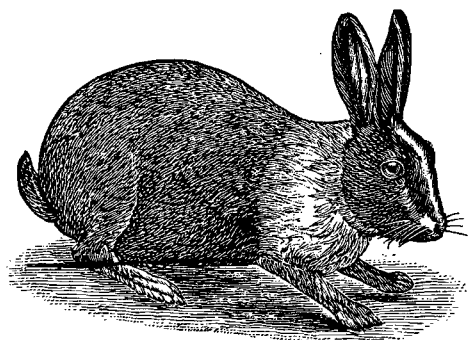


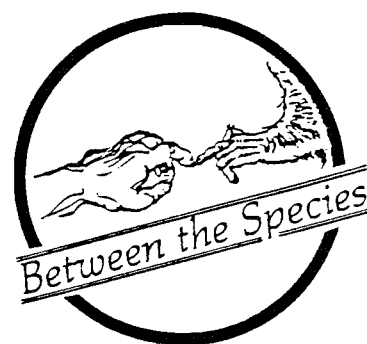
ANIMALS IN THE RESEARCH LABORATORY: SCIENCE OR PSEUDOSCIENCE?

George D. Catalano
Louisiana State University



What distinguishes science from pseudoscience? Is the demarcation linked to the application of the laws of probability? Is it possible to derive any valid law of nature from a finite number of facts? Answers to such questions, and, thus, a construction of a line of demarcation between science and pseudoscience are problems of vital social and political importance. This issue is especially relevant when a consideration of the ethics of using animals in research laboratories is undertaken.

The word, 'science,' derived from the Latin, *scientia*, has been reserved historically for the most respected kind of knowledge. St. Thomas Aquinas (Pegis, 1948) believed that the principles of any science are either in themselves self-evident or reducible to the knowledge of a higher science. For example, the science of optics can be deduced from principles established in geometry and music from mathematics. Aquinas also maintained that science involves theories whose cognitive values are independent of their psychological influence on people's minds. Hume (Bigge, 1966) stated, "Does it (scientific theory) contain any experimental reasoning concerning matters of fact and existence? If not then commit it to the flames!" In scientific research, as described by Newton and Kepler, theories are formulated and then confronted with observed facts which must be supportive or the theories become obsolescent. It is interesting to note that



Newton, who proposed circular planetary motion, claimed that he deduced his scientific laws from Kepler who had predicted that planets follow elliptical paths. A.M. Ampere's pioneering work in electricity and magnetism was documented in a manuscript entitled Mathematical Theory of Electrodynamic Phenomena Unequivocally Deduced from Experiment. However, Ampere never performed many of the experiments he described. With Einstein's contribution of the theory of relativity, the somewhat utopian and, thus, unattainable standards demanded by the scientific community in its search for natural laws were realized. Today, one can easily demonstrate that there can be no valid derivation of a law of nature from a finite number of observable facts. All proposed scientific theories are equally unprovable (Popper, 1934). Popper argued that the mathematical probability of all theories, scientific or pseudoscientific, given any amount of evidence is zero. Thus, theories are equally unprovable and improbable.

As a solution to the problem of demarcating science from pseudoscience, Popper proposed the establishment of the following falsifiability criterion. A theory is scientific if one is prepared to specify in advance a crucial experiment (or observation) which can falsify it and is pseudoscientific if one refuses to specify such a potential falsifier. A theory will become genuine knowledge or decay into pseudoscientific dogma



PHILOSOPHY OF SCIENCE

depending upon the ability of its proponents to state observable conditions which would refute it. Implicit in the establishment of a falsifiability criterion is the construction of a crucial test or experiment.

The purpose of this essay is to address the nature of a research program based upon animal subjects and to ascertain if such a program is scientific or pseudoscientific and, thus, degenerative. Popper's falsifiability criterion will serve as the mechanism whereby this issue shall be examined. I maintain that such use of animals in the research laboratory is not science but rather pseudoscience, and shall postulate critical experiments which prove the degenerative nature of this practice.

Defenders of animal use routinely and energetically point to the success of vaccines developed from animal experimentation as demonstrable proof to their contention that human lives have been saved. The effectiveness of vaccines is pivotal to the supporters of animal use. Therefore, it warrants historical detail. The origins of the word are Latin. Vaccination is from the word 'vacca' meaning cow, and its meaning has become generalized so that today vaccination, immunization, and inoculation have become interchangeable in application. Wilson (1967) has defined vaccination today as, "a principle of protection against infectious disease before-hand." Ancient Chinese were thought to use a primitive form of vaccination involving the blowing of the crust from a pox into the nose of a patient (Reidman, 1960). Work done in the West began with Lady Montague and her inoculation of peasants in Turkey against smallpox with a "little nutshell containing only the best smallpox." The method of vaccination was taken from art form to 'scientific' practice by Jenner (Reidman, 1960). Subsequent to Jenner, Pasteur was credited with the rabies, vaccine, and Koch, the identification of the bacillus as the source of the rabies infection. Koch also was awarded the Nobel Prize in Medicine for his development of Tuberculin, a vaccine claimed to prevent tuberculosis.

