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DRAFT PROPOSAL
Proposed for NSF but
not formally submitted

UNIVERSITY RESEARCH UTILIZATION

INTRODUCTION

The research facilities that have been built up in universities since 1955 represent a large and continuing expenditure of public funds, and the public deserves maximum return on this investment. While federally funded university research has made valuable contributions to the defense, space and atomic programs, it has not produced an appreciable number of commercially successful inventions or discoveries in other fields. This apparent lack of commercial utility does not mean that commercially successful results cannot be obtained from university research but rather that there has been no incentive for commercial development. As a matter of fact, ongoing university research represents a valuable national resource that should be exploited more fully for the benefit of the public. However, successful exploitation can only be obtained by providing incentives for the university, and for the private company that will handle the commercial development or the state or local agency that may utilize the results of the research.

STATEMENT OF THE PROBLEM

Federal research contracts and grants to universities do not have a budget line-item for research utilization but publication usually is funded. This means that the results of the research are published and then the project is terminated without any study of the possibilities for utilization. Most universities are interested in promoting the use of their research, and do provide limited funds

for patent and copyright protection, but they cannot afford an adequate research utilization program. Some arrangement is needed so that each research project can be critically examined for useful technology, and support can be provided to develop inventions and discoveries that appear to have potential for successful commercial development or would be useful to the public.

THE PRESENT SITUATION

There is a widely held opinion that much of the research financed by the federal government has not been fully utilized. There are no data to indicate that discoveries are being withheld from the public, but the vast sums spent on research and the small number of patents granted on the work indicates a lack of utilization. For example, in the four years 1966-70 the NSF issued 16,207 grants or contracts for 905 million dollars and reported only 237 patent disclosures and 21 patents granted. There is no information available on any commercial use of these patents. Some utilization without patent protection may occur, but in general the additional expenditure needed for commercialization will not be incurred by a private company without patent protection.

The federal policy on patent protection has been a major factor in deterring private industry from using federally funded research. The liberalization by presidential order has given a policy that is workable although still considered unsatisfactory by many companies; but even this policy, which offers minimal patent protection, is now under court attack by consumer groups. The

uncertainty of patent protection greatly increases the problem of technology transfer.

University Activity The orientation toward basic research in universities is changing somewhat to include more mission-oriented research in accordance with the demands of sponsors. Some investigators welcome this trend, but the majority are still primarily interested in basis research and consider publication in a refereed journal as the logical and sufficient end product of their research. An educational program is needed to inform faculty members on procedures for technology transfer and to convince them that it is also rewarding to have their research used in industry or contributing to better social conditions. The Research Management Improvement Section of the NSF is supporting an exploratory project in this field through their contract with the Research Corporation (1)*. A number of universities and colleges, particularly those with a Land Grant background, have long promoted research utilization, but only to a limited degree and never across the whole field of research. Surveys of university activity have recently been made by the University of California and Northwestern University. Partial reports of their finds are given in the Appendix (2)* (3)*.

Some general conclusions that can be drawn from these surveys are:

A. University of California

* Numbers refer to material in the appendix.

1. A majority of the institutions use outside consultants but few use outside management firms.
2. Royalties to the inventor vary from 15% to 50% with a rough average of 30%.
3. The major part of the income always comes from one or two patents, irrespective of the size of the program.
4. The inventor's department and college usually do not share in the royalty income.
5. Most institutions do not have full-time patent employees.
6. Based on the number of disclosures, more applications per disclosure are filed by universities than is usual for patent management firms.

B. Northwestern University

1. In general, the conclusions of the California survey are confirmed.
2. Over half of the institutions use a patent committee to decide whether to file a patent application. 22 out of the 57 institutions use outside consultants to help them determine whether to file.
3. Patent activity increases rapidly with increased professional time devoted to patent promotion.
4. Only 11 out of 49 reported full recovery of expenses from royalties.
5. The roughly estimated cost of administration varies from 0 to $100,000 with the average for 25 schools being $17,500.

6. An unusually large number of patents are licensed.

Government Activity Technology transfer and research utilization programs are being offered by a number of federal and state agencies. Among these programs, the Intergovernmental Science, the Experimental R&D Incentives, and the Research Management Improvement programs in the National Science Foundation are the ones most applicable to universities; but no government program directly and fully covers the university situation. A satisfactory university research utilization program should provide:

A. continual review of all research to identify any projects suitable for commercial development or public use.

B. capability for patent coverage either in-house or through an external agency.

C. agreements with one or more external technology development agencies.

D. the right to obtain and license patents resulting from sponsored or unsponsored research.

E. support for limited development of inventions or discoveries to the point where nonfederal sponsors will provide support.

