CHAPTER 15

The Future of University Partnerships

Frank H. T. Rhodes

INTRODUCTION

Universities were created to nurture partnerships. Universities came into existence in the Western world in the 12th and 13th centuries to overcome the inevitable limitations of isolated scholarship. This scholarship was for centuries pursued largely in monastic seclusion and, though some individual contributions were notable—one thinks of the Venerable Bead—and a few monasteries blossomed as centers of scholarship, the limitations of secluded scholarship became increasingly evident. Those limitations remain today. The isolated scholar, sheltered from conflicting viewpoints, untouched by contemporary issues and events, unchallenged by those from other disciplines, is liable not only to limitation of viewpoint, but also to either dogmatism, on the one hand, or unalloyed skepticism on the other.

There was also another major weakness of isolated scholarship: personal knowledge frequently died with the scholar. Only in a community of younger and older scholars could knowledge itself be created, shared and perpetuated. So teaching, as well as learning, became an essential part of the new communities. By contrast to this earlier isolation, in community, knowledge itself became expansive; contested by opposing interpretations, informed by other disciplines, it gained new vigor; shared with others, this new community allowed both students and masters to enlarge their range of interests and increase their skills. Once partnership developed, both in the community of scholars, and in the community of masters and students, the circle of discussion was enlarged, the effectiveness of study was increased and the impact and usefulness of knowledge was expanded.

It was from these monastic scholarly communities that the universities emerged. Even in their earlier days, such communities became centers, not only of rote learning, but also of disputation, where one viewpoint contended with another, and where one discipline impinged upon another. It was within these communities that the earliest student guilds and faculties or colleges were formed, the prototypes of later partnerships. So canon law flourished alongside philosophy, and theology existed side-by-side with classical learning and mathematics.

The needs that led to the creation of these ancient colleges, almost a millennium ago, remain with us. Knowledge itself requires the refinement and testing that come from partnership. It is not only that existing knowledge is too vast for any solo effort, but also that it is so demanding in its assumptions, so broad in its implications and so intricate in its relationships that it becomes vital to study it in comprehensive multidisciplinary terms. Abstraction and dissection produce abstracted and dissected conclusions. Broad understanding of the implications and impact of our knowledge of the natural world, or current events or social programs or the human condition, requires this broadly integrated approach to learning.

The social benefits of the partnerships embodied in universities have been so extraordinary that all developed societies have chosen to create and support their own universities, which have, over the centuries, exercised an influence and yielded a societal benefit out of all proportion to their numbers. Educating a growing portion of the young people of their own lands and others, they have been a steady influence for good, whether in liberal education, the inculcation of civic virtue, preparation for professional careers, the advancement of knowledge, or the general leavening of the intellectual, civic and moral health of their societies. Their expanding influence has reached far beyond the ministry of the church, for which the earliest institutions were created, to such a degree that governments, communities, individual benefactors, and, more recently, industries and corporations, now continue to create and enlarge universities to serve their own social purposes. Nor is any diminution of that role yet apparent. Universities continue to expand their influence as engines of scientific discovery, as communities of technical invention and as supporters of both social analysis and economic growth. From agriculture to medicine, from architecture to international studies, from engineering to urban planning, the universities play an increasingly large role in the life and wellbeing of contemporary society.

That social contribution reflects the fact that the partnerships within the university have not been confined to those between the scholarly disciplines. From their earliest days, universities have also embraced the professions—law and medicine, for example—within their membership. And as the professions have multiplied in numbers and scope—engineering,

architecture and management, for example—so each, in turn, has been incorporated within the expansive membership of the university, partners alike in both teaching and practice. Perhaps the best test of their success has been the fact that few patients would now choose to undergo major medical procedures at a facility other than an academic medical center.

It is because such professional partnerships have been so successful, that the question emerges as to whether they could, or should, be further expanded. Should we encourage still broader partnerships with industry, for example, or with professional societies, local communities, governments, or non-government organizations? If some academic walls have come down, should all be demolished? Before addressing that question, it may be worthwhile to review the existing situation.

