PART I-INTRODUCTION

A. Purpose of the Report

The purpose of this report is to discuss the results of the first university survey conducted by the Clearinghouse on University-Industry Relations. The subject matter of the request was conflict of interest and delay of publication policies of universities engaging in collaborative research efforts with business. The principal focus of the report is not the form of the collaboration but rather how the institutions have prepared for and managed the constraints of entering into such ventures.

The Clearinghouse appreciates the willingness of all respondents to participate in the survey, particularly those who provided copies of policies and supplemental materials.

B. Background: The Growth of University-Industry Collaborative Research

The federal government provides most of the support for basic research at universities. Only a small percentage of university research is sponsored by corporations. There continues to be a great deal of reliance upon corporate philanthropy, but increasingly, universities and industry are establishing collaborative research relationships, more like partnerships. These relationships are based on a *quid pro quo*: the corporate sponsor provides financial support of specific research in

exchange for certain rights to use the results or to maintain an exclusive relationship with the research activity.

Collaborative arrangements have flourished because competition has increased in recent years, increasing the pressure on industry to develop new technologies and be at the forefront of innovation. Concurrently, university and industry scientists find their work more closely linked as the boundaries between "basic" and "applied" research become blurred, especially in areas of new technologies. In general, universities find that research collaboration with industry meets their research needs without compromising fundamental academic principles. The university has the benefit of research support, valuable research experience for students, and broader research opportunities for faculty who might otherwise be lured from the academic environment to industry.

Further, there is growing support for the involvement of universities in the technological and scientific growth of the business community. As the fourteenth annual report of the National Science Board states, "...the interdependencies between good science and good development have been long recognized, but because of the changing character of the problems, more direct research interactions between science and industry are now occurring." /1

Federal, state and local governments encourage university-industry relations. State economic development programs and

legislative initiatives promote collaboration among government, industry, and universities. On the federal level, the National Science Foundation funds start-up research centers in which federal support is phased-out as industry sponsorship is established. Other federal agencies, such as the Department of Commerce, encourage universities to develop research relationships with industry. The National Academy of Sciences is sponsoring the Government-University-Industry Research Roundtable to "foster strong American science through effective working relationships among government, universities, and industry." /2

Generally, universities have been responsive to establishing collaborative research arrangements with industry. The form of the collaboration varies, even within a single university. The most highly publicized arrangements are multi-year, multi-million dollar projects between one university and one company. However, there are many more programs in which several universities and several corporations join to establish a research center or project in which the universities jointly undertake numerous research tasks. Some industries have formed non-profit corporations or foundations to provide support for basic research at universities.

Despite the growth of corporate support for university research, such support is not expected to provide more than a small supplement to federal assistance. Even so, many universities welcome the additional commitment to research. Although the

federal government's support for basic research is strong, it is not always reliable. Most glaring is the long absence of federal funding to remodel and replace inadequate research facilities and instrumentation.

C. Congressional Response to the Emerging Collaborative Relationships and the Establishment of the Clearinghouse on University-Industry Relations

In light of these new collaborative relationships, it was not overlooked that universities and industry have missions that are different, and in some cases, divergent. Policy-makers and university administrators are concerned that university-industry research relationships could damage the research enterprise. Interested observers, including members of Congress and the press, have also expressed concern. Their fear is that universities engaged in these arrangements may compromise their goals of free inquiry and open dissemination of ideas. The Report of the University-Industry Relations Project at the University of California (1982) summarizes the concern of universities: to provide diversity of research activities while preserving the university's independence from undue influence from a single source. /3

In 1981, the Oversight Subcommittee of the House Committee on Science and Technology asked the Association of American Universities (AAU) to develop ethical guidelines to govern university-industry collaboration. That request stated, "...the

ethical dilemmas posed by the metamorphosis of our scientific research force from educators to entrepreneurs have not been resolved. Changes in research priorities, allocation of resources, faculty-student and faculty-university relationships, as well as diminishing scientific openness may soon be evolving from a shifting value system." /4

A Committee on University-Industry Relations was formed by AAU to respond to the Congressional request. The Committee determined that uniform guidelines appeared unnecessary. However, it did conclude that universities, industry, Congress, and the public would benefit greatly from the sharing of information regarding research collaboration. The responsibility for establishing a clearinghouse for such information was undertaken by the AAU. Thus, the Clearinghouse on University-Industry Relations was established by AAU in September, 1983.

D. The Clearinghouse's Initial Project: Establish an Information Source and Conduct a Study of Conflict of Interest and Delay of Publication Policies

Since the establishment of the Clearinghouse, university administrators and industry managers have expressed a great deal of interest in information sharing. The Advisory Committee to the Clearinghouse recommended how best to address that interest. As a result, the Clearinghouse now actively collects and disseminates information relating to university-industry relations.

The Clearinghouse also has established a program of gathering information on a systematic basis from universities concerning activities with industrial sponsors of research. The first request, made during the spring of 1984, focused on two specific problem areas: conflict of interest and delay of publication. The request was made in writing to fifty-six universities. A detailed description of the requested information was provided to each respondent (see Appendix A). The universities were asked to provide copies of relevant documents and examples of cases that arose at their campuses. The information was reviewed and analyzed in detail. In all, fifty-one universities responded.

Conflict of interest and delay of publication are policy issues that arise in almost every type of research arrangement with industry. Each focuses on a different aspect of the university's policies with regard to the university and the faculty. Knowledge about the content of the policies and practices and when and how they are implemented are important tools for other institutions to use in evaluating their own activities. In addition, the patterns of establishing policies and procedures provides insight into the extent to which universities have developed their own structures and procedures for research collaboration, and the extent to which universities accommodate the interests of business entities.

PART II-CONFLICT OF INTEREST POLICIES

A. Background

Universities rely on faculty to make decisions concerning the appropriateness of research, both substantively and procedurally, and to carry out the purposes and goals of the institution. Overwhelmingly, this arrangement is a success for faculty and the institution. Nevertheless, there is not always a single view of the appropriate balance between outside activities that enhance the knowledge and experience of the faculty member, and his or her commitment to the university.

The university itself must recognize its goals and objectives for faculty. At most universities, consulting and sponsored research activities are encouraged. They provide intellectual stimulation and financial support. The line is drawn, however, when that support becomes an improper influence over the faculty member and as a result, university responsibilities are neglected or the faculty member becomes biased in favor of industry's proprietary goals.

Conflict of interest within a university can have two meanings. First, conflict of interest arises when the faculty member's commitment to his or her responsibilities in the university are not met as a result of outside activities. The conventional solution to this conflict is to provide a policy which describes

the faculty member's teaching, research, and administrative duties, and limits outside research and consulting activities to one day per week. Within the past twenty years, the issue of faculty consulting prompted many universities to develop such a policy.

Second, conflict of interest arises where a faculty member uses influence within the university to advance his or her own personal gain. For example a faculty member could promote a research relationship with an outside sponsor in which he or she has an equity interest, managerial role, or consulting relationship. The university would be adversely affected if the faculty member subordinated his or her university teaching and research to the activities of the outside company or used university facilities, equipment, and instrumentation, or graduate students for that purpose.

Of course, conflict of interest is not a new problem. In 1964, the American Association of University Professors (AAUP) and the American Council on Education (ACE) jointly issued a statement entitled On Preventing Conflict of Interest in Government-Sponsored Research at Universities, which has been endorsed by most research universities. The joint statement provides a detailed discussion of conflict of interest and encourages individual universities to establish procedures to address it.

According to the AAUP/ACE statement, conflicts may arise when a faculty member undertakes or orients his or her university

research to serve the needs of a private firm, purchases equipment from a firm in which the faculty member has an interest, transmits to a private firm otherwise unavailable information, influences negotiation between the university and a private firm with which the faculty member has a relationship, or accepts gratuities or special favors from a private firm which might be interpreted as an attempt to influence the recipient's conduct of his or her duties.

The joint statement also addresses a faculty member's conflict of commitment. It states that a researcher has a responsibility not to mislead the sponsor of research or the university about the amount of time and effort to be devoted to the research project. Precise time accounting is recommended.

With respect to the university's responsibilities, the AAUP/ACE statement recommends that each university develop and disclose its accounting procedures, procedures to inform the university about the outside professional work of faculty members, procedures to inform faculty members about the standards relating to conflict of interest, and the availability of advice and guidance to faculty members regarding potential conflicts.

The joint statement concludes:

> The above process of disclosure and consultation is the obligation assumed by the university when it accepts Government funds for research. The process must, of course, be carried out in a manner that does not infringe on the legitimate freedoms and flexibility of action of the university and its staff members that have traditionally characterized a university. It is

> desirable that standards and procedures of the kind discussed be formulated and administered by members of the university community themselves, through their joint initiative and responsibility, for it is they who are the best judges of the conditions which can most effectively stimulate the search for knowledge and preserve the requirements of academic freedom. Experience indicates that such standards and procedures should be developed and specified by joint administrative-faculty action. /5

B. Results of the Survey

As one might expect from the attention drawn to the problem by the AAUP/ACE statement issued over twenty years ago, most universities in the sample have procedures within the university to direct the initiation and management of sponsored research. Since the university must approve sponsored research projects, the approval process includes a review of the activity for potential conflicts of interest.

It is not surprising that 46 of the respondents have established written conflict of interest policies which are applicable to business-sponsored research as well. Most have been revised in the last five years (See Appendix B).

Twelve conflict policies (out of 22 public institutions responding) are based upon existing state law applicable to public university employees. For example:

> 1. A university officer or employee is forbidden to participate in his/her official capacity with respect to any transaction between the university and a business entity in which the officer or employee has a substantial interest.
>
> 2. A university officer or employee is forbidden to receive compensation (in addition to regular budgeted salary or wages for service to the university) as a result of, or in connection with, any transaction between the university

and a business entity in which the officer or employee has a substantial interest.

3. A university officer or employee is forbidden to accept employment or engage in any business or professional activity which he/she might reasonably expect would require or induce him or her to disclose confidential information acquired by reason of the officer or employee's university position.

4. A university officer or employee is forbidden to disclose confidential information acquired by reason of his/her university position, or to use such information for his/her or another's gain or benefit.

5. A university officer or employee is forbidden to accept other employment which he/she might reasonably expect would impair his/her independence of judgment in the performance of university duties and responsibilities.

* * * *

7. A university officer or employee is forbidden to have personal investments in any business entity which will create a substantial conflict between his/her private interests and university duties. /6

The distinctions among the various policies on conflict of interest were less dramatic than one might expect. Appendix C categorizes the principal focus of the various conflict policies.

The most significant difference among the policies was the mechanism within the university for disclosure of outside activities. One distinction lies in which party, university or faculty member, initiates the disclosure. Nineteen institutions provide for a faculty-initiated disclosure when the faculty member determines that a sponsored research arrangement to which he or she is a party may present a conflict. Many of these policies require a disclosure by the faculty member only if he or she intends to take an equity interest or management position with the sponsor entity.

