

★

COMMENTS ON THE DESIRABILITY OF INSTITUTIONAL
PATENT AGREEMENTS FOR UNIVERSITIES

by
Thomas F. Jones
Vice President for Research
Massachusetts Institute of Technology

INTRODUCTION

Thank you for the opportunity afforded me to participate in this public hearing on the proposed implementation of a uniform, government-wide program of Institutional Patent Agreements, specifically as applied to universities.

My comments today are offered on behalf of the Association of American Universities which represents 48 institutions, the National Association of State Universities and Land-Grant Colleges, the National Association of College and University Business Officers, the American Association of State Colleges and Universities, and the American Council on Education which represents some 2,000 higher educational institutions in the United States, that latter being an umbrella over all the major educational associations. Each of these associations has reviewed the testimony and given their endorsement and asked that they be mentioned. My remarks also represent the position of the Massachusetts Institute of Technology where I serve.

I sincerely hope that this exchange of ideas and philosophies in approaching the patent implications of government-sponsored research at universities will serve as a constructive means of continuing communications on this matter between universities, the government and the public.

Universities generally support Institutional Patent Agreements, not because of potential financial return (which is minimal), but because of their value as effective instruments for technology transfer. For this reason, we believe that such agreements are in the best interest of the public and hence the United States. With your indulgence, I would like to spend the remainder of my time developing this theme.

NATURE OF UNIVERSITY INVENTIONS

As you well know, the United States Government, through its various agencies, spends hundreds of millions of dollars per year to support research at American universities. The total figure is about \$3.6 billion.

Chairman Nelson. How does that break down?

Mr. Jones. Well, it is, of course, for the major part, basic research. The NSF has a budget of about \$900 million of which some \$650 million is basic research according to my recollection.

The National Institutes of Health sponsors research at a level slightly over \$1 billion. In addition, the Department of Defense is a major supporter of research in universities as well as elsewhere and there are other government bureaus which are lesser, but still significant supporters.

Chairman Nelson. The total is about \$3.9 billion, is that what you are saying?

Mr. Jones. I mentioned \$3.6 billion but the figures are in the order of that magnitude. I do not have the precise figures.

Because of the unique nature of the universities, the type of research differs from that performed under other government-funded contracts. Further, the university's special goals of education and research result in unique patent concerns and hence different technology transfer processes.

The university, by its very nature, is oriented to basic and fundamental research as an integral part of its education process. The university is not and should not be a business or commercial enterprise. It does not develop products nor sell goods. Inventions made in the performance of government-sponsored research are usually incidental to that research, i.e., by-products rather than specified objectives. The government does not fund a university to create patentable inventions, but rather to extend the knowledge of man in areas of vital importance to the community. Universities are not funded to produce marketable products, but to explore the frontiers of science and technology in order to add to our fund of knowledge.

Consequently, it is rare that a university, in the course of performing government-supported research, will develop an invention capable of being transferred immediately to the market.

To translate technologically useful concepts created at the university into commercially viable developments from which the public can directly benefit requires a considerable amount of additional development, testing and marketing.

UNIVERSITY-DEVELOPED INVENTIONS -- TRANSFER TECHNOLOGY

Experience shows that it often costs ten times, or a 100 times or 1,000 times more to transfer a basic, university-generated invention to the marketplace than it did initially to invent it. This is because the report, the data or the breadboard model developed at the university, however interesting or potentially worthwhile, will never benefit society as a whole unless someone is willing and has been provided with sufficient incentive to take the necessary follow-on steps to transfer the basic technology into a form capable of assuming commercial utility.

It follows that the transfer of technology takes time, requires specialized expertise and costs considerable amounts of money. To encourage industry to spend this time, effort and money, it is often essential to offer prospective licensees sound patent protection, coupled with reasonable license terms. Without such inducements, many excellent inventions would never be effectively recognized or used; and, when that happens, it is the public which suffers the greatest harm. Within our free enterprise system, the profit motive remains an essential ingredient to the effective transfer of technology. The social value of this philosophy is explicitly recognized by the framers of the Constitution and is included in Article 1, Section 8, which directs Congress to "promote the progress of science and useful arts by securing for limited terms to authors and inventors the exclusive right to their respective writings and discoveries." The patent system resulting therefrom was not created to benefit a select few but to provide an incentive to develop and commercialize innovative ideas to help the public.

Since the commercialization process cannot appropriately be done by a university or, for that matter, by the government, this phase of technology transfer should best be handled by the private sector of our economy. Understandably, companies are usually reluctant to take on these tasks unless they are assured of reasonable legal and business protection and inducements in the form of patents and licensing arrangements.

M.I.T.'s experience, and I am sure that of other universities, tends to illustrate these points. For example, methods of producing Vitamin A and Penicillin were both discovered at M.I.T. Although the technical feasibility of these inventions was successfully demonstrated in the laboratory, a considerable amount of clinical testing and government approvals were necessary prior to marketing. This, in turn, cost considerable money and required the making of numerous risk decisions. The university itself was certainly not in a position, nor did it have the motivation or expertise to assume this burden. Commercial licensees within the private sector were eventually located, and these licensees did risk their money, time and effort in commercializing the inventions. Consequently, these inventions were, and still are, made widely available to the public with resultant benefit to all. The university's ownership of patents and ability to negotiate reasonable licenses constitute, I believe, a major inducement to this technology transfer.

The magnetic core memory, which was also developed at M.I.T., became a primary element in the growth of the computer industry as we know it today. This invention, which was developed through government funding (and for which the government received a royalty-free right and license), constitutes another significant example of the value of a government, industry and university cooperating in an atmosphere that encourages patent licensing and commercialization of useful ideas.

Dr. Forrester, Director of the Whirlwind Project, conceived this invention and personally proved the concept in practice through numberless overtime hours.

By the way, maybe a dozen years or so passed before another technique having the reliability, the capability and the cost benefit ratio equal to this invention came into being. The core memory was the only satisfactory solution to fast computer memory throughout this period. Dr. Forrester's invention gave American computers a fantastic edge in foreign markets. This invention became a significant part of the American technological mystique.