THE PRESENT SITUATION IN INDUSTRY

- **Globalization.** When one examines the present situation in industry, there are several trends that appear characteristic across the range of particular industries. The most striking of these is the globalization of the economy and the increasingly international character of most major businesses, typified by the great multinational corporations. With this globalization, there has also emerged an increasingly multicultural membership of the corporations themselves, so that board members, senior executives and staff are now recruited and employed on a global basis.
- **Role of research.** Furthermore, with the increase in international competition has come a sharpening of focus, and—perhaps because of this—a relative de-emphasis in comprehensive corporate R & D, with the breakup of what had been integrated corporate research labs. These earlier great corporate laboratories, including those of Bell Labs, IBM, GE, and RCA, were not only centers of formidable technical expertise and development, but also of extraordinarily distinguished work in basic science. They have been replaced by three alternative means of conducting research and development: the creation of R & D centers attached to particular businesses, rather than the parent corporation; the creation of less costly R & D centers in developing countries, such as India, and, to a lesser extent, the outsourcing of R & D to universities and other research centers. With this dispersion of R & D has gone a relative decline in support for longer term research in favor of more emphasis on shorter term development.
- **Corporate education.** With these trends in industrial research has gone one other: Corporations are creating their own universities.

These range in sophistication from Hamburger University created by MacDonald's, to the John F. Welch Executive Education Center at General Electric, Crotonville, New York, and the General Motors Institute in Michigan. There are now reported to be some 2,000 corporate universities in the United States, up from 800 in 1988. In the same period, more than 100 four-year colleges have closed (Meister, 2001). The broad purpose of these various corporate universities is not only to "fill the gaps" in conventional educational programs, but also to provide employees at all levels with opportunities for lifelong learning. Admirable as those intentions are, the growing number of these institutions represents a significant competitive challenge to traditional university education and especially to university-based continuing education programs. It is a challenge that should be welcomed and accepted. In fact, it provides an opportunity for new styles of partnership.

- **Educational partnerships.** Corporate concern for continuing education has produced new partnerships. Thus, the University of Connecticut offers certificate programs in business to Hartford Financial Services Group (Meister, 2001). But, although 92 percent of U.S. corporations outsource the delivery of education and training programs and 60 percent outsource some aspect of course design, only 16 percent of all corporate education partnerships are with traditional colleges and universities, perhaps because other educational providers prove more nimble and less costly than universities. Conversely, corporate universities are now offering courses to the general public. This mixture of missions and providers seems likely to continue as demand for lifelong learning increases.

PRESENT SITUATION IN THE UNIVERSITIES

The landscape within which higher education functions is broadly similar for all universities and colleges, whatever their particular mission and goals and whatever their sources of funding and varieties of governance. In the United States, and, to some extent, beyond, several trends are now emerging.

- **Deregulation.** Universities have long had a monopoly of educational programs; self-accrediting, and self-authenticating, their monopoly of resources, whether in faculty expertise, library holdings, technical facilities or experimental equipment, has given them a unique role and a particular responsibility. That has recently changed as accrediting agencies have not only recognized, but have also credentialed

and accepted a range of complementary institutions, many of them quite unlike traditional universities. These increasingly include not only the corporate universities already mentioned, but also for-profit institutions (see below). The accreditation of these emerging institutions represents for the first time a threat to the monopoly that the universities have enjoyed for almost a thousand years.

- **Privatization.** With this new accreditation, and the ability it gives for novel institutions to provide what have been traditional and limited credentials, has come a wave of privatization. For-profit providers are now an established part of the landscape and it is estimated that there are now more than 650 for-profit degree-granting colleges and universities in the U.S. Some of these are supported by for-profit companies (the University of Phoenix and Jones University, for example), and others are supported by traditional universities as free-standing for-profit ventures. Most have chosen not a direct assault upon the traditional comprehensive portfolio of universities, but a selective series of offerings, especially those in areas most likely to attract a large number of fee-paying students. The University of Phoenix, for example, has established programs aimed at the young, working adult, pursuing career-related courses on a part-time basis.
- **Competition.** The combined effect of deregulation and privatization has been a striking increase in competition. Competition has always existed for North American universities—from athletics to student admissions, faculty recruitment and federal research support—but in many other countries such competition has been regarded as unseemly, an activity unworthy of those devoted to the life of the mind.

That has now changed. Central regulation of salaries for leading faculty in the UK, for example, has been replaced by a more free market approach. New Zealand has, perhaps, experienced the most sweeping changes. Reduction in funding and lightening controls on higher education, which began in 1988, led to "skyrocketing tuition fees; the strong institutions have become stronger but a number of the weaker institutions may be forced to close and are facing bankruptcy. There has been a 20 percent decrease in higher education enrollments from the country's poorer districts." (Newman & Couturier, 2001).

