each year by the government, about one-half is administered by these agencies. Strong evidence is mounting that use of IPAs enhances the transfer of technology for the public benefit.

In addition, there is also increasing evidence that where an IPA is in effect the attitude of commercial organizations towards inventions generated with government funds within the scope of that agreement is changing. For example, there are now more instances where commercial organizations have made some contribution to government-funded research projects at universities where only the prospective rights to inventions, yet unmade, is involved. The certainty of the institution having the first option to any invention made under an IPA is the prime motivation for such contribution.

Knowing that patent rights to inventions are to remain with the university under the terms of an IPA also permits early filing of appropriate patent applications, thus providing a strong hedge against the publish and problem.

In the nine years since the IPA with DHEW became effective,

WARF has filed 65 United States patent applications under the provisions of the agreement, 40 of which have matured into patents. Currently, 22 licenses under these applications and patents have been executed--strong evidence that the arrangement is working.

Although the current DHEW and NSF policies have been effective, there are reported to be 22 different patent policies being utilized by the other government agencies. These policies, some statutory and some administrative, some written and some attitudinal, have created a difficult environment for achieving the transfer of technology from universities to the public sector.

Some attempts are being made to untangle this web of policies and reach greater uniformity. One action which may be beneficial is the recent announcement that the Federal Procurement Regulations are proposed to be amended to provide for the use of IPAs by all government agencies in contracts with universities and non-profit organizations. However, the most significant current attempt to consolidate the fragmented and inefficient system of handling the results of federally sponsored research is the Thornton Bill, H.R. 8596, which was introduced into the House of Representatives early in 1977 "to establish a uniform federal system for management, protection, and utilization of the results of federally sponsored scientific and technological research and development..." The provisions of this bill move strongly in the direction of establishing a uniform patent policy for all agencies and are responsive to many of the problems involved in and ancillary to the successful transfer of technology for the public benefit.

In today's environment, the publish and perish problem for the university community is magnified by many laws and regulations, some existing and some prospective, which have been promulgated without a clear understanding, or perhaps even a consideration, of how they might reduce the ability to transfer technology. Judicial interpretation, or perhaps misinterpretation, of some of those laws resulting from public interest group-initiated litigation may also add difficulties to the transfer of technology. Among the most insidious of such laws is the Freedom of Information Act (FOIA) and its associated acts, the Federal Advisory Committee Act and the Government in the Sunshine Act.

As a basic premise, we believe that the existence of a licensable patent right is a primary factor in the successful transfer of university invention to industry and the market. A failure to establish such right, or to protect the ability to establish such right, may fatally affect such a transfer. This right can be precluded by premature publication - another example of publish and perish. Since the FOIA generally requires the disclosure of government records upon request, research protocols, hypotheses and designs submitted to a government

agency as part of an initial grant application must be presumed to be publicly available. The only exception which could conceivably prevent disclosure of the content of grant applications was intended to deny access to "trade secrets and commercial or financial information obtained from a person and privileged or confidential". However, recent litigation has raised serious doubts as to the predictability of protection of proprietary information under that exemption. In a landmark case denying the use of this exemption for scientists, the court stated:

> "It is clear enough that a noncommercial scientist's research design is not literally a trade secret or item of commercial information, for it defies common sense to pretend that the scientist is engaged in trade or commerce. This is not to say that the scientist may not have a preference for or an interest in nondisclosure of this research design, only that it is not a trade or commercial interest..."

As a consequence, in general, it may be presumed that research protocols contained in grant applications will be made available to those requesting them under the FOIA, unless it can be shown that they contain traditional forms of trade secret or other valuable commercial information such as patentable ideas.

Here again it is publish and perish for the university investigator. But it is not only the investigator in such situations who is the loser. If the ability to obtain valid patent protection is lost as a result of requests for information under the FOIA, it is highly probable that the public will never benefit from the research, even if ultimately funded by the government, since the incentive needed to obtain private risk capital, an exclusive licensing arrangement, presumably, simply will not be available.

Consider also that this information is readily available to foreign companies and countries, literally without restriction, and free of any royalty or other fee. The potentially adverse impact of such a situation on our country's position in the world economy is readily apparent when one realizes that the $4 billion returned every year to the United States as royalties and fees for technology transfer is more than nine times the amount paid out to foreign patent holders in royalties and fees by U.S. firms, and that it is estimated that the total value of production associated with those receipts is close to $85 billion. As Rimmer de Vries, Vice President and Chief International Economist for Morgan Guaranty Trust Co., said in a recent BUSINESS WEEK article:

> "We need a national export policy to refurbish and

> strengthen our industry. Through fiscal policy, we should stimulate research and development... We have to develop new technology and go out and sell the stuff."

In the current climate of non-uniform federal patent policy, and ancillary impinging legislation, along with some judicial misinterpretations, the charge from Mr. de Vries becomes a challenging one to meet, indeed.

A Prospective Concern

Since the early 1960s, a few powerfully-situated and highly vocal title-in-the-Government proponents have shown almost a religious fervor in their advocacy. This group has recently again been active, obviously prodded by the apparent favorable reaction of various government agencies toward the Thornton Bill, and are urging a new Presidential Policy Statement requiring all agencies in the Executive Branch to adopt the policy they advocate. They do not present any hard data from which a well-reasoned document in support of that position could be derived. Rather, they take refuge in catch-words such as "give-away", "windfall", "anti-competitive" and last, but certainly not least, a phrase that is most simplistic, but appealing to the uninformed: "What the Government pays for it should own."

It is indeed a noble motive to give to the people the benefits of publicly supported research and we can agree that tax dollars should not be used as a means of enriching private parties. We must, however, be vigilant, for the views on the issues involved lend themselves to emotional molding. Making outspoken claims to the guardianship of the public interest or public welfare is a rich field for enhancing political power. A deadening result of political emphasis on such guardianship is the proliferation and growth of the bureaucratic maze where accountability becomes a fear. Under such conditions, the atmosphere generated tends to be one of self-protective caution resulting in the operation of the system becoming a disproportionate part of the objective.

Effort is fundamental to the transfer of technology to the marketplace, and, wherever effort is needed, incentive is required. Not only does the title-in-the-government policy reject the need for the incentive provided by patents, it also rejects continuing participation by the investigator-inventor--an important consideration with university generated inventions which tend to be embryonic in nature and which almost always require additional development. And remember that a flow of free information is available to foreign companies and countries, an invitation to them to increase our trade deficit even further.

In today's technologically intensive atmosphere, some protection for the heavy investment required in development is

more than ever necessary. The lead time given by exclusive knowledge or patents is shorter than ever before. If that lead time is reduced or disappears through further weakening of the patent system--and if the government takes and holds title to thousands of inventions, that system is weakened--it may become economically sound to be second in the field. There is already evidence of a "second-place" philosophy in some industries today. Further erosion of the exclusive rights to intellectual property afforded under the Constitution could lead to a second-place attitude, generally, in all U.S. industry. The next step is the development of a willingness to be a second-place nation.

It is indeed publish and perish.

Abstract

A successful technology transfer mechanism operating under a workable university patent policy is described in historical perspective and as to current activity. A concern for the future of this type of operation is explored in light of today's economic, legislative and political climates.

Biographic Notes

Howard W. Bremer obtained baccalaureates from the University of Wisconsin in both chemical engineering and law. He is admitted to practice law in Wisconsin and before the Patent and Trademark Office, Court of Customs and Patent Appeals and the United States Supreme Court. After a two-year stint in the U.S. Navy, Mr. Bremer served for 11 years as a patent attorney with the Procter and Gamble Company. Since 1960 he has been patent counsel for the Wisconsin Alumni Research Foundation. He is a member of various professional law associations and is currently serving a term as President of the Society of University Patent Administrators.

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Patent Program of the University of California

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The University of California is a very large institution comprising nine campuses, some 80,000 faculty and staff members, and 125,000 students. The annual budget of the University is a little over $2 billion, with a substantial research budget supported by State and Federal grants, and, to a lesser extent, industry and non-profit foundations.

While the University faculty has been research-oriented from the early days of the institution, it was not until the 1940's that a patent program was developed to administer inventions that might result from faculty research. In the early days, patents were a very minor consideration to the University, but a potentially lucrative invention had evolved at the Davis campus which was assigned to the University by the inventor, and this stimulated the formation of the program.

Today the program is unique in that there is an entirely separate Board appointed by The Regents of the University of California to establish policy and procedure for the administration and processing of patents. This Board is composed of one academic representative from each of the nine campuses of the University, one representative of the Academic Senate, and the chairman of the Patent Board, who represents the University administration. Day-to-day activities of the patent operation are carried out by the office of the Patent Administrator and a staff of three clerical assistants. This office receives and reviews all disclosures of inventions which are developed within the University of California system by its staff and faculty. (Parenthetically, student inventions to the extent that the students are not also employees of the University are excluded from the patent program.)

Use of the program by the faculty was optional until 1963. In that year, mandatory assignment of inventions to the University was required, and, at the same time, the distribution of royalty income was increased from the previous downward sliding scale, from 25% to 15%, based on gross royalties, to a 50% distribution based on net royalties. As a result of this change

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to an arrangement more favorable to the inventor, the disclosure rate increased from about 20 per year to the present 200 to 300 per year.

The invention disclosures are analyzed to determine what restrictions, if any, have been imposed by sponsoring agencies. Experts in the field of the invention are chosen from among the faculty and staff to review the disclosures, primarily for novelty, feasibility and commercial potential. If the preliminary review is favorable, a patent search is undertaken. Based on the total analysis, the invention is either reported to the sponsoring agency, released to the inventor, or patent prosecution procedures are begun.

Two criteria must be met before patent prosecution may be undertaken: There must be reasonable hope for developing a defensible patent position and reasonable hope for licensing the invention in the foreseeable future.

Thereafter the office of the Patent Administrator seeks out licensing prospects, negotiates licenses and assumes all subsequent responsibility for their enforcement. Distribution of royalties to inventors is a further responsibility of this office.

Another important function of the Patent Administrator is to assist members of the University staff and faculty in the negotiation of patent provisions in research contracts and grants to ensure that sponsors do not impose unreasonable constraints on the University with regard to inventions.

Aside from the State of California, there are three basic sources of research sponsorships within the University. Of these the Federal Government is the most significant. The fact that there is no one clear coherent Federal patent policy has been a serious problem. There are more than twenty Federal agencies which sponsor research and almost an equal number of policies with varying degrees of restrictions and obligations. Although the University has been successful in renegotiating some very onerous patent restrictions such as the background patent provision first introduced by United States Department of the Interior, for the most part, restrictive patent provisions imposed by the Federal Government are not negotiable to any great degree.

The two other sources of research funding are private industry and non-profit foundations. In this area, the University has established a "Schedule of Support and Patent Privileges". Under this policy no royalty-free rights may be granted to private industry. The University at the very most can agree to grant an exclusive license to the sponsors, subject to the payment of reasonable royalties, if the sponsor has supported all direct and indirect costs of the research project, including a pro rata share of all salaries. If the sponsor has offered less than this, the licensing terms are limited and may be no more than a grant of a non-exclusive, but royalty-bearing

license.

As far as non-profit foundations are concerned, the University attempts to retain any patent rights under the rationale that the University is better able to ensure widespread public use of whatever inventions may result from the research. The seeking of licensees and the successful negotiation of licenses are, of course, the heart of any patent program. There are many sources of licensees. One is existing licensees. Perhaps an existing licensee is doing a good job handling current University inventions, and we may feel that the new invention would be a valuable adjunct to the licensee's product line. In that situation we might offer the new invention to an existing licensee. The more common practice, however, is to make industry-wide solicitations to see if interest exists for the new invention. The names of prospective licensees for such general mailing can be found in the Thomas Register of American Manufacturers and various other trade publications. The University also is well known as a source of new technology; representatives of private industry who are seeking new ideas and inventions call upon us periodically. The inventor, himself, is frequently a good source to tap for prospective licensees, since he is frequently very knowledgeable about existing manufacturers and products in his particular field.

The terms and conditions of licenses are quite similar to those used by other educational institutions or industries which are involved in licensing programs. While we prefer to license on a nonexclusive basis, in many situations this is not possible because inventions emerging from University research require a good deal of time and money to develop for the commercial market. For this reason, many of the licenses must be exclusive for at least a period of years as an incentive for a company to invest its time and risk capital.

Licenses include provisions for payment of a license issue fee which is in the nature of earnest money, and a condition for getting the license. The license, typically, has due diligence clauses which require that the licensee energetically develop the invention for the market and thereafter meet market demands. If the due diligence requirements are not met, the University has the right to terminate the license. Royalty terms are consistent with those of industry for like inventions. A minimum annual royalty payment guarantee is insisted upon, especially as a part of an exclusive arrangement.

The licensee will have the benefit of having the inventor participate in developing the commercial model of the invention in varying degrees. Know-how, per se, is not licensed, but if the licensee wishes to have the services of an inventor beyond a casual exchange of information, it must make separate arrangements with the inventor. The inventors are usually eager to see their inventions made available and utilized by the public, and, therefore, it is not at all uncommon for licensees to work out

such arrangements with inventors.

At present the patent program is generating about $1 million per year from its patent licensing activity. A number of inventions, each returning rather modest amounts, contribute to the total. This is felt to be a healthier situation than to have one or two very large income-producing inventions which could become involved quite easily in costly litigation.

Some concern has been expressed over the years by faculty members about the worth of the program and the manner in which it has been conducted. These concerns have now essentially disappeared. Recently the State Auditor made a complete review of the program and reported favorably on its effectiveness. As a consequence, the program is expected to be continued with little or no change in the immediate future.

In this paper I have given only very general information about the patent program of the University of California. I hope this bird's-eye view of the extent of the activities of the program will be helpful to those who wish to become licensees and to those who may be contemplating setting up similar programs at other institutions.

Abstract

The University of California has had a patent program for over thirty years. Revised in 1963, the current program provides for mandatory assignment of inventions developed by members of the faculty and staff utilizing University facilities. A full-time patent staff administers the program. Inventions covering a wide variety of fields are reported and processed. The processing involves complying with research sponsor commitments, evaluating, patenting and licensing of patent rights. Royalty income is shared between the inventors and the University; the University's share is used for research and educational purposes.

Biographic Notes

Since 1955, Mark Owens, Jr. has progressed from Assistant Counsel to the Regents of the University of California to his present position as Deputy Associate Director for Administration at the Lawrence Berkeley Laboratories. During this long period of time, he was involved in many legal and administrative duties, including complete responsibility for all patent and copyright matters for the University system. Mr. Owens has a baccalaureate in political science from the University of California at Los Angeles and a doctor of jurisprudence degree from Hastings College of the Law, University of California. He is admitted to the practice of law in California and before the United States Supreme Court, and currently is dean and professor of law at San Francisco Law School.

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Patents: Potential Economic Benefits for Minority-Run Universities

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It is well known that black colleges and universities have extremely small endowments. They are constantly in need of funds just to meet their operating costs. Capital expenditures are usually financed out of special capital fund drives that sometimes fail to reach the desired goals. This financial anemia has a detrimental effect on the quality of these institutions, including teachers, students, and research workers. The faculties of these institutions have been particularly hard hit also by the effective efforts of their predominantly white counterparts to integrate their faculties and student bodies.

In the United States there are about 120 predominantly black colleges and universities. While they are not all of the same quality, some being excellent and some not being accredited at all, over the years these institutions have served thousands of minority students. They are, indeed, a national resource, since they provide a pool of expertise that enables students who have been educationally deprived prior to entering college to achieve a quality education.

Generally, most white institutions are in a position, financially, to offer larger salaries, better working conditions, and many other advantages which enable them to lure both top teaching talent and top students away from black institutions. In the scientific field, loss of top teaching talent tends to further lower the quality of the research activities at any academic institution, as well as the quality of its science students. This, in turn, affects the ability of the institution to attract money for research. To try to overcome this self-feeding downward spiral, I recommend that predominantly black universities direct a part of their attention and resources to the potential economic benefits which may reside in their research activities. In the following discussion these benefits, and how they may be realized,

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are detailed.

Technology Transfer

Most sponsors of research in this country, whether public or private, are interested in increasing the number and rate of technology transfers. They seek research results that lead to the solution of human and/or societal problems. Most research dollars used by academic institutions come from the U.S. Federal Government. Both Congress and the Executive Branch are putting a higher premium on better utilization of government-sponsored research results, especially those results that are patentable.

The National Science Foundation, for example, under administrative regulations, has moved to require recipients of research grants and contracts to develop and institute patent policies and disclosure procedures in order to be eligible for research dollars. Although a law suit has postponed the enactment of similar regulations proposed by the General Services Administration, the attitude of the government embodied in these proposed regulations definitely represents a trend which emphasizes the need for patent policies, patent awareness, and research management that will be effective in achieving greater technology transfers.

Patents are the best method in this country and, for that matter, in most of the world, for achieving more effective technology transfer from research results. Patents are, in essence, economic tools. Their most attractive feature is that of exclusivity. This exclusivity flows from the patent owner's right, for a period of 17 years, to exclude others from making, using and selling his patented invention. This right to exclude others is a property right. The patent owner can grant licenses to others to make, use and sell his invention, or he can sell his patent. In return for this right to exclude others for 17 years the inventor must disclose his invention to the public.

Maximizing Technology Transfer

To maximize the realization of benefits from university research efforts, the research program itself must be planned. Such planning should include clearly stated research objectives, a comprehensive, as well as a positive, institutional patent policy and an appropriate administrative structure for the disclosure and evaluation of inventions. The patent policy should state the views of the university regarding the handling of inventions. It should detail income sharing arrangements between the university, the inventor and research sponsors.

Administrative Structures

The administrative structure may involve any one, a combination, or all of these components: in-house management office,

university-affiliated foundation, or a professional outside patent-management organization.

Under the in-house approach, the university is reponsible for evaluating inventions before the decision to patent is made, for the filing and prosecution of patent applications, and for licensing, using university patent administration services. The major disadvantage of this approach is the requirement for an early outlay of money for patent applications and for the continuing overhead costs of patent administration services. The advantage of this system is the much larger return, or income on royalties, as a result of in-house development and marketing.

The second mechanism is the use of an institution-affiliated foundation. Examples are the Wisconsin Alumni Research Foundation and Rutgers Research and Endowment Foundation. The advantages of the institution-affiliated foundation are an increased ability to raise funds, greater freedom to employ commercial methods to develop and promote the use of the invention and the opportunity to establish working relationships between the university and industry. The major disadvantage includes the need for early outlay of money for start-up costs.

The third mechanism is the use of so-called patent-management organizations. Examples are Research Corporation, Battelle Development Corporation, and Arthur D. Little Inc. This alternative provides a significant amount of legal, marketing and patent expertise to be used at no up-front cost to the institution. The disadvantage of this system is that a large or substantial portion of any royalties earned are shared with the patent-management organization as compensation for services rendered.

Research Management

Since the mission of most sponsored research is utilitarian, the particular research, be it fundamental or applied, is connected in one way or another with improving technology and maximizing the output of solutions for individual human and societal problems. It is obvious that there will be a greater need for management in carrying out future research activities. Effective management requires clearly stated research objectives. Among the objectives which universities might properly entertain are:

1. Making research activities complement the teaching responsibilities of the university.
2. Utilizing research activities to maximize the competence of the faculty, and ultimately the reputation of the university, in particular research fields.
3. Utilizing research activities and the funds obtained therefrom to help maintain the overall research overhead of the university.
4. Utilizing research activities to improve, attract, and maintain the quality of both teachers and students.
5. Utilizing research activities to provide a better link

between the university's discipline orientation and the interdisciplinary orientation of the non-academic world.

6. Utilizing research activities and patents or research results to ensure their more ethical use in solving the problems of society.
7. Facilitating the transfer of technology to provide maximum benefit to the public.
8. Encouraging research and scholarship to develop a greater spirit of inquiry, thereby generating new knowledge.
9. Providing better machinery for determining the significance of discoveries so that commercially meritorious inventions may be brought promptly into public use.
10. Assisting in an equitable disposition of property interests in inventions among the inventor, the institution, and a sponsor, when applicable.
11. Assisting in the fulfillment of the terms of research grants and contracts.
12. Facilitating the development of institutional patent agreements with the Federal Government.

Once the objectives of a university's research activities are clearly stated, the administrative offices can begin to coordinate the research and research related activities in an effective and productive manner. Research resources can be better managed for the benefit of the entire university research community, research grants and contracts can be pursued in a more comprehensive way, and reporting deadlines of sponsors can be met on a more consistent basis.

Benefits Derived by Some Institutions

Many academic institutions are beginning to realize that the existence of a positive patent policy together with a high degree of patent awareness are effective tools in achieving greater research management. Indeed, the relationship of patent policies and patent awareness to research management is symbiotic. Existence of the former increases the latter. Increases in the latter result in more effective use of research resources as well as greater technology transfers. All of this reinforces the patent policies and increases the level of patent awareness.