The point I wish to make is that commercial incentives and the effective use of the private sector of our society were necessary to transfer the university-developed inventions in a way to help each of us as citizens, both in the improvement of our health and in the advancement of our technological growth. Assuming that we all agree on these needs, we come to the issue of whether the government or the university is best suited to effectuate this transfer.

GOVERNMENT OWNERSHIP OF RESEARCH INVENTIONS

At first blush, a very strong argument would seem to exist that inventions made in the course of government-sponsored research should be owned by the government since taxpayers' money has been used. If the people pay money through their government to encourage the conduct of research at educational institutions, then why shouldn't the people (again through their government) enjoy the fruits of the technology produced from such research. The answer, of course, is that the people should indeed benefit and that the taxpayer should be given a return for his investment by way of technology transfer. The universities do not contest this right in the taxpayer and, in fact, are completely in agreement with it.

The key question to be answered is whether government ownership of patents produced through federally-sponsored research is really an efficient and reasonable way of accomplishing that goal. As you know, over the years, a number of government agencies have operated with a so-called "title" provision. As of 1972, the United States Government had in its portfolio approximately 24,000 government-owned patents. Since that time, many thousands more have been added. To my knowledge, only a relatively small number of these patents have been actually licensed.

This is not a reflection on the abilities of the various government agencies, but rather a commentary on the nature of the licensing process, vis-a-vis the objectives of the government. The government is not philosophically or pragmatically attuned to licensing as an effective tool of technology transfer. In this country, it has traditionally been the norm that, wherever possible, technology development shall be through the private sector of our economy although often with the help and stimulus of the government. President Carter,

in his State of the Nation address, emphasized this point when he promised that, under his administration, economic goals would be achieved in conjunction with the private economy and in terms of a true partnership between the government and its people.

The universities believe that a government "title" provision is undesirable for a number of reasons:

1. Government personnel are in a much less favorable marketability of an invention since they cannot be as intimately familiar with the invention as a university inventor himself. Hence, the transfer of necessary know-how would be drastically curtailed. This, in turn, would seriously impair the licensing process.
2. Most government agencies do not now possess mechanisms for licensing and marketing. To perform these functions would, therefore, require significant increases in administration costs and personnel.
3. It is feared that title in the government would have a depressing effect on the amount and quality of invention disclosures from inventors since there would tend to be fewer incentives for the considerable additional effort needed over and above merely a legal compliance with the provisions of the research contract.

For example, my staff works at encouraging the filing of disclosures. University scientists, by the nature of their personal dedications, do not think in terms of patents and commercialization until we stimulate them to do so.

4. Government ownership (even where waiver procedure is contemplated) would tend to discourage university/industry/government cooperative research projects since the university will be unable to provide industry with a quick and certain definition of licensing rights at the initial contractual stage. This situation would be contrary to the cooperative research programs that the government itself is actively supporting.

A policy of government ownership will remove any incentives that universities without an established licensing program may have to explore the possibilities of creating such a capability; and, for those universities with an existing, viable licensing program, this policy will, at best, significantly increase the paperwork and administration while decreasing licensing output, thereby decreasing technology transfer.

In short, the university community believes that such a policy will result in effectively denying to the public many worthwhile technological developments. Such a result is, of course, not in keeping with the goals either of government or the university, nor does it benefit the taxpaying public.

UNIVERSITY OWNERSHIP OF RESEARCH INVENTIONS

The universities propose that they be allowed to retain ownership of inventions made in the course of government-supported research at their institutions. In making this proposal, the universities certainly do not intend to hold themselves out as possessing all of the answers to complex problems of technology transfer. We recognize our many and varied imperfections in this area.

But we are learning, and this learning is valuable. The licensing process draws the research university closer to industry, which everyone recognizes to be a desirable goal.

As I stated at the outset, in terms of dollars earned, university licensing is hardly to be considered a source of financial security. For example, a recent survey of research universities by the Association of American Universities determined that, of 29 universities, 19 had gross royalty income in 1977 of less than \$80,000; 7 had annual gross royalty income of less than \$500,000; 2 had royalties in the area of approximately \$900,000; and one of approximately \$1,000,000.

My institution, the Massachusetts Institute of Technology, is one of those top three. Our government research, including the Lincoln Laboratory which we manage for DOD, totals approximately \$200,000,000 per year. Most patents are so futuristic that their 17 years run out before significant use!

I would point out that not all of the income-earning inventions resulted from government-supported research. It is difficult, however, to arrive at the appropriate ratio. The survey also indicated that most of the universities reported that more than 20% of patent filings generated income. Although the survey results are not broad enough to be conclusive, they do tend to agree with previous, more detailed studies.

For example, a 1974 survey by DHEW of over 60 institutions managing 329 patent properties generated under DHEW-sponsored research indicated that 122 licenses were granted on at least 79 different patent entities. In other words, the data showed that about 24% of the patent properties were licensed. (This figure is a minimum, and may well have been as high as 37%, depending on the interpretation of the data.)

A 1973 survey by Northwestern University of 50 institutions managing 236 patent properties indicated that 86 licenses were granted on at least 56 different patent properties. In other words, the data showed that, as a minimum, 24% of the patent entities were licensed (although, again, the figure could be as high as 37%, depending on the interpretation of the data in the survey.) Likewise, an earlier NACUBO* survey showed similar results. A 1977 survey by the Society for University Patent Administrators shows that approximately 50%

of patents issued were licensed over the last 10 years. It should be recognized that the above figures represent an average, and that the size and aggressiveness of their patent management programs may differ substantially. However, the point to be made is that those universities with a patent licensing program, although they may not generate major royalty income, do transfer a reasonable amount of technology via the licensing process.

The M.I.T. experience is nearer 10% of patents licensed and 5% that yield significantly beyond patent management costs and to give you another figure that may be useful, Senator Nelson, only about one patent in 1,000 breaks the million dollar earnings level over its lifetime.

A university is better able than government to effect this transfer. It is the origin of the invention. Furthermore, in many cases, the direct interaction between the inventor and his university on the one hand, and the commercial licensee on the other hand is most productive in ensuring an effective transfer, since it encourages the free flow of know-how and data which is essential to strengthen and support the licensed invention. Who but the inventor is best qualified to provide the technological background material and know-how that is needed to enable the licensee to fully develop the invention? Technological qualification, of course, is only part of the need. As noted previously, the university invention is often only an embryonic commercial idea at its inception. It requires constant attention, continuing interest and sustained faith in its ultimate worth if its potential for public benefit is ever to be realized. My experience leads me to believe that this need is best met by the inventor within the context of the university environment.