Higher education is now a $740 billion a year industry and accounts for some 10 percent of the U.S. gross domestic product. And it is growing, becoming an agent of economic growth, a central player in the new knowledge economy.

It is still unclear as to how such new ventures as Barnes and Noble University's courses on Shakespeare, or those from Motorola University on continuous improvement techniques (offered at sites in 13 different countries) will compete with, rather than complement, traditional offerings. But one thing is clear: lifelong learning needs, personalization of learning opportunities, pedagogic effectiveness and institutional responsiveness are likely to be the requirements for success within this new competitive environment.

This competition is not a future prospect, but a present reality. The reported existence of more than 650 for-profit degree granting universities and colleges and an estimated 2,000 institutions of all kinds offering virtual courses to over one-and-a-half million students (Newman, 2001) are compelling evidence of the scale of existing efforts.

- **Non-traditional students.** The last two decades have seen a steady rise in what have been generally referred to as non-traditional students. These include not only students of more mature years, who have undertaken other activities before enrolling in college, but also increasingly, part-time students enrolled in urban universities, and continuing professional education students, pursuing full-time careers and incorporating such activities as specialized weekend workshops, as well as more traditional graduate and professional programs. It is estimated that 42 percent of students enrolled in U.S. colleges and universities in Fall 2000 were 25 or older (US Department of Education, 1999).
- **Research funding.** A stasis in federal research funding has become a major concern in some areas of the physical sciences, mathematics and engineering. Though funds have increased markedly in the biomedical sciences, federal funding during the nineties fell by as much as 20 percent in some fields of the physical sciences and engineering.
- **Information technology.** The precise impact of information technology on both distance learning and conventional education is still unclear. It is reported, however, that over 2,000 institutions are now offering distance learning programs, with some 1.5 million students enrolled. The extent to which distance education will replace, rather than supplement, on-site and, in some cases, residential education is still unclear. There are certain areas of learning which are demonstrably well served by distance learning. It seems equally likely, however, that other areas, including both cognitive and non-cognitive, are less easily developed in cyberspace. Nor is it clear that, while IT has improved learning in some areas, it has yet reduced teaching costs. It is particularly difficult to judge the likelihood that virtual lectures, by star scholars and "presenters," will replace traditional lectures, with

faculty members acting more as coaches and facilitators than as lecturers. The range of such electronic courses is, as yet, small, but it is likely to increase rapidly [1].

- **Virtual partnerships.** While it is unclear as to just what effect IT will have upon the conventional teaching practices of the university, it is already clear that IT can provide a powerful tool for extra university partnerships, so that virtual partnerships, based on IT, may in some cases become equally effective as real communities. Among the more prominent virtual consortia are: Cardean University, which includes Chicago, Carnegie Mellon, Columbia Business School, London School of Economics and Stanford as its partners in business education; Western Governors University; Universitas 21, which includes 18 universities from 10 countries; African Virtual University; Fathom, which includes not only universities in the U.S. and U.K., but also publishers, museums and libraries; and the Jesuit Distance Education Network.
- **Unbundling of functions.** These collective trends indicate that there is a strong probability that the universities will face challenges from the unbundling of some of the many services that they now provide, together with cherry-picking of more attractive and potentially profitable areas by for-profit and other corporations. Already, such things as elementary language instruction and teaching of algebra and calculus are being offered by "knowledge providers" beyond the campus. The pattern already established in such non-academic areas as student catering, health services, books, supplies, and janitorial services, where outsourcing is already frequent, also could be pursued in the academic area.
- **Intellectual fragmentation.** In view of this, it might be supposed that the universities would exhibit a new level of internal partnership and cohesion in order to meet what are likely to be substantial external challenges. This is scarcely the case, for, while new centers constantly emerge to span the divisions between the disciplines, schools and colleges, the increasing rate of specialization within the disciplines raises the walls higher and higher, and, since appointment, tenure, promotion and salary decisions typically flow from within the traditional disciplinary departments, professors instinctively know on which side their bread is buttered and their careers develop accordingly. The barriers between the disciplines remain high and, even within the disciplines, new barriers and fences are emerging. With

1 The literature on this topic is substantial and the conclusions tentative. For a useful overview, see Newman, F. & Scurry, N. (2001).

many notable and praiseworthy exceptions, partnerships beyond the campus are often somewhat easier to develop than meaningful partnerships on the campus. This lack of intellectual community between undergraduate, graduate students and faculty, and between departments, schools and colleges, is one of the most glaring weaknesses of the contemporary university. And it is one of the most difficult to eliminate.

