Letters

NIDA's Role in War on Drugs

Drug abuse is a complex social, economic, and medical problem deserving of attention. Because of the general lack of understanding of the issues related to drug abuse, even among scientists, the current series in *Science* on this problem has been providing a valuable service. William Booth's article "War breaks out over drug research agency" (News & Comment, 5 Aug., p. 648) raises important questions about science, its management, and the role of science in public policy. The implication of some of the comments in the article, however, is that the basic and applied research supported by the National Institute on Drug Abuse (NIDA) is irrelevant to the broader issues relating to the drug problem. I take serious issue with that implication.

As Booth writes, NIDA's role is to determine the biological and behavioral causes of drug abuse and to use this information in the development of new treatment and prevention activities. Like every other institute of the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) and the National Institutes of Health (NIH), we try to provide sound, credible, and reliable data on which policy decisions can be based. Nowhere in the health field is the separation between the objective development of knowledge and the more subjective development of policy more important than in the emotionally charged arena of drug abuse. Society's basic belief that drug abuse is a corrupting and destructive influence can impel public policy-makers to search for the most negative effects of drugs, without regard to the scientific soundness of the information. But NIDA has maintained this separation and has remained credible in the face of understandable pressures to do otherwise.

NIDA's approach regarding public policy and research findings is similar to that used elsewhere at NIH and ADAMHA. The National Cancer Institute (NCI), for example, recently reported on the potential carcinogenicity of the herbicide 2,4-D. NCI's role is not to develop and enforce regulations concerning the uses of this chemical, but rather to provide that data to the appropriate regulatory authorities so that the public health can be protected. Their role as a research agency is clearly relevant to solving an important public health problem. So it is with NIDA.

Technology transfer is an essential part of NIDA's mission. NIDA has produced and distributed hundreds of publications on research findings, including more than 80 technical monographs covering the entire spectrum of drug abuse problems. A dozen or more conferences also are held each year to assess and make available the latest findings in basic, clinical, and applied research.

In addition, findings from NIDA's research programs have constituted the scientific basis for every major public information campaign directed at drug abuse, including "Cocaine: The Big Lie," of the past 2 years. NIDA staff members have provided data through hundreds of interviews with the media in an effort to make the public aware of the dangers of drug abuse.

Although it is important for *Science* to report on possible corruption, we are concerned that Booth's article repeats unfounded allegations against NIDA and its grantees without substantiation. These charges are serious. If corruption means illegal activities, such activities should be investigated. If, as I suspect, it is merely a way of saying that NIDA's research findings do not always unequivocally report what many would wish, then it is a different matter and can be understood within the context of knowledge gained through individual experience rather than scientific investigation.

Let me address concerns about NIDA's peer-review system and an "old boy network" of funding. Our system is virtually identical to the one used at NIH. In carrying out the President's Drug Abuse Initiative, NIDA mailed out grant announcements and requests for applications to more than 6000 scientists in every state and 12 foreign countries and to all relevant scientific professional organizations. More than 800 applications were received, at least half of which were from researchers who had never before applied to NIDA for a grant. After review by the NIDA Advisory Council, we funded 124 of these applications. More than 90 of the funded applications were from applicants who had never before had a NIDA grant.

Finally, I feel that the entire tone of the article was questionable. The accomplishments of NIDA during the past 14 years, as Booth points out, are noteworthy. Most of the information currently known about drugs and drug effects, the most effective treatment and prevention programs, and the state of the drug abuse problem results from NIDA-supported research. NIDA's enviable record and that of the scientists it supports have been accomplished with a budget that, until 1986, was smaller than that of any NIH institute. As a society, we have always recognized the value of knowledge in helping us find solutions to problems. I am proud of the contributions of NIDA's research to serious and effective policy-making on the drug problem. We will continue to provide such research-based guidance in the future.

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Booth's article of 5 August provides a useful service in emphasizing that the controversy surrounding NIDA pertains to *what* the institute does, not how well it does it. The "over-the-back-fence" tone of the article, however, reflects some confusion about the nature of the controversy.

The controversy over NIDA reflects a tendency to confuse policy based on science with science itself. The leadership of ADAMHA and NIDA share the nation's concern about the impact of illegal drug use on society. We have the added responsibility, however, of distinguishing between the moral convictions that can and should govern policy and the limits—and limitations—of empirical research.

At any given time in its development, the research data base will not always provide incontrovertible support for our moral convictions or substitute for common sense. Thus we must recognize that when a study fails to demonstrate impairment in some users, this neither undermines our national antidrug use policy or negates the value of research.

To an even greater extent than all the other "fourth-level" and first-rate biomedical research institutes in NIH and ADAMHA, NIDA generates new knowledge relevant to the causes, treatment, and prevention of drug abuse. Scientists at NIDA inform the planning and development of strategies and tactics through research on the incidence and prevalence of drug use and seek to prevent the fundamental causes of such use through basic research intended ultimately to effect attitude and behavior change and to elucidate how drugs do what to the brain—information that is essential to understanding why some users begin, some persist, and some succumb to addiction despite social and criminal sanctions. The institute plays a role in rallying the nation through research-based public education campaigns such as "Cocaine: The Big Lie" and, through clinical research, makes possible effective medical care for users who fail to heed the warnings.

