The University, Industry, and Cooperative Research

A. Bartlett Giamatti

Summary. Yale University intends to issue a statement of policy governing the nature and extent of university and faculty involvement in the commercial application of scientific research. This policy will be based on the university's principles of openness and free dissemination of ideas, and will recognize the need of profit-oriented companies to treat knowledge as private property. The university will continue to allow relationships between faculty members and commercial companies, even in arrangements involving university-based results, but a faculty member who goes beyond any reasonable definition of "consulting" may be asked to take an unpaid leave of absence or to sever his or her ties with the university. While a university should not ignore the potential availability of funds from commercial sponsors, neither should it be driven to arrangements that are not compatible with the norms and mission of the university.

In this century, the time lag between the creation of a new scientific concept and its general application is usually measured in decades. Occasionally, however, the gap is compressed as a new theoretical insight moves swiftly to the stage of application and, hence, of wide, practical dissemination. We are now in the throes of such a movement in the field of applied research in genetic engineering.

At times of swift and intellectually exciting development, with the potential for enormous benefits to society and financial profits to skillful entrepreneurs, it is natural to ask questions about the appropriate relationship of universities to commercial sponsors of university research, and, indeed, about the very nature of the university. Because Yale participates actively in many developing areas of science and technology, we have been seeking answers to these questions. For the past year, a faculty Committee on Cooperative Research, Patents, and Licensing has been considering the issues raised by our increasing relationships to private commercial firms. On the basis of the committee's recommendations, and in consultation with the Research Advisory Board, chaired by the provost, we will soon bring before the Yale Corporation the results of these deliberations. The corporation will then issue a statement of policy to govern the nature and extent of university and faculty involvement in the commercial application of our scientific and scholarly research. In this article I discuss some principles on which such a policy can rest.

The university exists to protect and foster an environment conducive to free inquiry, the advancement of knowledge, and the free exchange of ideas. Such an environment depends crucially on trust and openness, and on a clear understanding of a set of principles governing scholarly inquiry. The principles are simply stated: the university and individual members of the faculty pledge themselves to the open, unimpeded, and objective pursuit of ideas; to the exchange of ideas openly and without deceit; and to the full and wide dissemination, through teaching and written publication, of the results of scholarly inquiry. The appropriate discipline on the dissemination of ideas is the critical scrutiny of responsible experts in order to assure the general public that completeness in investigation and citation, and rigorous and logical analysis in drawing conclusions, have been applied in the work.

As the university in its corporate body pledges to protect and foster an environment conducive to free inquiry, so also must the individual members of the faculty. As that environment and those principles engage a spirit that transcends the letter of stated principles, so each faculty member must sustain the university's commitment to free inquiry by fostering a spirit of collegiality, a shared sense of respect for and trusteeship of shared values of openness and intellectual freedom that the university exists to embody in the larger society. And, as the university in its administrative body must recognize that the members of the faculty, collectively and individually, are at the core of the university; and that, on behalf of members of the faculty, it is essential to protect academic freedom as well as to foster traditions of faculty self-regulation and self-government, so also is it essential that each faculty member recognize that the primary and overriding obligation of every faculty member, in terms of his or her commitment of time, attention, and intellectual energy, is to the university, that is, to the students, colleagues, and general mission of the university.

These principles of free inquiry and open dissemination of ideas, as well as the values of collegiality, mutual trust, and primary commitment, exist to protect the environment for free inquiry. They also form the principles and assumptions underlying all that follows.

Both university-based research, concerned primarily with the advancement of fundamental knowledge, and industry-based research, concerned primarily with marketable application, should serve the general well-being of society albeit in differing ways. Since the knowledge typically developed in university-based research is of a fundamental nature, it will often have a multitude of potentially useful applications. Because many of these eventual applications cannot be foreseen, it is particularly appropriate that such knowledge be disseminated as widely as possible so that all may use it if they will. While private industry pursues basic research, it does so less often, in part because it is so difficult to capture an adequate financial return from such long-term, risky efforts.

Universities are marketplaces where ideas are freely available; where knowledge is pursued by way of the norms of free discussion and the free access to and exchange of information; and where the freedom to publish must obtain. In contrast to the university, the commercial enterprise is appropriately animated by the profit motive. Commercial application of new knowledge typically requires a substantial investment in applied re-

The author is president of Yale University, New Haven, Connecticut 06520, and is professor of English and Comparative Literature. This article is based on a speech given in September 1982 to incoming graduate and professional students at Yale.