The university encourages this interaction between the inventor and the university and the commercial licensee by the mechanisms of additional industrial support and/or by the consulting process. The importance of an Institutional Patent Agreement in this regard cannot be overemphasized. The certainty of ownership afforded the university at the outset of its contracting with the government allows the university, in turn, to expedite the process of encouraging the industrial interface needed for commercialization.

Our Institute, and other major research universities, provide formal mechanisms by which industry can keep informed of research activities and new developments. These programs function hand in hand with the licensing program.

The university community generally follows a policy, wherever feasible, of granting non-exclusive, royalty-bearing licenses to all qualified applicants. However, exclusive licenses may be granted if it is determined that this is required as an incentive to encourage the marketing and eventual public use of the invention. Before granting an exclusive license, however, a bona fide effort is made to interest companies known to have the necessary expertise to further develop the invention through the granting of a non-exclusive license. If these attempts are not successful and an exclusive license appears

to be the only effective way to transfer the technology, then such a license will be limited in duration and will incorporate a number of restrictions and safeguards to insure that the licensee actively develops the invention in order to make it available to the public at reasonable rates as soon as possible. In determining the length of exclusivity, the stated policies of the various government agencies are used. For example, under the Institutional Patent Agreement with the Department of Health, Education and Welfare, universities are restricted to an exclusive licensing term of no more than 3 years from the first commercial sale or 5 years from the date of the license agreement, whichever occurs first. Such licenses will also incorporate development schedules and requirements in the form of milestones to be met by the licensee in order to ensure a timely commercialization of the invention.

Retention of licensing rights by the university encourages in a practical way the partnership of the government, the university and industry and hence greatly enhances the probability of a successful technology transfer. The ultimate beneficiary in this respect is the public.

I would like to depart from the text for a moment here to cite a typical kind of case history of exclusive license; in the case of some inventions we will have many interested companies, or several at least, come to us and say they want that invention. They will have heard of it through a technical paper presented, or through our publication of licensing opportunities, a loose-leaf binder which carries some 400 or 500 patents available for licensing, or through some of the computer listings that are accessible to the industrial community, or by word of mouth, or some other communication process.

As we talk with these potential licensees, we may find that none would consider taking on a non-exclusive license, but we always make an effort to define that possibility. They may insist they can only take it on an exclusive basis. In that case, we have the rather onerous task of choosing among them. To do this we look at their technical expertise. We look at their soundness as an institution, and their ability to market the product. Then begins the process of negotiation to set the terms which will assure that the company will not sit on the patent but will meet the milestones that have been agreed on, and set penalties for not keeping those milestones, including marketing.

That is how exclusive licenses from universities come about.

INSTITUTIONAL PATENT AGREEMENTS

The universities propose that the Institutional Patent Agreement is most suitable to answering the needs of the university for ownership and licensing of inventions, while meeting the concerns of those advocating greater government control. We believe that an Institutional Patent Agreement such as that published in the February 2, 1978 Federal Register, will most effectively attain the goals of government and the universities in ensuring that technology developed by public funds is made available for public use as quickly, efficiently and inexpensively as possible.

Any university desiring to enter into an Institutional Patent Agreement would first be required to demonstrate that it has a viable technology transfer program.

I noticed this was covered pretty well in your opening remarks yesterday, Senator, but I will further complete the record and read this.

The information required of a university to meet this requirement is detailed and extensive, including the university's statement of purpose, source of funding, patent policy, disclosure procedure, inventor/employee agreement, royalty sharing practices, licensing program and other criteria designed to give the sponsoring agency a detailed picture of the university's operational procedures and philosophies in the area of patent licensing.

The Institutional Patent Agreement itself will require that university inventions be quickly and efficiently identified and disclosed to the sponsoring agency and further that the university promptly file patent applications on those inventions it elects to attempt to license. There are many additional provisions designed to encourage technology transfer while ensuring adequate government controls. For example, the university must furnish the sponsoring agency with a technical disclosure for each invention within a specified time period; interim and final progress reports are also required. Further, detailed time periods are established for the filing of patent applications and for the execution and delivery of confirmatory licenses to the government. In this latter respect, the Institutional Patent Agreement recognizes, of course, that even in those instances where a university elects to retain ownership of an invention, it must provide the government with a royalty-free right to use.

Once a university qualifies for an Institutional Patent Agreement and after it has met the obligations of reporting inventions to the government and filing patent applications on those inventions it wishes to license, the university continues to be required to meet certain safeguards. For example, the government can require the university to license all responsible applications on reasonable terms, unless the university can demonstrate that it has been effective, within given time constraints, in transferring the technology. The agency may also require compulsory licensing where this is needed for government regulation, to maintain public health or safety standards, or for other public purposes stipulated in the applicable contract. In addition, licenses granted by the university must be at reasonable royalty rates and must be in accord with other prescribed safeguards. All net royalty income (after deduction of expenses, including payments to inventors) must be utilized by the university for the support of education or research. There is a further provision that the agreement with the university may be terminated at any time by either party upon 30 days' written notice.

To summarize, the university community supports the concept of an Institutional Patent Agreement for the following reasons:

1. Those universities that qualify will be assured from the outset of ownership rights, thereby expediting the technology transfer process.
2. An Institutional Patent Agreement will encourage continued cooperation between the university and industry.
3. It will provide a simple and uniform procedure for the disposition of government-funded research inventions.

4. Under such an agreement, universities would be allowed to license inventions at reasonable royalty rates. The royalty income would be returned to the university to meet its dual commitments of teaching and advancing research.
5. The Institutional Patent Agreement will allow the university to fulfill one of its primary objectives, i.e., advancing the frontiers of knowledge.

