LETTERS

Problem-Oriented Research

In his editorial (12 Mar.), Long has omitted an important issue—the relationship of applied research to the application of research. The application of research is not a simple process, but rather an interdisciplinary activity of great complexity. It takes place at the interface between knowledge and action. At that interface there are differences of language, psychology, and values.

The experience of industry, and of such mission-oriented agencies as National Aeronautics and Space Administration and the Department of Defense, has shown that successful application of applied research is very difficult if there is not a close and continuous interaction between those who are doing the research and those who are expected to use the results of research. The possible consequences of such interactions and their effect on the freedom and independence of the university and its programs should be carefully considered by those who would like to see more applied research for the public good done in universities.

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Male Bias and Women's Fate

In a letter (12 Feb.) Demorest Davenport defends the widespread discrimination against women in science on the grounds that women are (for a variety of reasons kindly supplied by M. B. Jensen in a following letter) too irresolute to be trusted to succeed in the opportunities that might be offered to them. The paucity of good openings for female scientists, and the substandard character of those that are available, is proof that the male scientists who run the establishment are largely in agreement with Davenport's views.

Yet the argument is one that could be made in better conscience by a physicist or a geologist than by a biologist. The physical scientists keep their female graduate students down to a tiny minority, and thus avoid the paradox of training those whom they would not employ. Biologists, however, have not been so fastidious. Beguiled by lavish federal funds for graduate student training, the men who run our graduate biology departments have played a shameless numbers game, eagerly enticing women students to swell departmental rolls and bring in the money. The inconvenient fact that winning a Ph.D. would be unlikely to entitle a girl to more than second-class citizenship in the scientific world has, of course, gone unmentioned. The acceptance of this situation is to many men merely a matter of being realistic, though some are honest enough to admit that "cynical" would be a better word. The best word for it would be stronger.

During the 1960's, the percentage of Ph.D.'s in biology awarded to women ranged from 16 percent in the 11 most prestigious institutions to more than 30 percent in numerous others. I should like to ask Davenport who was a department chairman during that decade: How many members of my unreliable sex has his department admitted in recent years? How many have been awarded doctorates? Why?

Florence Moog
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In their attempts to justify lower salaries for women scientists, both Davenport and Jensen assume that there are "no data" on the relative scientific productivity of men and women and that such comparisons are only "theoretically possible." As readers of Science, they should not have to rely on what they "have heard" or would be "willing to bet" on what they "think the results would be," since a recent article on this subject noted the higher productivity of women in science (1). Or do they feel that an obligation to consider all available evidence only applies in the laboratory, and may conveniently be discarded when one is dealing with trivial matters like human aspirations?

William Lockeretz
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Reference

By resorting to hearsay in the absence of data, Jensen has himself already refuted at least one prejudice against women which assigns gossip to the female domain.

Ruth Rosin
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Davenport and Jensen have alluded to a situation which is present in many fields... if the expectation of less job mobility in males is considered an important asset, over and above the current performance for which pay is ostensibly given, an easy solution is possible. At present, what happens if the male, paid at a preferred rate because of statistical expectation of longer employment, leaves for another job after a couple of years? Well, for one thing, he gets to keep the extra money.

If there is going to be a differential in rate of pay, it should be based on an enforceable expectation. That is, a bonus rate should be paid to anyone, male or female, who is willing to sign a long-term contract binding him or her to remain with the employer for a period of years, barring involuntary physical disability (this wouldn't include pregnancy), with a penalty clause providing that the extra pay over and above that of persons not signing such a contract, must be repaid to the employer if he defaults.

Some persons might be reluctant to sign such a contract, feeling that they were selling themselves into slavery. But at least it would mean that the person who claims a right to preferential pay on the basis of hypothetically greater job stability would have to either deliver or forfeit the extra proceeds.

The principle which Davenport and Jensen appear to accept is reminiscent of the man who gave his three sons a good whipping every day after breakfast, on the grounds that they were sure to do something to deserve it before the day was over. If we are going to punish occupational infidelity, it would be better to adopt the more generally accepted corrective principle of exacting the penalty after rather than before the crime is committed.

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Some hypothesis might be tested to the satisfaction of all participants. Assume the validity of the following statements: (i) women receive lower salaries than men, all things but gender being equal; (ii) such a situation would be rational if, in fact, the "job mortality" would be higher for women than for men (due to sex-specific factors). Both of these statements should receive grudging agreement from all parties. Further, assume that past and present behavior is the best predictor available for future behavior (most behavioral scientists would accept this); specifically, it should be possible to stipulate a period of employment (N years, say, where N = 4 or 5) which would indicate that a specific woman had a "job mortality" factor at least as low as that of a typical man in the same position.