0036-8075/82/1224-1278$01.00/0

search and development, and commonly in the equipment required by new products or methods of production. A profit-making enterprise will undertake such an investment, and all its associated risks, only when it can reasonably expect an adequate return, a return not likely to occur if competitors are first to the marketplace. The opportunity for private profit provides the encouragement for the socially beneficial application of new technology. To realize profits from technological innovation, however, a company must strive to protect its proprietary knowledge and to prevent its exploitation by commercial competitors.

The development of theoretical concepts, born in the university, and the transformation by industry of those concepts into practical application, are often complementary processes. The complementary nature of their activities, however, simply throws into relief the basic difference between universities and industries: the academic imperative to seek knowledge objectively and to share it openly and freely; and the industrial imperative to garner a profit, which creates the incentive to treat knowledge as private property.

With these underlying principles of free inquiry and free market in mind, we can now examine specific issues concerning university-industry relationships. The first is the appropriate nature of faculty involvement with profit-oriented companies, particularly such companies which seek to market new processes and products growing from university-based research. The second is the appropriate conditions of grants or contracts for basic research by existing companies to universities, especially when these conditions require some form of exclusive relationship, of license or treatment, by the university with the company as a condition to the grant. There may well be cases that are ambiguous and where reasonable people will have to wrestle with the application of whatever policy emerges. For that reason, I see the provost's Research Advisory Board playing a continuing role in administering our policy. I believe that the following considerations must be taken into account in forming that policy.

Faculty Involvement with Profit Oriented Companies

There are potential conflicts of commitment and potential conflicts of interest whenever a member of the faculty is involved with extra-university entities. Let us here consider the specific issues surrounding the involvement of a member of the faculty with a company seeking to exploit university-based research.

I doubt that a faculty member can ordinarily devote the time and energy the university requires and also pursue a substantial involvement in any such outside company. Such involvement necessarily demands great concentration and commitment, particularly at the outset or if business goes badly. When a faculty member becomes substantially involved in a company, the conflict in norms governing the dissemination of knowledge becomes very difficult to reconcile. The burden of maintaining a teaching program and two separate research programs, where the results of one research program are to be widely disseminated and the results of the other may have to be kept secret in the pursuit of commercial success, is more than even the most responsible faculty member can be expected to shoulder. Finally, such involvement risks putting one's students and research associates in ambiguous circumstances, such that the graduate or postdoctoral student would not know, when working with a professor, for whom he or she was working—the university, the professor, or the company. Of all members of the university community, the student especially ought to be working for himself or herself, and ought to be guided in research and trained in skills and techniques that are designed to produce a first-rate scholar, not profit for a company in the private sector.

I believe that if a faculty member becomes a manager of a company pursuing commercial application of his or her university-based research; or acquires, through gift or purchase, stock shares in this kind of company in such proportion to the total number of shares that he or she can have a significant effect on the decision-making of that company, then there is a presumption that the faculty member's involvement in the outside entity is substantial. In such an event, there should be a review of the relationship, the possible consequence being that the faculty member might well have to decide to leave the faculty for a limited period of time, perhaps 1 year, by taking an unpaid leave of abscence to pursue those outside interests. If, at the end of that time, the faculty member were to wish to retain the outside interests described above, then that person would relinquish tenure, if he or she had it, and assume "adjunct" status if the relevant department or school were to recommend such an appointment in the usual way. The alternative for such a person would be to sever completely all ties to the university. Were such a person to wish to become a full-time member of the faculty at a later date, such a possibility would require the availability of an open position and the use of the institution's full appointments procedure.

There are relationships of individual faculty members to commercial companies, even those using the results of university-based research, that traditionally the university has allowed and will continue to allow. In these "consulting" relationships members of the faculty provide advice to companies but do not directly manage corporate research. "Consulting" can enhance a person's professional competence, and further the mission of the university. Our rule is that a faculty member may spend not more than 1 day in a 7-day week in such a role. Thus there is a limit on the commitment of time and energy.

Serving as a consultant to a company or, within the rule of reason, accepting payment in equities from some cash-poor, idea-rich company, is less likely to create conflicts of commitment or conflicts of interest than serving in a role that has a significant effect on corporate decision-making. A faculty member who has gone beyond any reasonable definition of "consulting" has reached the point where the question arises whether he or she should remain a full-time member of the faculty.

Universities frequently require that faculty members wishing to engage in consulting obtain the permission of a chairman or dean. More recently, the Committee on Cooperative Research, Patents, and Licensing has also recommended that each faculty member provide, as part of the routine annual report to the president, a description of the commitment and the organizations involved in his or her nonuniversity professional work. This recommendation has been accepted, and it will be implemented in the coming academic year.