Such an agreement will also be of benefit to the government for the following reasons:

1. By encouraging interaction between the university community and the private sectors of our economy, the government will meet its objective of ensuring that the benefits of publicly funded research are made available to the public itself as quickly as possible.
2. Under an Institutional Patent Agreement, the government's right to use the invention will be assured, and adequate safeguards will exist to enable the government to monitor the university's performance of technology transfer at all stages of its development.
3. The Institutional Patent Agreement will minimize unnecessary administrative burdens on the government and will encourage universities to more fully participate with industry in the transfer of technological developments.
4. Of major importance, the government would have acted in its proper role as the catalyst for technology transfer, thus ensuring that the requirements of this administration shall be met.

The universities recognize that there may, on occasion, be particular research projects that must be exempted from an Institutional Patent Agreement due to their particular nature. They also recognize and accept the need for the restrictions and limitations embodied in the Institutional Patent Agreements to ensure that government money is properly spent. We appreciate the intentions of this committee and its need to carefully scrutinize the proposed regulations. We are happy to work with you in seeking to accomplish what we believe to be identical objectives.

I would like to depart from the text at this point to mention an M.I.T. patent situation which has been mentioned in the press in the past and which I understand will be entered in the testimony here this morning. It relates to the Innovation Center at M.I.T. which I think is one of the great experiments in undergraduate technological education in the United States.

The Innovation Center, a program made possible by a National Science Foundation grant trains young people in the function of the entrepreneur and inventor in our society. They get experience and instruction both in the classroom and in our society. They get instruction in how to look at a problem innovatively; they study how to recognize the public need and to devise solutions.

They also get instruction in the problems of finance. They then get some guidance in proceeding on an idea to the achievement of invention. One of the inventions which came out of that group was an electronic game, the kind of thing you play with your TV set -- ping pong, and things like that which are becoming more and more prominent especially in the Christmas toy market.

In this case, the young people did find a sponsor, a person who was retired but wanted to market their invention. I might mention he was the only taker they found, and they expected great sales; something like \$35 million was anticipated. Of course, that was recognized as a guess and a gamble. The game did enjoy pretty good sales for a year and a half and these young people, some five of them, got royalties of about \$15,000 for their share. The company, though, went bankrupt and is still in debt to us for something in the order of \$70,000 or \$80,000 in royalties. The articles and editorials which have been written about this make the point of the students losing this particular income. I wanted to mention for the record that we did employ counsel to look into the affairs of this company. They looked into their assets which were minimum or less, and counsel advised that unless some unknown assets appeared, it was not worth the expense to go in for an audit and that we should hold for further developments in the case. That explains the apparent lack of diligence but the matter was pursued diligently and prudently.

The young people did get fantastic experience. The game which they invented is now out of date. Seventeen years was about five times too long for an invention such as that.

These young people are now busily at work in new, very flexible games using microprocessors which will allow an array of games to be changed by changing magnetic tape cassettes. One can put in another tape and play another game.

I would say the educational goals of the program were met and the financial rewards were gratifying to the students and that these young people are off again on an exciting career.

Subsequent to preparation of this testimony, a series of questions were received from the committee. Through no fault of the committee they got lost. We have since prepared the answer to those questions and they are appended. I would gladly discuss each of them in more detail if you wish.

In closing this part of my statement, I respectfully request that the record be kept open for fourteen days so that those concerned in other universities can submit statements for inclusion in the record.

As I say, I shall be happy to answer any further questions that you may have.

Chairman Nelson. The record will remain open for quite some time.

Mr. Jones. I would like to forward communications I have to your counsel.

Chairman Nelson. On page 12 in the last paragraph starting in the middle of the page you state once a university qualifies for a patent agreement, the government reserves certain rights requiring the university to license all responsible applicants, require compulsory licensing when needed for government regulation and so forth and all net royalty income must be utilized by the university for the support of education and research.

Are you referring in this paragraph to the agreement M.I.T. has or to the agreement proposed?

Mr. Jones. The agreement proposed is not greatly different from our agreements in the past. I will turn to my counsel for the provisions of a standard agreement.

Chairman Nelson. But is this agreement the one M.I.T. has now?

Mr. Jones. The agreement we have now with the National Science Foundation.

Mr. Smith. We were specifically referring to the proposed regulation, the proposed IPA. However, we have, and have had IPA's with HEW and NSF for some time now and both of those also have provisions that we feel are very similar to what has been published.

Chairman Nelson. The major provisions that are recited here in the Institutional Patent Agreements that you have had in the past with HEW or NSF, is that what you are saying?

Mr. Smith. Yes, essentially we believe that is the case.

Mr. Jones. In any case, it represents our behavior in these matters and the relationship we have had with the organizations.

Chairman Nelson. And you do not have any objection to these provisions which the government reserves the authority or the right to require compulsory licensing in certain circumstances?

Mr. Jones. I think they are quite fair.

Chairman Nelson. All of the provisions that you have mentioned here would you say the universities involved in research would basically agree?

Mr. Jones. We accept those without challenge.

Chairman Nelson. All the institutions you are representing here today accept all those provisions?

Mr. Jones. The organizations I represent that read the testimony endorsed this and I assume they accept. That is a detail they may not have thought all the way through, but the only question is at what point should or may an organization come in and say license all prospective applicants. I think that if there were real questions in any particular case there could be a negotiation, a discussion or negotiation on that point. In any case, I think that we have accepted it and would continue to accept it and that the intent of that provision is quite proper.

Chairman Nelson. Is it the standard practice that any royalties received go back into the same type of research as was done to produce the patent in the first place?

Mr. Jones. Let me say that is not the policy. The policy is that it goes back into education and research. The fact is that if a given professor has been particularly successful and he comes to the Provost or myself and says I need some equipment or need some help in getting another project going he is likely to be heard and given help. I think that is the common practice. It is not written. It is not even understood, but that is the way it works.

Chairman Nelson. But in this paragraph you state all net royalty income must be utilized by the university to support education and research.

Mr. Jones. Yes.

Chairman Nelson. Is that the way your agreement with your institution reads?

Mr. Jones. Yes, it does and that is the universal one in the 29 institutions surveyed. One of the questions that was asked is what do you do with the royalty income and in each and every case they replied that they use it for education and research which means that it is not only a stipulation but it is widely understood.

Let me just make a remark on the kind of thing we do with royalty income. If a university only operated on grants and contracts there would be a very high likelihood that the research would in time become in some sense sterile. Program officers are rather reticent to take what you might call "the big gamble."