For example, a typical policy statement in this category reads, in part:

> Responsibility for establishing that activities in business ventures do not conflict with Institute commitments rests first with the Faculty member. Further, on request from cognizant Division Chairmen, the Provost, or the President, the Faculty member shall make a full disclosure of all such ventures including the names of companies, the nature of agreements, the responsibilities assumed by the Faculty member, and the time involved. /7

Twenty-six universities have conflict of interest policies that provide a university-initiated disclosure or annual report from each faculty member engaged in sponsored research or require approval to be granted before the faculty member may undertake a a consulting or sponsored research project. Many annual reporting requirements were similar to the following:

> D. Reporting.
>
> All faculty members must report through their chairman to both the Dean and the Office of Science and Technology Development all outside professional activities at their inception and shall amend these reports as circumstances change...Such reports shall include consulting arrangements as well as equity holdings, board memberships, managerial positions, etc. in relevent organizations. /8

A summary of a sample financial disclosure procedure at a state university further illustrates:

> A. Principal investigators disclose <u>whether</u> <u>or</u> <u>not</u> they have a financial interest in the sponsor of a proposed research project when funding in whole or in part is through a contract or grant from a non-governmental entity;
>
> B. Principal investigators disclose <u>whether</u> <u>or</u> <u>not</u> they have a financial interest in the donor of a gift when the gift is from a non-governmental entity and is earmarked by the donor for a specific principal investigator or for a specific research project;

C. Disclosure statements be filed (1) before final acceptance of such a contract, grant, or gift; (2) when funding for such a contract or grant is renewed; and (3) within 90 days after expiration in the case of a contract or grant, or after funds have been completely expended in the case of a gift;

D. When disclosure indicates that a financial interest exists, an independent substantive review of the disclosure statement and research project take place before the contract, grant, or gift is accepted; and

E. Department chairs disqualify themselves from approving a research proposal for a project to be funded in whole or in part by a non-governmental entity in which they have a financial interest.

Failure by a principal investigator to make the required disclosure or by a department chair to disqualify himself or herself may result in state enforcement proceedings against him or her as an individual, as well as University sanctions. /9

With regard to equity interests and faculty managerial involvement in businesses providing research or development, twenty-one institutions have developed specific policies to address this issue. None of the policies prohibited such activities. Rather, the involvement of a faculty member in an outside business is recognized as a potential conflict of interest and commitment for the faculty member which should be disclosed to and approved by the dean. Several state institutions have ceilings beyond which no faculty member may have an ownership interest in a company which does business with the university. For example:

(e) No member of the faculty or academic staff or members of their immediate families and no business in which they own or control at least 5% interest of the outstanding stock, or at least 5% interest in such business, or in which they are an officer or director may enter into any commercial contract with the university unless the contract has been awarded through a process of public notice and competitive bidding under section 16.75(1), Wis. Stats., or unless the

member of the faculty [or] academic staff is not in a position to approve or influence the university's decision to grant the contract. /10

Appendix D lists the respondents that have equity interest provisions in their conflict policies.

Many institutions responded to the survey by providing supplemental materials illustrating recent guidelines or memoranda addressing conflict of interest issues directly related to industry-sponsored research. The following excerpt is an example of one institution's treatment of conflicts arising from equity ownership and management participation in a commercial entity:

> 1. Participation of the University and its faculty in commercial organizations.
>
> The University, or a faculty member, may of course invest, own stock or other equity in a commercial enterprise. However, if the University and its faculty holds a controlling interest, participates in the management or the conduct of affairs of the commercial organization, or if the work of the University and its faculty is being funded by the organization, conflicts of interest are likely to exist, and the matter should be referred to the Policy Committee.
>
> Faculty members may own a controlling interest in a commercial enterprise, and may participate in its management or conduct of affairs, as long as such participation does not interfere with their ability to fulfill their University commitments, and as long as the activity of the commercial organization is not closely related to the area of the faculty member's University research. If there is a close relationship between the two, the question should be referred to the Policy Committee. The University does not participate in the management or conduct of affairs of a commercial organization.
>
> A faculty member may own significant stock or equity in a commercial enterprise, but a conflict of interest may exist if the faculty member's University research is closely related to the activity of the enterprise, especially when

the faculty member participates in management, in which case the question should be referred to the Policy Committee.

* * * *

2. Funding of research or conduct of research at the University by commercial organizations.

* * * *

If a faculty member has significant stock or other equity interest in a commercial corporation and/or participates in the management or the conduct of its affairs, it is not normally permissible for the University and the faculty member to receive funding from that organization for the faculty member's research at [this] University. These rules apply with particular force when faculty members in question hold administrative positions which permit them significant control of space and other resources at the University. /11

A few institutions have policies relating to the protection of graduate students. For example:

(4) STUDENT RESEARCH PROTECTION. A member of the unclassified staff shall inform students engaged in research under his or her supervision of any financial interest which the unclassified staff member has in the research activity, including, but not limited to, financial arrangements involved in the direct support of the activity, agreements made by the unclassified staff member to obtain data for the research, or agreements concerning copyright or patent rights arising from the research. /12

Finally, several universities responded to the survey with examples of possible conflicts that were reviewed and resolved. One state university with a mandatory disclosure procedure required by state law provided an interesting example:

It was the unanimous opinion of the ISRC [independent substantive review committee] that Professor A's project be recommended for disapproval. The Committee's decision was made on the basis of an extensive and thorough discussion of the issues raised in Professor A's Disclosure of Financial Interest and in his personal appearance before the Committee. The principal reason for recommending disapproval of the project is the absence of an arms-length relationship

> In determining the amount of monies to be paid the university as between Professor A, the Principal Investigator (and thus the individual who determines the amount of such monies on behalf of the University) and Dr. A, the President and 100 percent owner of The Company, who must pay such monies.
>
> A second serious concern of the Committee was that the employees who actually do the work funded by the contract are performing 'secret' work. That is, they are conducting analyses of chemical compounds which have been provided to the Company by outside sponsors who have insisted that the results of the analyses not be disclosed. While the agreement between the University and the Company did not contain a restriction on the publication of research findings, Professor A indicated that all decisions concerning publication will be made by him. He stated that he would honor the commitments made by the Company to its sponsors not to disclose their findings. Thus, a conflict of interest exists between Dr. A's role as a University Professor, with the obligation to disclose the findings of his work, and Dr. A's role as the President of a private corporation which has agreed to treat his findings as confidential. It is Dr. A who will determine whether or not the findings of these projects will be published and therein lies the conflict of interest. /13

In some cases, detailed conditions have been imposed on faculty members. For example, a letter from a university official to a faculty member sets forth conditions under which the faculty member would be allowed to proceed with a project:

> The purpose of this letter is to respond to your inquiry concerning your participation in the commercial development of certain prior research efforts .... It is my further understanding that your participation would take the form of an investment or some receipt of an equity interest in the corporation.
>
> * * * *
>
> It is further understood that you agree to the following specific provisions regarding your participation in the above described corporation:
>
> 1. Your equity interest shall not exceed 26 percent and the cumulative equity interest of all members of your department shall not exceed 40 percent of total equity in the new corporation.

2. You do not, and will not in the future, have any involvement in or responsibility for the operation of the new corporation.

3. ... you are under no obligation to make present or future research results available to the corporation, nor will you undertake such an obligation.

4. You will not allow the interests of the corporation to have any influence whatsoever on the current or future directions of your College research.

5. You will not allow the interests of the corporation to have any influence whatsoever on the current or future directions of the College research of members of the Department.

6. You agree to disclose immediately to the Dean any real or apparent conflict of interest that may arise in relation to your interest in the corporation and your position on the [University] faculty.

7. The terms of any consulting agreement or other form of business agreement or relationship between you and the corporation shall be disclosed to the University and be subject to prior University approval.

8. Any use of funds of the new corporation to support your College research will require the prior approval of the Dean.

9. No resources of the University will be committed to the furtherance of the purposes of the corporation without the prior review and approval of the Dean and the negotiation of a written University contract.

10. You will initially provide to the Dean a report of all aspects of your participation in the corporation and you will disclose any proposed changes or modification in the relationships between you and the corporation and your on-going University research. /14

C. Summary

In general, it can be concluded that universities responding to the survey have developed conflict of interest policies that address the faculty problems arising out of university-industry relationships. A key feature of most of the policies is reliance

on disclosure as a mechanism to deal with conflicts. Perhaps this reflects a conclusion that disclosure will inhibit the formation of inappropriate relationships at the outset. Or, it could be based on the theory that so long as the business relationship between a faculty member and an industrial sponsor has the informed consent of the university, the faculty member may proceed with confidence. In the final analysis, however, should policies based on disclosure actually reveal serious conflicts, the test of the effectiveness of such policies will be in the ability of institutions to use the information that is in their possession.

PART III-DELAY OF PUBLICATION POLICIES

A. Background

Delay of publication relates to the issue of openness. Exchange of ideas, including research results, is an integral part of increasing knowledge. Free communication also allows scholars and scientists to verify and critique research of others and lessen duplication of effort. Further, each faculty member relies on the freedom to select a research path regardless of whether it is likely to produce commercial success.

The federal government has often asserted the sensitivity of research results for national security reasons and requested or required that it be embargoed. In the case of industry-sponsored research, the sponsor is interested in protecting the proprietary

nature of the research and may not want competitors to have access to the information resulting from the sponsored research. Within this context, sponsors of research sometimes request restriction of openness.

The opposing views about information are often a subject of negotiation in university-industry relations. Most frequently, the resolution is a contract provision which allows a specified delay of the publication of the research results in order to permit the sponsor to protect its interests by filing a patent application with the U.S. Patent Office. Patent rights are based on the premise that the owner of the rights should disclose the invention in exchange for the right to exclude others from using or manufacturing it. Thus, the end result of a patent is openness.

In addition to patent rights, some universities allow a specified delay of publication to permit the sponsor to review the publication for proprietary data. Most frequenty, proprietary data means information the sponsor supplied to the research enterprise which was not otherwise public. If the sponsor supplied that information to the researcher, it may be determined by the parties, in advance, that such information is not intended to be made available when the results of the research are published.