Some of the benefits derived from the United States Patent System, based on previous case history of patentable research results at the university level, include funds to augment college and university endowments, to provide for additional research development, and to improve the financial status of the inventor. Other important benefits derived from patent activity include enhancing:

- the university's general reputation in science;
- the inventor's reputation, not only through publication of patentable material, but also in terms of this inventive ability;

- the research status of the university, thereby enabling it to attract better students, teachers, and greater research support;
- the university's reputation in the community at large.

Wisconsin Alumni Research Foundation in its research and patent activities has generated over $26,000,000 in royalty income for the University of Wisconsin in the past 40 years. Rutgers Research and Endowment Foundation has received $7,000,000 in royalties on antibiotic patents. Reportedly the University of Florida has received substantial royalties from a patent covering "Gatorade". The University of Rochester has received over $250,000 in royalties from patents on orthopedic shoes. The Board of Patents of the University of California has received over $1,000,000 in royalties in the last 10 years. These are just a few of the benefits that have been derived from patented products by white institutions. Other predominantly white academic institutions such as MIT, Stanford, North Carolina State, University of Illinois, Miami, and Cornell are also benefiting from royalty income.

Research Activity at Predominantly Black Schools

The nature and extent of research activities at some black institutions have the potential of generating economic benefits. An unpublished report, entitled "The Patent Potential at Predominantly Black Colleges and Universities", discusses a 1972 study of the research activities at Tennessee State, Howard, Atlanta, Fisk, and Southern Universities, Tuskegee Institute and Meharry Medical College. This report disclosed that:

1. A total of at least $11,000,000 was then being spent by these institutions in research or research related activities.
2. Four of the schools studied expect a substantial increase of at least 100% in research expenditures over the next five years. This estimate seems accurate in view of the numerous problems facing this country, such as the energy crisis, in which the U.S. Government will invest funds for research.
3. Most of the research is basic. However, in at least three of the schools, researchers indicated that they frequently design and/or modify techniques, procedures and devices in order to achieve their research goals.
4. Research will become more applied than basic. In part, this change in the nature of research will arise as a consequence of new policies adopted by government funding agencies. During the study, it was noted several times that government agencies were tending to use the contract route to achieve their goals rather than the grant route. This policy dictates a change in the nature of research.

5. The attitudes of most faculty members and administrators toward the patent system were positive. Indeed, the need for greater invention and patent awareness in black academic institutions was enthusiastically supported.

There is no question that blacks can invent. The list of patented inventions is long. In chemistry one outstanding black scientist, the late Dr. Percy Julian, generated over 150 patents and built his own company, which he sold for more than $3,000,000.

George Washington Carver, a superb research chemist who worked at Tuskegee Institute, discovered many uses for the peanut, and, in so doing, generated many potentially valuable inventions. For his efforts, neither Tuskegee Institute nor Carver reaped any financial benefits since these valuable inventions were not patented. Reportedly, the State of Alabama has received over $60,000,000 from his inventions. Today, years later, Tuskegee Institute is struggling with the same financial burdens which beset black colleges and universities all over America.

Had Carver patented his inventions, Tuskegee Institute would today be financially comfortable. We strongly recommend that black institutions use the resource of research in the same astute ways that they have used other institutional resources to maintain the viability of black education. As I have shown, some white schools have benefited form these resources in the past and others are currently organizing themselves toward this end. Black schools should do the same, if for no other reason than to maintain their qualifications for receiving federal funds available for academic research.

Patent Awareness at Black Institutions

To increase patent awareness, a program was conducted in 1974 and 1975 over a period of twelve months at Atlanta, Howard and Southern universities, Tuskegee Institute and Meharry Medical College. Presentations were made during the course of one or more site visits to each school to approximately 370 people including academic deans, administrators, researchers and students. The presentations were well received. Feedback has indicated that while the program stimulated a great deal of interest and awareness at the time, these have declined substantially since then.

Many administrators expressed an interest in using patent awareness as a vehicle for improving research management. They all felt somewhat restrained since their institutions did not have clear policies regarding inventions or other intellectual property. We tried to persuade key officials of each institution of the necessity of establishing such policies. In certain instances, where we were requested, draft patent policies were presented to interested institutions as "talking papers". To date however, no patent policies have been adopted where none existed before the patent awareness program. Policies which should have been clarified have not been improved. My campus contacts have reported

that a few individuals involved in research have become very much aware of patents are making inquiries concerning the possibility of patenting certain of their research results. Apparently, some of these researchers feel that it is advantageous that their university does not have a patent policy. They believe that in the absence of a policy all financial proceeds would be theirs exclusively.

Clearly, for a patent awareness program to have a continued effect at any university, (1) the program must be presented regularly, (2) the university must have a clear patent policy, and (3) the relevant people on campus must be informed regularly of the existence of the policy.

Abstract

Many minority-run universities suffer from financial anemia. This condition adversely affects their ability to attract top students, teachers and research and development support. Studies show that the current and expected research activity at some minority-run universities would benefit from the adoption and implementation of a patent policy and better research management. The benefits would include increased financial strength and improvement in the ability to attract higher quality students, better teachers and additional research funding.

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Biographic Notes

J. Richard Everett is presently employed as an attorney at Eastman Kodak Company specializing in patent matters. His responsibilities include all phases of patent activity, including prosecution, enforcement and licensing in all the major countries of the world. He is a member of the Board of Directors of Bankers Trust of Western New York. As a panel member of the New York State Public Employees Relation Board, he acts as a mediator and fact finder in reaching agreements between municipal governments and their employees. Mr. Everett is particularly interested in raising the level of patent awareness and research management at predominantly black universities. His academic awards include baccalaureates from Morehouse University in science and from St. John's University in law.

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8

Patent Policies at Educational and Nonprofit Scientific Institutions

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Seventy-two years ago, Dr. Frederick Gardner Cottrell, then a professor of physical chemistry at the University of California at Berkeley, invented the equipment and process which made economically practical the electrostatic precipitation of fine particulate material. Dr. Cottrell felt that commercial development of his invention was beyond the scope of both himself and the University as both were primarily engaged in teaching and carrying on scientific research. Nevertheless, he felt that the University and the next generation of scientists should benefit in some way from any commercial usefulness of his innovation. He explored the possibility of administering the patents on his invention through both the University of California and the American Chemical Society, but these institutions felt this idea was impractical. He next discussed with the Smithsonian Institution whether that organization would undertake the transfer of his newly discovered technology to public use using any income for further research at the Smithsonian. Again he was turned down on the basis that a publicly supported institution was neither equipped for nor qualified to undertake such a venture. The Secretary of the Smithsonian, however, was intrigued with Cottrell's concept, and, with the authorization of the Smithsonian Board of Regents, cooperated in bringing together a number of well-known and influential industrial and financial leaders. They agreed to help Cottrell form a new organization with a charter specifically designed to accomplish his objectives. Thus was Research Corporation born, in 1912, with the objectives of acquiring and marketing patents from scientists, and using the net profits from this endeavor for the further support of basic scientific research (1).

Twelve years later, in 1924, Dr. Harry Steenbock at the University of Wisconsin developed an irradiation process for producing Vitamin D in foods and pharmaceuticals which, in turn, were used to prevent or cure certain nutritional diseases. The University had no administrative mechanism for handling the transfer of this obviously useful and important technology for

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use by the general public. A group of concerned alumni and friends with industrial and financial backgrounds formed the Wisconsin Alumni Research Foundation (WARF) in 1925 for the express purpose of making available to the public some of the results of the University's research and to assist the University in its grants program for the support of basic research and special research facilities (2). WARF, an autonomous institution, separate and distinct from the University it serves, has been highly successful over the years, and its administrative structure has served as a model for many other university-connected research foundations (3).

In the middle 1930's the administration at the Massachusetts Institute of Technology became concerned that much of the research done at that institution, although appearing to have high potential for public use, was not being developed commercially. After considerable study the Institute, in conjunction with Research Corporation, developed a patent policy and an operating procedure, involving an agreement between the two organizations. M. I. T. inventions would be assigned to Research Corporation, and its staff would evaluate them, patenting and licensing those having promise. The M. I. T. patent policy was a forerunner of many others formulated over the next four decades, a number being developed as adjuncts to patent administration agreements with Research Corporation.

Scientific research at universities in the later 1930's and early 1940's was severely interrupted by World War II when most academic research was oriented toward developing war-related materiel and equipment. During this period little interest in scientific research existed in universities, much less in its commercial development. However, by 1946, general interest revived; the Office of Naval Research was organized, and, along with the National Institutes of Health, began to provide substantial financial support for academic scientific research. The formation of the National Science Foundation in 1950 added further impetus to these thrusts.

Federal funding for basic scientific research at educational institutions increased annually in the 1950's and 1960's, reaching a peak in 1967, after which a decline in constant dollars occurred for several years. On the increase again, basic research for fiscal year 1978 is budgetted for $3.3 billion, a large amount by any measure.

The administration of these large amounts of funding has fostered formation at almost every American university and college of contracts and grants offices or university-connected research foundations, particularly during the past 15 years, and has nurtured the development of a wholly new class of professional administrators. Accounting for these federal funds involves detailed and complex clerical procedures and financial controls. Setting up and monitoring these controls has required, in turn, that governing bodies of academic institutions set guidelines

and develop policy statements, particularly with respect to inventions and other products of intellectual research. Thus, patent and copyright policies have come to assume considerable importance in the day-to-day activities of most academic institutions.

These brief anecdotal summaries at ten to 15 year intervals, starting some seventy years ago, show clearly the increasing interest of academic institutions and the Federal Government in developing methods for successful transfer of scientific research to public use. Although these administrative procedures are continuing to evolve, a high level of understanding has already been acquired of the complex processes and multiple factors involved in the transfer of patentable inventions to public use.

University Patent Policies

Having established the current need for patent policy statements in academia, I would like now to turn to a generalized, but detailed discussion of such policies as they currently exist, and give a few examples showing how they work in practice. A more detailed discussion of academic patent policies, along with a specimen policy, is given in the Handbook of College and University Administration, published by McGraw-Hill Co. (4).

Purpose

The purpose of a university patent policy is to define clearly and understandably a basic philosophy for guiding the further development of inventive concepts resulting from scientific research at an institution, to set forth the arrangements by which the contributors to the concepts will share in the fruits of their endeavors, and to indicate how any income will be used.

Objectives

University patent policies, in general, have these objectives:

- To encourage innovation by providing incentives to university researchers
- To transfer useful ideas from paper and the workbench to public availability
- To meet the obligations imposed by the terms of grants and contracts with sponsors
- To produce income that might finance future university research and other activities.

Authorization

Approval from the highest governing board at the university is required to provide the necessary authority to back the patent policy of the institution. This does not imply that the governing board itself should develop the policy in its sole discretion. On the contrary, a patent policy which has not had the benefit of input from and sanction by both faculty and administrative officers will not be likely to be accepted gracefully and will lead to unnecessary dissension. Initial formulation of the policy is best accomplished by a joint effort of faculty and university administrators. The product of this joint effort should then be reviewed by university counsel and top administrative officers before forwarding to the governing board for final approval. The approved policy should be disseminated in writing broadly to all faculty members, administrators, other employees and students.

Administering Office

The patent policy should state clearly the responsible administrative office and the sequential procedures to be used by that office in handling an invention from its conception through its entire life as an income-producing product or process.

Patent Committee

The patent policy should provide for a permanent patent committee made up of faculty and at least one administrator, who could serve as secretary to the committee. A five- or seven-member committee is preferable to either a smaller or larger one. The committee membership should be for a specified time and appointments should be staggered to provide continuity. At least one scientific or technical professional member should serve on the committee at all times. Lawyers and business or financially-oriented members may be helpful, but are not essential. The committee should hold regularly scheduled, well-publicized meetings during the academic year.

The patent committee should concern itself with matters of equity rather than the specific substantive features of inventions and patents and their commercial development. Evaluation, patenting, licensing and starting new ventures are highly complex endeavors requiring a broad mixture of technical and entrepreneurial skills, and are best left to experienced specialists either from inside or outside the university.

The patent committee should concern itself with the possible ethical, moral and social consequences which might arise from the further development of inventive concepts. The committee should also function as arbiter or mediator should disputes arise

between inventors, between inventors and the university, or with outside parties.

Coverage

The patent policy should state clearly to whom it applies. Normally, the policy should cover all employees of the university, from the top administrative officer to the part-time laboratory technician. Students, especially graduate students, should be included, but inclusion of undergraduate students and secretarial employees might be optional.

Federal agency grants and contracts require a written statement by all persons working on government-supported research that they will conform to the published university patent policy and to the terms of the grant or contract. Other sponsors of research may have similar requirements. In any event such written statements should be obtained as a condition of employment for new employees including faculty, and from continuing employees, wherever possible.

Patent Rights Ownership

The patent policy should state how ownership of a patent is determined and under what conditions different ownership occurs.

In general, determination of ownership is based on the source of funding which supported the research (5). There are seven relationships which will cover in toto practically all cases. These are:

- Funding is provided entirely by the university from its operating budget.
- Funding is provided entirely by Federal grants or contracts.
- Funding is provided entirely by private commercial organizations.
- Funding is provided entirely by private nonprofit organizations.
- Funding is provided through a combination of one or more of the above sources.
- The researcher works on his own time but uses university facilities and equipment.
- The researcher uses his own time and facilities although employed by the university.

Ownership of patents should reside in a single party as multiple ownership leads to almost unresolvable complications during licensing negotiations.

When outside funding has been involved, ownership will be determined with reference to both the policy of the sponsor and of the institution. In the case of federal agencies, the patent policy varies with the agency, but all agencies generally provide a possibility of obtaining waiver of patent rights to the university.

Reporting of Inventions

The patent policy should set forth accepted procedures for timely reporting of inventions by the faculty researcher in sufficient detail to enable a reasonably complete evaluation. Reliance is generally on the researcher to make the initial report. Such reports are more easily handled if a form to be filled out is provided. This form should have blanks for entering names and dates of publications and names and dates of disclosures to others, since this information is of utmost importance from a patent standpoint.

The policy should also set forth the action sequence to be followed by the office to which an invention is reported. This action sequence should be followed promptly and expeditiously by office personnel in order to obtain timely filing of patent applications and minimize inventor discontent.

Patenting and Licensing Procedures

A statement should be included in the policy concerning the steps to be taken in-house in patenting and licensing inventions and whether outside patent administration organizations or consultants are available under blanket agreement. Brief reference to the terms of the agreements with such organizations or individuals should be made.

Distribution of Income

The distribution of income received from patents is generally perceived to be the item of greatest interest to both the university and the inventor. In developing an acceptable patent policy it is the delineation of the income distribution rules that, frequently, is the most time consuming. The policy on income distribution must be clear and unequivocal.

Generally, any income is customarily shared between the university and the inventors. If an outside patent administration organization is involved, it also shares. If an individual outside consultant is used, a fee for services is usually charged without sharing of continuing income.

Income sharing seems to be more commonly done on a "net" rather than a "gross" basis. Net income is usually defined as gross income less expenses. However, expenses can be defined in several ways. A commonly accepted definition is out-of-pocket expenses for patenting and licensing. Defined in this manner expenses would not include in-house office expenses and possible litigation costs. In any event, whatever way expenses are defined, the definition of net income should be clearly stated in the patent policy.

Income sharing on a gross income basis avoids the problem of defining net income and identifying specific cost items as

expense. Use of the gross income basis is advocated by the Department of Health, Education, and Welfare (DHEW) and the National Science Foundation (NSF) in their Institutional Patent Agreements. The three major patent administration organizations, Research Corporation, University Patents, Inc., and Battelle Development Corporation, also use gross income as a basis for distribution of income.

A variety of distribution schemes is used. The specified arrangement most suitable for a given university will depend on a number of factors and, pragmatically, will probably be dictated by a consensus of the university governing board, taking into consideration the expressed feelings of faculty, administration and sponsors.

The most commonly used arrangements are as follows:

50% to inventors, 50% to university of net income.

25% to inventors, 75% to university of net income.

15% to inventors, 85% to university of net income.

Sliding scale downward to inventors (40% to 15%), remainder to university of net income.

50% of first $3,000; 25% of next $10,000; 15% of all over $13,000 of cumulated gross income to inventors, the remainder to the university and any patent administration organization. This is the formula used in DHEW and NSF Institutional Patent Agreements.

57.5% to university, 42.5% to patent management organization, of gross income. All expenses are usually borne by patent management organization, except for special litigation expenses. The university may distribute some of its share to the inventors. This arrangement is used by Research Corporation and with minor modifications by University Patents, Inc., and Battelle Development Corporation.

15% to inventors, remainder divided equally after special expenses for litigation costs, if any, between university and patent administration organizations of gross income. All expenses borne by patent administration organization. This is an arrangement used by Research Corporation.

In three recent independent surveys of income distribution arrangements, the minimum amount based on gross income distributed to the inventors was 15%; the maximum, 29%. Two institutions reported 15% of gross income plus 40% or 50% of remaining net income.

These surveys also showed the minimum amount based on net income distributed to the inventors was 10%, and the maximum was 50%. Three institutions reported formulas involving incremental scaling down: from 80% to 25% in one case, and 60% to 30% in a second, and 40% to 30% in the third (6, 7, 8).

If any portion of the income accruing to the university is to be used for research in the department in which an invention

originated, this should be stated explicity. Generally speaking the policy should state the university's intended usage of any income from patents, at least in philosophical terms.

A few universities claim no onwership in faculty inventions and thus no financial or other reward, allowing the faculty inventor to handle his inventions as he wishes. This practice is now rare, as it conflicts with federal agency policy which prohibits ownership residing in individual inventors supported by government funding.

Selected Factors Influencing University Patent Policies

Government Agency Policies

For many years Federal Government granting agencies have taken the position that patent rights arising from federally supported research reside with the Federal Government. However, all these agencies provide that waiver of these rights can be obtained by a grantee on a showing of sufficient justification. The mission-oriented agencies, for example, National Aeronautics and Space Administration, Atomic Energy Commission, and more recently, Department of Energy, handle requests for waivers on a case-by-case basis through offices and committees set up to deal specifically with such matters. The Department of Defense frequently waives the patent rights on awarding a grant or contract and on request by a responsible grantee or contractor.

In contrast, the non-mission-oriented agencies, DHEW and NSF, arrange for retention of patent rights by a grantee institution through previously concluded Institutional Patent Agreements. These two agencies provide for patent rights waivers on a case-by-case basis as well. Since a large majority of Federal Government grants to universities for scientific research are from DHEW or NSF, university patent policies need particularly to recognize the possible overriding interest of DHEW and NSF.

Institutional Patent Agreements

Until 1968, universities were required to make a formal written request for a determination of patent rights ownership from DHEW for every invention resulting from DHEW-supported research. Beginning in that year, Institutional Patent Agreements (IPA) were instituted. These agreements, in effect, waive title to DHEW-supported inventions provided the university can and has shown a capacity and a capability to handle the transfer of such inventions in the public interest. Today IPAs are in effect with over 70 universities and scientific research institutions.

More recently the NSF has been entering into similar agreements and now has over 20 in effect.

These agreements foster non-exclusive licensing arrangements and allow them to be royalty-bearing. Exclusive licenses are also allowed under certain circumstances, but the exclusivity is

time-limited. Annual reports of activity are required of the university and march-in rights are retained by the Government in the event of poor or non-performance. Foreign patenting and licensing by the institution are allowed.

In spite of the restrictions contained in these agreements, they have been helpful in expediting the transfer of university inventions resulting from Government supported research, and universities should plan to enter into such agreements whenever feasible.

Foreign Patenting

As a matter of policy universities would be well advised to consider seriously foreign patenting of all suitable inventions resulting from university research, since income from foreign countries can often be substantial. The cost of foreign patenting can be borne by the university, by its licensees or by outside patent administration organizations.

Litigation

A patenting and licensing program, sooner or later, will involve a patent owner in litigation of one sort or another. While litigation is not common, it can be expensive. The usual types of litigation are patent office interferences and breach of contract and infringement suits, in increasing order of cost. As in foreign patenting, licensees and patent administration organizations can be frequently persuaded to assume the burden of litigation costs.

Patent Policies in Practice

At this point, perhaps a few actual examples will illustrate some basic problems which suitably drafted patent policy guidelines can help to resolve.

At a large, broad-based state university a professor of biophysics discovered by chance a major new therapeutic chemical. Apparently without reference to the existing published patent policy of the university or the proper administrative office, he arranged for funding for future research with two industrial companies, neither of which are in the drug business, and with one of the National Institutes of Health which operates under the DHEW patent policy. The institution has a DHEW Institutional Patent Agreement. Both industrial companies were given exclusive rights to any inventions resulting from the research; such a provision is in direct conflict with the rights requirement in the IPA. After some subsequent scientific research confirmed the initial promise of the materials, the university administration became aware of the situation and called attention to the deficiencies and inherent conflicts. Research Corporation was called in to undertake the necessary patenting and licensing.

It was necessary to bring in a third company knowledgeable

in the production and marketing of pharmaceuticals as the prime licensee, and to find a mutually agreeable way to satisfy the original sponsors, the DHEW, the inventors, the university administration and governing board within the guidelines of the university patent policy. This appears to have been accomplished after some 9 years, and products are expected to be on the market late this year or early next. Expansion of the usage of these drugs is continuing under study with another seven to ten years being needed before regulatory clearances are likely to be obtained.