On the other hand, the university must steer itself, by some mechanism, into the future. Now, the steering gear on your automobile is probably a few percent of the total weight, but it is a most important part of the vehicle. Likewise, the steering wheel, if you

wish, or the guiding of the research effort of universities are of equal importance for taking them into the future because the function of research is to help prepare young people for a career that will come to its high point 20 or more years after they leave the institution. Therefore, the research should be far enough out ahead that they can see a little further through that foggy crystal ball into the technological future of the country.

The research in the universities, as we said earlier, has this special relationship between education and research process for guiding the future leadership, technological leadership, of our country and helping that potential leadership to see many opportunities, or to have at least a glimpse of many opportunities, not yet quite clearly understood or realized.

Let me say further that the technology transfer process from the university depends, among other things, on the going out of the students, who are involved in this research, into our industries, taking with them large amounts of know-how which virtually is not publishable; I mean the written text is one of the lesser efficient ways of transferring knowledge as compared to, for example, the man who knows and knows he knows.

This going out of the students, with their masters degrees and doctors degrees, and with experience of working in the laboratories on the new concepts and ideas is one of the prime driving forces of the technological industry. The patent is another process, the publication in the journals is still another process.

Let me also mention a point that I think comes out in one of the appended questions. It is a fact of basic importance. The total patent earnings of all higher educational institutions in the U.S. has been estimated to be about \$9 million per year.

Chairman Nelson. You mean royalties from all patents?

Mr. Jones. For two thousand institutions, the royalties amount to less than \$9 million most of which is earned by some fifty institutions. But patent licensing provides a linkage with industry that is of the greatest importance.

Now, I know that several places in the Senate there has arisen concern for the relationship between education and industry for reasons that I mentioned earlier which are worth mentioning again. That is, we need a closer, tighter relationship of the university and industry both for the health of the industry and for the better transfer of students and technology to industry.

As a result, the NSF initially had in their budget a line item for cooperative research of universities and industry. I understand this was taken out by OMB saying simply they can compete out of the same pocket. NSF now is looking for cooperative possibilities in research, on some kind of a basis, and has indicated that they will also fund research in industry. They are trying to bring the universities and industry more closely together.

I am sure that this \$9 million in patent royalties is a small amount compared to the amount NSF will be spending for cooperative

research within a few years, but yet I believe that the patent licensing process and the resulting relationship of universities to industry is probably a more viable and effective mechanism than cooperative research.

I just wanted to mention that point for the record.

Chairman Nelson. Any of you gentlemen have any comment?

Mr. McCartney. I might indicate that, because of the IRS tax exemption status, we turn our royalty funds to educational and research purposes. It is the general nature of all institutions receiving royalty income that these funds are returned to funds either at the general level of education, or to special accounts back to the individual researchers, or allocated between the two.

Chairman Nelson. Where else could it go other than for research or education since that is what the institution is?

Mr. Jones. I think Mr. McCartney's statement here is that basically we have a charter as a non-profit educational institution and I think the point is right; that is the only place we could properly put it.

Mr. McCartney. That was in response to your question regarding the utilization of royalty income.

Chairman Nelson. I wondered what part of the universities you had not covered if the money had to go to education and research.

Mr. Jones. There is a third area, Senator Nelson, that most public spirited universities get involved in and that is public service. This is especially true in the state institutions. They think of themselves as a three-legged stool -- education, research, and public service and on that basis I say this money is not directed into public service ventures.

Chairman Nelson. One of the old, long standing establishments is the Wisconsin Alumni Research Foundation in which we have some very valuable patents. I do not know if it is still true but many years ago, perhaps 25 years ago there was criticism from time to time that all royalties that came in as a consequence of these patents went into natural sciences and none went to the social sciences which at that time was granted. I do not know. If some goes to general education, some would go to the social sciences rather than the natural sciences.

Mr. Jones. I do not believe we would draw a distinction of keeping it away from any part of the university.

The social sciences, as far as I know, have not produced any bountiful inventions yet, but a few copyrights.

Chairman Nelson. I am talking about royalties going to social science research.

Mr. Jones. I understand and I would say where there is an opportunity to direct efforts into fruitful research, research in social sciences would be an appropriate use of the income.

The social sciences are yet aborning as a tremendous force in our society.

Chairman Nelson. You mention the figure \$9 million. Is that gross or net?

Mr. Jones. Gross.

Chairman Nelson. When you say that, what do you have to eliminate to get the net?

Just how much is charged off?

Mr. Jones. The net would be far, far less. I make an estimate in my reply to one of your written questions. For the 29 institutions who replied to the questionnaire, and who are major research institutions, only about one-third operate their patent operations in the black at this time, so that basically the net would probably be on the order of say \$3 or \$4 million.

There is a certain size of operation that one needs to get to, a certain effectiveness that an institution needs to get to, before one can sustain the organization that will handle the patents effectively.

That is one of the reasons that many institutions use licensing organizations external to the institution. They do that while they are growing up in size.

Back in the 1950's M.I.T. used a research corporation as a licensor. I have heard but I have not documented that the break came over the magnetic core patent which I previously mentioned. This research corporation is said to have indicated that the invention was not worth pursuing a patent on since it was only useful in computers and there were not very many of them. This was, I am sure, an error that they regretted. M.I.T., fortunately, through the kind of insight such research develops, foresaw that the computer field was doubling every two years and that this invention was a valuable property and proceeded to obtain a patent. At that time M.I.T. proceeded to develop its own licensing operation. That happened within the last 20 years, you see. Only recently have universities become sufficient generators of inventions and patents to sustain an in-house marketing capability.

We are talking about a new phenomenon and I think that a study such as you are carrying out here is very timely.

Mr. Sturges. Mr. Jones you indicated that the Association of American Universities finds the proposed government-wide IPA acceptable.

I might note for the record it reflects some of the things your groups wanted and some does not include some things they did want. The letter from M.I.T. signed by Mr. Fitzsimmons indicated that the IPA be made mandatory, and there be no discretion left to federal agencies.

Mr. Smith. I do not recall that letter.

Mr. Sturges. A letter of comment on the draft.

Mr. Smith. O.K., fine.

