LETTERS

Animal Welfare and Scientific Research

Nicholas Wade's article "Animal rights: NIH cat sex study brings grief to New York museum" (News and Comment, 8 Oct., p. 162) requires a response because of its profound significance for science, and also because it is necessary to correct several substantive statements. Wade states, for example, that when the National Institutes of Health (NIH) asked the American Museum of Natural History for a special review of its animal welfare procedures, "instead of getting an independent committee to write them a clean bill of health," the Museum "turned to a group which consisted only of people with ties to the Museum. . . ." Wade fails to say that, in constituting this committee, the Museum followed *exactly* the instructions of NIH. This procedure, which the Museum has followed regularly and for many years, was clearly approved in a special report prepared by the NIH Animal Welfare Officer, Roy Kinard. Further, in response to a request by the Museum administration, William A. Sadler, chief of the Population and Reproduction Grants Branch of the National Institute of Child Health and Human Development, appointed an ad hoc committee consisting of Sadler and two leading research veterinarians, one from Harvard University and the other from the Oak Ridge National Laboratory. A detailed report of this committee was inserted by New York Congressman Edward Koch into the *Congressional Record* of 24 August 1976 which gave unqualified approval to all of our research procedures.

Wade describes one of the leaders of the actions against our institution, Henry Spira, as ". . . not an all-the-way antivivisectionist." In Spira's writings, repeated references are made to "mutilations" and "butchering" by the "greedy vivisectors" of "millions" of "defenseless animals." Spira mentions specifically rats, mice, hamsters, rabbits, guinea pigs, birds, monkeys, and innocent beings, that are "being driven insane, suffocated, poisoned, battered, radiated, crushed, blinded, scalded." In none of his articles does Spira acknowledge that any animal should ever be used for any experiment, no matter how crucial it may be judged to be for human welfare or survival. How much further is "all-the-way"?

Moreover, Wade devotes roughly one-third of the article to some of the rationale of the antivivisectionist movement, such as the simplistic, reductionist idea

that "alternatives to live animals," for example, research with computers, test tubes, and tissue cultures, can be substituted for animal experiments, and to the quasi-moralistic claim that animals have "rights" equal to the sociopolitical rights of women and minorities. Wade does not indicate that many see such statements as being antiscience and, in fact, fails to present any of the opposing views.

In Wade's effort to judge the value of our research on sex behavior of cats, he brushes aside the repeatedly favorable decisions of several peer review committees ("it is difficult to second-guess their judgment") and chooses as his sole criterion of scientific worthiness the number of citations in *Science Citation Index*. Of the 21 publications to which Wade refers, the seven full reports, each representing 3 to 5 years of continuous experimental observation, have all been cited except for one which was published in Moscow. In addition, two doctoral dissertations by former students have been cited as such, and later as journal publications. The remaining 14 publications were abstracts of reports given at scientific meetings while the work was in progress, and even a goodly number of these have been cited. As Eugene Garfield, father of the *Science Citation Index*, has emphasized, the index can only serve as a valid criterion if its limitations are recognized and it is used properly.

We believe that the criteria for the morality and ethics of research must include its significance for human welfare, but the statements made by critics of the moral and ethical aspects of our work raise doubts about their values in this respect. How much suffering does one allow, how many human lives and how many pets does one sacrifice in the name of the "rights" of discarded and unwanted cats and dogs or laboratory-raised animals? On the order of 1 million unwanted cats and dogs are destroyed each year in animal pounds, their use denied to legitimate research institutions. Wade chooses not to discuss these fundamental aspects of the problem. Ironically, we find ourselves in agreement with the antivivisectionists on one point. They are distributing copies of Wade's article, which they view as supporting their cause.

The AAAS, as the most representative organization of scientists in the country, is obligated to respond to the antiscience, anti-intellectual, and inhuman position taken by our critics.

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The demonstrations against the animal behavior research at the American Museum of Natural History are potentially damaging at several levels. First, there is the potential damage to the public reputations of Lester Aronson and Madeline Cooper. Those who are unfamiliar with their research may wonder whether it justified the cost in dollars and animal lives. However, Aronson and Cooper will continue to be regarded highly by their scientific colleagues. Few scientists have contributed more to making us aware of the complex interactions between behavioral experience and the neurological and hormonal control of behavior.