At another large, broad-based state university, a professor in the medical school developed a therapeutic procedure which he believed would have wide usefulness. Without reference to the university's published patent policy, he engaged a patent attorney to file a patent application and to try to develop industrial interest in both supporting further research and developing a commercial venture. His rationale was that such a discovery belonged to him alone as has been the traditional belief in academic circles. The university adminsitrative officers became aware of the invention, discovered the route its further development was taking, and promptly pointed out that the professor had signed a patent agreement with the university some years earlier as a condition of employment. By this time National Institutes of Health funding had also been obtained, so the DHEW patent policies needed to be taken into account. Research Corporation agreed to undertake the patenting and licensing of this invention, and to work out the necessary administrative details involved in bringing all parties into a mutually agreed upon course of action. Since the development of this invention is in a very early stage, seven to ten years will be required before necessary clearances and marketable products will be available.

At a well-known private university a professor of chemistry working, in part, with National Institutes of Health funding has become an internationally known expert in a certain area of useful complex organic chemical compounds. He has consultation agreements with several companies. The university does not have a patent policy. Since the professor feels that all patent rights should be the sole property of the companies for which he consults, no patent rights are retained by the university nor, to date, has the DHEW asserted their rights to any patents resulting from this work. In this situation neither the university nor the federal government can exert any control over the methods by which this research is transferred for the use of the general public; control is left entirely in the hands of the industrial patent owners. Some products based on the professor's discoveries are on the market, but others have not yet been developed, and no financial benefit has flowed back to the university for further research except as has been made available to the consultant-professor for his further research.

By contrast, at another well-known private university having

no stated patent policy, a professor of surgery and biochemistry at its medical school developed a therapeutic formulation for treating a specific infectious state. He requested advice from DHEW, the sponsors of his research, as to how best to proceed in developing the invention for widespread public use. The DHEW administrator suggested that Research Corporation work with the university's administrative personnel in developing a mutually acceptable agreement and procedures for developing marketable products. Over a period of approximately eight years this was accomplished with the United States market now approximating several million dollars. As a result a major portion of royalty income is being forwarded to the medical school for further research, and the university is developing a patent policy for guidance of both faculty members and administrators.

While these examples all have to do with the drug industry, other similar examples could be cited in the electrical, electronic and mechanical fields, if time permitted. These "case histories" indicate the need for definitive patent policy and its vigorous, intelligent and diligent administration by universities.

Summing up, I have given an historical perspective to the necessity for universities to formulate patent policies and have described their development to the present state of sophistication. I have described the major concepts which should be addressed in university patent policies, and have given some illustrations of typical problems that arise in handling inventions arising as a result of academic research.

The gist of this paper is that a very real public service need exists for academic institutions to accelerate and smooth the way for the transfer of the results of academic research for public use. This need can be filled through the development of clearly stated, well publicized patent policies, followed by their firm and dedicated implementation and administration. Filling the need in this manner uses the patent system most productively in encouraging and enabling industry to invest in new ideas for the public benefit while, at the same time, benefitting academic institutions and inventors -- scientists or engineers -- as well.

Abstract

Patent policies at educational and non-profit scientific institutions incorporate a number of common principles but vary widely in administrative detail. Policy provisions and administrative procedures which may expedite or may hinder the transfer of academic research results for the public benefit are illustrated with actual case histories taken from Research Corporation's long experience as invention administrator for such institutions.

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Biographic Notes

After more than 25 years experience in production and process research and development in the sugar industry, Willard Marcy joined the Patent Program of Research Corporation. As an associate in this group, he was involved in evaluating, arranging for patent coverage and licensing of inventions arising from research at more than 270 academic and scientific institutions. His present position is Vice President. Dr. Marcy also served as a Research Assistant at Massachusetts Institute of Technology for several years. He has a baccalaureate in chemical engineering and a doctorate in organic chemistry, both from M.I.T.

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Panel Discussion

COMMENT BY MR. LASKEN: I wish to correct an erroneous impression relating to the royalty sharing formula in the National Science Foundation's (NSF) Institutional Patent Agreement that might be conveyed by Dr. Marcy's paper. Unlike the Department of Health, Education, and Welfare, the NSF does not use a specific sharing formula but generally accepts that normally used by the university requesting the agreement. If the university's royalty sharing arrangement is not acceptable, in all probability an agreement would not be concluded.

QUESTION: Mr. Owens, of the 200 to 300 invention disclosures evaluated by you each year, how many patent applications are filed, and how many applications mature into patents?

MR. OWENS: We file about 25 patent applications annually. Most of those will issue finally as patents because of our careful selectivity. Only 2 or 3 of these 25 will be productive financially, however.

MR. BREMER: At Wisconsin, we evaluate about 60 disclosures a year, and we file patent applications on roughly a third of those. Most of these applications mature into patents.

DR. MARCY: Speaking for Research Corporation, we evaluate annually about 450 to 500 invention disclosures, of which we accept about 25 to 35 a year. Patent applications are filed covering each accepted disclosure, with about 95% to 98% of these applications issuing as patents. Of the approximately 30 disclosures accepted each year, about 10 to 12 are licensed eventually. Perhaps three of these will result in a financial return. On the average, about every five years an accepted invention will produce a large amount of income. At present, Research Corporation's income is coming from about 50 licensed inventions including four that brought in more than a $100,00 last year. These were disclosures that we began looking at 10 to 15 years

ago.

QUESTION: It sounds as though about 10% of disclosures that are turned in result in accepted cases, and yet each panel member commented that about 95% to 98% of the patent applications filed on those cases result in patents. Can the panel comment on whether they feel that, perhaps, sometimes they are a little on the conservative side on filing?

MR. OWENS: Responding for the University of California, I think we probably are conservative. Since we do not have an in-house patent counsel, we must pay patent attorneys in private practice, and this makes us quite conservative. We look for two things: the probability of obtaining strong patent claims that can be successfully licensed, and an even stronger consideration, whether there is a strong probability of substantial financial return. To us a good patent is one that will be licensable and produce royalty income. If an invention does not meet both those standards, it is returned to the inventor. We may lose money sometimes because of that, although I know of no specific case.

MR. BREMER: I should like to observe further that industry is interested in a defensive position, and we are not. That is why we have to be more selective at the outset. The inventions we look at are rather basic, and we know that someone will pay to operate under whatever protection we can give them through exclusive licensing. A defensive postion is not a licensable position to us. In industry people to have patent in order to protect the products that are already on the market. Whether they can license patents is of much less interest.

DR. MARCY: I think there is another factor. In our experience most of the inventions from universities describe fundamental discoveries and are not minor modifications or improvements. In fact, sometimes they are almost just a statement of a scientific principle with one experiment that shows that the idea works. In this situation we must draft a patent application that is almost a constructive reduction of practice, rather than a full-blown patent. We expect the inventor to continue work in his laboratory so that additional supporting material will become available during examination in the patent office. Our evaluations are based on a miniumum of information and analysis, yet frequently we can obtain basic patent coverage.

MR. EVERETT: Research in large industrial research laboratories seldom results in anything that can be considered a giant step forward or a pioneer invention. These laboratories are very good at improving and understanding a basic invention coming from an inventor's workroom or from a university, however.

QUESTION: In some instances university personnel are required to sign a patent agreement with the university and these same people, as consultants to a company, are asked to assign inventions to the company. It seems to me that this gives rise to a conflicting situation. How can this be resolved so that both the university and the company get their due?

MR. BREMER: The inventor at Wisconsin is not obligated to the university unless he is supported with federal funds. His responsibility to the company he consults for is normally written into the consulting arrangement. If federal funds are involved, inventions made under consulting arrangements can be assigned as long as recognition is made of a prior arrangement with the federal government.

DR. MARCY: In situations like that people must act in good faith in coming to a mutual understanding. Many universities arrange for the industrial sponsor to have the right of first refusal to any patents that come out of sponsored research, and not a direct assignment; otherwise the undersity won't take the money. If a professor makes his own arrangements without informing the university, the university may have difficulty in resolving the possible conflicts. Such conflicts are usually avoided through explaining the university's policies to the prospective sponsors beforehand. Then, if the industrial sponsor does not wish to moddify its demands, frequently, the university simply will not accept the funding, even though the professor is eager to do exactly what the company wants him to do.

MR. OWENS: At the University of California, all of our people do sign patent agreements with the university. However, the agreement requires only that they tell us about their inventions; the university asserts its rights only where it has an equity. Such equity results if university time or facilities were used or if the inventor was actually assigned to make inventions, which, of course, is extremely rare. The patent policy expressly provides that, if consulting is done and clearance has been obtained from the department, the university has no interest in any inventions which might arise. Such inventions are handled directly between the company and the faculty member-consultant. Of course, a lot of good faith must be involved to minimize conflicts. However, we rely primarily on the integrity of the person rather than use any formal policing methods.

MR. BREMER: It is important for industry to understand how universities view patent rights ownership, and that prior and current federal funding must be considered. The investigator should be asked by the prospective industrial sponsor if he has an obligation under federal funding. At Wisconsin we also give

a sponsoring industrial group the right of first refusal on inventions that may be generated; at least, we feel we have a moral obligation to offer such inventions to the sponsor first before talking to anyone else. But Wisconsin University usually wears two faces: we will not accept grants from private industry that have patent restrictions, regardless of any existing consulting arrangement; on the other hand, we will accept grants with patent restrictions from the government or some quasi-governmental agencies, like the American Cancer Society.

QUESTION: Have you made any studies or do you have any feelings as to what the effect of your program has been on faculty members in terms of their engaging in remunerative research; have they operated any differently than would have been the case if your program had not existed?

MR. BREMER: In our experience, they have not operated any differently. Sometimes we have problems with faculty inventors wishing to publish as soon as possible, but they are not asked to withhold publication because that's the way of life in universities. We don't see any other changes. There have been only two instances to our knowledge where someone, having th the complete freedom to go elsewhere with an invention, has gone directly to industry. The rest have all voluntarily used the facilities of Wisconsin Alumni Research Foundation (WARF). Much of the royalty income from patents is used to support special professorial chairs and provide other inducements to keep good faculty members on the campus. That kind of recognition is looked to more by the faculty member than his actual dollar value return from an invention. We keep reminding faculty inventors that 15% of something is better than 100% of nothing, and that WARF is instrumental in getting that something.

QUESTION: A number of years ago I saw a collection of university patent policies. Is there such a current text available today or other similar aids published by university patent administrators?

DR. MARCY: Here is a publication enetitled "Technology Transfer, University Opportunities and Responsibilities". It is the proceedings of a two-day symposium at Case Western University held October 15 and 16, 1974. This is the most recent comprehensive reference on university patent policies. The book you are probably referring to is entitled "University Research and Patent Policies, Practices and Procedures" by Archie M. Palmer, published in 1962 by the National Academy of Sciences-National Research Council. The contents of this book are pretty well out-of-date by now. Individual universities have made surveys of university patent practices but most of these have not been published. One developed by Northwestern University

is particularly informative and might be obtainable through the Vice President of Research at that institution.

QUESTION: What is the best way for a corporation interested in exploiting a university invention to approach the university, directly to the university or through the inventor?

MR. OWENS: At the University of California you should clear with the university patent office to make sure if any university equity in the invention exists. If it is a university-owned invention, then, you should deal with the university. If it isn't, then we will suggest you deal directly with the inventor. But I think it is critical with any university to at least touch base with the proper administrative office if you know a university has such an office.

QUESTION: Do you have any programs for approaching possible interested parties concerning those inventions that might be marginal candidates for filing patent applications?

MR. BREMER: We do at Wisconsin, in the pharmaceutical arts, in particular. We frequently bring an invention to the attention of a company, and are referred to another which might have an interest in the invention. This sort of rapport develops over the years with people in various industries, and this is very helpful in transferring university technology.

QUESTION: The Electric Power Research Institute (EPRI) insists that they have title to all inventions. How do you deal with that requirement?

DR. MARCY: EPRI is not the only organization that has that policy. So does the Petroleum Research Fund, which is administered by the American Chemical Society, as well as a number of other organizations. At Research Corporation we turn down automatically all inventions supported by funds from organizations having such policies.

COMMENT: With whatever university patent policy exists, federal granting agencies including mine, the Department of Defense, will have the problem of handling inventions from government-supported research which are not handled by the universities. Since we feel some of these are commercially valuable inventions, we are thinking seriously of obtaining patents and licensing them non-exclusively and royalty-bearing, at least domestically. If non-exclusive licenses are not possible we will try the exclusive license approach. If exclusive licenses are given, we will then have to enforce the patents against infringers which may be a problem for government agencies.

MR. EVERETT: Regarding the issuance of exclusive rights by the government, isn't it possible you will have opposition in Congress to this especially in view of Senator Long's recent letter to President Carter inveighing against the granting of exclusive licenses?

Regarding non-exclusive licenses, it does not seem realistic to me to expect such licenses to be acceptable to industrial companies. Where such licenses are concluded, I expect they will be with such large and dominant companies that the licenses, in effect, will be equivalent to exclusive licenses.

RESPONSE AND FURTHER COMMENT: Since both industry and Congress are complaining from opposite viewpoints about federal agency licensing procedures, these policies must be relatively good and proper. While the patent clauses in the recent Energy Research and Development Administration legislation outline the procedures I have suggested here, the same legislation is silent regarding royalties. We have already concluded royalty-bearing licenses with foreign companies on a non-exclusive basis, but we do not as yet, have equivalent domestic licenses We have also licensed domestic manufacturers for sales overseas. In this case a foreign company asked what our posture would be if they manufactured and sold in foreign countries; our response was that we would welcome having a test case of this sort so that we can bring an infringement suit in a foreign court. My feeling is that federal agencies owning patents must take on all the obligations patent ownership requires.

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Industry

Factors That Influence Patent and Licensing Policies at Ford Motor Company

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Ford Motor Company is probably best known as a major producer of automotive products on a world-wide basis. It is true that Ford's primary emphasis as a company is on the production and marketing of automobiles, trucks and tractors. But Ford and its subsidiaries also produce steel, glass, vinyl, paint, radios, and sophisticated electronic componentry.

This complex product line involves a broad spectrum of product, material and processing technologies. No single patent and licensing policy would be adequate to deal with all of these technologies.

Interestingly, some people outside the industry have the opinion that the automotive industry is not particularly interested in patents.

It occurred to me that there might be an historical basis for this latter point of view, since the automotive industry today seems to place a great deal of emphasis on patents. I can assure you that we at Ford are not only very much interested in patents, but also in the related subject of licensing.

Therefore, it will be pertinent to review some of the early history of the automotive industry in the United States as it relates to patent and licensing policies, especially since Ford is presently celebrating its Diamond Jubilee, having been organized in 1903.

This history was strongly influenced by a single U.S. patent. This patent (No. 546,160) was issued to George Baldwin Selden in 1895. The Selden patent included a number of claims. One of these claims related to the use "of a liquid hydrocarbon gas engine of the compression type" in "combination with a road-locomotive". The drawings and specifications described a horseless carriage of the general type that a number of inventors were tinkering with about that time. In other words, Mr. Selden claimed to have invented the automobile, and the issuance of a patent shows that the U.S. patent office of that day agreed with him.

At this point, I shall frankly admit that, although there

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is a popular legend that Henry Ford invented the automobile, this was not the case. In fact, the automobile was not invented by any one man, but by many inventors, and it was the invention of a practical internal combustion engine that eventually made the automobile a commercial reality.

In 1873 George Brayton of Boston invented one version of a compression engine using gasoline, and in 1876 Nikolaus Otto of Germany invented another version. It was the Otto cycle that was to become the basis for the modern passenger car engine, but this superiority only became clear as inventors continued to develop alternative concepts. The difference between the Brayton and Otto engines has an important bearing on the Selden story. Both were internal combustion engines of the reciprocating piston type, but the Brayton engine was arranged so that compression and expansion took place in separate chambers while in the Otto engine, the fuel/air mixture is compressed, ignited, and expanded in the same chamber.

As I mentioned earlier, Selden's patent was granted in 1895. Actually, the original patent application had been filed in 1879, but its issuance was delayed for 16 years. Selden was a very astute patent attorney -- in fact, he was George Eastman's patent attorney, and Eastman's signature appears on the Selden patent as a witness.

In 1899, Selden sold control of his patent to the Columbia Motor Car Company, under a contract by which he was to receive a percentage of the profits from the exploitation of the patent. The next year this company sued the Winton Motor Carriage Company for infringement. It was not until this time that a working model of the Selden car was actually built, as evidence for this patent infringement suit. In 1903, the validity of the patent was sustained by the court.

At this point the ten companies which had been licensed to build cars under the Selden patent formed the Association of Licensed Automobile Manufacturers. The main purpose of this Association was to collect and pay to the Columbia Motor Car Company royalties of 1-1/4% of the retail price of all automobiles sold. A second purpose was to assure that no rugged individualist could escape his share of the burden.

After Ford Motor Company was formed in 1903, Mr. Ford was contacted by the Association and advised that he would have to join and pay royalties on the Selden patent. But Mr. Ford was not about to concede that it was Mr. Selden who had invented the automobile. He refused to join the Association or to pay royalties. Accordingly, a lawsuit was brought against Ford Motor Company and seven other defendants who also refused to pay.

Although there were eight defendants, the fight was mainly against Ford, and was not limited to the courtroom. The Association took out newspaper advertisements to warn customers not to buy Ford cars. Ford retaliated by offering to indemnify both dealers and purchasers.

Meanwhile, the issue in the courts dragged on. Neither party seemed willing to let the matter be brought to a conclusion. New testimony was introduced, expert witnesses were called in from Europe, and the expensive legal battle continued. Finally, on September 15, 1909 the court rendered a decision sustaining the validity of the patent.

After the suit was decided in favor of the plaintiffs, most of Ford's co-defendants entered the Association. But Ford wouldn't concede and the verdict was appealed. On January 9, 1911 the appellate court reversed the district court's decree. Actually, the court upheld the validity of the patent but ruled that Ford was not infringing.

The basis for this decision was rather subtle. The Selden patent described a "road-locomotive" driven by "an engine of the compression type". However, the drawings supporting the claim, and the actual model that was subsequently built, were based on a version of the Brayton engine. The vehicles actually being built by Ford and others utilized Otto cycle engines. The ruling held that "the two engines do not perform the same function in substantially the same way" and hence were not equivalent. The court was thereby able to straddle the issue and hold that the patent was valid but not infringed.

As far as the owners of the Selden patent were concerned, the decision did not make much difference. By this time, the patent has less than a year to run, and the Association had already received about two million dollars in royalties, of which Selden got one-tenth. As a result of the decision, the Association of Licensed Automobile Manufacturers was dissolved and no more royalties were paid.

But the impact of the long court battle made a lasting impression on the new automotive industry. The potential value of patents had been amply demonstrated. More importantly, the potential risk of patent infringement was apparent. A common problem had been identified, and steps were taken to resolve the problem.

At this point in the the history of the automotive industry, there were more than 100 small companies producing cars in the United States.

Each of these competing companies employed engineers and inventors to advance the state of the art. The patent situation soon became hopelessly tangled. Nobody knew what sort of automobile he might legally make.

To deal with the problem, the National Automobile Chamber of Commerce was formed in 1913. All of the U.S. manufacturers except Ford Motor Company eventually joined. Their solution to the problem of patent infringement lawsuits was to form a patent pool. This was a cross-licensing agreement under which each party to the agreement licensed its patents to all of the other parties without payment of royalties. The patent pool went into effect in 1915 for an initial period of ten years. All of the members of

the National Automobile Chamber of Commerce except the Packard Motor Car Company became parties to the cross-licensing agreement. In the early years, membership in the patent pool averaged about 130 companies.

Upon termination of the original agreement in 1925, it was extended for a further period of five years. At the end of that period the agreement was again extended for a further five-year period, but to include only those patents held by the members as of January 1, 1930. Through 1930, the agreement had resulted in the exchange of licenses under about 1700 patents.

As the industry went through its inevitable shakeout, membership in the patent pool dropped to less than 50 companies. In 1934, the National Automobile Chamber of Commerce changed its name to the Automobile Manufacturers Association.

The agreement was again extended in 1935, but to include only those patents held by members up to 1920. The final extension of the agreement occurred in 1940, but excluded any inventions that had been made by divisions and subsidiaries not directly engaged in the manufacture of automobiles. This exclusion effectively emasculated the agreement because of the large volume of patents originating with divisions engaged in the manufacture of parts and accessories. The last patent to be cross-licensed expired in 1957.

During all these years, Ford never joined the National Automobile Chamber of Commerce and therefore did not participate in the cross-licensing arrangement. Packard was a member of the NACC, but not of the patent pool. Each had its own approach to patents and licensing.

According to a record of testimony given before a Congressional committee shortly before World War II, it was not the policy of Ford to sue infringers. Anyone requesting a license from Ford was granted a royalty-free license without restrictions. Conversely, when Ford needed a license, it did not expect to pay royalties.