Mr. Sturges. The letter also -- M.I.T. also asked for additional time for free market clearance not to be counted against the period of exclusive licensing.

Mr. Jones. If we had our choice I think we would prefer it that way, but we see it possible to function quite effectively within these limitations.

Chairman Nelson. Are you talking about the three or five years?

Mr. Jones. Yes, we would like to see it more open. It would be advantageous to have it more open.

On the other hand, we do not feel ourselves mortally wounded with that restriction.

Chairman Nelson. Three years after marketing? You may not ever get to market in five years.

Is there a provision that that may be a good cause showing to negotiate for an extension on an individual basis?

Mr. Smith. I believe that would be handled as far as I know, that would be possible but I have not really gone into it in detail.

I think the point is at the time comments were being requested the universities did come in and try to put forth their views. I think that it is a fair statement to say that the IPA as it is now proposed is quite acceptable.

Mr. Sturges. I guess I might note for the record the Committee on Government Regulations signed by you, Mr. McCartney, recommended the conflict of interest be dropped.

You mention the universities patent policy and there was an article on that subject of university patent policy in the fall, 1975 issue of the Journal of Colleges on university law and there

was a reference in the article perhaps a bit of advice -- further, the university should seek to license the patent on a non-discriminatory basis and grant exclusive rights preferably for only a limited period but in such cases it should be prepared to demonstrate the granting of exclusive rights constituted the only practical way to utilize the invention for the benefit of the public.

Now, that is only a journal comment but it seems to me a growing supposition on the part of the universities that exclusive licensing is necessary, not exceptional, but regular, normal practice.

How do you reconcile that?

Mr. McCartney. We would point to your own institution, Senator Nelson. I know the practice and knowledge of their policy they attempt to license on a non-exclusive basis as a preferential policy.

It is not always the case at other institutions that that policy is exactly the same. However, every institution in attempting to find capable licensees must examine the nature of the invention that we are attempting to license, examine the capabilities of the licensees in the field which varies everywhere from health related to engineering inventions to chemical formulas and it is a rather detailed process to determine capability of licensees and that, of course places the burden upon the licensor, the university, and we make these reports to our IPA agencies, HEW and NSF.

Once that capability is determined, then we proceed on a non-exclusive basis or exclusive basis if that is the practicability of the situation and I had in several instances of my own personal knowledge at the University of Southern California found that the small business community is where sometimes they are willing to take risks and that is not always true of large corporations. Small businesses want to get into new proprietary fields.

The IRS over the last several years has been scrutinizing university expenditures to see that they are related to our educational function. With all of this in hand, I think I can safely say for the community, government relations and our 107 institutions that we do, when we license, whether it is the IPA or individual waivers for those agencies that do not issue IPAs, attempt to determine the ability of the licensee to market to the public and that it is in the interest of the public and the government and the universities. We seek non-exclusive licensees, preferably.

Unfortunately, that is not always the fact of life in our free enterprise system where there is a large developmental effort required, a large amount of funds may be at risk.

Mr. Sturges. That is the point I am trying to get at. You make it sound more like a typical case whereas I would assume drugs would be a special case -- drugs would be more likely to require exclusive rights.

Mr. McCartney. It is interesting in the field of non-governmental research for a pharmaceutical company to provide research funds in the case of my university for the School of Pharmacy and because of the nature of the private enterprise they have proprietary interest in the use of their funds just as the government does, but in a different sense. They have proprietary need to satisfy their stockholders, so to speak. The government has the need to satisfy the needs of the public as a whole.

The pharmaceutical company many times will ask a university or insist when they issue research funds to a university that the contract terms require title of the invention to the pharmaceutical company. It is almost a general position in universities to negotiate such a contract and not accept that type of a requirement.

There could be special exemptions or special circumstances, but on the whole the most the universities would do is provide an option of license to such pharmaceutical companies.

Mr. Sturges. Well, you have to exchange the rights for the money in other words if the conditions are acceptable.

Let me pursue another point. What kind of test would be imposed to satisfy the suggestion here that granting of such exclusive rights constituted the only practical way to utilize the invention for the benefit of the public?

Must you contact 1, 2, 3, 5, 12 licensees, the number bearing on the nature of the industry and the invention?

Mr. McCartney. One of the most difficult things in technology transfer as Dr. Jones mentioned to you, maybe one out of a thousand inventions is really a big money maker and the difficult problem of the university is looking at an invention before putting any money into the patent application and a patent application is always a complicated process in itself. Because of the many demands universities' funds are not adequate to use for every filing that an inventor would like to have a filing on.

We have to utilize a great deal of scrutiny in developing a decision on the part of the university management. Is this a marketable invention, or just an invention that looks nice on paper in the view of the inventor.

Marketing studies are utilized. Just where and how large is the market for such an invention?

Some universities have been utilizing the staff and students in the school of business in their market incentive programs to provide staff assistance to the university management which has to make these decisions to try to find where is the market.

Also, is the market sufficient to utilize the invention and to provide finances to develop the patent application and to interest the company to invest its funds.

Then we have to look at what companies are in the field. There might not be any companies in the field. There might have to be a development of a new company, a new strategy to utilize this or there might be one or two companies that are at the present time in this type of work and that could utilize this invention. The marketing and development and decision making at that point is really where we have to determine what the field of capable licenses are.

Mr. Sturges. Well, I accept what you say but I do not think that really answers the question. I will put it in terms of the IPA. The IPA non-exclusive licensing is supposed to be the way to proceed. An exclusive license is an exception given on two conditions.

I would ask under the IPA what test in your probing for a market, what test must be satisfied before you can legally, confidently proceed with an exclusive?

Mr. McCartney. The test is do we have more than one company that is willing to invest the capital in a non-exclusive license.

Mr. Smith. I would like to comment on that. The IPA does not set some number of companies that have to be contacted. We go through the exact process Mr. McCartney pointed out.

In my experience if we find there is more than one individual licensee and those licensees have the capability; in other words they know the market, they do have the market expertise, and they have the money to invest in the invention and the technology transfer capability, we will definitely license them, non exclusively. We go through exactly the same process in attempting to meet the IPAs we work with under the non-exclusive.

Chairman Nelson. Do you, or have you as a practical matter ever found situations in which two qualified manufacturers have had all the necessary assets and say we will be glad to take this product on a non-exclusive basis even though we know one or two others are also interested?