I suggest the following critical experiment. Let us imagine a group of people, each to be bitten by an allegedly rabid wolf. Let us suppose that rabidness cannot be positively certified since the wolf could not be captured. Let us then inoculate

each person with the vaccine developed by Pasteur, from animal experimentation using infected animals. If the survival rate is no greater for those inoculated is greater than the survival rate without taking any action then the postulation that the use of animals is part of a scientific research program has been falsified. Has this experiment ever been performed? In fact, Pasteur has carried out the identical test (deKrief, 1953). Nineteen Russian peasants, bitten by an allegedly rabid wolf, travelled to Paris to receive the rabies vaccine from Pasteur himself. Sixteen patients were saved, three died yielding a success rate of 84%. Contrast this result with the observed fact that an extremely minute percentage of people bitten by a rapid animal catch the infection. In fact, what is diagnosed as rabid is often tetanus which can occur from the contamination of any kind of wound (*Der Spiegel*, 18/1972, p. 175).

The historical record concerning Koch and the winning of the Nobel Prize for the tuberculosis vaccine might also serve as a crucial experiment according to Popper. Toward the end of the nineteenth century in the large industrial cities of northern Europe, nearly one person out of seven died of tuberculosis. Koch announced in 1882 that he had discovered and isolated the specific germ that was responsible for the disease. In 1890, Koch further announced that a vaccine, Tuberculin, had been perfected which cured tuberculosis. Koch received the Nobel Prize in 1905 for his work. Several decades later, however, Koch and his research collaborators admitted that Tuberculin cured tuberculosis in guinea pigs only, and had proven capable of causing the disease in healthy, human patients.

The efficacy of the small pox and polio vaccinations can be similarly challenged as the foundation for the crucial experiment to prove the work done with animals in the laboratory as being science rather than pseudoscience. Brichwald, whose extensive studies of the small pox vaccination showed it leading to encephalitis, contended that the vaccination could also induce multiple sclerosis (*Der Deutsche Arzt*, 1971). Dubos (1968) had earlier written that the small pox vaccine does produce serious encephalitis in a few persons even when administered with the utmost care. Also, he noted that the risk of contracting small pox now from the vaccine is

much greater than the chance of contracting the disease directly. The French magazine *Vie et Action* (1966) expressed their view that, "In Great Britain, the small pox vaccination has not been compulsory since 1898 yet five times fewer people have died of small pox in Great Britain than in France where this vaccination is compulsory. The same is true for Holland."

Salk's polio vaccine, though greeted with the same enthusiasm as Koch's Tuberculin, was soon replaced by Sabin's due to the suspicion of a cancer potential. Notwithstanding the cancer inducing issue, consider the statistics issued by the New York State Office of Biostatistics (excluding New York City) for the 1922 to 1962 time period. Mass vaccinations were administered from 1958 to 1962. Yet the death rate per 100,000 population remained constant. Nationwide the case rate dropped by the same ratio in Rocky Mountain states where little vaccination occurred as in large metropolitan centers where vaccination was common. Worldwide, polio has almost completely vanished from Europe where the great majority of people were never inoculated.

The National Academy of Sciences maintains that the use of animals is justified by the lessening of human suffering. The intent again will be to establish a falsifiability criterion through a crucial experiment. Consider the serious disease, diabetes. It can lead to acidosis, irreversible lesions of the arteries, gangrene, uremia, angina pectoris, blindness and pulmonary tuberculosis. Insulin, the product of a massive animal experimentation effort, has been proposed as a cure. To establish this experimentation as a science, let us postulate the following criterion. If insulin is the product of pseudoscience rather than science, then the death rate caused by this disease will remain constant or increase. An examination of the relevant, available information yields the following statistics: (1) in 1900, 22 years before insulin was discovered, the death rate in the United States was 11 per each 100,000; (2) in 1954, the death rate was 15.6 per 100,000; (3) in 1963, the death rate was 17.2; and (4) in 1973, the death rate was 27.8 (Reusch, 1983). The statistics provided indicate that the hundreds of millions of animals that have forfeited their lives in the research involving insulin and diabetes have

been the victims of pseudoscientific practices, according to the application of the Popper principle. Moreover, reliance on animal experimentation has muddled the observable facts in this case. The highest incidence of diabetes occurs in countries, such as the United States, in which the consumption of animal fats and meat is the highest, and the rate is lowest in countries, such as Japan, in which the consumption is lowest.