Packard, on the other hand, granted and took out royalty-bearing licenses. Apparently, Packard was the only automotive company to operate in this fashion during the years prior to World War II.

From this review of the recorded history of patent and licensing policies of the automotive industry during its early years, it is difficult to find an historical basis for the view that the automotive industry was not particularly interested in patents. With the exception of Packard, the industry apparently did not try to make money out of patents through collection of royalties but, as we have seen, the subject of patents did receive a great deal of attention.

As you may have guessed by now, I had another reason for taking you through all of this history. The purpose was to illustrate that the automobile has been in production for a long time by many companies. Obviously, none of these companies has been able to gain control of the market through the use of patents.

Research and development today is often a process of seeking practical solutions to extremely difficult technical problems. These solutions often require long and expensive research to develop new materials and manufacturing processes. It is not unusual to arrive at practical solutions long after the basic "conceptual" patent has run its course.

To illustrate how patents and the related licensing activity can impact today's technical innovation process, I have chosen three examples of recent or on-going research projects. Each of these examples relates to engines that may -- someday -- replace the piston engine. Each example illustrates a different patent or licensing situation. The examples are the gas turbine engine, the Stirling engine, and the Wankel, or rotary engine.

The gas turbine engine operates on a version of the Brayton cycle which, as we have already noted, was invented by Brayton in 1873. The gas turbine engine is an internal combustion engine with continuous combustion; the reciprocating compressors and power pistons of Brayton's original engine are replaced by rotating components.

Interest in the gas turbine engine started to intensify prior to World War II; the technology then developed rapidly during and after the War for military aircraft applications. The state of the art has since advanced to a highly sophisticated level. Much of the progress in the development of this engine has resulted from the development of new superalloys and the related fabrication techniques. Gas turbine engines now are also widely used in selected non-aircraft applications, particularly where attributes such as light weight or quick start-up are important.

Research and development work on automotive gas turbine engines started at Ford in the early 1950s. This early work was able to utilize some of the materials technology and aerodynamic principles that had become publicly available from the development of the aircraft engine. In most other respects, however, the automotive application required a fresh approach.

During the 1950s and 1960s a number of Ford-designed prototype gas turbine engines of different sizes and configurations were built and tested in vehicles as well as in non-automotive applications. Most of the larger automotive manufacturers around the world have also built and tested prototype gas turbine engines at one time or the other during the past 25 years.

There is fairly general agreement that the automotive gas turbine engine has the potential for major improvements in fuel economy versus the piston engine. Demonstrating this potential in hardware has, however, proven to be a difficult task. The ability of an automotive gas turbine engine to meet legislated emission standards -- particularly the NO_x standard -- must also be demonstrated. Commercialization of the engine is dependent on the resolution of these open issues in hardware that can be mass produced at reasonable cost.

Based on this very brief review of the gas turbine engine's

history and status, the patent and licensing situation can be summarized as follows:

1) There are no basic cycle patents that would prevent any company from manufacturing gas turbine engines if it chose to do so.
2) The thermodynamic principles are, for the most part, well understood.
3) Since many companies have supported gas turbine R&D programs over the years, it is unlikely that any one company has a commanding patent position.
4) The risk of patent infringement can only be evaluated at the time a production engine has been designed and its manufacturing processes have been identified.

This does not mean there are no present opportunities for the licensing of gas turbine engine technology. For example, license grants might include the patents and know-how related to specific components or systems.

Now let's turn from the gas turbine engine to the Stirling engine, where a completely different patent and licensing situation exists.

The Stirling cycle is even older than the Brayton and Otto cycles, having been invented in 1816. The Stirling engine enjoyed considerable commercial success furing the 19th century until it was made obsolete by the internal combustion engine.

In 1938, the firm of N.V. Philips, located in Eindhoven, the Netherlands, "rediscovered" the Stirling engine. Philips is a major manufacturer of electronic products, such as radios. In the pre-transistor age, there was a need for an electrical power source for radios operated in remote areas. After the invention of the transistor, the need for an electrical power source for radios in remote areas became less important. By this time, however, the Stirling engine was beginning to look attractive for other applications.

Because Philips was the only firm with a major Stirling engine development program for many years, they were able to develop a proprietary position both in patents and in know-how. This know-how includes a more complete understanding of the cycle, as well as computer programs that permit the optimization of an engine for particular applications.

In the Stirling engine, combustion is continuous and the products of combustion do not come into contact with the working fluid. Continuous external combustion permits flexibility with respect to the type of fuel used, as well as in the control of exhaust emissions.

Ford was attracted to the Stirling engine because of its potential for low emissions together with improved fuel economy. Other attractions include multi-fuel capability and relatively quiet operation.

In July of 1972, Ford entered into a joint development program and license agreement with Philips. Philips had previously

granted licenses to United Stirling of Sweden and to two German diesel engine manufacturers, M.A.N. and M.W.M. Subject to the terms of these prior licenses and certain other restrictions, Ford obtained a partially exclusive license and sublicense rights for most automotive-type applications. Ford later entered into a non-exclusive license agreement with United Stirling that also includes certain sublicense rights.

From this brief summary of the Stirling engine's development history, it can be seen that the Stirling's history differs from that of the gas turbine's in two main respects that have a bearing on the patent and licensing situation:

1) Although Stirling engines were produced during the 19th century, commercial production in recent years has been limited to cryogenic devices (not engines). Gas turbine engines, on the other hand, have been in commercial production for many eyars by many companies as aircraft engines and for other non-automotive applications.
2) While many automotive manufacturers around the world have built and tested prototype gas turbine engines at one time or the other during the past 25 years, comparatively few of these manufacturers have had similar Stirling engine development programs.

For these reasons, the Stirling patent and licensing situation, although similar to that of the turbine in some respects, is different in others:

1) There are no basic cycle patents that would prevent any company from manufacturing either gas turbine or Stirling engines if it chose to do so.
2) While the thermodynamic principles of the gas turbine engine are, for the most part well understood, this is not the case with respect to certain aspects of the Stirling cycle. The Stirling cycle is complex, and much of the detailed know-how is proprietary with its developers.
3) Since relatively few companies have supported Stirling engine R&D programs over the years, presently existing patents are owned or controlled by these few developers.
4) As would be the case with the gas turbine engine or any other component, the risk of patent infringement can only be evaluated at the time a production engine has been designed and its manufacturing processes have been identified. It would appear, however, that the risk of infringement today might be greater in the case of Stirling than it would be in other situations.

My final example is the Wankel, or "rotary piston" engine. The patent and licensing situation surrounding this engine is totally different from the two previous examples.

In this case, it is the configuration of the engine that is important. The Wankel is an internal combustion engine that uses the same basic thermodynamic cycles that conventional reciproca-

ting piston engines have used for years. The difference is in the mechanical arrangement; the reciprocating motion of the pistons is replaced by an epitrochoidal rotary motion.

This configuration, and the adaptation of the Otto cycle to it, were invented by Felix Wankel in Germany in the late 1950s. I have not researched the history to determine when the first foreign patents issued, or when and how control of these patents was transferred to the eventual licensors.

Two U.S. patents, claiming the epitrochoidal rotary engine configuration and the application of the four-stroke engine cycle principle to this configuration, issued June 13, 1961. While these patents will expire this year, subsequent patents of perhaps less fundamental importance will continue to exist for at least the next several years.

What is known of the licensing history is interesting. The German licensors, Audi NSU Auto Union AG and Wankel GmbH, granted an exclusive license for North America to Curtiss-Wright. Thereafter, potential licensees seeking world-wide rights found it necessary to negotiate with both the German and the North American licensors. While this complicated arrangement may have inhibited some engine manufacturers, others became licensees and started development programs.

Ford obtained a license of limited scope and initiated an intensive rotary engine development program. This program was terminated when Ford concluded that a fully-developed rotary engine would not be competitive in terms of fuel economy with other alternatives.

Some companies are continuing to produce rotary engines and others are continuing research and development programs. The inventions that Ford made in the course of its research may prove to be of interest to these developers.

The Wankel licensing situation may well be a "once in a lifetime" story. In the early 1970s, some industry observers were predicting that all passenger vehicles would be equipped with rotary engines within 10 or 15 years. The Arab oil embargo broke that bubble, along with many others. As so often happens in this industry, some very promising technology was made obsolete while it was still on the drawing boards.

As I indicated in my opening remarks, no single patent and licensing policy would be adequate to deal with all of the technologies with which Ford Motor Company is involved. I hope that the examples of the gas turbine, Stirling, and Wankel engines adequately illustrate the need for flexibility.

Abstract

Ford Motor Company is probably best known as a major producer of automotive products on a world-wide basis. But Ford also has other business interests, including aerospace and communications products, and is a significant producer of basic materials such

as steel, glass, paint, plastics, and chemicals. This complex product line involves a broad spectrum of product, material, and processing technologies. It would be difficult to maintain a single patent and licensing policy that would be applicable in every situation. This paper discusses past and present licensing activities, with emphasis on automotive products, to illustrate how licensing fosters the technical innovation process.

Biographic Notes

James T. West has had a long career with the Ford Motor Company, serving in various engineering and planning assignments both in the United States and overseas. He presently is Manager of the New Technology Contract and Licensing Department of Ford's Engineering and Research Staff. Mr. West graduated from Northwestern University with a baccalaureate in Mechanical Engineering.

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10

Patent Policies in the Battery Industry

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The battery industry is something of an anomaly. By virture of the fact that the products, cells and batteries, are invariably used as sources of electrical energy, it is classified as a subset of the electrical and electronics industry. For example, the Standard Industrial Code classifies all batteries under No. 3690 - Electrical and Electronics. A large segment of the industry serves the automotive market and is associated for business analysis purposes with that industry. Chemistry, chemical engineering, metalurgy and mechanical engineering are the key disciplines forming the basis of the technology, however. Patent practices are allied to those in the chemical process and process equipment industries.

A note on the size and scope of the industry is in order. Batteries are classified as primary or secondary according to their ability to be electrically recharged and discharged repeatedly. Primary cells characteristically are capable of being discharged only once. Typical applications include flashlights, hearing aids, watches, portable radios and calculators. Such cells are sold mainly through a myriad of consumer outlets; some sales are to the original manufacturers of the equipment. Sales in the United States for the consumer market are estimated to have totaled approximately $460 million in 1976. When one considers that the average selling price per unit, e.g., D-size flashlight cell, is less than one dollar, it is apparent that we are dealing with a true mass production industry. Process and equipment optimization are paramount accordingly.

Secondary batteries employ electrochemical couples which are nearly reversible resulting in the ability to recharge the battery by reversing the flow of electricity. After being restored to a charged state a "cycle" is complete. In some applications many hundreds of cycles are achieved. The lead-acid system makes up over 90% of the dollar volume of secondary batteries produced in the United States. In 1975 this amounted to approximately 1,05 billion dollars. Two markets were dominant. Starting, lighting and ignition (SLI) batteries for the automotive market

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accounted for 82% of the lead-acid production. Some 50 million units were made, of which 40 million were replacement. The second major market segment is the industrial market, which in 1975 was split among motive power, standby power and miscellaneous portions in roughly the proportion 4:2:1.

The brief analysis given above applies only to production of batteries in the United States. Batteries of most types are manufactured and used the world over. It is estimated that the remainder of the free world has a battery production approximately 2.5 times that of the United States.

Patent policies and practices are affected by the maturity of the products and the technology incorporated therein. We first discuss the principal product lines. Just as the old and reliable lead - acid battery makes up over 90% of the secondary battery market, the major factor in U.S. and World primary battery sales is the Leclanche or carbon-zinc cell. In 1976 approximately 55% of primary battery sales were made up of cells based on that system. Interestingly both the lead-acid and the carbon-zinc batteries were discovered in the 1860s; the former was exhibited by Gaston Plante in 1860 and the latter was reported by Georges Leclanche in 1868. The durability of these two products is remarkable, particularly in the light of the enormous technological advances made in chemistry and electronics.

Despite diligent efforts by a host of inventors, scientists and engineers over the intervening decades only two secondary battery systems have succeeded in finding a noticeable place in the market. These are the Edison cell (nickel-iron) and the nickel-cadmium cell. Thomas Edison devoted many years to perfecting his cell based on iron as the anode, nickel oxide as the cathode and a potassium hydroxide electrolyte. One premature (1901) entry into the market place resulted in failure and return to the laboratory. Several years later, 1907, the cell was reintroduced and a modest business developed. Manufacture of conventional nickel-iron cells in the United States was discontinued in 1974, although a small business still exists overseas. However, new designs are being developed today for possible industrial and on-road electric vehicle use.

Since the work of Edison, the only secondary battery to be successfully developed is the nickel-cadmium. In 1975 production for all applications, consumer and industrial, amounted to about 80 million dollars in the U.S.

Among the various primary cells available, the carbon-zinc cell is found to be most cost effective for a large number of consumer applications, although the premium cells are taking an increasing share of the market. The most important of the latter by common name and electrochemical couple are:

alkaline	- manganese	($Zn/KOH/MnO_2$),
mercury	- zinc	($Zn/KOH/HgO$), and
silver	- zinc	($Zn/KOH/Ag_2O$).

While these represent relatively new products, the technology of each can be traced back to 1882, 1884 and 1883, from top to bottom in the table above.

Thus without important exception the products which form the basis of the battery industry all date back to a period of intense -- but empirical in approach -- research in electrochemistry. One might conclude from this that the level of research and development effort and consequent patenting activity would be low. This is not the case. However, battery research and development exhibits a dichotomy.

New electrochemical couples are receiving some research attention and this topic will be discussed separately. After many years of benign neglect the mature products are the focus of aggressive development programs. Here the efforts are directed toward one or both of the following:

(1) New formulations of active components, e.g., grid alloy compositions in lead-acid cells, which offer some performance advantage for particular applications.

(2) New manufacturing processes and process equipment offering lower manufacturing cost and, perhaps, better performance, e.g., new container materials and processes.

Many patents have been issued in the past decade in the areas above. In most cases the major battery manufacturers hold title. However, in some cases material and component or equipment suppliers have been the inventors and developers and enjoy a profitable business based on proprietary position. The microporous plastic separator for lead-acid batteries is an example.

The importance of patents centered around product improvements derives from the fact that business in the conventional or mature technology battery products is fiercely competitive. Products, e.g., automotive (SLI) batteries, tend to be undifferentiated. A consequence of this, and other attributes of the distribution system, is that profit margins are not so high as in businesses in which a continual flow of new products is the norm. Accordingly, patents which give a competitive edge, even though it appears slight to an outside observer, are perceived to be important by the battery industry. Such patents are filed worldwide since overseas the production of batteries of all types has a higher dollar volume than in the U.S.

Research and Development on New Battery Systems

Mature battery technology, while it has found a place in the market, has many well identified short-comings. Batteries with either increased energy content per unit weight or volume or longer calendar and/or cycle life, but at a cost equal to or lower than conventional batteries, would take over and expand the market. This truism has spurred only modest efforts at exploratory R&D directed toward new battery systems by the battery industry.

Attempts by other than battery firms to enter the market by developing batteries based on new electrochemistry have yielded similar negative results.

Since World War II military and space requirements have led the Department of Defense (DOD) and NASA to support battery R&D on several novel battery systems for these special needs. The industrial contractors have been firms representing many major industries including aerospace, petroleum and electrical manufacturing. In the case of DOD, the patent policies allowing the contractor to retain commercial rights, have been accepted with minimum dissent. DOD funding has been sporadic, peaking during the Korean and Viet Nam conflicts. While some success was achieved in developing battery systems for the military and space requirements, the systems so far have been found not cost effective for civilian applications. A generic example of a successful development is found in the battery systems for artillery fuzing. These reserve or activated batteries well satisfy the application needs, but have found no consumer or industrial markets. Patent policy is not much of an issue in such circumstances.

In the past three or four years battery R&D has assumed a new importance as a consequence of the energy situation, particularly the need to reduce domestic consumption of petroleum based fuels. Batteries, along with certain other means of energy storage, are viewed as offering two possible ways of reducing the consumption of petroleum fuels (4,5). The first is by means of storing base load electrical energy (generated off-peak by nuclear fission or combustion of coal) for use in meeting peak demands. Current practice for many utilities is to meet the peak loads with electricity from oil-fired gas turbines. The second method of oil conservation is through use of battery powered electric on-road automobiles (6). In effect such vehicles will substitute nuclear or coal based energy for petroleum. The importance ascribed to these potential methods of petroleum conservation is such that the Department of Energy (DOE) has a budget authorization for FY78 totaling 16.7 million dollars for battery R&D. Plans call for continuing such R&D funding at about this level for several years. In addition to DOE the Electric Power Research Institute (EPRI) is funding battery R&D at a level of approximately 5 million dollars per year. The objective in EPRI's case is bulk storage for peak-shaving on utility networks.

The performance requirements for these "new" applications are sufficiently demanding that the mature battery technologies are considered unlikely to meet them. Accordingly, the major R&D programs are focused on so-called "advanced" or even "exotic" electrochemical systems. An example which has received considerable attention in the lay and technical press is the sodium-sulfur battery. This system operates at an elevated temperature (300-350^{o}C) and employs molten electrodes (sodium and sodium polysulfides) with a solid ceramic electrolyte (Beta alumina).

The reader is referred to the substantial literature which is accumulating on this subject for further details on this and the other advanced battery systems under development (7). DOE and EPRI have sufficient faith in the promise of this system to invest heavily in its development. Ford Motor Co. is budgeted to receive about 4 million dollars for DOE in FY78. The General Electric Company will be funded by EPRI in 1978 in the amount of 1.1 million dollars.

Participation by such industrial firms as Ford Motor Co. and the General Electric Co. considerably expands our earlier preview of the battery industry. In effect we are concerned with the patent policies of a large segment of the technologically based industry of the United States. As evidenced by the publicly visible actions of these firms in the patent arena, as these actions relate to batteries, the protection offered by the patent system and agency procurement regulations is being aggressively sought. Two of the first few waivers to title to U.S. patents resulting from ERDA (DOE) contract supported work were obtained by battery R&D contractors. Ford Motor Co. and Dow Chemical Co. early applied for waivers as provided for in Public Law 93-577, Federal Non-nuclear Energy Research and Development Act of 1974. Several other waiver applications have been submitted in connection with contract awards presently under consideration.

Another rough indicator of patent policy is the number of patents granted in a given field. In the area of advanced and conventional batteries there has been substantial activity in recent years and this level is being maintained. In 1976 over 100 patents were issued in class 429 on the subject of batteries. It is worth noting that patents in this field are considered valuable despite the fact that the technical risks are high and the time to commercialization is viewed by some as inordinately long. The reason is, of course, that although the risks are high, the potential rewards are commensurate, connected as they are to the automotive and electric utility markets.

Summary

The attitudes toward the patent system of that segment of U.S. industry which concerns itself with manufacture and sale of batteries based on mature technology or R&D on advanced batteries can be summarized as follows:

(1) Patents and other intellectual property are considered valuable assets.
   (a) Basic, e.g., composition of matter, patents on the mature technologies are of questionable value in light of almost a century of prior art. Trade secrets and know-how are useful, but not essential, elements of a successful business.
   (b) Process, equipment and component inventions can have substantial value. Patents are obtained in

most situations. Trade secrets and know-how are equally useful.

(2) In the case of contract funded R&D the present DOE and EPRI regulations, although restrictive in calling for title to patents developed on contract to be held by the agency, have sufficient flexibility so as not to be considered disincentives to aggressive pursuit of contracts.

(a) DOE policy has been to grant waiver to title where warranted.

(b) EPRI has sufficient contractural flexibility so that contractors appear able to negotiate acceptable compromise positions between the extremes of relinquishing all title to EPRI and retaining a totally exclusive position.

Abstract

Patents historically have played an important role in the development of the battery industry. Typically, efforts are made to obtain coverage of as many facets as possible of the use, manufacture and sale of batteries and related products. A very broad range of classes of invention are involved, ranging from composition of matter, through processes and devices to applications. Licensing and cross-licensing among U.S. and foreign manufacturers is common both in the U.S. and overseas. The major battery manufacturers carry out R&D for the various Federal Government agencies. This requires careful planning and management of research and development and a well thought-out patent strategy. The need to protect a patent position may influence the terms and conditions of the R&D contract. Examples illustrating the various facets of patent policies in this industry are given.

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Biographic Notes

Joining Gould Inc. as Director of Research, David L. Douglas has served for the past 14 years in a number of responsible positions on the corporate staff. His current assignment is Vice President-Contract Research in the research and development arm of the company. Dr. Douglas has been awarded both a bachelor's degree and a doctorate in chemistry by California Institute of Technology. He is the holder of two patents, the author of over 40 publications, and has served as a director and president of the Minnesota Academy of Science and as a director of the North Star Division of Midwest Research Institute.

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11

Patents and Licensing in the Petroleum Industry

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The petroleum industry is a complex and fascinating business. It deals with a finite natural resource which most of us take for granted. We've always lived in the age of oil and it's difficult for us to imagine any other way of life.