Mr. Smith. Yes, Senator. We, in fact, have. Let us take desired non-exclusives first. There are definitely certain industries today where non-exclusive licensing continues to be the norm absolutely, and we have been in contact say with a number of companies, all qualified, all of whom wish a non-exclusive. That is fine and we will issue non-exclusive licenses.

Chairman Nelson. They do not even seek an exclusive?

Mr. Smith. That is correct.

Chairman Nelson. What is the reason for that?

Mr. Smith. Well, I suppose there are a number of reasons and probably one of them may well be that they are in an area, such as computers, where non-exclusive licensing is definitely the trend and that has quite a bit to do with the market and the dominance of the market by a number of companies. I am sure that goes into their thinking.

On the other hand, we have also been faced with situations where we have had qualified licensees but each of them indicated to us that there is no way they would develop that invention unless they get some sort of exclusivity and that is really the difficult issue to face -- do you let the invention die because you cannot get non-exclusive licensees or do you make a decision to license one of those at least for some limited period?

Now, obviously, we feel you have to make that latter decision. If you do that you are going to have to do it in a way in which you have extremely rigid controls to make sure that the invention is transferred as quickly as possible so you can get back in time to non-exclusive licensing.

Chairman Nelson. Is there anything in the IPA in the procedures for review -- or what procedures are followed in terms of licensing for the institution?

Mr. Smith. I believe we are required to submit reports as to what we have done with each invention under the IPA, who we have licensed, how we have done it and that sort of thing.

The agencies also have a right to request to look at the agreements or anything else they wish.

On the exclusives, we would be happy, in fact, to submit you any copies of what we propose to do in advance of doing it.

Mr. McCartney. The current IPA in DHEW has a specific time step where there is a three-year exclusivity issue that there may be application for an extension of two years if that period of time has expired and at that time the agency can take a very close look to determine whether the decisions made and are in effect are applicable and appropriate and they may at that time of application extend exclusivity for an additional two years.

Mr. Sturges. In your experience is that a thorough look by the agency and are extensions customarily granted?

Mr. McCartney. I know in our experience at the universities we take a great deal of time and trouble to present our case for the extension of the additional two years.

We have had specific instances where HEW has allowed us to extend our exclusivity for two years with licensees. The nature of their review has to be answered by the agency itself.

Mr. Sturges. Before we overlook it, would you describe the Association of American Universities? How many members?

Mr. Jones. 48, Mr. Sturges. This organization was set up in the wake of World War II as an organization of those institutions which had established unusual research capability. The research capabilities of universities prior to World War II was on a much, much smaller scale than Postwar and certainly, very much smaller

than today. A farsighted group of institutions that had developed capability during World War II and who foresaw their future in the much closer, tighter relationship and expanded relationship of research and education banded together. I do not think that the list has changed significantly since its founding in the late 1940's.

It is comprised of the 48 institutions that are members; some 40 of them would rank in the top 50 in the magnitude of research.

Mr. Sturges. My impression was that member institutions handle and receive something like 80% of the government R & D dollars.

Mr. Jones. That is probably correct.

Mr. Sturges. Do all of the AAU members have institutional patent agreements with HEW or NSF?

Mr. Jones. No, most do but there are a few exceptions as I recall.

Mr. Sturges. Is the University of California one of those exceptions?

Mr. Jones. It is.

Mr. Sturges: Why would some of your members not seek an IPA?

Mr. Jones. There have been some disagreements to this agreement and it may seem illogical -- grounds of principle so that although they have not said we would not have one under any circumstances, they have said there are certain provisions that we do not like and we will not have such an agreement under these conditions. That is the way I understand it.

I have not been involved and I am speaking from hearsay and therefore, I would ask that my testimony be taken in that light.

Mr. Sturges. Can any of the other two offer any instances?

Mr. Smith. I am not sure I can comment on that question. I assume there are certain universities that have applied for IPA and have not been qualified. You have to meet minimum qualifications.

Mr. Sturges. Assuming your members would be more likely to qualify.

Mr. Jones. Out of the 48, 29 returned the information you were mentioning which represented, I think, the principal ones involved in an aggressive licensing program.

Mr. McCartney. I am somewhat familiar with that, being from a sister university. However, the University of California system administers its patent policy for all nine campuses from their Berkeley headquarters and one of the areas of disagreement by California with accepting IPAs is the restriction on the patent royalty income. There have been waivers requested on individual basis with HEW but

in the past this ideological policy difference is the reason IPA has not been applied for or accepted by the University of California system.

It is my understanding now they have applied for an IPA but it has not been issued yet.

Mr. Sturges. Mr. Jones, granted it would be hearsay and not of your own direct knowledge, have you any additional examples?

Mr. Jones. I went over the forms that were returned and I noticed several. I did not take note of who they were and I could not make further specifications.

I would be glad to give staff that information if you like.

Mr. Sturges. Please.

As you know the government-wide IPA provides the institutions shall not bar or prohibit publication of disclosures of subject inventions on which patent applications have been filed.

In commenting on the draft regulations the Wisconsin Alumni Research Foundation wrote the implication of this language is that where no patent application is filed, the institution can bar or prohibit publication without limitation.

The comment then by the Interagency Committee in response was a university has this prerogative.

Now, does this mean that a scientist en route to an international meeting reading a paper and announces a discovery on which patent application has not been filed, he could be asked not to go?

Mr. Jones. I would say that would be a very grave mistake on the part of the administration if he had gotten that far.

I think, on the other hand, counseling is generally the practice of making clear what things are at stake. Certainly one of the most important traditions of the university is the dissemination of knowledge. That is the major concern. I know of no case where publication has been held up for more than 60 days and those were cases where the invention looked like a rather valuable property and the problem with that is the formal filing of the patent application.

In the U.S. you can disclose, you can publish. You have a year after publication for filing. But in many Western countries, unless you have applied in the United States, formally applied for a patent before publication, or, alternatively, apply abroad before publication, you are not eligible for a patent. This is the fly in the ointment, so to speak, and one which has led the Department of Energy to require some papers 60 days before publication with provisions for essentially indefinite delay while a patent application is prepared.