If the above assumptions are accepted, then an employer should be willing to give parity to prospective or current women employees (in terms of hiring preference or salary) if such employees had completed N years of continued performance as a professional. Do the employers who write to Science have salary parity for women who have been employed N years? Are they as likely to hire women with N years of employment as men with equivalent experience? If the answer is "yes," then the employers are behaving rationally, and women must argue the tenability of the "job mortality" assumption. If the answer is "no," then the employers are merely rationalizing irrational behavior in their letters to Science, and are hoist by their own petards (in the Middle French meaning of the term). Empirical tests can discriminate the good guys or gals from the bad.

DAVID E. CLEMENT
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Amen

Several letters dealing with the properties, preparation, and use of yogurt have appeared in Science during the past few months (1). I have recently been informed of some less technical studies which the researcher has compiled and plans to publish in a modest manual entitled "60 Things You Can Do With Yogurt" (2). Then too, his research assistants have prepared a short follow-up paper entitled "One More Thing You Can Do With Yogurt" (3).

FREDERICK H. GILES, JR.
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University of South Carolina,
Columbia 29208

References
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problems of interest to more than one discipline, or to the scientific community as a whole, or to society at large. As he sees it, the AAAS meeting should serve the needs of a number of different kinds of people—research scientists, students (about one-fifth of those attending the 1970 meeting registered as students), teachers, administrators, and interested laymen. But the process of change is far from complete, and it is meeting with resistance. As a result, the AAAS meeting as now constituted is a bewildering hodgepodge. At one extreme, affiliated societies, such as the American Society of Zoologists, schedule sessions that consist of dozens of short, contributed papers on narrow technical topics. Crafted on top of this there are symposia, planned by the AAAS central office, on such broad topics as "Reducing the Environmental Impact of a Growing Population."

**Autonomy of the Affiliates**

A glaring weakness of the AAAS meetings at present is that there is little or no editorial control. Programs proposed by the various AAAS disciplinary sections are rarely turned down by the central office, and programs sponsored by the autonomous affiliated societies that meet with the AAAS are considered virtually untouchable. The result is that there is often a great proliferation of programs on the same topic (environmental issues were omnipresent at the Chicago meeting), and some of the sessions actually work at cross-purposes with the rest of the meeting (as when an affiliated society offers nothing but short technical papers). Fully 30 percent of those who arranged symposia at the Chicago meeting claimed that other programs overlapped theirs in content.

The editorial anomaly could probably be cured by a more hard-nosed attitude in the central office, and there are signs that such an attitude is developing. One plan under consideration is to refuse to subsidize the meetings of affiliated groups which don't integrate their programs into the overall AAAS program. It cost the AAAS an estimated $35,000 to accommodate the affiliates at the 1970 meeting—a not inconsiderable contribution toward the overall meeting deficit of more than $200,000.

The annual meeting suffers from some of the same problems that have afflicted *Science* as the AAAS becomes more interested in broad issues and less interested in detailed technical reports. Thus the meeting has been criticized for going overboard on social problems and for failing to attract enough reports on red hot scientific advances. A survey indicated that almost a fourth of the papers presented at the Chicago meeting had been previously reported publicly, usually in a journal article or at another scientific meeting. That seems like an extraordinary amount of rehashing of old material, but it is probably inevitable that most scientists will continue to present new findings to their specialty groups rather than to the AAAS.

Perhaps the most worrisome criticism of AAAS meetings is that too many of the sessions are dreadfully dull. The radicals who disrupted the 1970 meeting complained that most of the speeches were "boring" and "irrelevant," and even AAAS officials acknowledge that the quality is spotty. Berl estimates that of some 120 symposia at the 1970 meeting, perhaps 20 were "good" and another 50 were "fair." However, quality often depends on the direction from which you are looking, and there were many students, teachers, and young scientists who said they found the 1970 meeting stimulating, broadening, and full of extremely relevant analyses of social problems. "Maybe a second-rate paper in biology is just the right thing for a physicist," one explained.

For the future, AAAS officials are apt to try to develop more centralized control of the program so as to cut down the number of papers and ensure better coverage of topics. There is also talk of holding different kinds of meetings—perhaps on a regional basis or on specialized topics—in addition to the annual meeting. And the effort to expand the reach of the meeting through videotapes, audiotapes, television, and other means will undoubtedly expand. Berl also hopes that the AAAS meetings can increasingly interact with the city in which they are held. This was a stated goal of the meetings back when the AAAS was founded, but in recent years the interaction has amounted to little more than a few tours and an exhibit or two put up in local institutions.

The publication of *Science* and the holding of an annual meeting have long been the major functions of the AAAS. But the association has also taken on, particularly in recent years, an array of other activities as well. The most important, by a long shot, has been the development of a new science curriculum for elementary schools, with the help of some $2 million from the National Science Foundation. Entitled "Science: A Process Approach," the new curriculum is being produced and marketed by the Xerox Corporation. Though only barely on the market, it's being used this year by some 70,000 elementary school teachers to instruct more than 2 million students.