When you think of the oil business, what comes to mind? Probably oil wells, pipelines, tankers, oil refineries, petrochemicals plants, and service stations. The oil business is all this and much more. An integrated oil company, such as Texaco, is involved in all phases of the business, from the exploration for oil deposits to marketing the final products to the consumer.

There are six principal fields of operation in which the integrated oil company participates: Exploration, Drilling and Production, Transportation, Refining and Manufacturing, Petrochemicals, and Marketing. The petroleum industry is doing a marvelous job of coordinating these operations, employing a large scale, highly efficient logistical network to deliver an abundant supply of products to consumers at relatively low prices.

It is estimated that we have now in the United States in proven oil fields, reserves of oil equal to or greater than the amounts that already have been produced. The problem is that the oil left in many of the oil fields is not readily produced. It is entrapped in the geological formation, or "sand", by strong capillary forces which resist displacement by other fluids.

Enhanced oil recovery methods are now at the forefront of research and development efforts of the major oil companies and of many smaller organizations as well. Some of the older fields have been water-flooded to strip the sands of some of their residual oil. Conventional water flooding, however, still leaves more than half of the original oil in place. Detergents and other chemical additives are being

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tested in many fields to improve the efficiency of the water-flood operations.

Other methods of improving oil recovery are being developed or are already in operation. Some methods use liquid solvents for the oil; some employ carbon dioxide, steam, or hydrocarbon vapors; some use combinations of these materials. It should be possible by the use of various enhanced oil recovery methods to recover nearly all the oil from a given reservoir.

The oil industry is actively pursuing alternative sources of fossil fuels, such as, petroleum from Athabaska tar sands in Canada; hydrocarbon fuels from oil shales in Colorado, Utah and Wyoming; and fuel gases and motor fuels from coal. It is only a matter of time until the price of oil will make the production of each of these alternative sources of fuel economical.

As you no doubt already know, there is a move afoot in this country to divest the oil companies of their interests in coal. Such a move, if successful, would likely prove very unfortunate, since the oil companies have the technology for better coal utilization. These companies developed this technology independently and on their own initiatives. It is significant that the first commercial scale, high pressure coal gasification project, a 160 ton per day plant in Germany which has now been in operation for over a month, uses the Texaco Coal Gasification Process. This is particularly significant in view of the history of coal gasification, for it was the Germans who, in the late thirties during World War II, first produced motor fuels on a large scale from coal via coal gasification.

The scope of research and development carried out by the oil companies covers a wide area of subjects and involves a broad spectrum of scientific disciplines ranging from microbiology to nuclear physics. Sometimes there are unexpected fallout benefits to other industries, such as a stratified charge internal combustion engine, an improved ignition system, a waste disposal process for paper mill wastes, and a smoke filter for diesel engines, all of which were by-products of research in an oil company laboratory.

Other areas at the forefront of R&D today, aside from petrochemicals, are new and better refinery catalysts, and processes to improve both yields and quality of petroleum products and to eliminate air pollution. Waste treatment processes and coal utilization methods are also receiving a great deal of attention from the oil industry. The air and water are kept cleaner, the quality and value of products improved, petroleum supplies augmented and extended, and the consumer dollar stretched further, all as a result of research and development.

Patents help a company to realize a return on its R&D expenditures. The general policy of the petroleum industry is to protect inventions and investments in research and development

by systematic and aggressive patent programs. Patents protect processes and products for a company's own use and, in the case of products, often provide a competitive advantage in the consumer market. You are made aware of some of the patented products by advertising programs. You know, for example, that one brand of motor oil is said to give the motorist increased gasoline mileage because it contains patented friction modifiers. With another brand, engines are kept cleaner and run longer because of certain patented additives in the lubricating oils. Top brand gasolines keep carburetors and spark plugs clean and prevent carburetor icing and corrosion by the use of patented additives.

The licensing of company owned patents and proprietary know-how is common everyday practice in the petroleum industry. The general policy is to make technology available to qualified applicants through licensing at reasonable royalty rates. Aside from a few exceptions, patented processes, compositions, and apparatus are available to others inside or outside the industry.

Some older and well established processes are available for license at standard royalty rates. Process royalty rates are commonly based on the quantity processed, that is, barrels of feed stock supplied to a catalytic cracking unit, or the amount of product, for example, pounds of toluene produced. In the case of chemicals or catalysts, the royalty may be based on pounds of chemicals used or produced or on the net sales price of the product. Apparatus may be licensed on a per unit basis.

Royalty rates and other details of license agreements are determined by negotiation. The royalty rate often is determined by the value of the technology to the licensee. Since most companies are both licensors and licensees, the prevailing view is that the terms of a license agreement should be such that it is a good business deal for both parties.

A survey by Business Week (1) indicates that the petroleum industry spent something over $750 million in 1976 for research and development. Funds for the research effort of the petroleum companies are, however, being restricted due to the tremendous demand for new capital investment in every area of the business. This need for investment capital results in a cutback in services, such as research and development, and consequently, in obtaining patents. As a result, the number of patents issued to the five most active oil companies decreased at the rate of about six percent per year from 1974 to 1977.

A survey by Citibank (2) showed that for the period 1970 to 1975 the capital outlays of 37 United States-based oil companies exceeded their available cash flow. In 1975, for example, the cash flow shortfall amounted to more than 10 billion dollars. Changing economic conditions and the increased dependence of the United States on foreign oil have created a demand for enormous amounts of capital and for new refinery processing equipment and petrochemicals plants. Nearly 60 percent of the

capital and exploratory expenditures of Texaco (3) for the 12 months ended September 30, 1977, were for producing operations. About 35 percent went for manufacturing and petrochemicals plants, with the remaining 5 percent covering all other capital expenditures.

As a result of this squeeze on capital, there has been a shift in emphasis in R&D programs in the oil industry over the past several years. Fundamental research and even long-term applied research are being phased out in favor of product research and other near-term applied research, such as enhanced oil recovery projects and environmental programs. This shift in emphasis in research expenditures is not limited to the petroleum industry, as is brought out in an article in a recent Wall Street Journal (4).

A consequence of the shortage of capital has been increased participation in industrial R&D by the Federal Government. In the past few years it has become a major source of capital in the alternative energy fields, particularly in the area of coal utilization. In the not-too-distant future, if not today, only the Federal Government may be able to finance the large coal conversion plants needed to replace oil and natural gas as industrial fuels.

When a company accepts government financing of a development project, its patent and licensing program in that area will have to be reconciled with government patent and data policies.

In dealing with Government agencies, such as the Department of Energy (DOE) for financing R&D, it is necessary to negotiate the terms affecting the ownership of patents and the control of data and licensing rights.

Dr. Betsy Ancker-Johnson, in 1976, when she was Assistant Secretary for Science and Technology at the Department of Commerce, in commenting on the lack of uniformity of policy among the more than 20 government agencies funding R&D, estimated that some 30,000 contracts per year must be negotiated with these agencies. Some of these agencies acquire title to all inventions, but may waive title to private sector contractors under certain conditions. Others acquire only a license to national and state agencies, while still others permit a waiver of rights after an invention is made under the contract. As stated by Dr. Ancker-Johnson, these negotiations have "placed an enormous and needless burden on both the agencies and their contractors" (5).

Representative Ray Thornton (D-Ark.) on April 6, 1977, in introducing a bill, H.R. 6249, to establish a uniform patent policy (6) for inventions resulting from federally funded R&D, said: "Determining patent rights when an invention is the result of federally funded research has become increasingly complex". Anyone who has been involved in government contracts must certainly agree with that. The Thornton Bill was reintroduced July 28, 1977, as H.R. 8596 and is now pending before Congress. Details of this bill are the subject of another paper (7) in this symposium.

Under the Thornton Bill the contractor would retain title to all patents resulting from federal contracts and grants and may be required to license others under certain specified situations designed to safeguard the public interest. I believe that Dr. Ancker-Johnson is correct in stating (8) that the contractor generally is willing to license third parties without a Federal requirement to do so.

Meanwhile we must live with the patents and data clause requirements of the various government agencies as they are today. When a company enters into a contract with DOE for the development or large-scale demonstration of one of its promising proprietary processes, it is in danger of losing proprietary rights in both its inventions and its data, or know-how. Both patents and know-how are important licensing assets.

Standard patent clauses in DOE contracts provide that the title in inventions made "in the course of or under the contract" is in the Government (9). Any invention which is first actually reduced to practice under the contract also belongs to the Government (10). This means that the Government may get title to inventions made prior to the contract, but first actually built and used during the course of work under the contract. Thus, the Government may actually obtain title to patents on inventions made prior to the Government contract.

The real incentive in entering into an R&D contract is that the work under the contract will lead to commercial plants. For example, let's suppose you have developed a new process. It looks good in the laboratory, but before the process can be sold or used commercially, a demonstration plant must be built. Your company is unable to raise the money for the demonstration plant, but the government agency is both ready and willing to help with financing the project. Now, suppose that during the course of the contract, the process is first actually reduced to practice. The government agency may get title to all your inventions, whether previously patented or not, unless a waiver of title was negotiated into the contract.

Now let us assume the process proves to be a great success and it looks as though 20 to 30 full scale plants will be built in the United States and potentially that many more abroad. Your company does not have the available capital to build the plants. It developed the process, but the best it can do is to participate in one or two plants. Ordinarily, it could expect a good flow of licensing revenue from all the other plants. But the investment required is so large that the only plants that will be built are likely to be financed at least in part by various government agencies. The Government has rights to your patents and to the data (11) developed under the contract and, under the usual contract provisions, it may extend these rights to others. Even if you have been able to negotiate a waiver of title, the Government retains an irrevocable, royalty-free license to use the process for Government purposes and can extend the right to

states and municipalities. So, you're left in a worse position than your competitors. You spent the seed money and they reap the harvest.

There are some ways to get around this dilemma in negotiating contracts which are too involved to go into in this paper, except to say that you may negotiate, for example, to retain foreign licensing rights; you may restrict release of data by limited rights provisions in the contract; and you may be able to assert a background patents position through requiring licensing under these patents at reasonable royalty rates (11).

As you can see, the various factors mentioned are forcing reassessment of R&D and patent policies. First of all, it is important to try to identify promising inventions which were made prior to a government contract as inventions actually reduced to practice before work is commenced under the contract. Patent applications covering these inventions should be already on file before work begins under the contract.

Close cooperation between the patent attorney and the research director should pinpoint those inventions which should be actually reduced to practice prior to a contract, then determine what acts are necessary to develop an actual reduction to practice of the important inventions with minimum R&D time and expense.

The need for additional capital for R&D efforts in the private sector is abundantly apparent. It is hoped that Congress will adopt a policy toward inventions resulting from Government-sponsored R&D which will permit industry to accept Government funding without fear of loss of its related proprietary technology as contained in patents and licensing rights.

Abstract

Competition in the petroleum industry necessitates large expenditures for research and development. Patents are essential to protect these investments. Active research is carried out in the areas of exploration for petroleum deposits, data processing procedures, petroleum production techniques, offshore oil producing equipment, enhanced oil recovery methods, refinery and petrochemical processes, catalysis, new products, and improved fuels and lubricants. Extensive licensing of patents and know-how relating to improved hydrocarbon processing methods has been customary in the oil business for many years. Licensing royalties and terms usually involve lengthy bargaining. Licensing revenues are often plowed back into research resulting in continuing opportunities for employment of professional chemists and engineers. However, with government-financed contracts, restrictive and regressive regulations pertaining to inventions, coupled with other requirements, such as environmental impact statements and increased taxation and equipment costs, have resulted in a decrease in private venture capital needed for research.

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Biographic Notes

For over 30 years, Thomas H. Whaley has been involved full-time with patent work in the petroleum industry. For the last 10 years he has served as General Patent Attorney for Texaco Development Corporation. He is active in several professional societies and is the inventor or co-inventor on over 25 U.S. patents and their foreign counterparts. Mr. Whaley's academic training was obtained at the University of Colorado and the University of Michigan, where he was awarded degrees in chemical engineering, and at New York University where he was awarded his Bachelor of Law degree.

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12

Patent Policies in the Pharmaceutical Industry

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While I do not represent the pharmaceutical industry in a formal sense, I should first like to discuss its general characteristics. My approach will be from the perspective of major research-based companies with strong manufacturing and marketing capabilities. There are many such companies represented here -- in the ACS and in this annual meeting too, companies such as Lilly, Merck, SmithKline, Johnson & Johnson, Pfizer, Abbott, Upjohn, Bristol-Myers, Squibb Syntex, Schering, Warner-Lambert and many other U.S. companies. And the problems, policies and potential of these U.S. companies are shared by foreign-based companies such as Hoechst, Bayer, BASF, ICI, Beecham, Burroughs-Wellcome, Glaxo, Takeda, Fujisawa, Roche, Sandoz, Ciba-Geigy, Astra, Asta, etc. These are organizations commanding respect amongst chemists and physicians for their achievements in medicinal chemistry. Their achievements are many; from their laboratories have come compounds useful in the alleviation of pain, control of conception, the palliation and, increasingly, some cures of cancer, the long-term control of hypertension and various cardio-vascular disorders, prompt cures of bacterial infection, relief of inflammation, and other conditions relating to health. Most of these companies around the world compete with each other -- in a commercial sense, for market share and profits, and in a social responsibility sense, to provide better medicine for relief of medical problems.

This is a proud history, a history of invention, innovation, investment, development and achievement. Of the investment I'll speak more later.

There is, by the way of contrast, another side of the pharmaceutical industry; the companies constituting this aspect are not research-based, are not innovative in a scientific sense and contribute little to the advancement of medical science. They perform distributive functions -- buying or producing and selling mostly older, off-patent drugs with an emphasis on price. These companies, of course, employ very few researchers, have low costs (though they often charge for their products what the traffic will

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bear) and sometimes come into conflict with the first group of companies over the infringement of their patents.

The entrepreneurial, research-based pharmaceutical industry has a few close relatives -- other organizations that make and bring pharmaceutical inventions into public use and benefit -- and in doing so rely upon the financial investment incentives of the patent system. Representative of such organizations are National Research Development Corp. (NRDC), a Crown corporation of the United Kingdom, and similar organizations in several other countries. In addition, SRI International of Menlo Park, California (formerly Stanford Research Institute), and Microbial Chemistry Research Foundation (MCRF), of Tokyo, both non-profit research institutions fund creative pharmaceutical research with monies generated from their sale of research results through patent licensing.

It is of interest, and significant to note, that these patent-dependent organizations historically have, and still are, producing most of the new drugs (new chemical entities) coming into modern health care -- see "The Life/Death Ratio" page 122, where it is said that:

> "It is a central fact that we get our new medications from research-and-development-intensive pharmaceutical houses. These are private-enterprise, profit-motivated businesses. They have proved to be more creative, innovative and economical than other sources."

And, unfortunately for the United States, for a variety of reasons, more and more of these new drugs are coming from foreign pharmaceutical companies.

Now, back to research and to patent policy within this type of research organization, i.e., research organizations characterized by their innovative pharmaceutical product goals and their funding out of profits from prior successes.

The first critical fact is that research in this industry is very, very expensive. At this point, I could cite many cost figures but I will not, or at least, not many. Please bear in mind that research and development (R&D) costs must be judged in comparison to market potential, and with a view to the probability of reaching that market by showing scientific merit and obtaining regulatory approvals (not necessarily the same problem). In a recent article in Clinical Pharmacology and Therapeutics, January 1976, Professor Gross of the University of Heidelberg laments:

> "Never before have budgets for the research and development for new drugs been as large as they are today. The results are not commensurate with the investments of time, effort, and money. To an increasing extent, research organizations within the drug industry have to devote a great part of their work to the observance of regulations..."

Last month (February 19, 1978) I read in the New York Times that the U.S. Department of Commerce had noted a loss of momentum in innovation and was about to study the question; among others:

"Is industrial research and development becoming increasingly 'defensive' rather than innovative to cope with proliferating Government regulations?"

I suppose that represents progress -- to recognize the question, if not the obvious answer.

So costs are high -- and in our economic system funds must be obtained from profits from product sales -- to amortize borrowed costs of research, or, more typically, to pay currently for new research looking forward to still newer product innovations.

PATENT PROTECTION SOUGHT

What do these costs and their recovery have to do with patent policy? Very much. Some statements of this industry's research/patent policy have appeared in print -- and I offer you some quotes:

One economist said in the book The Future of the Multinational Pharmaceutical Industry to 1990 by Barrie G. James:

"...patents are the essential means by which a firm gains funds for future research, rather than as a 'reward' for its past efforts, since it enables the continuity so essential to research."

Depending on a company's financing requirements, the patent position may be necessary also to recoup past expenditures from present sales. I believe that over 95% of the new drugs introduced in the United States in the last 10 years have been developed and first marketed under patent protection.

As a matter of policy, more realistically, of necessity, the pharmaceutical industry relies on patents to protect markets for its innovative drug products, thus enabling it to finance ongoing research.

A research management textbook, The Fundamentals of Research Management by William G. McLoughlin, has been cited with general approval within the industry, as follows:

"...All research and development should be conducted with a firm objective to produce a proprietary position for the company."

and later

"Patents and trade secrets are the evidence of a proprietary position, and the objective of research should be patents and trade secrets".

PAPER PATENTS

Parenthetically, and as one who has studied many patents, good, bad and mostly indifferent, it should be noted that the only patents and trade secrets constituting a proprietary position that will support research are those which deal with products of real value to users. Actual value of course only becomes known long subsequent to filing. "Paper patents" provide

very few basic benefits to their owners, do not aid investment and are not sought intentionally by industry.

To cite an example, the patents on 7-ACA and cephalosporin C brought in millions of pounds and dollars of royalty income to NRDC and supported much further research, but a great host of NRDC's related patents on cephalosporin products and processes which turned out to not represent an advance, brought in practically no income.

GEOGRAPHIC SCOPE OF FILING

Turning now to another aspect of research finance and patent policy, as R&D costs per drug have mounted (due, in major part, to regulatory demands), it has become imperative that patents be obtained in many countries so that the higher costs of development can be recouped from profits from sales or licensing in a larger market. Many chemists have learned about international patent filings when they are asked by patent attorneys to sign applications, petitions and assignments for each of perhaps 10-40 countries. Members of the industry have long since passed beyond provincialism to view as their natural market not merely their home country, but all nations where their drugs are useful. And the utility of medicinal products is almost universal since almost all of humanity share the same medical problems -- infection, hypertension, cancer, trauma, and pain among others.

It is obvious, but could be overlooked, that pharmaceutical products are notoriously easy to copy once their specifications, utility, dosage and other attributes have been established. The basic component of most pharmaceutical products are chemical compounds which competent chemists can make. Thus, without patent protection (and sometimes unfortunately with patent protection in hostile environments), costly research can be copied with comparatively little investment, and the innovators' field invaded; whether such copies are therapeutically equivalent is another story involving the current bioequivalents controversy. The protection afforded by patents is important to both large and small companies and to individual inventors; without patents they generally cannot afford to enter this arena of activity.

Another factor bearing on drug industry research funding and patent policies is the long gestation period of new medicinal products. To bring most products to clinical use requires from 5 to 15 years of developmental research, the shorter period in the case of some acute care drugs, e.g., anti-infectives, the longer where drugs are involved in chronic use such as hypertension, and peripheral vascular disease. Such long developmental periods substantially reduce the period of useful patent protection.

NEW INTERNATIONAL PATENT TREATIES

Up to the present, it has been possible to protect the re-

sults of research and development only under the terms of various national legal systems, each of which provides for the issuance of a patent restricted to a given geographical territory. Each country developed its own patent system and an international policy in patent law was encouraged only by the International Convention signed in Paris in 1883. Essentially, this Convention gave an applicant in any of the member countries a "right of priority" as to the date of the first application filed in his country.

This year, 1978, brought an end to this period and the beginning of a new era in patent policy. Effective this year, applicants seeking international patent coverage have the option of selecting from various filing procedures. These include the following:

In June 1970 an International Agreement was signed in Washington entitled Patent Cooperation Treaty (PCT) to simplify filing and novelty search procedures for the issuance of patents throughout the world.

In October 1973 an agreement was signed in Munich by certain European countries entitled European Patent Convention providing for a further simplification by providing a single examination procedure for the member countries.

Finally, in December 1975 the nine member states of the Common Market signed an international convention providing for the creation of a Community Patent, i.e., a single patent valid for all the Common Market countries.

These new international arrangements are so new that the pharmaceutical industry has no established practice or policy respecting them. A few years hence, this will be an interesting area to discuss.

PATENT AND KNOW-HOW LICENSING

Not all companies and organizations are able to market drugs in all countries. And some small companies choose to seek an ally before joining the rough and tumble of the marketplace. Some very productive research organizations like MCRF and SRI do not market at all. Such gaps in worldwide marketing capability coupled with excess marketing capacity in other markets, leads to another important practice or policy in the industry-- licensing activity. Most of the companies mentioned do substantial patent and know-how licensing. Most of these companies, in the markets they service, have both the capacity and a great need to market new products, more products than their own research and development groups can produce as well as products in fields in which they lack research competence.