B. Results of the Survey

Forty-nine universities responding to the survey provided materials on delay of publication. Thirty-two universities have written policies stating the institution's position on freedom to publish. Most of these statements were general admonitions that the university is committed to free publication and open dissemination of ideas. Some provide that delay in publication is permissible under specific circumstances, but that such delay may not be unreasonable. The length of time permitted for delay is rarely stated, but is determined on a case-by-case basis. For example:

> 3. Publication. In order to fulfill our educational objectives, and with our status as a tax-exempt educational institution, research at [University] aims to serve a public rather than a private purpose. Results are disseminated broadly and on a non-discriminatory basis. Thus [University] will not undertake studies whose results cannot be freely published. We will, however, recognize legitimate proprietary concerns of sponsors where appropriate. Publications may be deferred for an agreed upon limited period of time to protect patent rights, and sponsors may review our publications before release so that they are aware of the contents. On occasions where [University] may have accepted a sponsor's proprietary information as necessary background data for a research project, we will allow a publication review in order to identify any inadvertent disclosure of data that, on a reasonable-efforts basis, we agreed to keep confidential. /15

All of the institutions responding to the Clearinghouse request permit publication to be delayed. Appendix E summarizes the reasons for which the respondents will agree to delay publication. Overwhelmingly, the most common reasons given for permitting delay of publication were to permit the sponsor to review the proposed publication for patentable subject matter or confidential information and to permit the university or the

sponsor to file a patent application in the United States (and sometimes abroad) to protect the sponsor's interest in such subject matter. Nineteen universities specified patent review and filing as the only reason for delay. Twenty-one institutions specified both patent review and filing and review for confidential information supplied by the sponsor.

Delay of publication provisions tend to fall into three categories. Some merely state that the university will permit a delay. Others specify the total length of time that the university will delay. Others specify a two-tiered delay procedure involving a specified review period and a subsequent delay for patent application preparation and filing. This last category may be subdivided based on when the delay may commence. Some calculate the delay from the time that the proposed publication is submitted to the sponsor regardless of when it would have been published. Others calculate the delay from the time that the proposed publication would have been published. Publication includes any presentation of the research results to the public.

The following is an example of a publication provision in a contract between a respondent and an industrial sponsor:

> a. The University reserves the right, subject to the provisions of this Agreement, to use the results of all work provided by the University under this Agreement, including but not limited to, the results of tests and any raw data and statistical data generated therefrom, for its own teaching, research and publication purposes only. The University agrees, on behalf of itself and its employees,

students, assistants or associates, not to cause said results to be knowingly used for any commercial purpose whatsoever except as authorized by Sponsor in writing.

b. Any proposed publication by or on behalf of the University, its employees, students, assistants, or associates, involving work hereunder shall be submitted to Sponsor for review and comments at least ninety (90) days prior to submission for publication or presentation. At the end of ninety (90) days after said submission to Sponsor, the University shall be free to proceed with publication. However, if Sponsor believes patentable subject matter is inadvertently disclosed in any publication submitted for review, Sponsor shall immediately identify such subject matter to University. University shall use its best efforts to promptly file or assist Sponsor to file a patent application covering such subject matter with the United States Patent and Trademark Office or through the Patent Cooperation Treaty prior to publication. /16

The length of time that universities will delay publication varies among institutions and among arrangements within institutions. Among the respondents, the shortest delay was thirty days, the longest more than one year. Appendix F summarizes the time periods during which the respondents would delay publication.

C. Summary

In general, all respondents allow some form of delay of publication. Clearly, then, a reasonable delay is considered by institutions generally to be within the scope of free and open publication. Publication delay is confined to patent protection and pre-disclosed proprietary data, issues that are easily defined. Other types of intellectual property protection, such as trade secrets, do not appear in institutional policies as legitimate reasons for interfering with open dissemination of research results.

PART IV-CONCLUSION

All of the universities sampled in the Clearinghouse request have developed policies and practices relating to industry sponsored research. Whether particular policies are too narrow or too broad is a matter for each institution, and each interested person, to evaluate. The sample shows clearly that the issues relating to industry-sponsored research are being addressed by university administrations and faculties, and that generally, procedures are in place to provide adequate disclosure of the arrangements between universities and industry.

The natural extension of the issues addressed in this report concerns the entrepreneurial activities of the university itself. Increasingly, universities are establishing business entities to provide technology transfer and development services for the university. The Clearinghouse's next survey, which is scheduled to commence in May, 1985, will focus on university entrepreneurial activities, as well as intellectual property policies.

For further information or materials, contact:

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FOOTNOTES

/1 University-Industry Research Relationships: Myths, Realities, and Potentials, Fourteenth Annual Report of the National Science Board, October 1, 1982, p. 1.

/2 Government-University-Industry Research Roundtable letterhead, National Academy of Sciences.

/3 Report of the University-Industry Relations Project, The University of California, October, 1, 1982.

/4 Letter to Dr. Thomas A. Bartlett, President of the Association of American Universities from Representatives Gore and Fuqua, House Committee on Science and Technology, United States House of Representatives, November 18, 1981, p. 1.

/5 "On Preventing Conflict of Interest in Government-Sponsored Research at Universities", joint statement of the American Association of University Professors and the American Council on Education, December, 1964, p. 3.

/6 University of Utah Policy and Procedures Manual, January 22, 1981, based on Utah Public Officers' and Employees' Ethics Act, 1953 Utah Code Annotated, Sec. 67-16-1, et. seq.

/7 "Conflict of Interest and Conflict of Commitment", California Institute of Technology Faculty Handbook, chapter 7, p. 12.

/8 "Guidelines for Situations Involving Potential Conflicts of Interest Between Scholarly and Commercial Activities", Columbia University, Draft- May 21, 1984, p. 6.

/9 "Guidelines for Disclosure and Review of Principal Investigators' Financial Interests in Private Sponsors of Research", University of California, April 9, 1982, p. 2.

/10 Wisconsin Administrative Code, University of Wisconsin System, UWS 8.03(e).

/11 "Guidelines for Situations Involving Potential Conflicts of Interest Between Scholarly and Commercial Activities", Columbia University, Draft- May 21, 1984, p. 3-5.

/12 University of Wisconsin System Board of Regents Policies, UWS 8.03(4).

/13 Letter from the Vice Chancellor to Professor A, re: Positive Disclosure of Financial Interest from Professor, University of California, Los Angeles, March 4, 1983, p. 1.

/14 Cornell University, letter to a professor, March 1, 1984.

/15 "Research Relationships with Industry", Princeton University, p. 2.

/16 Sample publication contract clause, University of California at Los Angeles.

APPENDICES

APPENDIX A

Association of American Universities

March 20, 1984

CLEARINGHOUSE ON UNIVERSITY-INDUSTRY RELATIONS

This is a request for information about some specific university policies and practices in the area of university-industry relations. We would like to receive a response regarding your institution. The thoroughness of each response is crucial to the success of our effort. The purpose, simply stated, is to gather information about policies and practices affecting these relationships and to make it available in ways that will improve the quality of decisions university officers make.

Potential problems associated with university-industry research collaborations have become a subject of concern among interested observers, including members of Congress and the press. The fear is that the universities engaged in these arrangements may compromise the goals of free inquiry and open dissemination of ideas.

In 1981, the AAU was asked by the Oversight Subcommittee of the House Committee on Science and Technology to develop ethical guidelines to govern university-industry collaborations. That request stated, "...the ethical dilemmas posed by the metamorphosis of our scientific research force from educators to entrepreneurs have not been resolved. Changes in research priorities, allocation of resources, faculty-student and faculty-university relationships, as well as diminishing scientific openness may soon be evolving from a shifting value system."

A Committee on University-Industry Relations was formed by AAU to respond. That Committee determined that guidelines appeared unnecessary; however, it did conclude that universities, industry, Congress, and the public would benefit greatly from the sharing of information regarding research collaborations. The responsibility for establishing a clearinghouse for such information has been undertaken by the AAU.

Since the Clearinghouse was established in September, 1983, university administrators and industry managers have expressed a great deal of interest in information sharing. On November 28, 1983, the Advisory Committee to the Clearinghouse met in Washington to recommend how best to address that interest. The Committee recommended that the Clearinghouse request information from universities concerning activities with industrial sponsors of research, beginning with two specific problem areas: conflict of interest and delay of publication.

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This is the first request for information and it is confined to those two topics. We are interested in receiving written information concerning university policies and practices, including documentation of policy, such as statements, guidelines, and memoranda, and discussions and documentation of practices, including contracts and other agreements. We are not requesting confidential information. If it is necessary to delete names, dates, dollar amounts, or other specific details from documents, we would be pleased to receive them in such form. We hope to receive information covering the breadth and variety of university activities in this area while including the details of specific arrangements.

The following hypothetical examples may make clearer the kind of information we would like to get and the value that such information might have to university officers confronted with real cases.

> University A has a conflict of interest policy which states, in part, that faculty should avoid situations involving conflicts of interest such as financial dealings that are contrary to the University's best interest or which may obligate the faculty member to take actions adverse to the University's interest. Faculty member X, following extensive consulting arrangements with a small biotechnology company, is asked to join the company as a stock holding partner in order to head a new division in his area. X would only dedicate one day a week to the new company and would have the new division contract with him at the University to continue to do research. He notifies his department chairman of his desire to accept the offer, assuring him that the University's interests, including the selection of research topics and the learning experience of graduate students, would not be compromised.

What information about other universities' experiences in similar situations would you like to know to help you resolve University A's situation?

For example:

1. Conflict of interest policies.
2. Faculty contracts with industrial sponsors.
3. How similar matters were resolved, including procedures followed by other universities.

> Corporation A and University Y are negotiating a contract under which the university would receive $10 million over 5 years to conduct basic research in the area of X. The Corporation will be entitled to an exclusive license to develop patents owned by the university for products or

processes developed under the project, but it has asked for very restrictive access and publication measures to be imposed by the university in order to protect possible proprietary rights. As part of those restrictive measures, no faculty member or graduate student involved in research on the project may publish the results of the research without first submitting the proposed publication to the Company for review. The Company is requesting 120 days to determine whether the publication would reveal any patentable product or process, and a subsequent 120 days to file a patent application. The University has no stated policy concerning delay of publication; however, it has never agreed to delay publication for more than 90 days in the past.

What information about other universities' experiences in similar situations would you like to know to help you resolve University Y's situation?

For example:

1. Contracts with delay provisions.
2. Restrictive measures requested by companies.
3. How similar matters were resolved, and whether their resolution treated faculty members differently than graduate students.

We know we are asking your institution to undertake a significant task in responding to this request. We are convinced that it will be in the university community's best interest to share this information. It is important to demonstrate to those who are concerned about university interaction with industry that universities are addressing the legal and ethical problems of entering into business relationships to perform research. We hope your institution can assist in this effort.

All responses should be received at AAU by June 1, 1984. Please direct any inquiries and responses to:

April Lewis Burke, Esq.
Director of the Clearinghouse on
University-Industry Relations
Association of American Universities
One Dupont Circle, N.W., Suite 730
Washington, D.C. 20036
202-466-5030

Please let us know the name, address, and phone number of any member of the university's staff who will be assisting with this request.

Thank you.

