POLICY FORUM

Basic Research: The Gray Zone

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In these days of societal concern about practical applications of scientific research, the editorial columns of *Science*, *Nature*, and other journals argue the need for continued generous support of basic research in academia, because "while we can be certain that some of it will have practical value, none of us can confidently predict which of these advances and areas is destined to have the most impact" (*1*). Some borders have been drawn (*2*) by stating (correctly) that "in the administration of basic research, the ultimate question is strategic priorities." But what about the gray zone—when a basic research discovery moves toward practical implementation?

Explicitly or implicitly, the assumption is always made that academic eggheads in white coats should leave that job to industrial entrepreneurs. But dramatic changes are under way, and nowhere more strikingly than in the field of biomedical applications. While many news columns (*3*) have noted the pervasive connection of most top biomedical researchers in American universities to industry, the associated financial rewards are invariably criticized; the implication being that money in academia unfailingly corrupts. We tout America's thriving entrepreneurship (almost entirely based on prospects of financial gains) while deprecating flourishing academic entrepreneurship, forgetting that the biotechnology industry in America would never have taken off without the active involvement of academic investigators in hundreds of fledgling enterprises. Associated rewards in terms of stock options or stock ownership (standard currency in any industrial entrepreneurial setting) invite instant suspicion and criticism; the position of the Howard Hughes Medical Institute that Stanford's Irving Weissman resign his position after he founded Systemix Inc. is a dramatic example (*4*).

Let us not pretend that potential conflicts of interest and even egregious examples of academic misconduct are caused primarily by yearning for financial gains. Nobel lust or the craving for a multitude of lesser kudos are most commonly responsible for academic deviance, but I have yet to learn of an academic code of conduct addressing impermissible levels of personal ambition. The Hughes Institute would hardly have objected if Weissman had launched his discovery solely by way of the balloon of a scientific publication, even if the latter had then led to a Nobel check exceeding $1 million. The Hughes Institute would hardly have blinked if some industrial enterprise, say in Japan or Europe, had used these published results, uncontaminated and hence unprotected by a patent application, to develop human cancer therapeutics and reaped all ensuing financial benefits.

Why object automatically if the academic discoverer wishes to continue shepherding his or her scientific baby along the road to practical maturity, prompted in part by financial gains? Why should such person have to abandon the academic laboratory to do so? Monogamy is great for stable marriages, but what is the evidence against the benefits of intellectual bigamy in academia (with its associated financial benefits to the individual and eventually to society)? More than half of our graduate students and postdoctoral fellows pursue careers in industry. Could a professor with active participation in the extremely complicated, multidisciplinary approach to practical realization of laboratory discoveries not be a better mentor? Could an academic, serving in some part-time directorial or managerial position in industry not offer a perspective rare in conventional businesses?

These are not theoretical questions as my own experience attests. Years before the biotechnology explosion, I straddled both sides of a then much less penetrable wall by serving simultaneously as a chemistry professor at Stanford University and as an officer (including chief executive officer) of research-intensive industrial enterprises; the industrial position carried handsome compensation in terms of salary and stock options (*5*). There are other examples of such professional bigamy (most commonly disclosed in annual proxy statements) that have resulted in direct benefits to a wide community. I estimate that my own industrial activities, during my concurrent academic service, were responsible for several thousand jobs, most of them highly technical, in the San Francisco Bay area. None of this, of course, changes the perception (often by sanctimonious critics) of the corrupting influence of money received in return for intellectual services—a truism applicable to so many facets of contemporary society. The only feasible safeguard for society is open disclosure. Open professional bigamy, with all the associated legal responsibility, is far preferable to hidden affairs disguised under ambiguous terms such as "consultant" or "adviser."

I conclude that encouraging, rather than condemning, professional bigamy among academics, can be societally beneficial, provided it is accompanied by clearly defined guidelines. Such guidelines should cover the following topics:

1) *Time limits for outside activities by full-time academics*. The limit commonly imposed by universities is the one-day-per-week equivalent. It is unrealistic to enlarge this, nor is it generally feasible for an academic to assume outside managerial responsibilities under such a time constraint. The latter constraint appropriately restricts one's industrial activities to memberships on boards or to conventional short-term consultantships.

2) *Nature of permitted outside activities*. Rather than indulging in the maxim, "what is not permitted is proscribed," I would list the few activities that are always off limits and then set up an institutional mechanism that would handle on an ad hoc basis all other questionable practices. Examples of invariably prohibited activities include the utilization of university property, facilities, or personnel (notably students) for the benefit of the company with which the academic is associated; evaluation of actual or potential products for eventual government approval (a notable example being phase II and especially phase III clinical trials of experimental drugs) or promotional purposes; and the restriction of free publication of university-conducted research.