That ruling has been recently modified somewhat and Mr. McCartney can remark on that. This is a rather delicate question and brings up questions which are of greatest importance at this point in the development of our country's technological lead. The questions are: who should be responsible for foreign filings and how aggressive would the government managers of patents be in deciding to invest the rather significant amount of dollars in filing abroad (an expensive process)?

Further, many countries require an annual maintenance fee for so long as the patent is in force in that country and this is quite a drain which means you have to have a real and firm plan for pursuing the utilization of the invention in those countries in order to apply for and maintain a patent.

This is a rather complicated legal question on the one hand and a question which does fly into the face of one of the university's most sacred principles and that is the freedom to publish, in fact, the requirement to publish. It has not proved a great problem and one we have been able to deal with without having to stop a scientist in mid-air!

The closest we came to that concerned cryptographic codes but we will not go into that.

Mr. Sturges. The point I am trying to get at is the squeeze referring back to the letter Mr. Smith wrote urging that the IPA be made mandatory, that the agency be given no discretion.

If this provision were included is there not a good potential difficulty? You say you know of no case delayed more than 60 days.

Would this not allow the university holding an IPA to go for a much longer delay?

Mr. Smith. I do not think holding the IPA, whether the university holds or does not hold an IPA is at stake. The issue is the one of free dissemination of information.

In my experience at M.I.T., and I have been involved in patent licensing for 15 or 17 years, there has never been an action by the Patent Office where the Patent Office has indicated to an inventor you cannot publish that because we want to protect patent rights.

Instead, the only viable solution available to the university is to get those disclosures in as quickly as possible and get those patent applications on file. Often we are in a position of filling those applications the day before the inventor is on his way to a conference somewhere.

What I am saying is the burden is not on the inventor in my experience as far as delay in publication. The burden is on the Patent Office within the university.

Mr. Jones. Let me ask Mr. Smith a question. When did you file your first foreign application? Is this relatively recent or have you done it for many years?

Mr. Smith. We have been filing on a heavy -- I would say on a reasonable foreign program for about I guess 8 years now, or perhaps 7.

Prior to that we had filed, but not on the basis we do now.

Mr. Jones. The point is this is again a relatively new development, this problem of publication and patent rights is a question of foreign countries and this is a relatively new aspect of U.S. technological science.

Mr. Sturges. Would it not also be the case, though, that a factor contributing to the burden on the university patent office would be the need to search the scientific literature as well as the patent literature?

Do you search also the scientific literature as well as the patent literature?

Mr. Smith. You mean prior to filing?

Mr. Sturges. Yes.

Mr. Smith. If we had the time. If we do not have the time we file. The reason, you see, is the inventor himself researched that literature. He knows what the literature is because usually the disclosures coming are at the forefront of the technology which is why most universities are in favor of the IPA. We are dealing with a different type of technology from industrial technology. The inventor is at the forefront. He has already done the research.

Mr. Sturges. Mr. Chairman, could we ask one more question of Mr. Jones?

Chairman Nelson. Yes.

Mr. Sturges. Could we ask him in view of the charts we have, what public interest is in this whole area?

Is there a single definable public interest that covers grants for research and development, technology transfer and licensing of universities?

Mr. Jones. Mr. Sturges, on the basis of my experience (and although I am approaching retirement, it seems far too little) I would say my observation is that the most important thing we must address is getting technology to the using public and not leaving it in government files which has been pretty much the history of the patents which have been taken by the government in the past.

Of the 24,000 that are in the government domain, only a relatively few have been licensed. I wish I knew the numbers. There had been 20 exclusives up to 1972. How many total licenses, including non-exclusive licenses, I have no data on, but by and large there has been almost negligible licensing activity, although there was a government policy permitting licensing.

On the other hand, there are many advantages which I have enumerated here today for the universities to handle licensing. The IPA, an easy mechanism which came into being by Presidential action, has proved to be the best way thus far of minimizing the red tape and maximizing the transfer. I think the IPA process is functioning satisfactorily. I have watched the technology transfer with some pleasure and I feel the public interest has been well served. I cannot conceive of a totally different mechanism which would meet the needs that well.

That, Mr. Chairman, is based on only 62 years of experience.

Chairman Nelson. Of that 24,000 patents some of them appear to be commercially useful. Why would not the promoter who is qualified go to the government and say I would like a license?

What is the practical problem there?

Mr. Jones. I would speculate, which is all I can do, that it is difficult to get decisions on these matters in government especially where exclusive licensing would be the only practical way to bring the invention to the marketplace because of the investment and risk we have enumerated earlier and this would be a tough decision for a civil servant, for example, to make because it is tough for Art and myself in these where we have to make choices between major and minor U.S. corporations in the licensing process on the basis of all the data that we put together consciously and at considerable effort.

Let me just mention that over 60 percent of our licenses outstanding are to small businesses within the definition which I believe you hold for small businesses but each licensing choice was made on the basis of a great deal of study of the background of the companies, of the expected end use of the technology and with the one concept that the public is served if you can get it into the market place and get it into the market place as broadly as possible.

The time limits of exclusivity are, of course, a negotiated figure. When we talk with more than one company who is qualified and each demands an exclusive we can get a pretty good feeling for where they are as well as where we are in making these decisions. In each case, I can say that they have been carefully studied and the decisions made consciously and conscientiously. The system, I feel, works quite well.

Senator, I do not see the probability of an equivalent system in government.

Chairman Nelson. Well, is it your view that of the 24,000 it would be a number that would be very valuable and useful to the public?

Mr. Jones. The professor who conceived of and operates the Innovation Center which I spoke of earlier....

Chairman Nelson. I am sorry, the Professor who did what?

Mr. Jones. The professor who put in operation the Innovation Center I spoke of earlier has a contract with the Bureau of Standards in evaluating a number of those patents relating to energy and is trying to find whether there are some there which have real potential which have been overlooked. This is a very interesting kind of technology assessment; trying to determine the cost benefit of many patents which have lain in the coffers and have not been used.

This work is sponsored by the Bureau of Standards as I recall.

Chairman Nelson. Well, thank you, gentlemen, very much for your appearance. We appreciate your taking the time to come and testify.

Mr. Jones. It has been our pleasure.