APPENDIX B

DATES OF MOST RECENT REVISION OF CONFLICT POLICIES AT RESPONDENT UNIVERSITIES

No date provided

University of Maryland
Northwestern University
University of Pittsburgh
University of Rochester
University of Southern California
Yale University

1982-84

California Institute of Technology
University of California, Berkeley
University of California, Los Angeles
University of Chicago
University of Colorado
Columbia University
Duke University
Georgia Tech University
Harvard University
The Johns Hopkins University
University of Michigan
University of Missouri
University of Nebraska
University of North Carolina
University of Pennsylvania
Purdue University
Rensselaer Polytechnic Institute
Rockefeller University
Stanford University
University of Texas
University of Virginia
University of Wisconsin

1979-81

Brown University
Case Western Reserve University
The Catholic University of America
Indiana University
Iowa State University
University of Kansas
Massachusetts Institute of Technology
Ohio State University
The State University of New Jersey, Rutgers
University of Utah
Washington University

1970-79

Cornell University
Pennsylvania State University
Princeton University
Tulane University
University of Washington

1960-69

Vanderbilt University

* Updated

APPENDIX C

PRINCIPAL TERMS OF CONFLICT OF INTEREST POLICIES AT RESPONDENT UNIVERSITIES

No written conflict of interest policy provided

Carnegie-Mellon University
University of Minnesota
University of Massachusetts
University of Oregon
Syracuse University

General statement

University of Maryland

Faculty-initiated disclosure of outside professional activities or disclosure required only of equity interest involved

California Institute of Technology
University of Colorado
Cornell University
Indiana University
The Johns Hopkins University
University of Missouri
University of Nebraska
New York University
Ohio State University
Rensselaer Polytechnic Institute
Pennsylvania State University
Purdue University
Rockefeller University
Stanford University
University of Texas
Tulane University
University of Utah
Washington University
Yale University

University-initiated disclosure or annual disclosure or approval required to undertake sponsored research activity

Brown University
University of California, Berkeley
University of California, Los Angeles
Case Western Reserve University
The Catholic University of America
University of Chicago
Columbia University
Duke University

Georgia Institute of Technology
Harvard University
Iowa State University
University of Kansas
Massachusetts Institute of Technology
University of Michigan
University of North Carolina
Northwestern University
University of Pennsylvania
University of Pittsburgh
Princeton University
University of Rochester
The State University of New Jersey, Rutgers
University of Southern California
Vanderbilt University
University of Virginia
University of Washington
University of Wisconsin

APPENDIX D

RESPONDENTS HAVING EQUITY INTEREST PROVISIONS IN CONFLICT OF INTEREST POLICIES

The State University of New Jersey, Rutgers
Syracuse University
University of Texas
Tulane University
University of Utah
University of Washington
Yale University
University of Wisconsin
Columbia University
Cornell University (letter to faculty)
Purdue University
Rockefeller University
Duke University
Harvard University
The Johns Hopkins University
University of Michigan
University of Nebraska
New York University
University of North Carolina
University of Pennsylvania
University of Virginia

APPENDIX E

REASONS GIVEN BY RESPONDENT UNIVERSITIES FOR PERMISSIBLE DELAY OF PUBLICATION

Review for disclosure of patentable subject matter and filing of patent application

Brown University
California Institute of Technology
University of Colorado
Georgia Institute of Technology
Harvard University
Indiana University
Iowa State University
University of Maryland
University of Minnesota
University of Nebraska
University of North Carolina
Ohio State University
University of Pittsburgh
University of Rochester
Syracuse University
University of Texas
Tulane University
University of Virginia
Yale University

Review for disclosure of confidential information

University of Utah
University of Wisconsin

Review for disclosure of confidential information or patentable subject matter and filing of patent application

Case Western Reserve University
The Catholic University of America
Columbia University
Cornell University
Duke University
Massachusetts Institute of Technology
University of Michigan
New York University
Northwestern University
University of Oregon
University of Pennsylvania
Pennsylvania State University
Princeton University
Purdue University
Rensselaer Polytechnic Institute

University of Rochester
The State University of New Jersey, Rutgers
University of Southern California
Stanford University
University of Washington
Washington University

Review for confidential information and sponsor approval

Carnegie-Mellon University

Review for comment, patentable subject matter, and confidential information

University of California, Los Angeles

Comment and patent filing

University of California, Berkeley

Review and deletion of sensitive information

Vanderbilt University

Reason not stated

University of Chicago
University of Maryland
University of Missouri

APPENDIX F

LENGTH OF TIME PERMITTED BY RESPONDENT UNIVERSITIES FOR DELAY OF PUBLICATION*

30-45 Days

Rockefeller University
Yale University

60-90 Days

California Institute of Technology
University of Chicago
Columbia University
Duke University
Georgia Institute of Technology
Massachusetts Institute of Technology
New York University
Princeton University
University of Rochester
University of Southern California
Stanford University
University of Texas
Vanderbilt University
University of Wisconsin

91-120 Days

University of California, Los Angeles
Cornell University
University of Michigan
Northwestern University
University of Oregon
University of Washington
Washington University

121-365 Days

Brown University
Case Western Reserve University
University of Colorado
Indiana University
University of Kansas
University of Maryland
University of Minnesota
University of Nebraska
University of North Carolina
Ohio State University
University of Pennsylvania
University of Pittsburgh

Purdue University
Rensselaer Polytechnic Institute
The State University of New Jersey, Rutgers
Syracuse University
Tulane University
University of Utah
University of Virginia

More Than 365 Days

Carnegie-Mellon University

Other

1. "short period"
   - California Institute of Technology
   - University of California, Berkeley

2. "long enough for sponsor to protect their patent application"
   - The Catholic University of America

3. "will not delay publication significantly"
   - Harvard University

4. "limited time"
   - Iowa State University

* Each institution is placed in the category reflecting the longest delay possible, as described in their response. If an institution stated that it typically delays publication for "x days, or longer", such institution was placed in the next longest delay category following x.

UNIVERSITY OF CALIFORNIA

INTERIM GUIDELINES ON UNIVERSITY-INDUSTRY RELATIONS

Office of the President
November 3, 1982

Office of the President
November 3, 1982

INTERIM GUIDELINES ON UNIVERSITY-INDUSTRY RELATIONS: ISSUES AND RECOMMENDED RESPONSES

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I. INTRODUCTION

A. Background of Guidelines

Cooperation with industry in support of the University's principal missions of teaching, research, and public service has a long history at the University of California. Cooperative efforts are encouraged because they produce mutual benefits as well as benefits to society. Industry support contributes to the education of scientists, engineers, and others and also to the development of technologies that can be put to practical use by society. Facilitating the transfer of technology to improve the health and productivity of society is an important goal of the cooperative university-industry relationship.

Two years ago, the President began systematic consideration and review of these relationships by commissioning two reports on the subject. One was the Report of the University-Industry Relations Project, which provided a comprehensive context for evaluating opportunities for expanded university-industry relations and the limits to such relationships. The Report describes the various modes of university-industry interaction; identifies benefits to students, faculty, the institution, and industry; examines possible adverse effects from industry funding; and evaluates policies safeguarding University interests and values. The conclusions and recommendations address the adequacy of existing policy and steps the University can take to improve relationships with industry.

The second report was that of the Committee on Rights to Intellectual Property (CRIP). It is a more specialized study of several problems that became evident as a result of university-industry contracts in the field of genetic engineering. The Committee examined guidelines concerning faculty conflict of interest, policy regarding tangible research products (including cell lines) and their subsequent licensing; and the question of university ownership of commercial ventures arising from the research of their faculty.

These issues are important to all major research universities, and in March, 1982, university and industry leaders met at Pajaro Dunes to consider them. The meeting (March 25-26, 1982) produced for the public an eleven-page statement providing a suggested framework within which universities could develop guidance and codes of conduct. The statement of the Pajaro Dunes Conference focuses on research agreements, patent licensing, and the relationship between a university and its faculty.

The two University reports are now also ready for distribution. They provide background on the evolving issues of university-industry relations.

The President appointed a committee, chaired by Academic Vice President Frazer, and including Vice President Kleingartner and Acting Vice President Cheit, to identify the major issues raised by these studies and to provide appropriate guidance to the University community. These Interim Guidelines on University-Industry Relations (referred to as the Interim Guidelines) constitute the report of that committee. The scope of the Interim Guidelines was determined by the issues raised in the two earlier University reports. The committee did not undertake a separate study of issues not covered by the reports. The committee distilled from the reports the main topics of importance to the University, analyzed them, and provided an independent statement of policy for each major issue. The recommended response to the issue is referred to as the Interim Guideline.

The Interim Guidelines include several types of policy statements: those reaffirming existing policy; those recommending revision to existing policy; and those establishing new policy. Each guideline indicates the way recommendations are to be implemented. It may specify groups in the University with responsibility for oversight, review, or direct action and the action they are expected to take. The Interim Guidelines constitute interim University policy. They will be reassessed at the end of calendar year 1983, in preparation for the issuance of a final statement of policy.

B. Characteristics of University-Industry Relations

1. History

The extensive and productive history of cooperative relationships between the University and industry reflects the University's land grant origin and its goal of serving the productive sector of society in a variety of ways. One form of such service has been research and sharing of knowledge with agricultural and industrial users as practiced by the Agricultural Experiment Station and Cooperative Extension. Another form is the education and training of persons who work in industry, particularly engineers and managers. The links between the University and industry have expanded from agriculture and engineering to the physical, life, and social sciences. The development of professional schools has greatly expanded possibilities for cooperation.

2. Modes of Interaction

The character of university-industry relations is shaped by a variety of practices. They include:

a. Direct funding of research costs through contracts, grants, and gifts (including endowed chairs) designated for schools or colleges, individuals, and departments.

b. Consulting activities of faculty.

c. University-industry exchange programs and student internships.

d. Specialized programs designed by the University for continuing education and training of professionals, primarily through University Extension.

e. Participation of industry representatives on campus and systemwide advisory groups.

f. Cooperative research projects, some of which include government participation and often involve the use of specialized facilities.

g. Use of unique University facilities on a fee-for-service basis, for routine testing or demonstration by industry as well as government and other universities.

h. Activities of Cooperative Extension and the Agricultural Experiment Station.

3. Benefits

These relationships have provided many useful and unique benefits for students, faculty, the institution, and industry. They allow students to gain valuable educational opportunities and experience. They help the University recruit and retain faculty whose talents are in strong demand from other universities and industry. They provide opportunities for faculty research and creative activity and for appropriate forms of public service, as well as funds needed for these and other University purposes.

4. Funding

Industry (profit-making firms) supports a very small proportion of total University research. Industry funding through contracts, grants and gifts grew from $24 million in 1978-79 to $42 million in 1980-81 accounting for only 4 to 5 percent of total funds used by the University for research. Industry support is concentrated in a few fields--primarily medicine, agriculture, engineering, management, and chemistry--but even in these areas the proportion of total extramural support accounted for by industry is relatively small.

5. Equity Among Sponsors

The administration of funds for research from government and from private sources is governed by the same policies and regulations; gifts are covered by separate policies. The policies that have evolved from the University's experience from Federal funding apply to the growing relations with industry. These policies fall into four main categories: costs, health and safety, research conditions, and social policies.