Such disclosure—of consulting relationships, of relationships with outside companies engaged in application of a Yale faculty member's research, or of relationships with companies that sell to the university goods or services—is, I believe, the best stay against conflicts of interest or conflicts of commitment. Disclosure of this sort recognizes that there are grey areas where reasonable people might have differing views and it provides the occasion for discussion. In such disclosure to the administration, there is no monitoring of colleague by colleague. Rather a premium is put where it ought to be, on trust and openness.

Conditions of Grants and Contracts

The second issue for university-industry relationships concerns the appropriate principles in an agreement between an established company and the university when a company wishes to support basic research in a specific area. In discussing such agreements, questions of exclusivity often arise, either with regard to proprietary information provided by a company as part of an arrangement for cooperative research or with regard to exclusive license to whatever the university is entitled to patent.

The university is the only entity that can enter into arrangements for cooperative research, and the university's position with regard to exclusive licensing agreements is the following. In general, the university would prefer to grant nonexclusive licenses, in order to make knowledge as widely available as possible. The university, however, in certain circumstances, may grant an exclusive license, thus encouraging a firm to develop an invention. It will sometimes be clear that society will be better served by the grant of an exclusive license in order to bring the knowledge to the public and that the benefits to society from such exclusivity are greater than the costs of any diminished competition.

Each individual agreement must and will be negotiated on its merits. Through such negotiations, Yale will insist on principles which seek to assure that its patentable inventions will be fully and beneficially used, and that knowledge with a potential benefit to society at large will reach the public in a timely and useful fashion.

Research grants from business firms raise other questions as well, questions that are the same as those raised by research sponsored by the federal government or by private foundations. When contemplating a prospective grant or contract with any sponsor, the university will first consider whether the potential would exist for upsetting the intellectual equilibrium and human relationships in a department were one kind of research to be funded out of proportion to other kinds of research. As an indispensable condition to arrangements for cooperative research with industry, just as with government-sponsored research, the university will not accept restriction, inhibition, or infringement upon a member of the faculty's free inquiry or capacity orally to communicate the results of his or her research. In addition, the university will not accept any restriction of written publication, save the most minor delay to enable a sponsor to apply for a patent or license. Such a delay should not be so long as to lengthen appreciably the time normally required to bring results into print.

Yale has, through its faculty Committee on Cooperative Research, Patents, and Licensing and its Research Advisory Board, the capacity to assess adherence to these principles and conditions. The university will only agree to arrangements for sponsored research, from any sector of society, which are compatible with its norms and mission, and will not agree to any arrangement which will impair the environment of openness and free communication of ideas.

I have by no means addressed all the issues in this area. Difficult cases and anomalous situations, requiring the patience, wisdom, and goodwill of members of the faculty and administration alike, will present themselves. I have, however, suggested here some principles and general guidelines. We have responsible forums to explore these suggestions and to assess the cases that exist or that will arise.

The opportunities for cooperative research between universities and industries are very exciting and can rebound to the benefit of society. These opportunities should not drive us toward arrangements for basic research that abridge our principles. Nor should the university ignore the potential availability of funds from commercial sponsors. We should negotiate appropriate arrangements, openly arrived at, that can further our mission. The constant challenge for the university is to know in clear and principled terms how to cherish learning, and its pursuit, for its own sake; and how to assist in bringing the results of free inquiry to the rest of the society for the good of the public.

German Energy Technology Prospects

Manfred Popp

"Big science" in energy research and development, which depends on the strong involvement of governments through financing and planning, began with the first Geneva conference on the peaceful utilization of nuclear energy in 1955 and was devoted to the economic exploitation of a highly promising new technology. A second phase began with the energy crisis in 1973, which marked the beginning of an era of basically changed energy economics. At that time the success of the nuclear energy development program was clearly visible as the first full-scale commercial power plants were beginning operation. It seemed promising to pursue a similar R & D effort devoted to other new energy technologies in the areas of energy conservation, new and renewable energy sources, and coal, which had not been seriously considered before because of apparent economic problems. Many technologies suddenly seemed to offer new opportunities for providing a more efficient and economic energy supply or, at least, setting a ceiling on further price jumps in the oil sector. It was widely assumed that the remaining technical and economic problems could be solved by sufficiently strong R & D efforts. Consequently, a comprehensive energy R & D program was launched in the Federal Republic of Germany, as in all major industrialized countries of the Western world. International cooperation resulted in combined judgment on technological potentials, improved information exchange, and in a number of cases led to jointly financed projects.

Today, almost 10 years after the beginning of this second phase of energy R & D, it seems clear that this approach was too optimistic. Although the price of oil is at a level that even the most pessimistic forecasts did not predict in 1973, a breakthrough of another new energy

The author, director for energy research and development since 1976, is at the Bundesministerium für Forschung und Technologie, Bonn 2, Federal Republic of Germany.

0036-8075/82/1224-1280$01.00/0