Drug use is not only a moral outrage but a nasty, unpleasant problem as well. The crime it spawns, the vacant futures of kids who are burned out midway through high school, the risks—and, for some, the probability—of medical problems ranging from accidental injury to AIDS, make many ob-

servers want to turn their eyes from the problem. Research conducted and supported by NIDA legitimizes our hope and optimism that the problem eventually can be solved. Research is providing a better foundation on which the institutions cited above can base targeted interventions and general education efforts.

In fiscal year 1989, NIDA's investment of $240 million in research—less than 0.5% of what drug abuse costs the nation—will be a small salvo in a large war. Yet the knowledge we will gain is a potent weapon, one that will enhance the nation's concurrent investments in services and preventive outreach.

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Ecological Physiology

F. Harvey Pough's review (3 June, p. 1349) of the recent book *New Directions in Ecological Physiology* (*1*) clearly and accurately describes the views of the contributors to the book with respect to the importance of evolutionary considerations in future research activities in that field. Pough also notes that there is a "perception of stagnation" in the minds of many concerned active players. Over the past several years this perception has been the subject of much discussion. My impression is that an atmosphere of negativity has developed that is adversely affecting both the professional activities of many of the discussants and career decisions of graduate students.

Considerations not mentioned either in the book or in the review make me believe that gloomy forecasts for ecological physiology are unjustified. New developments of many kinds are injecting vigor and significance into the effort to understand the biochemical, physiological, and behavioral bases for the functioning of animals in their environments, whether these environments are natural or modified by human activities. The suggestions of both the book's authors and of Pough are on target, but the territory is larger. There are also a number of other, equally interesting, options.

An important part of the problem of negativism seems to be overly narrow definitions of the scope of ecological physiology. The core is certainly basic research, but applied research is also essential. Animal physiology as a discipline originated in human medicine and remains dominated by biomedical concerns. Ecological animal physiology ignores the problems of biomedicine, veterinary medicine, and environmental management and protection at its political and fiscal peril. There are a series of new and growing industries that are largely based on applied ecological physiology (for example, environmental toxicology; bioassays for pollution detection and monitoring; and environmental and endocrinological modifications of animal breeding).

Beyond this, the field is being revolutionized by new techniques that permit both study of important questions not previously accessible to controlled measurement or experimentation and study of much investigated questions at new levels of structural complexity. Four selected examples follow.

1) Direct studies of unrestrained animals in nature have begun to permit separation of ecological physiological realities from laboratory artifacts. New detectors, miniaturization, and computerization of electronics and telemetry techniques are combining to give us real world pictures of thermoregulation, activity, bioenergetics, circulatory adaptations, and so forth. One important set of such studies has been carried out on diving animals (*2*).

2) Applications of modern methods in neurobiology to classical questions relating to orientation and object location in vertebrates are producing sophisticated and elegant pictures of central nervous system organization and function, including striking demonstrations of close correlations between such different sensory modalities as sight and hearing (*3*).

3) Genetic engineering and other molecular biological techniques are permitting the elucidation of underlying mechanisms and controls for a wide array of physiological processes. One of the more promising approaches to the classic questions of genetic versus environmental influences derives from the ability to produce clones of readily available teleost fishes. This technique is also being applied on a large scale in the selective breeding of desired strains of several species of commercially important salmonid fishes (*4*).

4) An array of modern biochemical and biophysical techniques is permitting the clarification and understanding of the processes and controls involved at levels ranging from the submolecular to the organismic, thus making possible for the first time essentially complete descriptions of the mechanisms underlying ecologically significant physiological phenomena occurring at the organismic level. A striking set of examples may be found in studies of freezing resistance and freezing tolerance in Antarctic and Arctic fishes (*5*).

This list can be made much longer. In my view, ecological physiology is not in any way stagnating. It is, rather, at the threshold of a renaissance that will take it in many new directions.

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Sex Survey

Readers may be interested in further information about the two surveys conducted by Paul Cameron, cited by him in his letter of 13 May (p. 867), in which he stated that he has "better estimates of the true numbers of homosexuals" than those obtained elsewhere.

His first-cited study (*1*) refers to an earlier study of 4340 respondents (*2*). This paper did not say that "about 2% of U.S. males claimed to be homosexual and about another 2% claimed to be bisexual in 1983 . . . ." In that study, 5.8% of the male respondents reported themselves as "bi- or homosexual" (*2*, p. 293).

Making a mountain out of a molehill? Not at all. This 4% figure was applied to the denominator of a fraction expressing the incidence of AIDS among homosexuals (*1*). If the 5.8% figure is changed to 4%, the estimate of this incidence is increased from 0.0019 to 0.0027, a difference of more than 40%.

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Erratum: Figure 2A on page 1483 in the report "*Nef* protein of HIV-1 is a transcriptional repressor of HIV-1LTR" by N. Ahmad and S. Venkatesan (16 Sept., p. 1481) was incorrectly labeled. The *x* axis should have been "Time after transfection (hours)."