Thus, we in the pharmaceutical industry seek licenses from other companies or from the government or academic laboratories which cannot market. When new products are sought, the scope and strength of patent protection is of critical, often decisive im-

portance. If the R&D investment necessary to prove safety and efficacy has yet to be made, then only patented products are acceptable. Either exclusive or non-exclusive licenses are acceptable, the choice depending on the investment to be made, the territorial scope of rights available, the market potential of the product, and a number of other factors.

PUBLICATION POLICY

Intensive use of the patent system enables the pharmaceutical industry to encourage its scientists to publish research results quickly and completely in the scientific literature. And patents themselves are important publications. Publication by the great corps of industrial scientists has high social value in that further research is both guided and motivated by published research results.

POLICIES REGARDING LEGISLATION

It is also a policy of the pharmaceutical industry to defend the patent system in the legislative area, both as a general social policy, and in terms of the specific role of the system in the worldwide pharmaceutical industry. From time to time, various special interest groups and legislators have attacked the patent system, particularly as it relates to "drug patents" and other patents in areas of high public interest such as energy, pollution control, safety devices. It is my opinion, and an intellectual and ethical basis of my professional activity, and it is the industry position, that, in both philosophical and practical terms, a strong patent system serves the public good. The patent system provides economic incentives to engage in research and to encourage investment. It is desirable that individuals and companies have incentives, be strongly motivated, and well-financed in those fields of research that lead to improvement in medicine, health care, the production of energy and enhancement of safety. More importantly, of high value to the nation and its individual citizens, progress needs to be made in these areas more than in some areas of gadgetry patenting where negative interest is not generated in the general public and legislators. As fathers and mothers, sons and daughters, we want better drugs for our families -- to relieve pain, heart Problems, cancer, and other serious diseases -- and we individuals in the pharmaceutical industry want to preserve the patent incentive because it enables further research and development to be done.

The industry operates in the legislative area through the usual type of trade association, in this case, the Pharmaceutical Manufacturers Association (the "PMA"), through international associations and through ad hoc committees. For instance, an international ad hoc committee recently prepared a brief against a proposal that the Paris Convention (the basic international

treaty that provides the framework for much patent protection) be amended at the insistence of some lesser developed countries, to provide for exclusive compulsory licenses. This is folly magnified -- the inventors' protection would not only be nullified - but given to others and the innovator excluded. The royalty rates in compulsory licenses have almost never reflected adequately the value of the affected industrial property rights.

Advocacy in these areas is generally before national legislative bodies, such as the U.S. Congress, European parliaments, and the United Nations.

The recent enactment of certain legislation and recent court action have provided some heartening news - patent protection for drugs has gained some governmental support where it had not existed before. The European Common Market supports pharmaceutical patents as do most industrialized nations. Under Common Market pressure, in Italy, the courts recently held that the discrimination against drug patents violated long standing Italian law and that drugs should have equal protection under the old law. In 1968 Germany amended its patent law to permit product protection for chemical inventions including pharmaceutical inventions. In 1976, Japan followed suit, providing product patent protection.

Prior to amending their laws, both Germany and Japan had strong patent systems. Yet with the rapid progress of their domestic technology and the industrialization of their country, these countries deemed it advisable to provide even stronger patent systems. Other industrialized countries such as Switzerland and Holland are moving in the same direction, and this year the countries will permit product protection for pharmaceutical inventions.

There is a contrary movement also, since a number of developing countries have undertaken changes in their legislation with a clear intent towards weakening or abolishing patent protection in their countries. For example, Mexico, in 1976, in effect, abolished patent protection for pharmaceutical inventions by providing in their law that only certificates of invention shall be granted for inventions dealing with pharmaceuticals. In other developing countries, process patents only may be obtained even though the invention resides in a novel pharmaceutical compound.

In the United Kingdom, a new patent law will not contain their archetypical pharmaceutical compulsory licensing provision; the British have realized that such compulsory licensing constitutes bad public policy. Perhaps the Canadians will one day come to the same conclusion.

Meanwhile, the pharmaceutical industry, and most of us in it, will strongly support and try to maintain and to improve the operation of the patent system in the health care area.

GOVERNMENT PATENT POLICY

Some of the existing governmental policies, particularly those of the Department of Health, Education, and Welfare (HEW), are of importance to the pharmaceutical industry. The licensing policies of HEW which are of most importance to our industry, are quite reasonable and are reasonably administered. Our interests center in two areas -- first, the development and distribution of drugs where the relevant patents and know-how are held by the government or a government grantee, and second, the conduct of pharmaceutical research under government contract. In the first area, a developer can obtain exclusive rights from the government for a limited period of time, about 3 to 8 years. Since research and development costs are usually great, and exclusivity for as long a time as possible is generally necessary, it is the policy of industry generally to support existing HEW policy and proposed improvements to it.

Thus, to summarize, the principal patent policies of the pharmaceutical industry, which, in part, are also research planning policies, are:

First: to seek in research to discover and to develop compounds and processes that are patentable.

Second: to seek patents on new products and processes in many or all countries which afford meaningful patent protection and which constitute a significant market for such products.

Third: to seek patent rights from others through licensing to fully utilize capacity to manufacture and to market.

Fourth: to publish research results, relying on patents to protect proprietary interests.

Fifth: to advocate strong patent protection in legislative and regulatory forums throughout the world.

Sixth: to support the existing governmental patent licensing policy of HEW.

Abstract

The small proportion of research intensive U.S. pharmaceutical companies having substantial research programs are dependent for financing on the availability of patent protection. Industrial research produces most new drugs selected from hundreds of candidate compounds. Because of high initial R&D and product registration costs, which must be repeated in most major countries, industrial pharmaceutical research must result in products which are patentable in multiple markets in order to be

economically viable. Research activity is geographically dispersed on a worldwide basis; regulatory pressure in the U.S. tends to shift some research investment overseas. The availability of patent protection also facilitates public use of research results.

Biographic Notes

Curtis W. Carlson has spent over 20 years in the pharmaceutical industry as a patent attorney engaged in patent prosecution, litigation and licensing. At present he is Patent Counsel and serves as the chief licensing lawyer for the Bristol-Myers pharmaceutical companies. Mr. Carlson has been admitted to the bar in New York, Illinois and Wisconsin. He has both an arts baccalaureate and a law degree from the University of Wisconsin.

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The Role of Patent Liaison in the Protection of Intellectual Property

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Is it possible for a scientifically trained inventor and a legally trained patent attorney to combine forces to write and prosecute a viable patent application? With the difference in educational backgrounds of these two people, do they speak and understand the same language? Are there barriers to communication? Are there problems?

The Supreme Court, as long ago as 1892, signaled the existence of a problem when they stated (1): "The specification and claims of a patent, particularly if the invention be at all complicated, constitute one of the most difficult legal instruments to draw with accuracy; and in view of the fact that valuable inventions are often placed in the hands of inexperienced persons to prepare such specifications and claims, it is no matter of surprise that the latter frequently fail to describe with requisite certainty the exact invention of the patentee, and err either in claiming that which the patentee had not in fact invented, or in omitting some element which was a valuable or essential part of his actual invention."

Was the problem alluded to by the Court partially a problem of communication?

Some time ago, at a seminar on patents conducted by patent attorneys and attended by scientists, a young scientist asked the question: "Why aren't patent claims written in understandable English?" A senior attorney succinctly replied, "They are!"

Now it begins to sound as if there is a communication problem. But, is the communication problem just between the patent attorney and the scientist? Consider the following statement by the late Judge Smith, Associate Justice of the Court of Customs and Patent Appeals (2): "Those who may be called upon to adjudicate the validity of the patent granted thereon for the most part are non-technically trained."

A burden is created on both the attorney and the inventor to write a patent application in language which is legally and technically sound, yet of ultimate clarity to the "non-technical" audience. To lighten this burden, we recommend the incorporation

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of the "Patent Liaison Function" into the system. In developing this proposal we will dicuss four aspects:

1. The Communication Problem,
2. Why Pursue Patent Protection?
3. The Role of Patent Liaison,
4. The Qualifications for Patent Liaison Work.

1. The Communication Problem

A scientist, through his education and training, is taught, yes, even brainwashed, into thinking and communicating in the passive voice. This is a learned form of modesty, and when he becomes recognized by his peers, he gets a pat on the back. Additionally, he is expected to be logical.

A scientist, after running 23 experiments, in desperation, finally picks up some "serendipate" from the shelf, and, lo and behold, gets a yield of 86% for a new compound that will solve the energy shortage problem. His mind immediately goes to work with computer-like speed, and he states that obviously, when one considers the d orbitals, the "serendipate" would catalyze the reaction. Such a statement would send into orbit any self-respecting patent agent or attorney. For the legal mind, the words "obviously, inherently, theoretically or quantum mechanical model" are enough to send him home in a particularly foul mood. For the scientist, "whereas, hereinbefore, said, comprising, consisting essentially of," and similar legal jargon, raise the blood pressure. And so, we recognize that certain words raise red flags.

In comparing the backgrounds and experiences of lawyers and scientists, it appears that most scientists, especially young ones, have little or no training in patent literature, are not aware of the requirements of patentability, nor are they aware of the rights conferred by patents. On the other hand, although most patent attorneys have technical degrees, very few have practiced as scientists or engineers prior to becoming attorneys. Their primary language and understanding is the law as opposed to science. Hence, we have the scientist and lawyer, each with different backgrounds and languages, trying to communicate on a common ground. It is small wonder that confrontation and confusion frequently result.

Probably, the most difficult aspect of patent work for the attorney is setting the scope of an invention. No self-respecting scientist ever wants to admit that his invention is insignificant, and so he stretches and stretches, and in so doing encompasses all sorts of prior art. Prior art to the scientist seems to be nonexistent unless an experiment is done precisely as he, himself, did it. However, to the attorney, that prior art is most important because he knows what the patent examiner will do with it. And so, we have another example of the lack of mutual understanding between the scientist and

attorney.

Now, there are exceptions to this rule. For example, in those industries where all patentable matter is in one or two areas of technology, an attorney can specialize in these technologies and learn to communicate well. But, in a company that deals with many diverse technologies, the communication problem between the attorney and scientist can be severe. For example, in a company such as 3M, patent attorneys and agents in a single year have worked on applications involving unique fluorochemicals, adhesives, tapes, magnetic materials, electron beam lasers, copy media, pyroelectric materials, abrasives, ceramic materials, dental plaque, Fresnel lens, radiation shields and solar collectors, to name a few. To expect an attorney to master the multiplicity of scientific disciplines and technologies involved in such diverse technologies is a gigantic burden.

2. Why Pursue Patent Protection?

Let us quickly review the purpose of a patent. The decision to file and prosecute a patent application is a business decision, just as the decision to conduct research and development is a business decision. The successful prosecution results in a contract between an inventor or his assignee and a government.

This contract is known as letters patent, and in more precise terms: "A patent is a contract between a government and an inventor (or his assignee) in which the former agrees to give the latter the right to exclude others from making, using, vending or selling his invention for a limited period of time provided the inventor makes a public written disclosure in terms so clear that anyone 'skilled in the art' can practice the invention" (3). Please note the phrase, "the right to exclude others". The value of a patent, therefore, rests not in the inducement to invent, but in the protection afforded those who commercialize the invention.

Since whether to file an application is a business decision, it would be intelligent to recognize that in return for a full divulgation of the invention, the inventor or assignee will receive certain well-defined considerations. It is of importance to remember, further, that the same sort of business decision must be made on each foreign application. Marketing, production and level of sophistication of the technical data must all be considered in filing each application, as well as the level of capital investment.

Hence, business information must be clearly and effectively communicated to patent counsel to enable them to act expeditiously to build a foundation for future businesses of the company.

3. The Patent Liaison Role

The person performing the role of patent liaison must be of

significant aid to the inventor, the attorney and management if the function is to be viable.

As an aid to the inventor, patent liaison may provide guidance in defining the invention and suggesting experiments to establish its scope. Patent liaison may also be required to search out and interpret the prior art. Scientists seem to be able to read technical journals, but they are woefully inadequate when it comes to reading and interpreting the patent literature. Frequently, it may be necessary for patent liaison to write a technical working document in language that can be utilized by the attorney. Finally, he may be required to interpret requests for data from the patent attorney, and he may have to work with the inventor to devise a means for procuring such data.

As an aid to the attorney, patent liaison must serve as an expeditor in schedule setting and assessing priorities, as an interpreter and conveyer of technical data and business requirements, as a teacher of new technology, as a writer to help develop language for the patent application and as an expeditor to make sure that a draft of an application receives prompt review by the scientist.

As an aid to management, the patent liaison must take all the necessary steps to aid in the procurement of enforceable patents which cover the business envisioned. The word "enforceable" is key here; the patent liaison must be aware of the prior art, monitor records so that evidence for conception, diligence and corroboration are well documented; he must control divulgation so that foreign rights are not compromised, and he must be sure that patent claims are broad enough to protect the anticipated business. He must also be a controller and be aware of marketing. There is not much point in taking a case to the Board of Appeals or higher if the invention is not going to produce some revenue. First of all, it costs money and, secondly, but more important, it may tie up an attorney, a scientist, patent liaison and management when more important potential business should be protected. Actually, getting patent coverage is like playing poker. It's important to know when to fold your hand when the cost-benefit ratio is in danger of getting out of control. Or, conversely, it is important to know when to "go the limit" when the stakes are high.

4. The Qualifications for Patent Liaison

The qualifications which are basic requirements for the patent liaison function can be summarized in three categories:

1. Knowledge
2. Image
3. Communication skills

The most desirable knowledge includes technical training and experience, an understanding of the U.S. and foreign patent

system, an appreciation for trade secrets, an awareness of corporate and business goals and basic knowledge in management skills and interpersonal relationships.

In selecting the person for the patent liaison function the image of the person is most important if the position is to be viable. Technical competency, peer respect and pleasant personality are primary requirements. Additionally, the person must possess tact for he must deal effectively with the goals of management, the inventor and patent counsel. He must be willing to serve without credit; self-gratification results from knowing that his efforts contributed to the success of others. It is a matter of fact that, if a project is a huge success, business management will receive a preponderance of credit which is generally reflected onto technical management and the inventor or inventors. Unfortunately, the attorney is frequently forgotten when management passes out credits, but the attorney does gain stature among other attorneys for his wisdom in writing the claims and prosecuting the application to issuance of the patent. If the patent liaison individual is one who requires a continued pat on the back and continued credit for a job well done, he is not suited for the job. He must be a confident individual who is sufficiently self-motivated that continued credit is not a necessity. Such is the way of life of a staff function. As indicated previously, self-motivation and gratification come from knowing that his efforts contributed to the success of others.

Finally, we should like to emphasize that patent liaison must possess excellent communication skills. Both oral and written communications must be well organized so that the information will be meaningful to the inventor, the attorney or management. It is important to realize that each receiver of information may require a different type of presentation. Conversely, the patent liaison must be a good listener with ability to ferret out and analyze information. Also, selling skills will be required to convince each of the trio of the value of the others' requirements.

Why would anyone with all these great qualities want to take on a job such as patent liaison? Corporate responsibility entails providing to the patent liaison a good status as shown by well-appointed office and secretarial help, an excellent salary and evidence of reliance upon the function and the function's activities. Since the requirements for patent liaison suggest extensive technical experience, e.g., 10 to 15 years in the corporation, the position is a second career possibility. Hence, although the position is extremely challenging, it is also very attractive.

Patent liaison serves as a right arm for management, the inventor and the attorney. The result is expeditious filing and prosecution of patent applications. In addition, the patent liaison person may serve as a "bird dog" who can suggest to

management further developments or newer areas of research. The attention and recognition of technology by patent liaison gives stature to the inventor, providing critical review of the technical aspects of patent applications as well as prior art, and thus aiding in preparing viable and defensible patents. To the corporation, the patent liaison efforts enhance the protection of future business and resulting profits.

Obviously, the communication problems alluded to herein are immense and the solution of incorporating into the system the patent liaison function sounds almost too ideal. Yet, by careful selection of the candidate for the role, viable operations do ensue as evidenced by successful operations in such corporations as 3M, Dow, Phillips Petroleum, Kodak and other companies.

Abstract

The protection of intellectual property by the procurement of enforceable patents encourages industry to develop new technology, thereby stimulating sales, profits, the economy and the creation of new jobs. In diversified technological industries, the protection of intellectual property is exceedingly complex. The subject matter is frequently very complicated, and the validity of patents often must be adjudicated before non-technically trained judges. If the traditional direct interaction between attorney and inventor is expanded to include a patent liaison link, a more viable approach to protecting intellectual property is obtainable.

This paper describes how technically competent, tactful, legally-aware patent liaison can assist the inventor, patent counsel and management in defining inventions, developing adequate support documents, devising supporting experiments and preparing and prosecuting patent applications.

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Biographic Notes

J. Wade Van Valkenburg obtained his doctorate in surface and colloid chemistry at the University of Michigan. He worked as manager of patent administration at the Dow Chemical Company before joining the 3M Company where his present position is patent liaison. He is studying currently for the law at William Mitchell College of Law.

Donald R. Schultz is presently senior patent liaison at the 3M Company Central Research Laboratories. He has a doctorate in inorganic chemistry awarded by the University of Michigan and served for five years as patent liaison at 3M before assuming his present position.

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Panel Discussion

QUESTION: Assuming you have obtained Food and Drug Administration (FDA) approval to market a new drug covered by patent claims, must another company wishing to market this same drug obtain clearance again through submission of a New Drug Application (NDA), and include evidence of effectiveness, safety and use of good manufacturing practices?

MR. CARLSON: That is not quite true. In addition to complying with the good manufacturing practices regulations, the second company would need to obtain an approval to market such approval being different for certifiable drugs, basically antibiotics, from new drugs. With antibiotics proof of the identity of the second product with the existing approved product is sufficient. With new drugs it is necessary to show safety and efficacy using the same procedures as the original innovator did, unless it's a drug that's generally recognized as safe and effective. In that case there might be less of a burden.

QUESTION: Then a second company that might decide to infringe a first company's patent may have to go through essentially the same procedures with the FDA. Isn't that an additional protection for the first company?

MR. CARLSON: It is a form of protection, although the second company need not always be as detailed as the first in the material submitted to FDA.

QUESTION: It is my understanding that, once a drug is approved by FDA, another company marketing the same drug after the patent expired would not have to go through the complete toxicity and efficacy trials, but would merely have to show bioequivalency. And there's some question about whether bioequivalency would necessarily have to be shown for all such drugs. Is this true?

MR. CARLSON: What needs doing to get marketing approval is very complicated. Whether patent protection exists or does not exist is not material, because the existence of a patent, expired or not, makes no difference in obtaining authority to market. Unless the drug has achieved some status and is generally recognized as safe and effective, the testing work needs to be repeated. While some of the work may need to be repeated, and that affords a form of protection, the copier need only copy the successful testing, not any unsuccessful work, and this reduces tremendously the amount of investment needed to get drugs to the market.

COMMENT: A distinction needs to be made between pre-1962 approvals and post-1962 approvals. Before 1962 all drugs were reviewed by a special panel of the National Research Council which decided whether they were safe and effective. Drugs reviewed by this panel are in a different category from those reviewed or approved after 1962. Anyone who wishes to manufacture or sell an unpatented safe and effective drug approved before 1962 need only file data which proves that he has adequate manufacturing and quality controls. This filing is an Abbreviated New Drug Application. FDA will approve marketing on that basis. To obtain clearance to market a drug approved after 1962 one must present safety and efficacy data. This includes clinical efficacy, toxicology and all the other required evidence of the same quality as that presented for initial approval of that drug. A number of "grandfather" drugs, which were being marketed much earlier, require less information than the pre-1962 approved drugs.

QUESTION: How do companies generally decide whether to file patent applications? If it is a committee decision, what is the composition of the committee?

MR. WHALEY: At Texaco it is a combination of technical liaison men and patent attorneys, but no representative of the research and development (R&D) department. However, R&D's comments and its preliminary evaluation of the invention is considered by the committee.

QUESTION: There has been some controversy as to where the patent department should report in an industrial company. Should it report to a corporate counsel or should it report to the research and devlopment director? How does the patent liaison person fit into this organizational structure?

DR. VAN VALKENBURG: The organizational structure and reporting lines will vary from company to company. At Dow, as Manager of Patent Administration, I had dual line reporting, since I reported to both the Vice President of the division, and to

Research, through the Research Vice President. At the 3M Company, the Technical Directors have direct responsibility for patents. So within the organization the patent liaison people report to the Technical Directors. At 3M the legal arm has its own corporate vice president, and is a separate entity, and the patent attorneys do not report to reseach and development. In deciding about filing a patent application, the procedure involves the preparation of a patent proposal by patent liaison, after conferring with legal counsel as to patentability, and then a business decision on filing a patent application is made in the laboratory. An authorization to file is then given to patent counsel. The laboratory is charged for patent counsel's services.

MR. WEST: At Ford, engineering is going on in each of the several operating departments. Each of these departments is responsible for its own engineering and for centralized research. But invention disclosures can come out of any one of 20 to 25 different Ford organizations around the world. A centralized legal department then writes up the U.S. patent application.