6. Public Trust

Maintaining public trust is vital to the University. This is true in the formal sense in that the University has the status of a "public trust" under the State of California Constitution (Article IX, Section 9), and it has obligations both as a land grant university under the Morrill Act of 1862 and as the State's arm for research under the Master Plan. It is also true by tradition and interest. The University has a social responsibility to sustain the diversity of its research activities and to continue its tradition of independence from undue influence by a single source. Industry funding is compatible with this principle if it does not exclude responding to other social interests and needs.

C. Questions Addressed by Interim Guidelines

Assessment of the issues and their policy implication is based on several premises. These are that first consideration must be given to the University's mission--teaching, research, and public service; that in pursuit of these activities the University must maintain institutional independence and integrity to assure impartiality; that the University must maintain an environment that permits faculty and students freely to pursue learning and research; and, as noted, that the trust of the public must be kept. The Interim Guidelines respond to these considerations and to basic questions about whether the conditions of university-industry research are compatible with University goals and objectives.

1. Are policies and norms adequate to assure this compatibility? Are there norms of faculty conduct and effective policies guiding conditions of sponsored research, the use of University facilities, the suitability of research to the University, the ownership and disposition of intellectual property, consulting, and conflict of interest situations?

2. Do the pressures and incentives likely to arise from commercial interests in particular fields raise sufficiently new problems for faculty conduct so as to require review of some of the policies?

3. Do institutional obstacles prevent the University from taking advantage of opportunities offered by cooperation with industry for improved education and significantly broader research activity?

II. ISSUES AND RECOMMENDED RESPONSES

A. Openness and Freedom to Publish

1. Openness of the Research Environment

a. Background

University research, including research sponsored by industry, is governed by the tradition of the free exchange of ideas and prompt transmission of research results. The University is committed to a teaching and research environment that is open so that ideas can be exchanged freely among faculty and students in all of their forums--in the classroom, in the laboratory, at informal meetings, and elsewhere in the University. Such an environment contributes to the progress of research in all disciplines.

There is, nevertheless, an impression that in certain fields newly intensified commercial pressures are impeding faculty communication with their colleagues or their students about the progress of their research or their findings. Both University reports and the Pajaro Dunes Statement mention possible dangers in such departments from disruption of the largely informal exchange of research findings and products, lessening of collegiality, and the rise of competitive and adversarial relations among faculty. This issue is of considerable concern among faculty at the University.

The University-Industry Relations Project Report considered this issue and recommends that in fields where openness may be strained, the campus, departmental faculty, and the Academic Senate should establish appropriate norms to assure that an open environment exists. The reasoning behind the recommendation is that responsibility for determining the substance and form of guidance should rest with faculty and

administrators in departments and fields where the problem exists. Some favor establishing systemwide norms, and others think that diligent observation of existing norms is all that is needed.

b. Interim Guideline

The Administration and the Academic Senate should take steps to see that an open environment exists throughout the University. If barriers to openness exist they should be dealt with by the departments and schools concerned. If necessary, departments or schools should formulate guidance assuring openness in response to their particular circumstances.

2. Protecting freedom to publish

a. Background

Freedom to publish is fundamental to the University, and there can be no limitation of that freedom. Freedom to publish or to disseminate results is a major criterion of the appropriateness of a sponsored project, particularly a research project, and is long-standing University practice. Short periods of delay are acceptable to permit a sponsor to comment or to allow filing of patent applications. The Contract and Grant Manual gives examples of unacceptable limitations to this freedom:

1) assigning ownership of results to the extramural funding source;

2) assigning the final decision about what may be published to the extramural fund source;

3) placing an unreasonably long or unlimited delay period on the publication or dissemination of the information resulting from the work under the project.

Chancellors may make exceptions to this policy under specific, limited conditions. If there is any doubt concerning an exception, it should be resolved either by refusing to accept the award or by referring the problem to the President for resolution.

The freedom to publish is, of course, not an obligation to publish. Under the Faculty Code of Conduct, a faculty member "...accepts the obligation to exercise critical self-discipline and judgment in using, extending and transmitting knowledge..." The exercise of this self-discipline and judgment, not external factors, should determine the content and timing of publication.

b. Interim Guideline

Under present University policy, the freedom to publish and disseminate research results is a major criterion of the appropriateness of a sponsored research project. This freedom is protected by well-accepted conditions of research agreements which preclude assigning ownership of research results or the final decisions on what may be published to extramural sources or placing an unreasonably long or unlimited delay on the publication or dissemination of information. A limited period of delay is permissible only to enable a sponsor to comment or to review publications for inadvertant disclosure of inventions and to permit filing of patent applications. The practice of limiting delays in publication to no more than sixty days is reasonable.

B. Duties and Responsibilities of the Faculty

1. Background

Faculty members are expected to devote full working time to the University. No portion of time due to the University may be devoted to private purposes, and no outside obligations may interfere with the performance of University duties.

Faculty members are encouraged to engage in appropriate outside activities with the assumption that these activities further the ends of the University. Such activities give the individual experience and knowledge valuable to teaching and research. They offer suitable research opportunities through which the individual may make contributions to knowledge, or they constitute suitable public service. Individual faculty members have the responsibility for making the judgment that such activity does not interfere with their obligations to the University in teaching, research, and public service. Faculty must submit an annual report on such activities to the department chair. This information is included in the record and evaluated in the academic review process. The most recent policy statement on this subject is the Outside Professional Activities of Faculty Members, (April 13, 1979).

Faculty, as well as staff, managers, and other officials may not engage in any activity that places them in a conflict of interest between their official activities and any other interests or obligations. Conflict of interest in the conventional sense refers to situations in which employees have the opportunity to influence the University's business decisions in ways that could lead to personal gain or give improper advantage to the employee's associates. A number of specialized policies and guidelines have been issued in recognition of the need for guidance in this area, specifically the Compendium of Specialized University Policies, Guidelines, and Regulation Related to Conflict of Interest; (August 11, 1982).

The California Political Reform Act prohibits any University employee from making or participating in the making of a decision from which a financial gain is foreseeable. Exempted from the Act are decisions on the selection of teaching and other program materials and some decisions about research. Policy was recently promulgated under the Act requiring principal investigators who have a financial interest (equity, directorship, consultant) in the firm funding their research to disclose this interest and requiring

the statement of disclosure to be reviewed independently and substantively by a campus committee before funding for the research can be approved. These statements of disclosure are open to public inspection.

2. Issues

A considerable body of policy now deals with conflict of interest and consulting, excerpts of which are included in the Compendium mentioned above. The Report of the University-Industry Relations Project concluded that for the most part University policies regarding consulting and conflict of interest are adequate safeguards against the problems the policies are intended to prevent. These policies seek to assure that improper influence is avoided, while at the same time protecting privacy and the ability of a faculty member to engage in outside professional activities. The recently promulgated policy on disclosure meets an important need expressed in the University-Industry Relations Project Report, by the Fair Political Practices Commission (FPPC), and by the University. The experience and record resulting from the work of the newly created campus committees on independent substantive review will provide valuable information about the effectiveness of existing policy.

CRIP recommends expanding the faculty's disclosure requirements. According to this recommendation, faculty would report annually any interest held in an outside organization related to their professional field and positions of management responsibility in such organizations. Such reports along with other information on faculty activity would be reviewed by chairs or a Dean according to specified guidelines. The guidelines identify activities that may present a conflict of interest or commitment and indicate the type of consultation required for such activities.

3. Interim Guideline

Existing policies on outside professional activities and conflict of interest are comprehensive, directly relevant to current concerns, and suitable for this University. They provide reasonable safeguards in the form of principles, guidelines, and review procedures while at the same time protecting privacy and freedom of inquiry in research.

In addition, recent University policy requiring disclosure by principal investigators of financial interests in firms funding their research addresses a potential problem that was identified by the University and subsequently by the FPPC. Each campus is now implementing this policy, and campus committees are providing independent substantive review of disclosure statements. The University needs time to learn from this experience and to determine whether any revisions of disclosure requirements may be needed.

As part of the University's on-going obligation, the Academic Senate and the campuses will be monitoring the implementation of policy and assessing its adequacy. This review should take into account the CRIP recommendations for expanded disclosure requirements and implementation of new policy in this area. If there are recommendations for change arising from this review, they should be reported by December, 1983.

C. The Faculty-Graduate Student Relationship

1. Background

Situations could arise in which a faculty member, closely identified with an outside firm, allows that involvement to influence his or her role as a teacher, mentor, or supervisor of research, to the detriment of students.

Such influence could include: pressure on students to undertake research of little educational value in order to advance research of direct interest to the firm; transmission of a student's research results to the firm before the student has completed his or her research so that the firm can use them immediately; inability of a faculty member who is frequently absent from the research setting to give appropriate advice on the conduct of the student's research; and pressure on students to change research directions to work on projects that strengthen a firm's competitive position.

These potential problems must be seen in context. Graduate students and postdoctoral scholars gain a great deal of valuable experience and financial support working for firms in their areas of research, and any action taken to address potential problems must avoid jeopardizing these opportunities.

The University already has policies that apply to these situations. Of particular significance is the section in the Faculty Code of Conduct that provides:

> As a teacher, the professor encourages the free pursuit of learning in his students. He holds before them the best scholarly standards of his discipline. He demonstrates respect for the student as an individual, and adheres to his proper role as intellectual guide and counselor. He makes every reasonable effort to foster honest academic conduct and to assure that his evaluation of students reflects their true merit. He respects the confidential nature of the relationship between professor and student. He avoids any exploitation of students for his private advantage and acknowledges significant assistance from them. He protects their academic freedom (AAUP Statement, 1966).

2. Interim Guideline

The principle protecting a student's academic freedom, which is stated in the Faculty Code of Conduct, represents the accepted

standard of faculty conduct. Responsibility for adherence to the principle rests with the faculty. Students who believe they are in situations which appear to violate this principle should seek the advice of their department chairs. The Academic Senate's Graduate Councils and Coordinating Committee on Graduate Affairs should exercise vigilance to avoid the possibility that closer university-industry relations might create new strains in the professor-student relationship.

D. Patents and Other Intellectual Property

Inventions, it should be pointed out, are incidental to the research process at the University. The University has an active program for identifying and patenting potentially useful discoveries and for licensing them to interested firms. For that research where the potential for patentable discoveries exists, patents and patent licensing provide valuable incentives that speed the conversion of scientific discoveries into useful products and processes. By protecting the rights of the inventor, patents encourage them and institutions to make public their discoveries, promoting the progress of science and technology. The University-Industry Relations Project Report and CRIP addressed the issues of patent policy and its administration, royalty-free non-exclusive licensing, exclusive licensing, and licensing of tangible research products.

1. Patent Policy and Administration

a. Background

University policy seeks to assure balance among several objectives: 1) facilitating prompt and effective development of useful inventions; 2) obtaining appropriate revenues for the University from the licensing of the patents; 3) preventing inappropriate use of public funds for private gain; and 4) maintaining good relations with industry to make the best use of opportunities for education and research funding.