Professional Organizations The National Association of State Universities and Land Grant Colleges made a study of university research utilization in 1973 and drafted a policy and position paper entitled "A University Delivery System for Resources and Knowledge Resources" (4). This paper has not been issued but the draft calls for an extensive federal, state and local government organization focused through one university in each state. Exten-

sion agents, similar to those in the present Cooperative Extension Services, would be the mechanism for research utilization.

It appears that this proposal would set up a new bureaucracy at all government levels that would be expensive and might actually hinder rather than assist transfer between the producer and the user. Technology and information transfer will proceed smoothly only if the university establishes credibility with the groups to whom information is to be transferred and these groups become receptive to university initiatives. These attitudes of credibility and receptivity can be attained better by direct negotiations between the principals than by negotiations through a third party.

The National Academy of Engineering recently made a study for the NSF and prepared a report entitled, "Technology Transfer and Utilization." This report dealt primarily with the transfer from federal agencies but indicated that it also could apply to universities. The report recommends that:

A. technology transfer and utilization (TTU) be given greater emphasis, particularly the utilization aspect.

B. only worthy projects be selected for action.

C. the proper environment for TTU be created; i.e.,

   1. provide funds for transfer preparation
   2. cover technical and financial risks of participants
   3. establish a budget line-item for TTU
   4. recognize the "transfer utilization agent" as a civil service position (a similar university position is implied)

5. grant exclusive licenses for government patents.

The NEA approach is preferable to that of the NASULGC in that it places the responsibility for transfer with the originating and receiving agencies and does not introduce an intermediary.

SUPPORT FOR TECHNOLOGY UTILIZATION

Three parties are involved in the commercial development of an invention or discovery made during a federal sponsored research project in a university. They are the federal agency that supplies the funds for basic research, the university where the research is conducted, and the private company that supplies the funds and the expertise to develop, manufacture and market the invention or discovery.

The first step in the process, the basic research, is only a moderate risk venture if the objective is to increase basic knowledge. A proposal by an experienced investigator, after passing a review panel, will very likely produce results that are of sufficient value to warrant publication in a refereed journal. On the other hand, a proposal for basic research, continuing for only one or two years, with the expectation of a commercial product as the result, is a very high risk proposal with little chance of success.

At the end of the basic research step, which has produced the desired extension of knowledge, a review of the results by an expert in the field may indicate that an invention or discovery has been made. At this point the research utilization process begins as a high risk venture whose cost usually far exceeds the cost of

the basic research. The original sponsoring agency might well be satisfied that its original objective has been attained, and transfer rights for development including the patent rights to the university for further action.

The most suitable method of funding from this point would be for the university to cover any developmental costs to the stage where a patent application is filed, and then attempt to license the patent to a private company for commercial development. However few universities can afford this course of action. As stated earlier, less than half of the universities in the Northwestern University survey showed a net profit from their research utilization activities. The California survey, which covered 23 of the larger and older universities, showed only 70% with a net profit. Also in every case the major source of income was from one or two patents. Unless a university is fortunate enough to produce a high return patent in its early years of operation, it will have many years of deficit which must be made up from the educational budget. Federal support during this unavoidable period of deficit would allow universities to plan and carry out effective programs of research utilization.

A PROPOSED UNIVERSITY PROGRAM FOR TECHNOLOGY TRANSFER AND UTILIZATION

The information presented above indicates that new procedures are needed to utilize the information and technology that results from university research. Worthy material must be identified, put in proper form for transfer, and then directed to the public or private

agencies that will further develop the material for their particular use. The cost of utilization should be shared by the sponsoring agency, the university and the user. The following procedure is proposed to accomplish these objectives.

1. The university would submit to its federal sponsor a proposal for technology transfer and utilization (TTU).
2. The federal agency and the university would negotiate a TTU direct-cost line-item for all contracts or grants (estimated less than 1% of direct costs).
3. The university would match the sponsors contribution to TTU.
4. The TTU funds would be placed in a special account subject to federal audit.
5. An Institutional Patent Agreement that permits exclusive licensing would be negotiated between the agency and the university.
6. A limited amount of prelicensing development would be allowed under the TTU program.
7. Development costs after licensing would be paid by licensee.
8. Royalty income from licenses would be placed in the TTU account.
9. A reserve equal to one year of operating expenses would be allowed to accumulate in the TTU account. Any funds in excess of this amount could be used to support university research. At this point the federal support would be stopped or reduced to a small amount to cover only

identification of inventions.

The principal of the direct-cost line-item in university grants and contracts for technology transfer should be accepted by all federal agencies for the full application of this proposal. However, acceptance of the concept by the NSF alone would enable many universities to expand their present technology programs. The experience gained on the NSF demonstration program could then be used to promote acceptance by other agencies.