DR. DOUGLAS: At Gould the patent organization reports to the chief legal counsel but he has a very strong staff relationship to the director or vice president of R&D. We do not have patent liaison people. The decisions on filing patent applications are made by a committee which involves the management of any divisions that happened to have a business interest in the invention. With a totally new technical development Gould has a New Business division, which would probably have representation on the committee.

QUESTION: Mr. Van Valkenburg, at what point do the patent liaison people complete their work as communication links between the inventor and the patent attorney or agent, allowing these two people to continue developing patent applications face-to-face?

DR. VAN VALKENBURG: It is very critical that the attorneys and the inventors do get together. The liaison activity usually phases out after the patent proposal has been written. The patent attorney then generally talks to the inventor, getting first-hand any additional information needed. The patent proposal, as just a working document, gives basic information which aids the attorney at the start. The attorney keeps the patent liaison people aware of his progress so that information can be obtained relating to technical or business points which could help to strengthen the patent claims in light of marketing requirements. 3M's patent attorneys are all corporate staff members.

QUESTION: Mr. Van Valkenburg, how do you recruit your patent liaison people? Do you lure them from research or other divisions within the company, or do you hire them from outside

the company?

DR. VAN VALKENBURG: The last person we recruited for patent liaison was a physicist who had been in our laboratory for 15 years. He had made a number of inventions that had done well, and was the unanimous choice of the existing patent liaison staff. He was asked if he was ready for a second career, and he accepted this concept. In a patent liaison organization, there is a danger that management, even though it supports the function, may wish to impose on the liaison group someone who has not worked out well elsewhere in the company. This should be resisted. The patent liaison person must be well qualified and he has to be so recognized as this will establish stature within the organization so that people will aspire to the liaison position. Usually people should have 10 to 15 years of experience within the company company, thus bringing with them a broad knowledge of the company as a whole.

QUESTION: There has been some movement recently towards reforming the patent system. The point has been made today that the actual viable life of a patent is more nearly five to seven years rather than the statutory 17 years. Is there any movement among patent attorneys to revise the statutory life of a patent to make it agree more with reality?

MR. CARLSON: I know of no such movement in the pharmaceutical industry. Bills have been introduced into Congress which make the statutory life of a patent 17 years from the date of first marketing rather than the date of issue of the patent, but this provision does not have much support at present from either industry or the patent bar.

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General

Impact of Patent Policies on Creativity in Industrial Research Laboratories

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What I am going to discuss is based on personal experience and observations which antedate my present employment and concern the somewhat conflicting requirements of protecting intellectual property and fostering a creative environment. Protection requires restriction of the flow of information and the flow of personnel. Neither of these restrictions is conducive to maximization of creative effort, which requires an open, largely unrestricted flow of information, both formal and informal.

Let me illustrate. The Chemistry Department at Brookhaven National Laboratory was originally housed in buildings left over from World War I. There were no offices for the majority of research personnel. There was a single, wide corridor adjacent to the laboratories with desks on one side and blackboards on the other. The result was a considerable amount of impromptu discussions and conferences triggered by what appeared on a blackboard. Passers-by joined in or did not as their interests dictated. Wisely, when a new building was constructed, this arrangement was preserved. This made for an exceptionally open and unrestricted environment, thus stimulating others to provide new perceptions and different views, or to ask penetrating questions about many problems. Normal record keeping by the research personnel themselves was required but formal periodic reports were not, although informal reports at Departmental meetings were encouraged.

Such an environment is probably as open and unstructured as any research laboratory can hope to be. It is impossible to achieve such openness where retention of proprietary interest in the results is required. No matter what the nature of that proprietary interest is, it must be a documented interest. This requires formal recording of data, observations, solutions to problems and whatever else may be necessary to demonstrate that the knowledge for which a right is asserted resides within the organization asserting that right. Thus, the staff must be discouraged from not recording ideas. Timely documentation is important. Moreover, free exchange of ideas and data must be

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limited. At a minimum those made privy to the data must understand and protect its confidential nature. At the extreme, both those holding the data and any potential recipients of the data will operate on a "need to know" basis. That is, if there is not a demonstrated need for the data it is neither requested nor given. This extreme seriously restricts the stimulation of thought that new perspectives can bring.

Examination of the two extremes of policy, "Patent Everything Patentable" and "Patent Nothing, Keep Everything Secret", shows that both policies require record-keeping procedures that meet certain legal requirements. Any prospective patent application always entails the potential necessity of establishing the date of and completeness of the invention for patent priority purposes. This necessitates complete and accurate descriptions of the invention and establishment of its date of conception.

Most attorneys discourage any disclosure outside of the company prior to filing a patent application. Additionally, if the invention is important, both legal counsel and management may be reluctant to let information out even after an application is filed in order to preserve any technological lead the company may have. Such secrecy may be in conflict with the inventor's desire for recognition outside his own laboratory. It can be a particularly trying circumstance when the inventor must remain silent while academic investigators publish work which he has already done.

If the policy is "Patent Nothing, Keep Everything Secret" the record keeping becomes even more onerous. Not only must the proprietary interest be documented, the fact that it was regarded as and treated as a trade secret must also be documented. This requires that only those who need to know do know the trade secret, and unquestionably also requires that any disclosures outside of the company be under a written confidentiality agreement. The requirements of such a policy are considerably more restrictive than a policy requiring the patenting of inventions.

Let us look for a moment at the effects of patent policy on the inventor, the repository of the creativity that we are discussing. While I have never seen a "Patent Everything" policy written out, I have seen policies that come close to it. Such a policy has several interesting effects, not the least of which is much increased competition for the resources necessary to do research. This makes research direction difficult; if the organization is of any size, there is much "noise" in the system. The less creative workers are increasingly reluctant to give up on anything that shows any promise and they try hard to sell their ideas. There is an increased tendency to assert individual rights to ideas which may properly be ascribed to a group effort. Unless management separates the better workers from the less promising, the more creative researchers become increasingly disenchanted with the inevitable political maneuvering. Unless management is particularly astute what is thought to encourage productivity may

have a discouraging effect on creativity.

Let us take a little closer look at a creative individual in such a situation. I was once working, as patent counsel, with a small group of research chemists assigned to a common project. It had, on this occasion, bogged down. New ideas were needed. We were in a group conference discussing the problem. As attorneys will, I noticed that one group member, who apparently was only casually engaged in the discussion to the extent of an occasional question, was asking questions in a definite pattern and with definite direction. It was clear that he knew the answer but was not going to voice it. By the end of the session his questions had led the group to the correct answer. When it came time to file the patent application there was considerable sentiment within the group that this individual had made no significant contribution and should not be included as an inventor. It was years later on reading of studies with children on the effect of a creative child that I realised that his was usual behaviour. The studies reported that the group had first to reject the ideas of a creative child before adopting them. The astute creative individual is apt to avoid this frustrating experience by leading others to the answer, avoiding difficulties which might arise on a more direct approach. Failure to include this unagressive but highly creative individual as an inventor could have had a distinctly negative effect.

Policy is only a guide, no matter how enlightened. It must be implemented and its implementation depends upon human beings, those human beings we call "management". Let us look again at a "Patent Everything" laboratory management and the setting of professional standards. An inevitable result of such a policy, whether the policy is explicitly stated or implied by management actions, is that sheer numbers become important. Quantity, not quality, becomes the criterion. The result is a lowering of the quality of data deemed to be adequate. Emphasis is on getting a job "completed" and this soon degenerates to demonstrating simply that something can be done. Every patent attorney has seen the type of work that results; the description of the invention contains little or no reference to applicable literature, a single experiment, or at best a few experiments and no data defining ranges of key variables or conditions. A patent, if any is issued at all, based on such data is apt to be weak and easily avoided. It may be that more is given away than protected. Conflicts arise between inventor and attorney when questions such as "Why can't our attorneys get patents on such data when our competitors can?" are asked. It does not make for a productive environment unless numbers are the game and all play it. However, this game wastes both monetary and human resources.

If a patent policy is going to be productive, creativity must come first, the quality of the work must be high and good work and its source must be recognized. If this is done, good patents will result. On occasion skilled drafting and prosecution can mend in-

adequate data, but these situations are few. On the whole a patent can be no better than the data on which it is based. Recognition of the source of good work includes all of the usual means, such as promotion in rank and monetary rewards. Recognition must be given properly. The individuals within an organization always know who the best are, probably better than management. If the most creative individuals are not recognized, management is rewarding something other than creativity. Whatever that factor may be, that will be what the majority will strive for. It will become the unwritten but understood criterion for success in that organization.

In speaking of recognition, direct monetary awards to inventors needs mentioning. Proponents of this type of reward believe that creativity would be fostered. Direct monetary rewards certainly could be part of any patent policy, but, personally, I have great difficulty with this concept stemming from the fact that projects are assigned and are not selected by those doing the research. The truly creative people are a precious few. Good management is apt to reserve them for projects where immediate results are required. I have known cases where scientists of little more than average ability have made inventions of considerable economic importance because management could afford to assign them to long-term projects. Providing high rewards for such efforts is akin to a lottery. Such rewards are not apt to foster a climate in which individuals feel rewards stem from excellence rather than from the luck of the draw. Consequently, I have very deep and profound doubts that direct monetary awards are apt to make a positive contribution to a creative environment.

In summary, I doubt that a patent policy of itself can have a very profound effect on creativity in a research organization. Wisely and equitably implemented, a patent policy can provide a necessary discipline in record keeping and reporting, and a recognition that research is an economically important endeavor. Within my experience the more creative individuals have the curiosity required for thorough exploration of a problem. Indeed, it appears that major breakthroughs have come only after an individual has become totally immersed in all aspects of a previously unsolvable problem. Regular record keeping is not necessarily an irritation. Properly approached it requires that an investigator take the time to reflect on his data and its meaning. Consequently, it is doubtful that the mechanical requirements of a patent policy have any profound impact.

As always, when dealing with questions of creativity, we come back to the human element. It is not what a patent policy is that is important, it is what that policy is perceived to be that is important. What management communicates then also becomes important. A productive patent policy must be based on a commitment to creativity and must provide an environment that fosters creative activity. There is no difficulty in writing such a policy statement; the difficulty is in implementing it. There is no reason

why formal procedures, other than those necessary to safeguard secrecy, should be inconsistent with the practice of good scientific research. The human element is what is important. Do management actions communicate a commitment to excellence, a willingness to permit attempts at new solutions, and an accurate appraisal of individual contributions coupled with commensurate awards? Does management communicate enthusiasm for good work and a sense that it is important? These are elements of patent policy which cannot be written, but which are the keys to the effective use of the people in creative organizations.

Abstract

Patent policy is part of a broader policy relating to the protection and use of intellectual property, including patentable and patented inventions, and proprietary technology which may or may not be patentable. Invention is a creative endeavor, requiring an appropriate environment. Such an environment must be relatively informal, unstructured and open. A patent policy is protective and tends to be formal, structured and, where there is a necessity for secrecy, closed. Patent policy provisions should try to maximize creative efforts as well as maximize the protection of the products of those efforts. Patent policy provisions should also recognize the requirements of the individual, the law and the company. These requirements include recognition and career advancement for inventors; record keeping, determination of inventorship, and other legal matters; and protection of proprietary rights and the income from those rights for the company. The relationship of these factors is explored through examples and examination of the effects of overly broad policies such as "Patent everything patentable" and "Patent nothing, keep everything secret".

Biographic Notes

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The Inventor's Interest

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Other speakers at this symposium have said much about balancing the rights of the public, represented by the government, as against those of contractors and grantees using government funds. I am going to use a chemical analogy and speak of the balance as an equilibrium. Some say the equation is Government (G) $\rightleftharpoons$ Contractor or Grantee (C), where the government pays substantial amounts for research and gets relatively little in return. Others say it is G $\rightleftharpoons$ C, where all of the patent rights are given up by the contractor/grantee for small amounts of research funding, when much more money is needed to exploit an invention commercially.

I suggest that, in the case of government contractors, there is a third element that has not been given adequate consideration, namely the inventor. I believe we should be striving not only for a true equilibrium between G and C, but also with the inventor (I): G $\rightleftharpoons$ C $\rightleftharpoons$ I. I contend that the present relationship between C and I is like this: C $\rightleftharpoons$ I. The contractors pay salary and benefits, whether the researcher invents or not, and give only token payments to the inventors for the inventions. In return, the contractor gets the inventions that sometimes are of enormous value. The really valuable inventions are a windfall that no one has expected. Should the contractor C get the entire benefit of the windfall? Or should he give a proportionate share to the inventor I? C $\rightleftharpoons$ I.

Company managements contend that the reverse is true. The contractor pays huge amounts to researchers whether they invent or not, and gets very few economically valuable inventions in return. Those few pay for the cost of supporting the many that are not economically valuable. In the great majority of cases C I, the employee gets much more than he gives in terms of economic benefits to the employer.

How can we restore the equilibrium to the relationship between C $\rightleftharpoons$ I?

In 1790, when the first patent act was passed, there was no middle man between G and I. The inventor disclosed his invention in return for the right to exclude others for limited times. Even

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today, a substantial number of inventions are made by principals, either individuals or persons owning an equity position in a corporate owner. But in modern industry, the great majority of inventions require hugh investments for laboratory facilities, equipment, support services, and similar needs, so the individual or principal inventor is rare. Instead inventors are almost always supported by the supplier of the huge capital investment, usually a corporation. Clearly this is a very large arrow running to the inventor from the contractor. $C \longrightarrow I$. In return, the contractor gets some inventions, but probably not enough to furnish an adequate return on his investment. Some years ago, Dr. D'Ouville of Standard Oil (Indiana) made a study of inventors in his company and found that of the 1384 patents granted to his company during a ten year period, five were worth more than all of the rest put together. I contend that as to those five inventors, who received no special compensation beyond the flat payment given to all who disclose inventions within the company, the balance was not fair. That is $C \rightleftharpoons I$. I believe that the unfairness should be corrected, and that it can partly be corrected by government patent policy.

As to the other 1379 inventors whose patents were not worth much, was the balance fair? I do not know all of the facts, but I would assume so. $C \rightleftharpoons I$. The contractor gave salaries for 10 years, laboratory facilities, security, pensions and other benefits. In return the inventor gave his solutions to the research problem, whether or not patentable, and provided the basis for 1379 patents. Considering the overall picture of 1384 inventors, did $C \rightleftharpoons I$? I would argue that it did not, because the incentive provided by the patent system was absent. Dr. D'Ouville argued that there was a fair balance or equilibrium because it wouldn't be fair to pay special compensation to only five of 1384 inventors. He contended that all should be treated equally.

The issue is whether we continue to fail to recognize excellence, and thus promote mediocrity, or whether we restore the incentives to strive for excellence designed into our Constitution.

The Constitution recognizes the need for equal treatment and our founding fathers were much impressed by the Jeffersonian idea that "all men are created equal". The love of equality was emphasized again almost a century after the Declaration of Independence was proclaimed, when, in 1868, the 14th Amendment was ratified. This amendment requires that no state shall "...deny to any person within its jurisdiction the equal protection of the laws,".

These fundamental beliefs have led to a spate of laws designed to prevent discrimination - formerly on race or religion, but now on sex or age. I applaud these laws. They are the mark of a civilized society. There is, unfortunately, an unhappy side effect resulting from our romance with the notion of equality. This side effect is contrary to the thinking of the founding fathers and flatly against the independence of beliefs so strongly stated in the Declaration of Independence and firmly entrenched in

the minds of the drafters of the Constitution.

This side effect is the tendency to stifle the urge to excel - the urge to be better than anyone else. If one looks at the world superficially, equality of opportunity means that everyone has the same chance to get a job; that seniority, not performance, determines income; that deviations from the normal, conventional wisdom should not be encouraged because they disturb the equality of the status quo.

The trade union movement in this country in the last 50 years has been responsible for this state of affairs to a large extent. A person holding a union job cannot be rewarded for excellent performance because it would upset the established regime by which all members of the union are compensated on the same equal basis, usually seniority.

The reality is that our emphasis on equality has resulted in celebrating mediocrity. What possible incentives are there for a union member to excel, to do more than the prescribed duties assigned to him? Fortunately for our nation, Americans have a lot of other qualities that propel them forward beyond the present mediocrity. These qualities may be derived from pride of self, pride of family, pride of country, or other self-propelling incentives that make some strive harder and achieve more than others. Some people call it the Puritan Ethic, although I've observed it strongly in some Chinese friends, in Jewish friends, and in many others who are not Puritan descendants.

The founding fathers in creating our Constitution borrowed an idea that had been used to good effect in Great Britain. In fact, it was a Renaissance idea born in Italy, but accepted throughout most of Europe. The idea was to reward the creation of new inventions by granting exclusive rights to the inventions for limited times. The theory was to provide an economic incentive to inventors to come forward and disclose an invention.

But what of equality before the law, you say? The framers of the Constitution would reply that equality meant equal opportunity to run the race on fair terms, but excellence of performance evidenced by winning the race is to be encouraged. Individual effort is the key to reward, not organizational advantages like tax incentives or monopolies.

The incentive for a reward as drafted in the Constitution goes to the inventor, not his sponsor, employer, banker or spouse. It is the inventor who is to be encouraged, not the investor of mere money. Money cannot buy inventions, which do not exist until created. Individual people must create them. I believe that the patent clause in an employment agreement is a strong inducement to invent, not a disincentive.

An incentive, by definition, is an inducement to action. If the employee has nothing more than a salary, which he will get whether he invents or just performs the research assigned to him, then what is the inducement to create something which is not obvious to one of ordinary skill in the art? Inducement to excel is

a cornerstone of our American heritage, be it Puritan ethic, Chinese ethic, Jewish ethic, or whatever, If we want to find imaginative solutions to the pressing problems facing our nation, we must have incentives. Some people will create without economic incentives, a pat on the back being sufficient for a long time. However, economic incentive - money - is a powerful force that can induce the extraordinary creativity that produces inventions. The founding fathers recognized it and wrote the incentive concept into the Constitution. Present-day employers have neutralized this incentive by requiring all inventions to be turned over to the employer even before they are conceived. It is time to restore the incentive to the inventor who is the essential link in the economic chain of getting new products to the market.

There is nothing sinister in giving money to creators. Our society does it routinely. Advertising agencies pay "creative" people much more than chemists. There is also no question that money motivates us to a great extent. Most job changes are motivated, at least in part, by more money, rather than by the nature of the work, for example. The theory is that more money will produce higher performance - again a fundamental belief. Therefore, it is surprising to hear opponents of fair compensation for inventors contend that inventors are not motivated by money. Some inventors may invent in spite of a lack of compensation beyond salary, but this is not proof that inventors will not invent more, or that new inventors will not be induced to invent. Logic and experience tell us that we do try harder if there is promise of a pot of gold at the end of the rainbow.

The currently pending Thornton Bill (H.R. 8596) includes provisions for incentive awards to inventors employed by the government. These awards are in relation to the value of the inventions. I think this is as it should be, and I believe that all employed inventors, including those in industry, should be given extra compensation if they come up with something of extraordinary economic value. In most cases, this does not happen. Any extra compensation to inventors is usually a flat amount, say $100, having nothing to do with the value of the invention. However, I do not advocate any fixed percentage, because many factors need to be considered in determining what is fair.

It is in the contractors' self-interest to compensate inventors. The incentive system works for management to get bonuses; it will work for employed inventors to get extra awards for important inventions. Too many researchers have a "why bother" attitude when faced with a new departure from established lines. They will, of course, do their assigned research as well as they can, but they sometimes lack the incentive to push hard in new directions because they see no possible personal benefit coming from it. Many employed inventors however, perceive that the incentive provided by the patent system has been assumed by the employer rather than used to reward the inventor.

We are not getting the return on investment in research and

development we used to get, nor are we getting the return other nations get. We should, therefore, restore the balance between the government, industry and the inventor by looking at the economic value of inventions and making sure that the inventor gets extra compensation for inventions of extraordinary economic value. The government should license its inventions for economic return according to their values, and contractors should get the incentive award of exclusive property rights as a fair balance between themselves, government and the inventor. It is in the contractor's interest to align himself with the interests of the inventor in dealing with government, since it not an odious "giveaway" if the inventor gets a fair share of any economic return.

I applaud the effort of the drafters of the Thornton Bill to reward employed inventors of the government. It sets forth a fair assessment of the rights and duties of employer and employee. In fact, the Thornton Bill sets forth rules much like the common law. I would like to see this sort of fair treatment for employed inventors enforced as a matter of government policy for employees of contractors, as well as for government employees, just as equal employment and other policies are. The fact is that most contractors alter the common law relationship with inventors by contract. The contract says that the employer will own all future inventions and the employee is given nothing in return by contract. In fact, most contracts relating to patent rights are not even signed by the employer, so only the employee has any obligation. Government patent policy, such as is provided by the Thornton Bill, can help lead to more equitable treatment of employed inventors.