University Policy Regarding Patents was initiated in 1943 and revised most recently in 1980. Since 1963, it has required every employee to agree to disclose inventions arising from University research and to assign employment-related patents to the University (consulting activities that do not use University facilities are exempted). The University handles all stages of patent applications and negotiates licenses and other agreements. Licenses to inventions arising under the research grants are royalty bearing with the circumstances for granting exclusive and non-exclusive licenses are set forth in the document, the Schedule of Support and Patent Privileges, adopted in 1956. Faculty members share equally with the University in the net royalties resulting from a license. The administration of patent policy is a responsibility of the Board of Patents, appointed by The Regents, which has delegated responsibility to the Patent Administrator. The major duties of the Board of Patents and the Patent Administrator include evaluating inventions and discoveries for patentability, negotiating licenses and related agreements, and distributing patent income. Patent policy is interpreted uniformly and consistently. Patent administration is centralized in one University office.

b. Issues

For the most part, the University's patent policy is well accepted as is the need for a systemwide office to administer this complex and technical area. Nonetheless, a number of concerns were expressed about the policy and its administration during the development of the University-Industry Relations Project and the CRIP report; in fact, patent policy was regarded as a difficult problem interfering with improved industry relations. Some believed that centralization of the administration of the policy, though understandable for some purposes, has in the past seriously inhibited campus flexibility and speed in responding to firms. The process for granting exceptions and

for appeals was thought to be cumbersome and insufficiently publicized. Some expressed frustration that campus values and priorities often seemed to be inadequately represented in the negotiation process. Some people believe the answer lies in better policy guidance on what is and is not appropriate for campuses to handle on their own in the process of developing and negotiating research agreements. Others want more direct assistance from the Patent Office. Additional issues concern the need to change the distribution of royalty income to include campuses and the role and reporting relationships of the Patent Board and the Patent Administrator.

The Report of the University-Industry Relations Project responded to the issues it addressed by recommending that campuses be assisted in improving patent administration functions and the Chancellor's authority be expanded to provide for increased flexibility and effectiveness in negotiations with industry sponsors. The Patent Board and Patent Administrator were encouraged to move in this direction. CRIP made recommendations on the licensing of tangible research products (see 4 below), distribution of royalty income, patent office liaison staff, and the organization of the Patent Board. Specifically, CRIP calls for a charge to the Board of Patents that includes all intellectual property (patents, copyrights, tangible research products, trademarks); changes the name to the Board of Intellectual Property, and gives the President "clear and singular" authority to implement Regental policy on intellectual property.

c. Interim Guideline

1) A uniform patent policy, centrally administered and uniformly interpreted, is in the best interest of the University. Campuses should be assisted in improving patent administration functions and given the maximum flexibility consistent with a uniform policy.

2) The CRIP recommendation calling for redistribution of royalty income to include a share for the campuses, if the flow of funds to the Patent Fund permits, should be developed further and implemented.

3) The present reporting relationship of the Board of Patents is an anachronism which should be corrected. The authority for patent policy and administration should be assigned to the President, with the Board of Patents advisory to the President. This change would permit the President to provide direction in this increasingly important area of activity and to help in achieving balance among the different objectives of policy.

4) The charge to the Board of Patents should be expanded to include all forms of intellectual property--copyrights, trademarks, and tangible research products, in addition to patents. Development of these policies in a coordinated framework is desirable. They are interrelated in practice and when new policy is needed, as in the case of the licensing of tangible research products, a broader context will exist for developing, evaluating and implementing such new policy.

2. Royalty Free Non-exclusive Licenses

a. Background

Past University policy required all licenses to inventions arising under a research project to be royalty-bearing. Recently, this policy has been questioned because certain firms, ready to provide substantial funding for University research, would not proceed with funding unless the University permitted the granting of a royalty-free non-exclusive license.

Firms seeking such arrangements are prepared to fund total costs of the research and do not foresee patentable ideas arising from the research they support. They are only

interested in non-exclusive licenses and point to other major research universities which accept this condition. The University has had reservations about such a departure from policy; for one thing, the practice would deny the University potential income from any royalties and could be considered as a use of public funds for private gain. On the other hand, the potential royalty income is judged to be small compared to the potential research support which would be lost.

The Board of Patents considered policy exceptions allowing for a royalty-free non-exclusive license as an option to research sponsors. At its June 21, 1982 meeting, it passed a motion establishing a class exception to policy, for the period July 1, 1982 to June 30, 1983, enabling companies who fund the total costs of research to receive a royalty-free non-exclusive license to inventions resulting from the research, subject to several conditions.

b. Interim Guideline

The Board of Patents' action establishing a class exception to policy for a year beginning July 1, 1982 is a good interim solution. During the current academic year, the Board and the Patent Administrator should develop criteria for evaluating the impact of the class exception so that at the end of the period they will be able to determine whether to extend the exception, change the policy, or continue with present policy.

3. Exclusive Licenses

a. Background

University patent policy permits granting a right of refusal to an exclusive license for inventions arising from research funded by a company. An agreement describes the research, the costs, and the nature of the license. To obtain such a license, the firm must agree to pay all of the direct and

indirect costs of the research, provide an assurance of due diligence in development of the invention, and pay royalties on sales or use of the product. If a patentable invention arises during the course of the research, the Patent Office may negotiate an exclusive license with the firm sponsoring the research.

Where there is no prior agreement--i.e., an invention arises independently from a research agreement--an exclusive license may be granted if a firm provides an assurance of due diligence and agrees to pay royalties. Without a prior commitment to an industrial sponsor through an agreement, inventions are normally licensed on a non-exclusive basis, except when exclusivity is believed necessary to achieve rapid commercial development. In circumstances where Federal funding is involved, additional constraints are imposed on the University's ability to grant licenses, including an exclusive license.

b. Interim Guideline

Exclusive licensing is not a controversial issue for the University because the terms and conditions of the policy are fair, clear, and reasonable. The principle of open dissemination of research results is not compromised.

4. Licensing of Tangible Research Products

a. Background

The University does not have a written policy authorizing the licensing of tangible research products which may have commercial value but are either not patentable or not subject to copyright. Such licensing is a means both to obtain support for research that otherwise might not be available and to encourage technology transfer. Among the tangible research products involved, biological materials (cell lines, plasmids),

chemical compounds, and computer software constitute the bulk of the tangible research products that the University might want to license. There are also other tangible research products related to, but apart from, patents that are being licensed. These products consist of "know-how" in the form of mechanical specifications, drawings, and schematics. Licensing of the latter ("know-how"), as part of the licensing of the patent, may depend on some secrecy, i.e., not making material available upon request to other companies.

The University is unwilling to place limitations on the dissemination of tangible research products when they are to be used only for scientific and educational purposes. A letter accompanying the dissemination of biological materials states this and also states explicitly that the University does not authorize the use of the product for commercial purposes. The letter is a way of asserting and maintaining the University's property right in such products.

CRIP recommends licensing of tangible research products but only under provisions stating that the results of the research project are publishable, that there can be no restraints on the free exchange of ideas among those participating in the research process, and that the principal investigator concur in writing. CRIP states that the practical licensing value of tangible research products will not be compromised by publication since detailed information on the product is not usually included in scholarly publications nor presented at professional meetings CRIP recommends that Chancellors monitor the effect of these arrangements on academic publications and interchange.

b. Interim Guideline

A University policy authorizing the licensing of tangible research products is recommended and should be developed by the

appropriate Vice Presidents in consultation with the Chancellors and the Academic Senate.

1) Such a policy should state that the University's paramount obligation is to assure the free exchange of ideas and the dissemination of research results. For example, the policy should make clear that the terms of any commercial license must include an explicit reservation providing that the University can freely disseminate the products for scientific and educational purposes.

2) The policy should require that agreements to license tangible research products include written concurrence of the principal investigator and written approval of the Chancellor of the campus involved.

3) The policy should state the University's strong preference, whenever possible, for patenting or copyrighting tangible research products and that steps should be taken to do so.

4) The policy should require Chancellors to monitor the effect of these arrangements on academic publication and interchange. The policy should not have the unintended effect of sanctioning an incentive for faculty to refrain from publishing in order to accept a firm's conditions. Through the gathering of data and other means, the policy should be reviewed and monitored for the effects on publication and dissemination of research results.

E. <u>The Use of University Facilities</u>

a. Background

It has long been University policy that its facilities are not to be used for purely routine tests or applied kinds of research best done by commercial facilities. Regulation 4, which has been in

effect for twenty-five years, is the basic policy governing the use of University facilities. It establishes guidelines limiting research to that which is appropriate to the University:

> University participation in tests and investigations shall be limited to activities which lead to the extension of knowledge or to increased effectiveness in teaching. Routine tasks of a commonplace type will not be undertaken.
>
> University laboratories, bureaus and facilities are not to be used for tests, studies or investigations of purely commercial character, such as mineral assays, determination of properties of materials, the performance efficiencies of machines, analyses of soils, water, insecticides, fertilizers, feeds, fuels, and other materials, statistical calculations, etc., except when it is shown conclusively that satisfactory facilities for such services do not exist elsewhere. Those requiring such tests or services should apply to business firms or to such public agencies as the State Division of Mines, the State Department of Agriculture, or the State Food and Drug Laboratory, etc.

The University, in a limited number of instances within the scope of Regulation 4, permits the use of either unique or very specialized University facilities to outside users, both industry and government agencies, on a fee-for-service basis. These arrangements provide a service to industry contacts, i.e., short-form contracts beneficial to the University that are used on occasion for routine drug testing and for the use of special engineering and other laboratories available at the University of California. Examples of unique facilities include the Earthquake Shaker Table, the five-million-pound press at University of California, Berkeley, and the Pesticide Data Bank at University of California, Davis.

The Report of the University-Industry Relations Project recognized that certain features of the policy are out of date. It recommended that Regulation 4 be revised to correct for technical inaccuracies. It also recommended that the policy be revised to serve as a University policy restating the principles governing relationships with outside sponsors of research, focusing particularly on industry sponsors.

2. Interim Guideline

The principles of Regulation 4 have served the University well and should continue to serve as its basic policy governing the use of University facilities. Some portions of Regulation 4 should be revised to correct for inaccuracies and obsolete language.

F. Recovering Costs from Research Sponsors: Gift/Grant Distinctions

1. Background

In accepting contracts and grants from extramural sources, the University expects to recover the full direct and indirect costs of the activity. In the case of federally supported research, the University may agree to share some costs, usually in the form of contributed effort. In the case of grants from independent philanthropic foundations, the University does occasionally waive indirect costs as a form of cost sharing. The University does not require that gifts be administered in this way, however. Therefore, the criteria that distinguish gifts from other sources of support are extremely important.