The AAAS also conducts a host of smaller educational projects. It stages the popular Holiday Science Lectures at which eminent scientists address promising high school students in cities throughout the country. It holds seminars for congressmen, diplomats, school administrators, teachers, and others. It awards prizes for outstanding work in science and science journalism. It administers the Gordon Research Conferences, at which the very hottest of hot research is discussed. And it publishes bibliographies, symposium volumes, reports on public issues, *Guide to Scientific Instruments*, and other documents. All of these projects have their critics and their supporters, and all seem to prove useful to someone somewhere. But whether, taken as a whole, they add up to a significant program, is open to question. Many of these programs are undergoing review to determine whether they should be dropped, altered, or enlarged as the AAAS maps out an ambitious program for the 1970's. That program will be discussed in next week's article.

—PHILIP M. BOFFEY

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**RECENT DEATHS**

Dillman S. Bullock, 92; director emeritus, El Vergel Agricultural School, Angol, Chile; 5 April.

Jack Chernick, 59; head, reactor physics division, Brookhaven National Laboratory; 8 April.

George E. Crofoot, 92; professor emeritus of mechanical engineering, University of Pennsylvania; 4 April.

Joseph K. Hill, 52; former president, Downstate Medical Center, State University of New York, Brooklyn; 19 April.

George F. Hunt, 51; professor of wildlife management, University of Michigan; 29 March.

Rollo J. Masselink, 66; former assistant professor of neurology, College of Physicians and Surgeons, Columbia University; 12 April.
care administrators and industrial engineers, systems analysts, operations researchers, and health care researchers who are interested in the potential contribution to ambulatory care of quantitative decision-making techniques.

"Engineering in Medicine—Automatic Cytology," 26-30 July, New England College; Kendall Preston, Jr., Perkin-Elmer Corp., chairman. Research workers from the United States, the United Kingdom, and Europe will gather to exchange and discuss recent results of their efforts in the automation of cytological determinations. Included will be discussions of high-speed electrooptical imaging and image processing systems, as well as allied work in fluid dynamics, cytometry, and computer science.

"Engineering in Medicine—Biotelemetry"; 2-6 August, New England College; Charles W. Garrett, Committee on Interplay of Engineering with Medicine and Biology, National Academy of Engineering, chairman. Recent developments in electronic devices and their application to the medical practices will be explored. Case histories of various systems, embracing successes, problems, and causes of failure, will be presented.

"Enzyme Engineering"; 9-13 August, New England College; Lemuel B. Wingard, Jr., State University of New York at Buffalo and University of Pittsburgh, chairman. This conference will examine the engineering knowledge needed for the successful, practical, and economic realization of new possibilities for conducting highly selective, enzyme-catalyzed reactions during industrial processing, laboratory analyses, and medical therapy. An assessment of the progress to date, an exchange of ideas on the scope and possible routes for solution of the major problems, and the exploration of specific areas of application are major goals of the conference.

"Engineering Utility Tunnels in Urban Areas"; 16-20 August, New England College; Lloyd A. Dove, Institute for Municipal Engineering, American Public Works Association, chairman. Three utility tunnel applications will be considered: (i) a new town, (ii) an urban renewal project in a central business district, and (iii) major street reconstructions in conjunction with the installation of a new rapid transit subway.

"Research to Reduce Cost of High-Voltage Underground Transmission"; 23-27 August, New England College; Lester H. Fink, Philadelphia Electric Company, and T. W. Mermel, Bureau of Reclamation, cochairmen. The state of the art and the requirements for underground transmission systems will be discussed in light of environmental constraints on overhead transmission systems of the future.


"Future Power Systems—Research, Reliability and Regulation"; 16-20 August, Proctor Academy; Elias Schutzman, Division of Engineering, National Science Foundation, chairman. This conference will examine in depth the resources of the university, industry, government, and the utilities and the way they may be best organized to meet the demands of future power systems.

"Corrosion Engineering"; 23-27 August, Proctor Academy; Walter K. Boyd, Columbus Laboratories, Battelle Memorial Institute, chairman. Several facets of corrosion will be discussed: (i) the application of metals and alloys to provide a practical solution to plant corrosion problems; (ii) such preventative techniques as inhibition and cathodic and anodic protection; and (iii) the practical use of accelerated laboratory tests and other laboratory techniques for assessing corrosion behavior of materials and factors responsible for corrosion in a given system.

"Technology Assessment: Management, Manpower, and Methodologies"; 30 August-3 September, Proctor Academy; Bodo Bartocha, National Science Foundation, and Joel Goldhar, Rensselaer Polytechnic Institute of Connecticut, cochairmen. A follow-up of an Engineering Foundation Conference on technology assessment held 2 years ago, this meeting will focus on the operational problems of performing assessments and preparing individuals for the expected demand for trained assessors.

Additional information and application forms are available from the author.