FUTURE CONDITIONS, SOCIAL AND ECONOMIC

It is increasingly clear that knowledge is the new economic capital. Though, in the past, a nation's natural resources provided the foundation of its wealth, and though these traditional resources will still be of major importance, it is knowledge that will be the most important economic driver of the new millennium. It is knowledge that provides the basis for both existing industries and for new ventures. It is knowledge that provides the means for urban renewal and social development. It is knowledge that provides improved methods of health care and public welfare. It is knowledge that allows new methods of defense and environmental protection. It is knowledge that provides the foundation for a full and meaningful life and for a just and generous civil society. Unlike other natural resources, which are depleted by their use, knowledge multiplies at the hands of its users. It expands, even as it is challenged, tested and refined. It grows, even as it is applied and incorporated. But, unlike other natural resources, which can be mined, purchased, or otherwise extracted, knowledge comes only to the prepared mind. It is available only to the informed participant.

This places a degree of responsibility on the universities, which is even greater than that of earlier times. In a period when knowledge is said to multiply every five years, and in which there is increasing mobility, not only between different "jobs", but also between different careers, there exists an increasingly heavy public obligation upon the university.

Nor is this all, for the application of knowledge to the burgeoning variety of social problems also requires the engagement of universities and a multidisciplinary approach to the issues involved. Interdisciplinary scholarship, so called, is of little help here. To be useful in interdisciplinary activity, one must first be skilled in the disciplines. What is required is the partnership of multiple disciplines, converging in addressing particular problems. For the challenges of society are no respecters of disciplinary provincialism. They sprawl across our jealous boundaries and they spread across our rising scholarly fences. If ever we are to harvest the benefits of insight, discovery and invention, we must confront the exclusivity of the disciplines and the easy adoption of reductionism as the sole approach to knowledge.

POWER OF PARTNERSHIPS

In summary, partnerships, both formal and informal, can help to restore the community that was once the university, partly by inreach and partly by outreach. Constructive partnerships can renew both the university and society; there are unlimited opportunities for new partnerships within and between institutions, departments, centers, institutes, schools and colleges, new partnerships between teaching and research, between passive learning and active engagement, between "book learning" and practical experience, between academic studies and civic engagement, between the university and industry, between the university and non-profits, professional associations and academies, museums, libraries, research centers, government—local, state, federal—and other local, statewide, international and regional bodies, as well as local communities. Each can provide direct benefit, not only to the partners engaged, but also to the activities of the partners in other fields of endeavor.

OBSTACLES TO PARTNERSHIPS

If partnerships on this scale are to be encouraged, one must ask: what are the costs and what are the obstacles? Perhaps it is useful to consider costs and obstacles as sub-headings of the same general category, since each is likely to be a deterrent to the development of effective partnerships.

- **Costs.** Perhaps the most immediate obstacle to partnerships is cost. Cost may involve both financial implications and personal commitment. Not only is the time of faculty members already under severe pressure, but the finances of universities are already painfully stressed. Even if funding can be secured and time provided for such partnerships, the dangers of dilution of individual effort and diffusion of institutional purpose are also real. The university neither can, nor should, be all things to all people. It must make a conscious decision as to how best to employ its resources, not only financial and physical, but also human.
- **Indirect costs.** One specific financial concern is that the real costs of any corporate partnership are rarely covered by the indirect support provided to the institution. Such costs as administrative, technical and faculty time, office materials, library expenses, equipment and operating costs, as well as the unremitting costs of building operation, maintenance and support, all deserve to be critically reviewed in the light of particular research programs. Though this can be dealt with effectively at the time a contract is developed, often the wishes of the

department for support "at any cost" compete with the longer-term interests of the university in obtaining adequate indirect cost support, even though this will clearly increase the size of the total program proposal and cost. In any dispute of this sort, it seems clear that the institution should seek maximum recovery of indirect costs associated directly with research.