Their recent work on the amygdala demonstrates that some widely held opinions on the function of this important part of the brain are wrong, partly because these opinions derived from research less sophisticated than that characteristic of Aronson and Cooper. Next, there is the potential damage to the Museum's Department of Animal Behavior. Since the late 1930's, this department has had a major influence on the conceptualization of human and animal behavior. Several of this nation's leading behavioral scientists were trained there, and the department's academic progeny are now teaching and doing laboratory and field research around the world. Under the curatorships of Frank A. Beach, T. C. Schneirla, and Lester Aronson, the department became a center of the "epigenetic" view of development, a theory which emphasizes that each stage of an organism's development results from a dynamic interaction between the organism and its environment. This view served as antithesis to the more preformationistic thesis of classical European ethology. If there is a current synthesis, it emerged from the interaction between the epigeneticists and the classical ethologists.

The broadest potential impact of the antivivisectionists is to reduce or eliminate the use of animals, or at least domestic animals and primates, in basic and applied biomedical research. Since these animals are often the most appropriate physiological models, the outcome would be to terminate research that cannot be initiated with humans. To the extent that this broad goal is achieved, human health and human knowledge may pay a terrible price.

The public's right to challenge the ethics and economics of animal research is unquestioned. The present peer review system, as fallible as it may be, has been largely successful in curbing unethical excesses and in fitting research priorities to available funds. Until a better system is developed, the peer review process should prevail.

One final note. Ten years ago, *Science* rejected, without review, a report by Aronson and Cooper because the editor felt that the sex research on cats, as described in that report, would offend the sensibilities of some *Science* readers, including antivivisectionists. Ultimately, *Science* had the report reviewed and published a modified version (8 Apr. 1966, p. 226) with no adverse repercussions. Despite the superficial sexual enlightenment of the last decade, the current reaction to the sexual aspects of the research of Aronson and Cooper and many of their colleagues indicates that, for many persons, basic research on sexual behavior is still beyond the pale. As Wade suggests, sex research tends to gain notoriety easily, no matter how ethically it may be conceived and executed.

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Let me comment on the "historical trend . . . from minorities' rights, to women's rights, to animal rights" that, according to Wade, has given philosophical fuel to the controversy on animal experimentation. If the trend continues, it may well bring the controversy to an end. As recounted by Samuel Butler (*1*) this is precisely what happened a long time ago in the mythical country of Erewhon. A fussy old prophet, it seems, had stood up for the rights of animals with such fervor that for 600 years the Erewhonians were by law allowed to eat animal food only if the animal had died of natural causes, including suicide. Then along came a philosophically inclined Professor of Botany who argued convincingly that vegetables are only animals under another name. The Professor maintained, in fact, ". . . that animals and plants are cousins, and would have been seen to be so, all along, if people had not made an arbitrary and unreasonable division between what they chose to call the animal and vegetable kingdoms." He therefore proposed that the natural death rule should logically also apply to vegetables and their seeds. "Having thus driven his fellow-countrymen into a corner at the point of a logical bayonet," Butler continues, the Professor referred the confused Erewhonians to an Oracle, whose response sanctioned the eating of fresh vegetables and, by extension, of animals killed for the purpose. The Erewhonians then repealed the ill-tolerated and controversial vegetarian laws, and lived more or less happily ever after.

Thus, we'll just have to wait for the modern counterpart of the old philosopher who will stand up for the rights of vegetables. When vegetarians, botanists, farmers, and gardeners arouse the same outraged feelings as meat eaters, experimental psychologists, dogcatchers, and baby-seal clobberers are doing now, an Oracle may be found whose words will retrieve us, as Butler puts it, from wandering in the wilderness of philosophy.

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References

1. S. Butler, *Erewhon, or Over the Range* (New American Library, New York, 1960), pp. 199–214.

Is it utterly foolish to wish that people could get as steamed up about operations on scientists at Leningrad state prison (Letters, 8 Oct., p. 133) as on cats at the American Museum of Natural History?

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The scientific establishment is not, as many feel, under attack from overemotional antivivisectionists. Other organizations with a more balanced approach, such as The Humane Society of the United States, have also voiced their concern. The embarrassing scenario involving the Department of Animal Behavior at the American Museum of Natural History is symptomatic of the effect of a widespread and relatively radical change in societal values and attitudes. These values and attitudes impinge upon biomedical research and especially upon so-called basic research, which is (to quote the director of the Museum) the "freedom to study whatever it [the Museum] chooses, without regard to its demonstrable practical value." The scientific community that uses animals and whose basic research is supported wholly or in part by the taxpayer should be open to discussion of the validity of their work.