The University policy titled Review of Gifts/Grants for Research (1980) provides criteria for making the distinction between a gift and a grant. Awards are characterized as gifts when the donor does not impose contractual requirements and these funds are given irrevocably. They are characterized as grants if they reflect seven characteristics that are specified in the policy. If an award does not reflect all seven characteristics, judgment is to be used in classifying it as a gift or grant, taking into account the intent of the policy and the conditions of the award. The Report of the University-Industry Relations Project discussed this issue and recommended monitoring the policy for effectiveness after it has been in existence for a reasonable period of time.

2. Interim Guideline

The distinction, as defined in the 1980 policy, between gifts on the one hand and grants on the other is important to the integrity of the University's sponsored research program. Now that the policy has been in effect for over two years, a review and evaluation of the policy should be undertaken to determine whether it is serving the purposes for which it was intended and whether it is being interpreted uniformly.

G. Expanding Relations with Industry

1. Background

The University is taking advantage of opportunities for increased cooperation with industry to improve education and broaden research activity. Considerable activity is underway. The Report of the University-Industry Relations Project recommended a number of actions the University could take to improve relations with industry and strengthen the University's ability to respond effectively to opportunities. These efforts supplement the principal ways contacts between industry and the University are most frequently made, which is through scientific and professional associations of individual faculty.

The Report of the University-Industry Relations Project urges the University to do the following:

- "...take a positive stance in expanding involvement with industry within a reasonable framework of policy and guidance."

- Make clear that no bias against cooperation with industrial firms and associations exists and that for those individuals and groups of faculty and the private sector who want to embark on cooperative efforts, the means for doing so should be understandable and readily available.

-- Provide, as appropriate for the circumstances, assistance to faculty for developing the detailed arrangements of cooperative agreements regarding gifts, grants and contracts. Arrangements should be made to provide assistance in counseling, identifying industry sponsors, negotiating support, and interpreting University policy to faculty and firms. This service should be available to each interested campus and possibly to specific schools and colleges. It might be funded from patent income and industry support as an overhead cost. The administrative effort would draw on the abilities of development officers, contract and grant officers, and business officers, and patent administrators who have skills in developing cooperative relations with firms and University programs.

-- Prepare a University handbook for campus administrators including Deans, Department chairs, and investigators that includes relevant policies and procedures and provides guidance for developing cooperative agreements with firms.

-- Exert the influence of the University at the State and Federal level through its governmental relations efforts to improve opportunities for industry support of university research by a) supporting tax legislation that would encourage more funding of University research; b) assisting government officials in developing tax incentives to locate potentially productive high technology industry in California near campuses of the University; and c) working cooperatively with industry, through such groups as the Business/Higher Education Forum, to identify mutual interests such as the shortage of scientists in certain fields and to take cooperative action when that would be desirable.

-- Explore innovative organizational approaches for industry funding of University research such as efforts that insulate University activities from business pressures while at the same time supporting worthy research. If these efforts involve a

significantly novel approach or substantial resources, they should be coordinated with President, who would be expected to assure an efficient process for their consideration.

CRIP considered the question of whether the University should look favorably upon proposals that it secure ownership interest in commercial ventures based on research activity of University faculty. About a year and a half ago, Harvard rejected a proposal that it share in the equity of a company being set up by members of its biology department. CRIP concluded that it is not desirable for the University to pursue an investment policy specifically tied to the commercial development of the new ideas created or advanced through University research.

2. Interim Guideline

The University community is encouraged to continue to expand its relations with industry and to act on the recommendations of the University-Industry Relations Project Report as appropriate. Innovative organizational approaches for funding of University research, if promising for the purposes of the University, should be pursued and should be coordinated with the President's office. The President should be advised about any large scale efforts, in terms of resources and time, and those that might create a precedent. The President should provide for a clear and efficient process for considering such proposals.

In general, it is not appropriate for the University to support an investment policy specifically tied to the commercial development of new ideas created or advanced through University research.

15

Unit 15

TITLE: CLASSIFYING, EVALUATING, AND MANAGING TECHNOLOGIES FOR TRANSFER

PURPOSE: This unit is aimed at the classification, evaluation, and management of new technology from various perspectives. The material outlines how and why information and data are collected in the classification process and how they are used to evaluate and manage new technologies from both the government and private sector orientation.

OBJECTIVES: Upon completion of this unit, participants will:

- Understand who are the users and beneficiaries of a technology management system
- Understand that technology managers must encourage and may need to stimulate innovation awareness
- Be familiar with the concept and process of technology classification
- Be aware of the evaluation process as perceived by the private sector
- Be familiar with the concept of a transfer strategy or technology exploitation plan
- Be aware of factors affecting the implementation of a management system.

MATERIALS:

Transparency 15-1:	Classifying, Evaluating, and Managing Technologies for Transfer
Transparency 15-2:	Overview
Transparency 15-3:	Elements of Technology Management
Transparency 15-4:	Attributes of a Technology Portfolio Management System
Transparency 15-5:	Users and Beneficiaries
Transparency 15-6:	Soliciting and Identifying Candidate Technologies
Transparency 15-7:	Classifying Technology
Transparency 15-8:	Evaluating Technology
Transparency 15-9:	Transfer Strategy
Transparency 15-10:	Implementation Considerations

REQUIRED READING:

Issue Paper VII--Classification System for Technology

Issue Paper VIII--Evaluating Technology for Transfer

OPTIONAL READING:

1. Coopers & Lybrand and U.S. Department of Commerce, Office of Productivity, Technology and Innovation, Evaluating R&D and New Product Development Ventures, 1986 (NTIS Order No. PB86-110806).

2. Gerald Udell et al., Guide to Invention and Innovation Evaluation, University of Oregon, College of Business Administration, 1977 (prepared for NSF).

NOTES TO INSTRUCTOR:

1. This session is designed to include examples that are agency and/or laboratory-specific. The instructor should plan such examples in conjunction with transparencies 15-6 through 15-9.

2. This unit builds on concepts presented in Unit 10 (Management of Technology Transfer).

3. The optional readings by Coopers & Lybrand and OPTI deal with the private sector evaluation approach. The optional reading by Udell et al. describes the evaluation system developed at the Oregon Innovation Center.

ESTIMATED TIME:

20 minutes for presentation
40 minutes with discussion

Unit 15

CLASSIFYING, EVALUATING, AND MANAGING TECHNOLOGIES FOR TRANSFER

Transparency 15-1: Classifying, Evaluating, and Managing Technologies for Transfer

NOTE: PRESENT PURPOSE AND OBJECTIVES OF THIS UNIT.

NOTE: IF THE PARTICIPANTS HAVE NOT BEEN INTRODUCED TO UNIT 10 (MANAGEMENT OF TECHNOLOGY TRANSFER), REVIEW THE BASIC CONCLUSIONS AS NEEDED.

OVERVIEW

Transparency 15-2: Overview

In this discussion, we will review the elements of technology transfer management (as introduced in Unit 10: Management of Technology Transfer), describe the attributes of a technology management system, and indicate who might be using it and for what purpose. Then we will look at some practical approaches to soliciting and identifying candidate technologies, classifying and evaluating technologies, and developing transfer strategies. Finally, we will briefly address system implementation.

Let me stress at the outset that throughout this discussion, the word "classification" as we will use it means categorization, and it doesn't imply a security classification. It's a classification for sorting rather than classification for restrictive use.

TRANSFER MANAGEMENT

Transparency 15-3: Elements of Technology Management

The key technology transfer management tasks are:

- Be aware of and identify candidate technologies and technological opportunities
- Classify and evaluate in some way to permit subsequent management

- Develop and implement transfer strategies, including provision of appropriate protection of intellectual property
- Bring these technologies to the marketplace.

PORTFOLIO MANAGEMENT

Transparency 15-4: Attributes of a Technology Portfolio Management System

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The first step in transfer management is to establish a technology portfolio management system.

NOTE: THE USE OF PORTFOLIO CONCEPTS AS A TECHNOLOGY TRANSFER MANAGEMENT TECHNIQUE IS DISCUSSED IN UNIT 16.

As a beginning, the system needs to maintain an organized inventory of technological opportunities that are classified in a way that permits search and reporting. Evaluation capabilities must be present that provide an awareness of the readiness of technologies for the marketplace, or an understanding of what steps need to be taken to bring them into readiness.

The system must address marketing in at least two ways. First, each of the technologies must be described and categorized in market-relevant terms, so that the system can respond to a stated need from the marketplace. Second, the system should include a file of potential transferees, classified according to their needs, that can be used to develop prospects for a given technology. These two functions may be implemented as separate files, but the ability to match one against the other would be useful.

A management system might get so specific as to keep track of contacts with potential licensees, or transferees, which would provide a source of information for subsequent transfers and also an inventory of the needs and desires of the potential transferee candidates.

The system should enable tracking, since there is a time dimension attached to the portfolio management process. Needed elements would include status in the research and development process, an indication

of current activity, and even in some cases the ability to flag time and events so that you can check to see that a particular technology is on track.

The system should never be inundated, so there is an implied requirement that culling gets done at some point and in some organized way.

Another dimension has to do with financial management and risk assessment. It includes a cumulative record of what has been invested in the technology and a current discounted estimate of its value. Care must be taken because value includes externalities of all kinds. One should be able to look periodically at a technological opportunity and say: "If I internalize jobs, environment, all that good stuff, I still don't come up with a value that approaches what I have invested or what I am about to invest in this technological opportunity, and maybe it makes sense for me to put some effort elsewhere."

The system needs to be able to interact with related systems, such as the one that is probably already in place in most labs for the management of mission-oriented research. There should also be a capacity for moving data between systems, such as to agencies and through the FLC clearinghouse to FLC member labs. Lastly, versatility is obviously desirable.

CAN THE PARTICIPANTS IDENTIFY ANY OTHER ATTRIBUTES THAT SHOULD BE INCLUDED IN A PORTFOLIO MANAGEMENT SYSTEM?

USERS AND BENEFICIARIES

Transparency 15-5: Users and Beneficiaries of a Technology Portfolio Management System

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There are a number of uses to which such a system can be applied, ranging from risk assessment, through decision-making, to marketing. The system should also be usable by a variety of groups: the ORTA or other technology manager, laboratory management, agency management, and

other laboratories. A system that can partially mechanize the report-generation task will be an asset to laboratory management.

It should be mentioned that a system can be partitioned so that certain users have only partial access. For example, a seeker of technology could be given access to particular contents of the system for searching.

CANDIDATE TECHNOLOGIES

Transparency 15-6: Soliciting and Identifying Candidate Technologies

NOTE: INTRODUCE LAB-SPECIFIC OR AGENCY-SPECIFIC EXAMPLES.

Let's turn now to the inventory. In some labs, the technology manager may already be inundated with technological candidates and not looking for new opportunities. However, as the national transfer program picks up speed and transfers become more successful, demand-pull will occur and labs will want to have more to offer.

A technology portfolio doesn't just happen. It needs to be assembled. One obvious source is the invention disclosure. But, the volume of invention disclosures will probably be overwhelmed by the volume of new application recognitions that will occur as lab personnel become sensitized to innovation awareness and begin to realize that a process used for some time in the lab for one application may be useful outside for another. Thus, application or innovation awareness as a point of origin will become an important feeder to the inventory.