- **Time frames.** Another obstacle to such partnerships is the differing time frames on which partners typically work. What to industry is the maddeningly slow pace at which academic research proceeds is, to the faculty member, a guarantee of time for reflection and care in conclusion. Between the two, there is at present little in common and a degree of impatience on both sides tends to result. Yet there is surely ample room in this area for accommodation and compromise.
- **Intellectual property and integrity.** A more serious obstacle is the desire, on the part of some corporate sponsors, not only to protect the patent rights or corporate benefits that come from particular subsidized studies, but even, in extreme cases, to attempt to impose strictures on publication, or even modify or soften the conclusions of a sponsored study, when these are seen to be inconsistent with corporate interests. There have been accusations of such cases in some European biomedical research sponsored by pharmaceutical companies and fears in many more cases. In this area there can be no compromise. Though a delay of a month of two may be appropriate to protect patent rights, the integrity of the university will be undermined if external financial support limits the ability of faculty and researchers to publish and otherwise disseminate the results of their work.
- **Intellectual impartiality.** A comparable skepticism on the part of industry is also an obstacle to partnership, for while individual faculty members may be skeptical of industrial integrity, some corporate leaders look with skepticism upon the impartiality of members of the faculty. What is seen—rightly or wrongly—as the chilling rise of political correctness has done little to reassure institutional partners.
- **Academic turf.** Departmental protectionism and collegiate turf control, though generally secondary to the desire for financial support, remain a fact of life in most institutions. These attitudes are not likely to change quickly, though one may hope that they will be corrected over time by the positive benefits, not only to individual faculty members, but also to their students and their institutions, arising from corporate partnerships. A subsidiary aspect of this is the unspoken prejudice, even in some professional schools, that association with industrial and other external partners is in some way impure or

disloyal to the institution itself, even though federal funding is seen as something to be prized. So promotion, salary increases and preferment tend sometimes to be weighted towards those who are less engaged in industrial activities.

- **Institutional concerns.** Institutional conservatism has tended to be less of an obstacle in this regard than has individual departmental inertia and suspicion. Facing growing financial pressure, institutions have tended to welcome more rewarding partnerships with industry.
- **Scholarly work.** The notion that the scholarship produced by multidisciplinary work is not only less pure, but also less rigorous than that produced within the context of the disciplines is sometimes an obstacle to internal partnerships, including especially new intellectual coalitions between what were once independent, free-standing disciplines. But instances abound where this is not the case; the margins of the disciplines are increasingly fruitful areas of enquiry. In science over the centuries, the great discoveries have come at the margins of the disciplines by conscious pooling of the expertise derived from each. One can reflect, for example, upon the Darwin-Wallace theory of natural selection, embracing as it did so many areas—from geology to genetics, anatomy, systematics, botany, psychology and zoogeography—that are now distinct fields, or the discovery of the structure of DNA by Crick and Watson, which depended not only upon biology, but also on x-ray crystallography, exquisite structural chemical analysis, microbiology, genetics, and quantum mechanics. The same pattern was seen with the development of plate tectonics, perhaps the most significant unifying theory of the last quarter century, which involved a combination of paleogeography, geophysics, geology, oceanography, magnetism and paleontology, in order to be developed in its fullest sense. And what is true of science is no less true of other areas, whether in the professions or in the traditional humanities and social sciences. In law, for example, questions of ethics, economics, sociology and psychology are profoundly intertwined with legal aspects of many cases. In civil engineering, there is growing emphasis not only on alternative structures and materials, but also on environmental, ecological, economic and aesthetic aspects of construction, while in the humanities, the new literary criticism takes in vast areas of what had traditionally been the province of such other disciplines as sociology, psychology and anthropology.

In spite of some confusion, overlapping and jostling at the boundaries between the disciplines, these boundaries are areas of increasingly fruitful

interaction. We dare not allow those issues that confront us to fall between the cracks of our ancient boundaries.

