Editorial

Concerns

I am concerned about the future of science. When I received my collegiate training in the 1950's, American science was in an exponential growth phase - as measured by increase in the numbers of practicing scientists, the number of experimental approaches and tools available, the funds available for extramural support of science, the number of positions for trained personnel, and the commitment of institutions to the generation of knowledge.

Now the personnel pipeline is plugged at the assistant professor level. There are few jobs in either the academic or the industrial sphere; there is a glut of postdoctoral researchers over the positions available. Downsizing/rightsizing is the buzz word in both academic and industrial domains.

There are not enough extramural funds to support the submitted and approved meritorious research proposals. The institutions have become like motels renting lab spaces to those who contribute overhead to support the evolved bureaucracy. The outlook of the institutions has changed to emphasize what can be done that will lead to patents and profit for the institution and its endowment. It is no longer sufficient to explore the unknown and to ask questions to develop an understanding of how things work.

Not all is gloom and doom, for what has continued to develop at an exponential rate are the experimental tools and the reagents with which sophisticated experimental questions can be easily answered. Many commercial firms make these tools; of course to stay in business they must make a profit. Research is easier because of the increased experimental tools and reagents but it is much more expensive. The cost of many of these tools has risen faster than the rate of inflation.

Threats to freedom in research and further addition to the cost come from OSHA, DOT, EPA, NRC, GAO regulations and requirements as well as from private interest groups. New accounting procedure proposals as interpreted by institutions are absurd. For example, if a laboratory has several grants supporting different aspects of research and uses NaCl, the accountants desire that separate bottles be used for each grant project. Rather than the standardization of a uniform lot, and the savings of bulk purchase, the regulators want separate bottles. In the late 1950's, I laughed at the mentality of a Home Economics College's laboratory where there were separate beakers for bean and for pea research - separate because of the source of funds not because of scientific need. Now the regulators and administrators want to impose their ridiculous and wasteful mentality on science. When a graduate student's source of funding changes, a new notebook must be started and there must be a change in emphasis (direction) of research so that it is easy for administrators to justify the change to the higher administrators. I could go on but I hope that each reader realizes this danger to science. Science produces fruit only in an atmosphere of freedom.

With so much competition for limited extra- or intra-mural funding, the camaraderie of science has been eroded. Rather than a departmental or university family of scientists who work together and freely share, individual fiefdoms have developed where there is competition for release time, recognition, priority of instrument use, space, and facilities. War among faculty members is often visited upon the "enemy's" graduate students. When students are "nurtured" in such an adversarial atmosphere, it is little wonder that this destructive *modus operandi* is perpetuated. The community of science should attack the unknown and not succumb to the temptation of enlarging an individual's share by eliminating other scientists. No one wants to be the one who is downsized, de-emphasized or eliminated.

The technical aspects and the unpredictable nature of the results of much of science makes it unappreciated by the public. Because many technical advances and/or products can be used in warfare or may produce some perceived health or environment threat, scientists are mistrusted. Any amount of a chemical is perceived as detrimental when there is a well-known threshold and a dose response. Resources

are wasted on clean-up when the amount of pollutant present and/or its movement doesn't pose a threat. It used to be "better living through chemistry"; now chemists are viewed as evil monsters creating those chemicals that destroy the environment. Wealth has become the guiding light of society rather than philosophy, religion, science, and arts.

Sensationalism in journalism and in the courtroom sells, and attracts public attention -just watch what is on TV. Some science journals try one-upmanship by writing exaggerated claims about the potential importance of reports to be published, rather than awaiting the tests of peer evaluation over time. The slow, methodical building of scientific fact upon preceding facts isn't the thrill-generating front-page news story that reporters and editors seek. The object of a lawyer's effort is to win the case, not to establish the truth (see the discussion by Dan Burk, *The Scientist,* Sept 16, 1996, p. 9). This approach is not appropriate for science.

The code of ethics of King Arthur's Knights of the Round Table and Judeo-Christian morality have long been rules of conduct. The basic reliance of science on truth and honesty as fundamental tenets of action and the camaraderie of scientists demands respect of intellectual property. This stems as much from the nature of science as it does from codified laws. What disturbs me most is the emergence of renegade researchers who do not respect the rules of operation of the peer review process. These individuals will delay processing a manuscript given them for review until they have had time to appropriate and exploit the communicated data.

An example of this behavior is the Cistron versus Immunex case. Attorney Robert Armitage believes that the "paper clearly stopped being confidential at the point at which (the authors) began steps to get it to the scientific community by submitting it for publication." Edmond Fischer, a Nobel prize-winning biochemist, views this action as "shockingly unethical and dishonest that a reviewer ... should take advantage of a colleague by using the information in a manuscript to his or her own advantage". A reviewer must protect the confidentiality of an unpublished manuscript. This is a requirement of the Chemists' Code of Ethics of the American Chemical Society. The use of unpublished data without the authors' permission is intellectual plagiarism. Just consider the cases prosecuted by the Office of Research Integrity relating to ideas presented in grant applications.

What twisted logic some pirates used: "some scientists believe that it is unrealistic and even unethical not to use whatever information is available to them" said Dr. Gregory Siskind in discussing use of material in privileged communication such as manuscripts under review.

The argument is made that there is no accepted standard, but evaluate the following quote from the fifth edition of the Council of Biology Editors Style Manual, p. 5: "Ethics for Reviewers -The reviewer, like the editor, must treat the paper as a confidential communication. In knowing this principle of confidentiality, reviewers accept the underlying premise that a paper's intellectual content is the property of the author until the paper is formally published; reviewers are not free to use any of the content for their own purposes." The date on this publication is 1983, which is in the time frame under consideration.

The American Society of Microbiology has the following statement in its Code of Ethics (ASM News, 53, 626 (1987). "Microbiologists will endeavor to recognize conflicts of interest and to avoid the abuse of privileged positions. Such privileged positions include, but are not limited to, the review and evaluation of manuscripts and grant applications use for one's personal or professional advantage information or materials gathered through service in a privileged position."

From the "Ethical Guidelines to the Publication of Chemical Research": "4. A reviewer should be sensitive to the appearance of a conflict of interest when the manuscript under review is closely related to the reviewer's work in progress or published." "6. A reviewer should treat a manuscript sent for review as a confidential document." [From ACS Style *Guide,* J.S. Dodd, Editor, American Chemical Society, Washington, DC, 1986, p. 221].

How can one say that there was no standard in existence at the time concerned with the Cistron vs. Immunex case? The Council of Biology Editors (CBE) is an international organization of editors and

clearly represents the consensus of many editors. Gregory Siskind became a member of CBE in 1996.

Science is in deep trouble if the type of behavior described above is permitted to continue. I hope that none of the students to whom I have taught the practice of science in our advanced techniques course (Bioch 5930) plagiarize or otherwise behave unethically. I explain to the students how science depends on truth and honesty and that it is robbery to take another's ideas before they have been published.

There are also cases where authors try to influence the acceptance of their manuscripts because of their position. These attempts at using power (position) rather than scientific merit established via peer review of the manuscript clearly constitute another case of unethical behavior. If individuals display such unethical behavior, how are we to believe their science?

Science is founded on truth, honesty, and confirmation of results. The practice of science, just as in any other profession, requires ethical behavior. If these attributes are lost in the race for fame, position, and rewards, then how are we to be sure that the scientific data reported is true?

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