Abstract

The forgotten element in the tension between owners and users of patent rights is the creator of those rights. In this country, inventors generally assign their rights to their employers pursuant to a pre-employment agreement; thereafter, the employers are the owners of the rights and can use them for private gain. In the public interest of carrying out the Constitutional intent to reward inventors for disclosing their inventions, redress of the unfairness of pre-employment assignment agreements is needed. Surely the exclusivity furnished by patents is a needed incentive for exploitation of inventions. But the appeal of the employer's case would be greatly enhanced if patents were seen by the legislature and the public as rewards to inventors rather than as tools of monopolists. The first step in focusing the incentive on the inventor is to compensate fairly the creators of economically valuable inventions.

Biographic Notes

John P. Sutton is in private practice as a patent attorney in San Francisco. He is admitted to the bar in Virginia and

California and practices before the United States Patent and Trademark Office. In addition to his law practice, he is an author and lecturer on matters relating to the law. He has been active in various bar associations and has served a term as president of the California Patent Law Association. He was awarded a B.A. by the University of Virginia and an LL.B. by George Washington University.

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Experiences with Industrial Patent Policy

A Constructive Approach to Long Term Corporate Growth

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The subject of this paper, namely industrial patent policy as perceived by inventors, should concern all scientists, engineers, and patent representatives.

In recent times we have been experiencing the emergence of new economic restraints such as raw material shortages, inflation, and international trade imbalances. We find ourselves unable to deal with the problems of this "new economics" with any measure of success, and it becomes self-evident that the adverse effects of these negative factors will be most damaging to the national and international viability of our economy. It should, therefore, become increasingly imperative for us to encourage invention through use of an appropriate patent policy.

The foundation of a patent policy is invention. Therefore, invention well deserves special organizational consideration, such as use of workable procedures which encourage productivity in invention. It is suggested that the corporate patent department be assigned sole responsibility for formulating and executing effective incentive programs, with full authority to recognize inventions through appropriate and meaningful awards. One important first step in establishing such a formula must be to separate invention into two separate categories, basic and developmental. These categories should be stated in the employee job descriptions. Scope and performance of the invention should be specified for each category. In addition to merit recognition, provision for adequate compensation should be specified in each job description to assure inventors and other employees that incentive contributions are essential for corporate growth.

With reference to young scientists and engineers with novel ideas, the patent department could arrange for these embryo inventors to be assigned temporarily to a "special services group", where they will be encouraged to pursue their ideas.

Since the inventor engaged in basic research has an individualistic attitude, he should be assigned to an informal work area. The developmental inventor, on the other hand, must plan and organize in an established area of research, and his approach

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to problem solving requires team effort. Thus the inventor in basic research should be assigned to a "special services group" under the direct responsibility of a vice president in a large company or the president in a small to medium-size company.

To provide an historical perspective, let us examine briefly some of our past industrial experiences as related to productivity in invention. In this context we might ask how to encourage productivity in invention for the benefit of the inventor, the industry and the economy. Some indication of past performance of industrial productivity has been published in an article, "Technological Innovation: Its Environment and Management" (1). Several studies by academic economists are reported in "invention sources in the 20th century".

Professor John Jewkes showed that, out of 61 important inventions of the 20th century, over half stemmed from independent inventors or small firms (2).

Professor Daniel Hamberg of the University of Maryland studied major inventions made during the decade 1946-55 and found that over two thirds resulted from the work of independent inventors and small companies (3). He also studied 13 major innovations in the American steel industry; four came from inventions made at European companies, seven from independent inventors and none from inventions made at American steel companies (4).

Professor Merton Peck of Harvard University studied 149 inventions in aluminum welding, aluminum fabricating techniques and aluminum finishing. Major producers accounted for only one of seven important inventions (5).

Professor John Enos of the Massachusetts Institute of Technology studied seven major inventions in refining and cracking of petroleum and all seven were made by independent inventors. The contributions of large companies were largely in the area of improvement inventions (6).

These studies are consistent in indicating that independent inventors and small firms are responsible for a remarkable percentage of the important inventions and innovations of the 20th century, a much larger percentage than the investment made by these sources would suggest. An underlying thought in these studies prompts one to ask: Why should not the larger organization encourage invention through providing the identical environments and freedoms which prove so productive to individuals and small organizations?

Still another aspect of the demonstrated individual (and small firm) inventive productivity warrants notice: Are not the large organizations "losing some good bets" by ignoring, or deliberately shutting themselves off from valuable pools of inventive talent? The typical "not invented here" corporate philosophy is clearly retrograde, and the typical corporate "Submission of Invention" agreement is so heavily encrusted in one-sided conditions that most submissions are summarily stifled. A simple standard form with a minumum of redundant "legalese" which pro-

tects both parties is long overdue. Such a modification to corporate philosophy would benefit both the independent outside inventor and any organization requiring an inflow of potentially profitable new product lines.

What conclusions can we draw about the present level of inventive productivity in industry? In an article in the Wall Street Journal, October 17, 1977, a continued diversion of funding away from basic and applied research toward product development was reported. In this article, headlined "Many Concerns Stress Product Development and Reduce Research", it was noted that, "The R is slipping away from R&D and many scientists and foreign trade specialists figure that spells trouble. They discern an ominous change in the nation's scientific posture. Industry is curbing slow pay-off basic research aimed at finding new products and instead is favoring hard nosed, quick pay-off development of existing technology. If this trend continues, the United States could eventually lose its standing as both the world's most innovative country and biggest exporter of high technology goods."

Comments expressed in this article by leading directors of research and economists give some indication of the present general attitude about research and point up the need to encourage productivity in invention. For example, N.B. Hannay of Bell Telephone Laboratories commented, "I don't hear many of my industrial contemporaries talking about exciting new major discoveries they think will shake the world"; and T.A. Vanderslice of General Electric stated, "There are trends that, unless corrected, could lead to a maturing crisis".

R.E. Heckert of Du Pont commented, "Who is going to develop expensive coal processing when natural gas is selling at half its real market price?" With gas prices held down by Federal regulations, Mr. Heckert stated that industry is concerned about "whether it could even get a buyer for any higher-priced synthetic fuels." Du Pont has deemphasized making substantial investment in what it considers "new adventures", and is channelling available funds into "improvements to existing businesses". According to Heckert, "this new policy means much lower risks and much higher rewards. In a way, the company has given up looking for another nylon or dacron. Du Pont isn't searching for more extensions of plastics and synthetics because there aren't any simple combinations left. There are only so many ways you can mix around basic molecules."

A Raytheon spokesman was blunt about it with the comment: "Very definitely we have gotten away from long-term general research; all the research we are doing now is applied research with well-defined goals, better focus on business objectives, and a promise of pay-back within a reasonable period of time."

Alan Greenspan, former chairman of the President's Council of Economic Advisors stated: "During periods of uncertainty, companies aren't in any mood for high risks. Uncertainty is plaguing the investment community and is more pervasive than it was a

decade ago. Under these circumstances, it is no wonder this country hasn't done much research into synthetic fuels, the pay-off is too far down the road."

George Gols of Arthur D. Little, Inc., suggests there is a deeper problem: "Industry in the long run does not really believe that fuel is going to be much more expensive or scarce."

Conclusions drawn by leading executives and economists are that the new fast pay-off approach to R&D can be attributed to the high rate of inflation, shortage of capital, sharp competition here and abroad for existing high technology and uncertainty about federal regulations and policies.

In the judgment of this author, it appears that the productivity of invention sources has been overlooked since basic and applied research today has been reduced to "improvements for existing businesses".

A commonly accepted definition of a basic invention, well expressed by Edwin Land, is that "it must be startling, unexpected, and come to a world that isn't prepared for it". This definition is in sharp contrast to a developmental invention wherein invention results from a planned and organized effort. It is suggested that industrial patent policies recognize and establish invention categories using these definitions for the encouragement of productivity in invention.

Some years ago, while working in a laboratory, I became interested in the incomplete enzymatic oxidation of steroids. This was an intriguing idea, since, up to that time, steroid oxidations had been, for the most part, chemical oxidations. I began to search for a suitable enzyme system; the first compound I succeeded in oxidizing by this method was an androstene compound. The structure of the oxidation product was confirmed by chromatographic, colorimetric and similar test procedures.

Sometime during the mid-forties, prior to my initial observations on incomplete oxidations, several workers at Merck developed a chemical method for manufacture of cortisone from desoxycholic acid. Their work was supported by Kendall, co-discoverer of cortisone, and his co-workers. In the late forties, very much aware of the cumbersome and costly chemical method developed at Merck, Murray and Peterson of Upjohn discovered and developed an enzymatic method for 11-oxygenation of steroids. This method significantly contributed to a substantial reduction in process cost over Merck's chemical method.

In the early fifties, having succeeded in the incomplete enzymatic oxidation of androstenes, chromatographic evidence was found in the product mixture of two novel oxidation products of cortisone and hydrocortisone. Bulk quantities of these novel compounds were prepared and tested successfully for animal and human response as anti-inflammatory agents. These compounds were later identified as delta-1, 4-pregnadienes and were finally marketed in 1955 as prednisolone and prednisone. In addition to patent claims covering the products themselves, claims to a method for enzyme

manufacture and use also were issued (7).

After pregnadiene research became known, the pathway that corticoid research pursued changed considerably. Basically, industrial research was diverted from natural corticoids to the unnatural pregnadiene structures. Thus, in 1957, Upjohn began marketing 6-methyl-pregnadienes (8); in 1958, E.R. Squibb & Sons and Lederle Laboratories both brought 9-fluoro-16-hydroxy-pregnadienes to the market (9); and Merck followed with the introduction of 9-fluoro-16-methyl-pregnadienes (10). Later Syntex and several European companies marketed modified pregnadienes.

The discovery of cortisone and the invention of the pregnadienes were followed by the development of corticoid processes and pregnadiene modifications, respectively. Developmental invention was essential to optimize the clinical efficacy, enhance the availability and reduce the cost of these new materials. On the other hand, basic steroid research was ignored. The demise of basic steroid research shows the need for a patent policy to establish organizational responsibilities including workable procedures in order to maintain both basic and developmental research to support long-term corporate growth.

As indicated by the history of invention sources, "the prepared mind" is most productive when functioning in an atmosphere of freedom from established thought and with freedom to communicate with others.

Abstract

To improve long-term corporate growth, a distinction should be made between the basic and the developmental inventor. The basic inventor must be provided with an informal research work area, whereas the developmental inventor should be provided with a "team" environment. Both types of inventors should receive compensation commensurate with their contributions. The establishment of these two inventor categories could give more balanced stimulation to different research attitudes, and, in return, an understanding of these two basic approaches would encourage both types of inventors to contribute towards long-term corporate growth. Examples are presented indicating that many inventions come from outside major companies, particularly from independent inventors and small firms, thus showing a need to improve the output of inventors in industry.

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Biographic Notes

Arthur Nobile has written a large number of publications and holds several patents, covering commercially successful steroid products. He is associated currently with Organon, Inc., where he serves as Director of Technical Services. Dr. Nobile obtained his degrees from the University of California, Washington State University and San Diego State University.

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General Discussion

COMMENT: In industry, ideas are numerous, but to my mind the real inventor is the promoter - the person who drives and sells. While this person does not get his name on a patent, his creativity is really greater than the person who dreams up a concept. If we reward the inventor, as under the German law, we should also reward the promoter.

RESPONSE BY MR. SUTTON: The man who sells is very, very important, but he does have to have something to sell. In addition, ownership of a proprietary right is also necessary to obtain success. Therefore, it seems necessary to me that the value of inventions which lead to proprietary rights, such as a patent, should be shared with the creators of such inventions. The sharing should not be on an arbitrarily fixed percentage basis, but should be determined only after evaluating all of the factors that ought to be considered. In my opinion, this is not now being done in an adequate fashion.

COMMENT: I find it hard to understand what Mr. Sutton means by compensation. In the past research managements have been preoccupied with dual - track award systems - administrative and scientific. In my experience, very few inventors who have made major inventive contributions have not been rewarded in terms of upgraded status, salary increases and recognition as senior scientists. These are rewards based on the value of the inventors' contributions.

RESPONSE: I agree that these means for rewarding creative people exist, but, in my experience, many inventors are not so rewarded. While it is in his enlightened self-interest for an employer to reward such employees, and this is the way American business is usually run, there are still many employers who not only do not recognize their creative employees, but actually give them a hard time and a run-around. The reality is that most inventors do not get any kind of direct recognition for

inventions. The majority get a token payment or nothing at all. It is the large, well-run corporations that are the exceptions, that do reward their inventors, mostly in the indirect ways you mention.

COMMENT: You seem to me to have too narrow a view of the creative process and who the creative people are. Creativity can be dampened, but a truly creative person will create one way or another. If not permitted to do so on the job, he will find an outlet outside. It is not so much a matter of money as it is a matter of being stifled by other people or by management refusing to let a person be creative by demanding that things be done in traditional ways.

RESPONSE: I agree that stifling of creativity occurs becasue of management failure, but this would not foreclose rewarding those people who are creative in accordance with the value of the results of their creativity.

COMMENT: The value of a patent is relatively small when compared to the additional input that must go into the developmetn of that patent to the marketable stage. This is particularly marked in the pharmaceutical industry. I find it difficult to understand why the inventor of one successfully marketed product that didn't quite make it to the market should not be compensated.

RESPONSE: Difficult judgemental decisions are certainly necessary. In my opinion, it is not unreasonable for the inventor of the marketable product to be rewarded simply because he is the creator of the product which happens to make the company a profit.

COMMENT: Representing the point of view of the industrial research organization, I think one of its problems is that not as many highly creative people exist as has been suggested in the papers given. Creative people cannot be created by promising a prize. But when they do exist, they have to be nurtured and there are various ways of showing appreciation. Creative people do not create because of the prize, but because they are driven to win. By singling out people who happen to have their names on patents which happen to become big commercial successes, we would be destroying within the organization what has been done to compensate for the lack of a large number of highly creative people. We try to compensate for this lack by assembling teams of researchers who work cooperatively together to find and develop ideas. I think we have to work that way and we don't want to disturb it, because I don't think we have any alternative. I do not think there is any evidence that extra compensation will increase creativity, nor is there any evidence that our present

system has caused us to lag in creativity.

COMMENT: Superimposing the reward concept on subjective emotional, social and political aspects of ownership, which are themselves overpowering factors, considerably complicates the problem of inventor compensation.

COMMENT AND QUESTION: The role of the marketing man is sometimes crucial to the commercial success of a product. Shouldn't he be compensated as well?

RESPONSE: Marketing men usually make more money than research people; it appears that, in the chain from creation to marketplace, other people know how to take care of themselves better than do chemists.

COMMENT AND QUESTION: There are many factors which contribute to the commercial success of a product. Sometimes commercial success is due overwhelmingly to factors other than the invention itself, such as marketing, or sales skills, to say nothing of the contribution of the patent lawyer. If we assume that the poeple who are in these other areas will seek the same realtive degree of compensation as inventors, is it equitable to the other people on the team who contribute a material, inseparable part of the success of the product, and would it not act as some disincentive to the other members of the team who aren't compensated, if we were to single out the inventors for further compensation or rewards?

RESPONSE: All you are telling me is that in determining the amount and distribution of compensation one has to consider all these things. If the creator's input isn't worth anything and an invention was successfully marketed because of the skill of a draftsman of patent claims then obviously the inventor is not deserving of a great deal. I suggest that all of the factors have to be considered in determining what's fair and equitable in the circumstances.

QUESTION: Then, would you reward the other members who contributed a material and inseparable part to the commercial success under the same equitable principle?

ANSWER: Yes, I think that's wise. I concur entirely that there are many things that go into personnel management. The care and feeding of all employees is a worthwhile endeavor. I surely am not trying to say that you disregard everybody else in the entire organization except the inventor. There are bonuses for executives, and patent attorneys are paid adequately in industrial organizations, but there just isn't anybody looking out for the inventor's interests. And he is different. The inventor

is different because he is the sine qua non. There isn't anything without him. And if you don't have something created in the first place, all of this giant structure is nothing but a house of cards.

COMMENT: The problem I find with Mr. Sutton's argument is that this concept of equity is difficult to define or to sustain. I make the effort to teach my children that as moral individuals they ought to provide equity to others but as realistic individuals, they ought not to expect it for themselves, because the world simply is not constructed that way. If one carries Mr. Sutton's argument to its logical conclusion, equity must be defined in a social sense as what is good for the world. By this definition, an inventor who invents a hula hoop which sells like crazy, in my opinion, has produced something with no social value. On the other hand an inventor who invents an esthetic dental filling, in my opinion, has produced something with enormous social value but with little chance to make much money. Now I can say one requires equitable sharing of rewards and the other does not, and award one of the inventors accordingly. Unfortunately, other people may not agree with me. Therefore, I prefer the free market.

RESPONSE: I think that the free market should be used to determine the value of an innovation. Whether the hula hoop turns out to be economically valuable even though it has no socially redeeming qualities, or whether a drug or enormous value has no economic benefit, what happens in the marketplace should be used to determine fairly and equitably the sharing of any economic advantage. Moreover, I think that is what the founders of this country felt and what is called for in the Constitution. I would suggest we should return to this concept.

COMMENT: One hears frequently today that the United States may not be getting as much for the dollars that it spends as it should, and that the United States is being out-invented or out-created by some foreign countries. Are there some additional incentives that could provide us with a better performance than we have at the present time? Among other countries, including industrialized countries, there has been a rather uniform trend in the direction of more rather than less legislation designed to compensate for inventions. In addition, from discussions with many people I feel that some of the strongest supporters for rewarding inventors more have been research directors, often those who have retired and are freer to express their opinions. These people have felt that more effort should be used to try to get more out of their employees. Commissions and bonuses are commonly used in industry to reward the person who has done an extra job in order to persuade him and others to do a better job next year. Perhaps the chief

concern about extra compensation rewards is the obvious administrative difficulty of handling such a system, but I'm not sure that that should stand in the way if rewards of this nature conceivably might accomplish something worthwhile.

COMMENT: While there are differences of opinion as to what constitutes fair compensation to inventors, I don't think there are any outright opponents of the concept. In order to administer any rewards in a fair and equitable manner, we cannot reward just the person who has his name on a patent without also rewarding all other people involved in helping to make a successful invention a commercial reality. We should not take the position that the inventor of a successful product should be rewarded and the inventor of an unsuccessful product should not.

COMMENT: I think we all agree that there should be some equitable reward for the input to a product that becomes a resounding commercial success. However, the inventor is only one pin in this whole bit of machinery that leads to successful commercialization. It is argued that all people who make some input should be equitably rewarded, but the fact is that we are not yet smart enough to identity and reward equitably every bit of input into a commercial success. To reward only the inventor or to attempt to do it in a manner that is inevitably inequitable can do more than anything that I could imagine to stifle creativity.

COMMENT: Echoing the comment that there may be alternate solutions for compensating employed inventors, I might point out that, in my company, inventors whether they are bench chemists or in management, have a management stock option plan, and quarterly extra compensation based on profits, in addition to their salaries. One of our most prolific inventors, who has about 20 patents, when asked specifically if he would like to be compensated on the basis of the amount of earnings on his patents and give up his specific profit incentive or profit payment, said he would rather take the compensation as he has it now.

RESPONSE: Of course he would. Nobody wants to give up anything. I suggest that you posed a false premise to him. The fact of the matter is that there is plenty of money to go around to provide fair compensation to inventors and still do business. Certainly it is an increased cost of doing business, but if such compensation induces further inventions and if it brings new products to market under the patent system, then profits will increase and the whole cycle should be self-perpetuating. To induce further inventions is a desirable goal for the future that ought to be continued. With regard to referring to the inventor as only one pin in the whole innovative process, I would suggest that he is the linchpin.

COMMENT: The compensation plan Mr. Sutton has been outlining sounds very much like that specified in the German compensation law. As I understand it, the German law is not felt by people who have been operating under it to be a good law. Also, under the German law, agreements are made with the inventors after the inventions have been made and patent applications have been filed in the patent office. Under the terms of the agreements the inventors settle for a fixed amount of reward, but, while usually more than $100, these are not big amounts.

RESPONSE: The administrative difficulty is conceded; it is the only real objection to the whole program. The way to get around this problem is to deal only with the very few inventions which are commercially successful, ignoring the many inventions which are not.

RESPONSE FROM A GERMAN PATENT PRACTIONER: It is true that the administration of the law is difficult, but administrative problems can be solved. The formula in the German law is quite complicated. The formula is rarely used by the companies in the first instance because it is so complicated, but it is used in those cases not easily resolved which may be headed for arbitration court. Then the formula is used, because it takes care of the many aspects which have to be considered. One cannot say that the German law is unworkable. For day-to-day application companies use a simplified formula which can be handled more easily. But one should not forget that there are two kinds of inventors, those who really contributed something valuable, and those who think they did, but did not. In this aspect, the law is very valuable because it provides a formula to bring reality into the picture so that rewards can be given only to those who deserve them.

COMMENT: To compensate the large number of people in a research organization who might be involved in making an invention successful, a certain amount of money must be set aside as a reserve for payment at a later date when success has been established. The later date may be 15 or 20 years from the date the invention was made. By that time some of the people involved may be long gone or even dead. So who gets the rewards? I just don't see how this couls work - certainly not in the type of business my company is in.

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