3) *Length of unpaid academic leave*. Most universities have pertinent rules, ranging from the most common 2-year period (for example, Harvard University) to open-ended arrangements, the latter usually associated with important positions in government (as if power were not as corruptible as money). I would favor specified limits for such leaves, irrespective of the justification.

4) *Scope and nature of part-time positions*. Most of the institutional precedents pertain to medical schools with their part-time clinical appointments, which are justified on professional grounds: to find teachers who can tell students about the real (clinical) world. This argument should be invoked for most other professional areas in order to encourage, rather than restrict, part-time academic positions once the quality control of approved tenure has been passed. The academic commitment should not go much below 50% in order to assure adequate physical presence on campus; such a level would still permit meaningful in-

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volvement even at the managerial level in many technical enterprises. Outside managerial or directorial responsibility could be restricted to areas having a direct bearing on the academic's professional field of competence, as is the case with all clinical appointments.

Entrepreneurship could flourish under such liberal, part-time rules with associated societal benefits. Nor is there any evidence that such entrepreneurial activities by responsible part-time academics impair in any sense the quality of their teaching or research. In these days of constrained university budgets, increased numbers of part-time, tenured faculty may help in many ways. For instance, because many universities pay no fringe benefits below the 50% level, a 49% level of academic commitment would relieve the university of a substantial financial burden that is usually assumed by the outside employer. Because such part-time faculty is more likely to come from scientific or engineering disciplines, the savings could be funneled to the arts and humanities, which are suffering in the current economic climate.

Many studio art and creative-writing programs are proud to claim well-known artists, writers, or poets as part-time university faculty. In contrast to the case for scientific collaborations, hardly anyone has raised the question whether universities are entitled to a percentage of the sale of high-priced items of art or to copyright and a share of royalties of best sellers from such faculty members.

5) *Patent policy*. The institution's patent and royalty policy is the origin of most conflicts of interest and of potentially the largest monetary rewards. There is a viable alternative for the range of restrictive or free-wheeling patent policies currently found among American universities: A Stanford University committee, under the chairmanship of the biologist Craig Heller, is drafting a more precise conflict-of-interest policy, which has received considerable media scrutiny (6). One proposal encompasses the requirement that all inventions made by Stanford faculty become automatically the intellectual property of the university unless it decides not to seek patent rights. This is precisely the situation under which virtually all full-time research personnel now operate in industry. Assignment of patent rights does not carry royalty benefits for such industrial inventors, presumably because practical invention is a key component of industrial employment. Because that is not the case in academia, royalty payments from any university-owned patents to the inventors are appropriate but with the university retaining a prospectively defined percentage. At present, many universities do this for those patent applications that a faculty member chooses to file. Under the recommended scheme, this choice will be made unilaterally by the university. The possibility of licensing such patents exclusively to some corporation already exists in many university patent policies and thus would not inhibit inventor-faculty involvement with new or existing companies. Objection to such exclusive licenses is often raised on populist grounds (why should the taxpayer's money benefit one company?) without realizing that in many technical areas, a company would not enter into royalty-bearing licenses of some basic research discovery without such exclusivity in view of the risk and extraordinary cost associated with bringing such discoveries to practical fruition. In the absence of such exclusive licenses, the taxpayer's original investment in basic research would benefit no one. A substantial element of conflict of interest would be removed if all such decisions were made at the university level with appropriate disclosure.

6) *Resolution of conflicts of interest*. It would be naïve to assume that the above list of recommended guidelines, or indeed a much longer one, would prevent all conflicts of interest. One helpful step would be to establish an office of a special ombudsperson, with experience in the academic and industrial world, to whose attention potential conflicts of interest could be brought in confidence at an early stage by any party.

I can think of few better ways to stimulate societal responsibility for one's basic research than to be formally involved in the necessary technology transfer from the laboratory to the ultimate consumer. The perception of the corrupting influence of money cannot be changed, but because it applies to virtually all areas of contemporary society, why not focus primarily on reality rather than perception?

REFERENCES AND NOTES

1. J. I. Brauman, *Science* **259**, 1519 (1993).
2. D. E. Koshland, Jr., *ibid.*, p. 1379.
3. C. Anderson, *ibid.*, p. 300.
4. ———, *ibid.*, p. 884.
5. C. Djerassi, *The Pill, Pygmy Chimps, and Degas' Horse* (Basic Books, New York, 1992).
6. B. Workman, *San Francisco Chronicle*, 11 May 1993, p. A13.