- **Academic recognition and advancement.** One practical concern for professional academics concerns less the appropriateness than the recognition, stature, support and reward of multidisciplinary studies. Because appointments, promotions and rewards still tend to come from within departments and from professional societies that are, themselves, in most cases disciplinary-based, there is a perception that multidisciplinary work tends to receive relatively less recognition and support than work within traditional fields. This concerns not only the career advancement of the individual professor, but also the financial support and publication of the work involved. This perception is, I think, a real one and it is also, for that reason, one that must be addressed. Department chairs, deans and provosts need to take this seriously if we are to provide the maximum benefits to the society that supports our universities.
- **Institutional autonomy.** A further concern is that universities will become either assimilated by, or, perhaps just as dangerously, tainted in their institutional autonomy and professional judgment by corporate partnerships, or whatever kind. In this view, it is both the integrity of the institution and the impartiality of scholarship that are seen to be at risk. It is argued, for example, that a clinical study of the effectiveness of a newly developed pharmaceutical product may be influenced if the support for clinical trials is provided by the parent company which developed the drug. This seems to be to be a legitimate concern and one that must be addressed by the creation of appropriate protocols by each institution. No protocol, of course, can cover every eventuality, but this concern is so fundamental in its implications that it must be faced squarely before any contract is finalized. A draft protocol has recently been proposed (Rhodes, 2001).
- **Student interests and concerns.** Some are concerned that, though the broad scholarly integrity of the university may be safeguarded by such arrangements, the wellbeing of students, particularly graduate students, may receive less attention than the priorities of the supporting company. The danger perceived here is that, for example, a graduate student may be assigned to a research topic, which, though it serves the direct interest of the sponsoring company, is nevertheless unsuitable for a Ph.D. thesis study. It seems to me that the only safeguard against this is openness on the part of the sponsor, professional responsibility on the part of the individual faculty member, and a

clear and public understanding that neither the pursuit of the study, nor the conclusions and publication of the work will be influenced by the views or desires of the sponsoring corporation.

- **Mission creep.** A related concern involves the wider mission of the institution, with the fear that this may be diluted or deflected by too close engagement with the corporate world. What I think is needed here is careful definition and statement of what the institutional mission is. In too many cases, the institution or department has no stated mission and may drift towards any major source of funding that happens to be readily available. This is not, of course, confined to corporate funding. It may well be that a department of astronomy, for example, leading the design and advocacy of a new telescope, which may cost anything from $100 million to $1 billion, could be largely absorbed and deflected by such activities, however praiseworthy they may be in their own right.
- **The Land Grant Model.** The concern that any partnerships with industry and other non-university institutions beyond the campus is, in some way, a new and corrupting development overlooks and underestimates the success of just such a program which is now more than a century and a quarter old. The Morrill Land Grant Act of 1862 created a system of outreach by which land grant universities would cooperate, not only with county, state and federal governments, but also with individual farmers and agricultural businesses. The subsequent history of that Act has been one of the great success stories of American higher education. Indeed, it has expanded in influence to other areas of the world, with untold benefits, not only to those who work on the land, but also to the larger community which depends on agriculture for its sustenance. Furthermore, the Bayh-Dole Act of 1980 explicitly encouraged the commercial application of publicly funded research in order to promote both economic development and wider social benefit.

PROTECTING THE CORE

What must be preserved? Any partnership agreement must preserve a few essential characteristics, both of the institution and of the company and of the public which supports it both in direct and indirect ways. At the institutional level, the following qualities must be preserved:

- Institutional autonomy,

- Faculty freedom to pursue promising areas of research, subject only to the canons of the particular discipline or profession and the university's overall requirements for such things as use of human subjects,
- The integrity of the disciplines and professions involved,
- Scholarly impartiality and freedom from obligation to slant or modify conclusions,
- The best interests of both undergraduate and graduate students in relation to the projects supported,
- Freedom of expression and publication,
- The preservation of an atmosphere of openness, free discussion, wide association and mutual trust and support.

While these qualities must be preserved, it is equally important that the interests of the corporation should be recognized and encouraged. These include, but are not limited to:

- The potential reward for corporate investment, both financial and human,
- The benefits to individual discoverers of new inventions, products and procedures,
- The freedom of the company to capitalize on new discoveries and bring them to market in appropriate form and timely fashion,
- The interests of shareholders, users, employees and the public must also be given appropriate consideration and appropriation recognition. A company is entitled to see some economic promise or potential from its investment in research and development, even though occasionally it may choose to support less focused programs and proposals.

FROM PROPOSAL TO PARTNERSHIP

In order to move from theoretical support for partnerships to their practical implementation, three initiatives are needed. First, the government's role in this is to recognize the national importance of nurturing academic-industrial partnerships and to provide appropriate tax incentives and monetary policies to encourage it. This should be part of a larger program of support for corporate investment in R & D, on which the future economic health of a country substantially depends.