NOTE: FOR VARIOUS APPROACHES TO STIMULATING INNOVATION THAT MAY BE HELPFUL IN INCREASING INNOVATION AWARENESS, THE INSTRUCTOR MAY WISH TO REFER TO TUDOR RICKARDS, STIMULATING INNOVATION, CHAPTER 5 (CREATIVITY), ST. MARTIN'S PRESS, NEW YORK, 1985.

In order for that to happen, people will need to be sensitized to innovation awareness. They also must find it easy to proceed and must perceive a reward of some kind for having participated.

Besides disclosures made internally by individuals, there are external processes for eliciting disclosures. There is a program, for example, in which a series of seminars is presented to professional staff, explaining the process of innovation, helping them to be sensitized to innovation awareness, and then providing a relatively simple way for the initial disclosure to be made. In addition, there will be circumstances in which a state agency or a company says "we need" that can trigger a specific search, formal or informal, within the lab for technologies that might be applied to that need.

NOTE: THE IDENTIFIED PROGRAM, WHICH WAS DEVELOPED BY CONTROL DATA CORPORATION, IS CALLED QUEST FOR TECHNOLOGY AND HAS BEEN USED IN UNIVERSITIES FOR MANY YEARS.

The evaluation process itself can yield new candidates. Remember that a single technological opportunity may be embodied in many applications. If the evaluation process includes a conscious attempt to recognize various applications, new inventory items can be identified. The evaluation process itself will also turn up related technologies that can be included. And, of course, patent files and existing project reports can contribute.

DO ANY OF THE PARTICIPANTS THINK THAT IT IS BETTER TO APPROACH TRANSFER ON AN INFORMAL, AD HOC BASIS RATHER THAN ESTABLISHING A FORMAL INVENTORY?

CAN THE PARTICIPANTS INDICATE ANY OTHER SOURCES FOR THE IDENTIFICATION OF CANDIDATE TECHNOLOGIES?

CLASSIFYING TECHNOLOGY

Transparency 15-7: Classifying Technology

NOTE: INTRODUCE LAB-SPECIFIC OR AGENCY-SPECIFIC EXAMPLES.

Technological opportunities need to be categorized so that they can be searched. There are four reasons for classification:

- To provide an unambiguous and useful description of the technology from the standpoint of scientific underpinnings, technological applications, and (ultimately) the relevant industry sector as characterized by an SIC or other industry code
- To assist in the evaluation process
- To provide management information
- To assist in marketing.

Deciding on which attributes to use for classification involves a tradeoff decision. Ideally, you would like to have versatility and as many attributes as possible within the constraints of the labor required to enter them and the cost of the system. Thus, decisions must be made on the basis of tradeoffs between versatility and cost.

The selection of attributes will vary from laboratory to laboratory in order to be relevant to the primary areas of interest. However, all must contain attributes that are market-relevant.

NOTE: TABLE 1 OF ISSUE PAPER VII--CLASSIFICATION SYSTEM FOR TECHNOLOGY (REQUIRED READING) CONTAINS A STARTER SET OF 13 MAJOR ATTRIBUTES THAT CAN BE USED AS A BASIS OF DISCUSSION.

EVALUATING TECHNOLOGY

Transparency 15-8: Evaluating Technology

NOTE: INTRODUCE LAB-SPECIFIC OR AGENCY-SPECIFIC EXAMPLES.

The context of evaluation depends on the nature of the laboratory in which the work has been done. In a private sector, product-oriented development lab, development work proceeds until market-oriented performance characteristics have been established, and evaluation consists simply in comparing the technology as it appears with the list of requirements.

In Federal labs, however, that first step will not have been done. So, the evaluation process is aimed at reaching a conclusion as to the

readiness of a technology or technological opportunity for the marketplace. This is an iterative process.

As a technology or technological opportunity moves through the innovation process, evaluation will be done and redone. The first evaluation will be very rough. Later evaluations will be more sophisticated, until the Federal lab reaches a point at which it will be able to talk with a potential private sector transferee on common terms.

The evaluation is done with a market perspective in the context of specific applications. Evaluating a technological opportunity out of the context of a commercial application is pointless. Evaluation has to occur in the context of a specific (or a group of specific) commercial end points. This requires a determination of the product or service in which the technology might be embodied and identification of the ultimate user group. One or more layers of the delivery sector is identified, then, ultimately, the candidate transferees.

Let's be a little more specific about the dimensions of evaluation by posing a few relevant questions:

1. Is the technology described accurately and in sufficient detail for a potential buyer, licensee, or investor to make an informed judgment regarding its commercial potential? Is the theory of operation well explained, and have its characteristics been quantified? In other words, is it an idea, or is it a technological opportunity?

2. With regard to development status, has the technology or technological opportunity been developed to the point that there is a well-defined product or service? If not, what further development or packaging needs to be done and by whom, and in what time and at what dollar cost?

3. Is the technology capable of being protected? If it's been publicly disclosed, has a patent been obtained or applied for?

4. Is the technology unique? If not, does it offer a sufficient advantage over similar products, processes, or services already on the market? What's the value of the technology and to whom. Can the products or services using it be sold at a price and in quantities

sufficient to recover development, manufacturing, and marketing costs with a satisfactory return?

It must be underscored that there are externalities that industry considers costs, but that are values to the Federal lab. The lab's perspective needs to be incorporated in the value analysis; but, in making judgments as to which technological opportunities to pursue, you need to have a sense of the value to the potential user to whom the opportunities are being offered.

There are four increasingly sophisticated techniques for estimating value:

1. Market pull analysis is applicable to the private sector development work in which a technology is tested against a product specification. Market pull analysis is not applicable in most government lab cases.

2. Market test is a technique in which the technology in the form of a nonproprietary description is submitted to potential transferees to determine their interest. That's obviously a limited approach, but if there are enough interested candidates, one has at least a preliminary determination of worth.

3. The third-party expert approach is when persons other than potential licensees are asked to perform the evaluation. A number of computer-supported models are offered purporting to do this.

4. The last approach is the internal assessment that can be done in the laboratory late in the innovation process, possibly with the assistance of computer models. Generally, this technique requires developing a strategic plan for commercialization, estimating costs, and doing a discounted analysis of what it will take to get the technology from where it is to where a manufacturer can market it.

Thus, there are a number of options that can be used to value technology, each requiring more information than its predecessor and capable of yielding more precise results. The techniques are usually applied sequentially as the technology moves through the innovation process.

The last point that needs to be considered in evaluation is that transfer from Federal labs is in competition with the internal R&D of companies. They are making portfolio management decisions as to

whether it's more cost effective to start from scratch and do the research and develop products entirely in-house, or reach outside at various stages and bring things in. One of the marketing tasks of a government lab is to convince potential transferees that the lab can deliver a technological opportunity at lower cost than the company can in-house.

CAN THE PARTICIPANTS INDICATE ANY ADDITIONAL EVALUATION CRITERIA THAT SHOULD BE EMPLOYED?

TRANSFER STRATEGIES

Transparency 15-9: Transfer Strategy

NOTE: INTRODUCE LAB-SPECIFIC OR AGENCY-SPECIFIC EXAMPLES.

Even after multiple evaluations, one is still faced with making a decision as to what to do with the technology. The evaluation can tell you that the technology may be a good candidate, but it isn't clear just what strategy should be used to take it to market. The required "roadmap" is referred to as a transfer strategy or technology exploitation plan.

Based on the output of the evaluation, the objective is to generate a road map that will assist in moving the technology along the desired path to a transferred state. Two types of options are available. One is what we'll call process options. The list on the transparency is self-explanatory. It is not all-inclusive, nor are the elements mutually exclusive. The end point can be to do no further work, to publish, to file SIRs, and so on.

Of greater interest are the options available in terms of the transferee. Unfortunately, there is no simple decision tree for moving down that path. You must decide on whether to deal with an established firm or an entrepreneurial venture, a large or a small firm, a firm that is national or international. If the evaluation that we have just done fails to find an existing firm whose capabilities and market

strengths match the technology, it may be best to work with a startup. On the other hand, if there are substantial entry barriers such as costly production or marketing, it may be well to work with an established firm having these capacities.

If the status assessment indicates that substantial additional costs and risks need to be incurred prior to commercialization, a large firm may be indicated. If the technology is well along toward commercialization and minimum additional costs are anticipated, a small firm or a startup might be the choice.

If the novelty assessment suggests that large expenditures may be required for patent defense, or that a preemptive marketing strategy will be necessary in order to secure rapid market penetration, a firm with large resources may be selected.

WHAT CONSIDERATIONS DO THE PARTICIPANTS THINK NEED TO BE EMPLOYED IN DECIDING ON WHICH TYPE OF FIRM TO DEAL WITH?

IMPLEMENTATION CONSIDERATIONS

Transparency 15-10: Implementation Considerations

Finally, let's consider a few implementation questions. After you have designed the perfect system, what do you do with it? Do you put it in a shoe box, on the PC, on time-share? That depends on what you want to accomplish.

The system should have the capability of searching a number of attributes, and probably combinations of attributes, in order to be responsive to a market. It probably should have the capacity to do some matching. Universities have found it useful to put together mini-portfolios of six or seven related technologies, making it more worthwhile for companies to evaluate the offering.

The system should make it possible to match a stated need with an inventory item. It could also assist in generating reports, either for superiors or for marketing. And, of course, it must provide the management handles that are needed for time and budgetary allocations.

If you feel that you can classify all of your inventory in a single dimension (say, SIC codes), then the shoe box might be just fine, because all you have to do is stick them in numerically and thumb through the shoe box by number. However, you will want to have the ability to sort on a number of attributes at the same time. Partial and full access by users will be a consideration. There will be questions of compatibility with the FLC and through the FLC with other labs, with agencies, with NTIS, and with other networkers. Cost and equipment availability are obvious dimensions.

Three or four hundred technologies can be inventoried reasonably well with a system that uses commercial database management software implemented on a PC. Such a system could encompass classification by scientific field, by three four-digit SICs, and by a series of key words and titles and could include the marketing contact and marketing feedback. This is not an inappropriate level of effort for a PC-supported system.

There are existing systems that might fit lab needs. SDI has a PC-XT-supported technology management system in place now. DOC has a technology management system at the block diagram stage (but well documented) that could easily be computer-implemented. The FLC clearinghouse will be adding other services to the existing resource directory, and it may be that one of their products could be a starting point.

NOTE: REMOVE TRANSPARENCY FROM SCREEN.

DO THE PARTICIPANTS HAVE ANY ADDITIONAL COMMENTS ON CLASSIFYING, EVALUATING, AND MANAGING TECHNOLOGIES FOR TRANSFER? IF THE OPTIONAL READINGS HAVE BEEN ASSIGNED, USE THEM AS A BASIS OF DISCUSSION.
