

UNIVERSITY-INDUSTRY RELATIONS: A CONFRONTATION OF ANACHRONISMS

by George S. Hammond

"Industrial research is nonexistent."

"University people know nothing about the real world."

"X may not be an outstanding student, but he will burn up the league in some industrial lab."

"The biggest problem of industry is technical obsolescence of people."

"We really need much closer relations between industry and the universities."

Of these statements, only the last, which is no more than a pious sentiment, would have any chance of achieving consensus in both the academic and industrial worlds. For the most part there is little resembling a direct, working relationship between the two systems, despite the fact that neither could survive without the other. Education consumes an ever increasing fraction of our national wealth, and our industries produce most of that wealth. Conversely, it is widely accepted that progressive industrial competence is uniquely dependent upon a sophisticated and dynamic system of education at all levels. Since the two communities are mostly symbiotic and only mildly competitive, a visitor from some other society might wonder at the lack of direct dialogue between them. As a matter of fact, so do members of *this* society. Recently there have been a number of pleas, mostly from industry, for expansion of the scope of university-industry interaction.

What do industries and universities want from each other? The recognized needs are simple: Industry needs graduates, and universities and colleges need money. Unfortunately, most attempts to establish communication are based directly on these commodities and on little else. Regrettably, each group generally regards the needs of the other with contempt and condescension. University faculties still tend to look on students bound for industry as unfortunate fellows headed for a life of weary prostitution. Although individual industrialists may be personally dedicated in their support of specific institutions, the corporate view usually is that a little money doled out to support education may help the recruiting program and comfort a few consciences. Although these basic needs are not base, they are one-sided enough to become tedious fare for sustained conversation.

There should be much more substance to relations between industry and academia. Both are con-

cerned with harmonious integration of the activities of large numbers of people; they need to evaluate and translate new ideas and new information; and they are eternally plagued by obsolescence of methods and products. Problems in the two communities are far from identical, but they are sufficiently related to generate a host of common interests. For the most part, this potentially broad base for discussion is rarely exploited.

A principal impediment to discussion lies in the reluctance of both academicians and industrialists to discuss their problems in a forthright manner. Within the privacy of their own organizations they grumble and brood over problems in human relations, information storage and retrieval, the lack of effective internal communication lines, the unruly and restive attitudes of employees (or students), and the conservative character of management (or the administration). However, in public both groups pretend that their problems are really superficial or nearly solved. Only rarely does one hear public confession by an educator that many university courses are badly outmoded—not just the methods of presentation but the actual content of the courses. Similarly, industrialists rarely discuss in public the fact that middle-level management is often in an untenable position, only vaguely aware of the objectives of the company, and barely able to discuss intelligently any nonroutine activities of its subordinates. The fact is that both industry and education are in need of major changes in their internal practices. They are saddled with stultifying traditions and are ashamed to discuss their problems outside their own walls. Since there are many interesting parallels in the problems, stimulating and novel suggestions for change might come from serious discussion.

An especially fertile field for interaction exists between technologically based industries and university research in science and engineering. Even in such a natural area, exchange of ideas is often desultory. I have the impression that interaction is better in relatively new fields, such as modern electrical engineering and space exploration, than in older fields, such as chemistry and geology. As a field becomes older, intercourse between universities and industry becomes more trivial. The two groups become set in their ways and really disin-

clined to make significant changes for any reason. They are especially loath to change their images of each other. Academicians tend to regard industrial researchers as a grubby lot of fellows who build better mousetraps to make a buck. They also have a strong suspicion that most industrial scientists have become intellectually soft and have little ambition to expand their competence by acquiring new ideas. The reciprocal sentiment of the industrialists is that university research is a game in which the researcher writes his own rules. A cardinal principle of the game is the premise that an observation becomes more fundamental as it becomes more difficult to relate to anything else. Industrial employers often criticize recent graduates on the grounds that students are now taught nothing of practical significance. The critics usually have in mind the good, solid material that they themselves learned in school 20 years ago. The same people are likely to gripe because the men in their laboratories are unable to keep up with the trends of modern science.

One reason for the persistence of such uncomplimentary impressions is the fact that they all contain a fair measure of truth. In a well-established field, academic scientists have a tendency to fasten onto old problems and solve them over and over again. Each round of investigation is designed to strike closer to the heart of some fundamental question, with the "heart" being defined as whatever happens to lie on the line of the thrust. In an entirely analogous manner, most industrial research really is aimed at improving some mousetrap by one percent.

Now there is nothing necessarily evil in research that lacks striking originality. Refinement of theoretical concepts by redoing experiments with minor modification is desirable and sometimes leads to important new concepts when people occasionally quit trying to force persistent deviations to fit existing theory. Similarly, slow improvement of industrial products and processes is not to be scorned. After all, the Stanley Steamer evolved into today's automobile by small, slow steps. However, discussion of the work may become dull rather rapidly. A matter that is properly of continuing concern within a university or industrial laboratory may not provide a basis for viable dialogue with an outsider.

The failure of scientific discussion at the university-industry interface is only an example of a general problem. Scientists in old fields do not talk to each other. It is not uncommon to find that members of two different research groups within a given laboratory do not communicate at all. They speak different languages and will sometimes maintain they have fundamentally different kinds of brains.

Breaking the scientific communication barrier

should be relatively simple. All that is required is to relinquish the foolish notion that one can talk science only by relating all the minutiae of his own work and thoughts. Astronomers seem to do especially well in discussing their work with other scientists and with the public. Although astronomers make fantastically precise measurements and work with complex mathematical models, I have never heard an astronomer attempt to relate such details of his work. I suppose that they do talk to one another in a private language, but they also have the grace to describe their most treasured observations and their grandest theories in common language.

Other men of science and technology should be able to do as well as astronomers. Why don't they? There are many reasons. Hardest to admit is the possibility that some "scientists" have never made a significant observation and have never understood a grand theory. Such a man is likely to be very comfortable hiding behind jargon and the notion that his work is too complex to be understood by ordinary mortals. Anyone who takes this view is almost certain to accord the work of a man in another part of his own field with the same sacrosanct respect. If the two men are an industrialist and an academician, they will begin any conversation with the tacit agreement that any real attempt to understand one another's work would be an affront to good taste.

At this point the industrialist may feel rather smug; after all, what can be more direct than the statement, "I am after a better mousetrap." But this is an illusion, and any industry that is engaged merely in a random hunt for better products will not survive long. The real job of the industrialist is to describe the models used to guide his search. This can be difficult and may lead to an embarrassing denouement. Some so-called scientists work with no model at all but are guided by a kind of experimental ritual. Others are unjustifiably ashamed of the simplicity of their models, even though they may be very effective. In any event, the model is usually made thoroughly incomprehensible by use of sophisticated language laid on merely to effect scientific respectability.

If scientists in universities and industries are to communicate, they must (1) develop more intellectual honesty, (2) strive to use language designed for communication of ideas rather than details, and (3) listen with the *intention* of understanding. When they can do this they will breathe more life into the relationship between the two communities. Unless I am sorely mistaken, the passage of students and money from one community to the other will also be accomplished far more graciously.