Second, the role of industry is critical to the success of these new partnerships. Success will require the recognition by corporate leaders of the huge research potential from university partnerships. But it will also require strate-

gic thinking, as well as tactical thinking, on the part of directors of R & D. Any partnership will require not only respect for the autonomy of the institution, together with its mission and goals, but also the recognition of the real cost to the institution which such a partnership may involve. Industry should also recognize the unique opportunities these partnerships provide to link research, education, retraining and recruiting under a single heading, so that longer term consultancies, student internships and R & D partnerships can become part of a growing corporate program of education and research.

Third, the university also has a role to play in facilitating these partnerships. This involves not only the removal of obstacles—institutional, collegiate and departmental—but also the provision of flexible appointments, sympathetic review of shared facilities and incentives for and recognition of such cooperation. Joint appointments will involve not only joint departmental appointments, but also appointments in which part of a faculty member's time is supported by soft money contributions from industry and other sources, just as it is now in many cases by federal research funds. There are, of course, dangers inherent in such arrangements, but, with proper oversight and forethought, these can be reduced.

An issue remains as to whether or not a university professor, employed full time by the university, should be allowed to accept a position as an officer within a startup or other company. Arrangements will differ from one institution to another, but my own reaction is that such an arrangement is undesirable. While I recognize that there are potential benefits inherent in an arrangement of this kind, it seems to me that the pitfalls and conflicts are even more substantial and that this practice should not be encouraged. In contrast, I see no fundamental conflict of time or interest and much potential benefit in individual faculty members serving as directors of corporations, providing that such affiliations are a matter of public record.

THE BENEFITS OF PARTNERSHIP

When new partnerships are created, the long term benefits will be substantial. For the university, perhaps the most obvious benefit is that industrial partnerships will provide new revenue, and, perhaps, catalyze new economic activity. It is estimated that, in 1999, universities filed 7,602 patent applications, generating $641 million in university income. In financial terms alone this is a source of significant revenue. Columbia University, for example, which ranked first among American universities in earnings from patent royalties for the past two years, received more than $143 million in royalty revenue in the year 2000 (Blumenstyk, 2001). These funds were used as internal venture capital, to sponsor promising new research initiatives.

Perhaps the most striking evidence of the wider economic benefits of university research is provided by a BankBoston study of MIT which estimates that if "the companies founded by MIT graduates and faculty formed an independent nation, the revenues produced by the companies would make that nation the 24th largest economy in the world. The 4,000 MIT-related companies employ 1.1 million people and have annual world sales of $232 billion. That is roughly equal to a gross domestic product of $116 billion, which is a little less than the GDP of South Africa and more than the GDP of Thailand. Eighty percent of the jobs in MIT-related firms are in manufacturing (compared to 16 percent nationally) and a high percentage of products are exported. The MIT-related companies have more than 8,500 plants in 50 states." (Bank of Boston Economics Department, 1997).

The larger benefits for the university and the wider society, beyond the mere financial benefits, are substantial. By closer alliance with industry, teaching and research are enlivened and enriched. Students, both undergraduate and graduate, have new opportunities for identifying fruitful careers, as well as opportunities for internships and experiences that will assist them in their own career choice and preparation.

Industrial challenges pose new intellectual challenges and some of these may be of fundamental, rather than of immediate practical, significance. Furthermore, both basic research and development work have already led to breakthroughs in biomedical devices, pharmaceutical products, engineering techniques and agricultural developments, which have provided benefits for all society.

It is this wider social benefit which is the ultimate argument for encouraging closer corporate liaison. Liaison will take place only if there are clear mutual benefits for the corporate sponsor and the university, but in the interests of serving the wider public, a protocol must be clearly defined and developed.

The responsibility for developing such a protocol rests squarely with the administration of the university, but it should not and, indeed, cannot be developed by them in isolation. It will need the constant input, review and support of the university faculty involved, as well as department chairs, deans and other officers. It must be a matter of review for the board of trustees and it must, of course, commend itself as equitable to corporate sponsors. It is also important, I believe, that such partnerships should be a matter of public record.

CONCLUSION

Fears that external partnerships and outreach would create bias, distorted priorities, divided allegiance and neglect of education, have been with us since

at least 1862, when the Morrill Act was signed by President Abraham Lincoln. The awareness of these concerns and the realization of these hazards should make it possible for universities to adopt protocols and encourage professional responsibility to safeguard against them. The ultimate beneficiary from new alliances and extended corporate partnerships must be the public, for it is the public that is ultimately served by both universities and corporations, and it is upon public recognition and support that both, in turn, depend for their existence and success.

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