The role of the university in genetic engineering

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From a cursory glance at university and industry responsibilities, it would appear that the roles are clearly different, easily distinguished from one another. Unfortunately, this is not so. In fact, some argue there should not be a clear distinction between the two, citing the current strength of the Japanese economy as resulting from close association of academic and industry research. At the other extreme, some voice concern over alleged or potential domination of research priorities by the private sector, fearing that free and open exchange of scientific ideas will be stifled because of the focus on proprietary needs in a competitive market.

As with most issues where views become polarized, the best resolution is to be found on some middle ground. In exploring this question, a useful example is the breeding and development of new crop varieties.

Crop variety development has been a major activity in state agricultural experiment stations since their inception. Early public sector work on new varieties occurred, mainly because there was little or no private capability or interest. However, as the science of plant breeding advanced, so did activity in the private sector. As the relationship evolved, the common view came to be that the role of the public sector is to develop and maintain germplasm, while that of the private sector is to develop commercial varieties.

It is not that simple. Variety development requires an extremely broad program with activity in pest management, crop physiology, and crop management, in addition to plant genetics and innovation in new breeding techniques. An extensive program to explore, develop, and maintain a germplasm reservoir is also an essential component.

It is clear that publicly supported research institutions will have to maintain those programs and that private companies cannot carry out all of these activities individually. Whatever part private industry takes in producing and marketing varieties, the public institution will inevitably develop some commercial varieties as a necessary part of the mission to train professionals, formulate new breeding strategies, and maintain a germplasm bank. Developing a commercial variety is not the mission of the public sector, but commercial varieties will, nevertheless, be developed as a part of the process. Hence, the difficulty in maintaining a sharp distinction between the two roles.

Training professionals

The process is no different in genetic engineering. The mission of the public institution is to seek knowledge that will form the base for the new biotechnology. Development of techniques for isolating plasmids, working on restriction enzymes, vectors, gene splicing, and others, and the **training of professionals** in this science will continue to be the primary mission. In that process, we will inevitably develop biological materials that will be patented and, perhaps, be of economic value. As with crop variety development, the distinction between public and private organizations at the laboratory bench is often indistinguishable—but each has evolved from a different fundamental mission.

An additional complexity in the new field of biotechnology is the role of the individual faculty member. In theory, genetic engineering has the potential to overcome natural plant breeding barriers. Most scientists are hesitant to predict when recombinant DNA technology will result in a new crop variety of commercial value, but whatever economic value might be ultimately realized, it has created the **perception** of immediate riches.

Because of the awesome potential of this genetic technology, new companies have proliferated. The result has been a tremendous demand for scientists with the requisite expertise and skills, and a number of academic leaders in this field have left universities for greatly increased salaries. Faculty also have more opportunities to serve as part-time consultants in exchange for fees and stock interests, or even to develop their own companies.

Private funding

Furthermore, private industry has great interest in funding research programs within the universities in return for some exclusivity in marketing the resulting products. Because public research funds have been rapidly dwindling, such a relationship is being looked upon with favor by scientists at many public institutions.

Does acceptance of equity in a corporation diminish a faculty member's loyalty to the university? Can the university protect the public investment in its research programs through patents and receipt of royalty income derived from products of privately sponsored research? In its quest for income through the patent process, has the university itself hindered free exchange of ideas and materials with other institutions? Should the university market its own products to ensure return on investment by the public sector?

There are no simple answers that do not jeopardize the very basis of scientific thought and inquiry—the entrepreneurship of the individual scientific mind. But exchange of information and materials can be maintained while protecting the proprietary interests of the university through well-conceived contracts. Loyalty to the university of faculty members associated with some private venture can be ensured through peer evaluation of their scientific accomplishments and through administrative review. There are ways of finding solutions and, hence, benefitting from a close public-private sector relationship if we identify the particular problem objectively and test various solutions thoughtfully.

The challenge is to preserve the beneficial aspects of the relationship between the public institutions and the private sector and to ensure a collaboration through which society will realize the potential benefits inherent in the new technology of genetic engineering.