Three questions need to be addressed: (i) Should the "luxury" of basic re-

search, of seeking knowledge for knowledge's sake (and with no forseeable applied value) be supported by public funds? (ii) Is it fair, ethically speaking, to use animals in studies—to create and destroy life and sometimes cause suffering (if unavoidably "essential" for the research) for purely intellectual reasons? (iii) If relevance of such animal studies to an understanding of human diseases or other "humanocentric" problems is claimed, does not the basic researcher create his own trap? Relevance, after years of reductionism and nonapplied research on esoteric subjects, may be very difficult to demonstrate.

The complex area of basic biomedical research—including many studies in animal behavior and physiological psychology—needs to be looked at from a new perspective. Beginning with animal rights is only a start. We will get nowhere if the basic researcher remains locked in his own conceptual world of consensus values, approved standards of animal care, and so forth. We must all be free to look "objectively" at ourselves and avoid being defensive under the fire of outside criticism by others who do not share the same world view. Basic research, and biomedical research in general, may well benefit once open and constructive dialog on animal research is achieved—with ultimate benefit, one would hope, to the animals themselves.

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I regret that Aronson finds hostile an article in which his assailants' two most serious charges are dismissed as groundless or absurd and the third is discussed but not endorsed. It is only in general terms, not in their specific attack on the Museum, that I think the animal rights groups' arguments are at least worth considering. Their campaign has undoubtedly been hard on Aronson and on the Museum. Aronson, as the article concludes in discussing the campaign, "is an established and productive scientist whose work, in the aspects for which it is being assailed, differs in no way from the research carried on by a great many other investigators."—N.W.

Erratum: In the letter from William R. Havender (1 Oct., page 9, column 2, paragraph 1, the next-to-last-sentence), the word "not" was inadvertently omitted from the parenthetical phrase, ". . . (or else, the within-group heritabilities would *not* be high, as posited)."

Erratum: In the reply to the letter from Vladimir J. Konečni by Harry W. Power (5 Nov., page 563, column 2, paragraph 1), the last sentence should have read "To treat a functional dichotomy as a continuum is to do as great a violence to truth as to treat a continuum as a dichotomy."

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force as deuterium is to the nuclear force. The interaction appears to be quite complicated. There is a need for large spin-orbit and tensor forces which are as as yet incompletely understood. The central force is not an inverse-square or harmonic-oscillator one, but something intermediate; roughly a force independent of the quark-antiquark separation. But in any case great optimism remains that in the long run the charmonium system can teach much about whether, why, and how quarks of fractional charge are confined within hadrons.

Thus, rather rapidly, the evidence for ψ being a member of the hadron family as well as a bound state of a spin 1/2 constituent with its antiparticle became quite decisive. Just this much explains its production by gamma-rays, the charmonium levels and helps to interpret the large yield of hadrons at high energy observed by CEA and SPEAR. The crucial test came in the expectation that charmed quarks will bind to uncharmed antiquarks, forming overtly charmed hadrons. Their rest energy could be estimated at about 2 Gev, and in analogy to the behavior of strange particles they would be unstable with respect to the weak interactions. This leads to an estimated lifetime of order 10^{-13} second for a 2-Gev charmed particle. No time was wasted in embarking on the search. Ting was in an especially good position to attempt the search himself, using his spectrometers to detect charmed particles which decayed into two oppositely charged hadrons. Ultimately 10 million events were accumulated, but no positive evidence was found. A similar experiment at Fermilab extended his result to higher energies, and as yet charmed hadrons have not been detected as products of hadron-hadron collisions.

Actually, it was expected that electron-positron annihilation and neutrino reactions would be the best sources of charmed particles, but for a long time the search was inconclusive. Neutrino-induced reactions did provide positive evidence for charm, but not until the discovery of charmed mesons at SPEAR this year did the case for charm become highly persuasive. There is perhaps still room for the skeptic to doubt the existence of charm (not to mention the quark) but it is a severe uphill battle to do so.

The charm concept is more than just a label for a fourth quark; it has specific implications for problems of the weak interactions. The word charm was intro-