A second test case constructed using Popper's ideas shall be offered. This involves matters which may have affected a Presidential election, and revolves around the possible outbreak of swine flu. President Ford in 1975 announced a \$135 million program to inoculate the American people. Several years prior, the French Pasteur Institute reported a vaccine for all strains of influenza (International Herald Tribune, 1973). According to Monod, a Nobel prize winner in medicine and the Institute Head, the vaccine was a revolutionary discovery that anticipated future strains of influenza. The Italian press first called for a massive inoculation in 1975. More working hours were lost in Italy during the following winter due

to flu than ever earlier documented. Then, in the following spring, Sabin (Tempo, 1976) stated, in a press conference in Salsomaggiore, Italy, that no reliable flu vaccines existed. The United States did not learn from the Italian example. The swine flu vaccination program continued for a period of time with a number of deaths and many more cases of paralysis the result. The deaths were mainly among the elderly. On December 27, 1976, Time Magazine wrote, "Federal officials indefinitely suspended the nationwide effort in an article titled, 'Roll Down Your Sleeves, America'." The vaccine for influenza in general (swine-flu, specifically) was the product of animal experimentation carried out at the Pasteur Institute in France. It was strongly advocated and then quickly withdrawn from use in Italy and the United States. Illness, paralysis and deaths are the legacy of the vaccine. If the lessening of human suffering qualifies as the criterion for the justification of animal experimentation as science then the application of the falsifiability criterion strongly implies the practice to be pseudoscience in the flu vaccine case as well.

Implicit in the defense of the use of animals in science and research by the National Academy of Sciences is that such practice constitutes a scientific research programme. The key adjective is 'scientific'. An attempt has been made in this work to examine the credibility of the application of the word reserved for the most respectable kind of knowledge. The development of the Popper Falsifiability Criterion and the required need for a crucial experiment have been used as a mechanism to examine the animal experimentation issue. Cases principally focussed on the research and development of vaccines against the diseases of rabies, small pox, tuberculosis, polio, and influenza as well as the prescription for insulin as a cure for diabetes are discussed from an historical perspective. In each case documented, an attempt to devise a crucial experiment and the line of demarcation would appear to judge such experimentation as pseudoscience rather than science, a degenerating research program consisting of theories fabricated only to accommodate known facts. Has, for example, animal experimentation ever led to the prediction of a stunning, novel fact successfully? It has resulted in famous unsuccessful predictions.

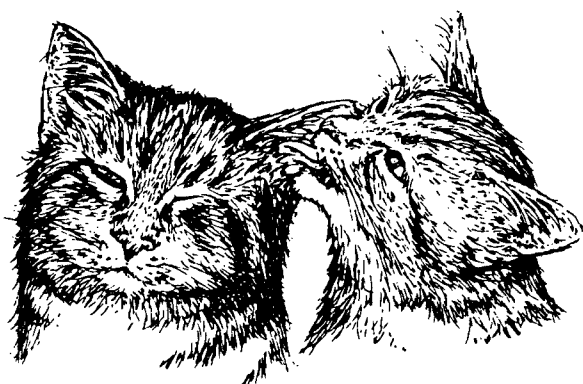
It predicted a vaccine for tuberculosis. It predicted a vaccine for past, present, and future strains of the influenza virus. It predicted a cure for diabetes, independent of the person's diet. Thus, the predictions of defenders and practitioners of animal usage have been bold and stunning but they have failed. Vivisectionists have explained all their failures; they explained the deaths and paralysis of those who received the swine flu vaccine as being old and/or weak. They have explained the inefficacy of the cholera vaccine in Portugal in 1975 as an anomaly (National Zeitung, 1975). They have explained the rise in the death rate due to diabetes as being linked to medical complications. They have announced breakthroughs in cancer research to the world press and then quietly backed away from those pronouncements (Time Magazine, Dec. 31, 1974). But their auxiliary hypotheses have been devised after the event to protect the practitioners from the facts. Newtonian mechanics has led to novel facts; the theories of the vivisectionist have been devised to try to catch up with them.

The hallmark of scientific progress is not trivial verification. A shell of iron floating atop the surface of water does not prove the principle of buoyancy declared by Archimedes over two thousand years ago no matter how often it is observed at sea. What really counts are dramatic, unexpected stunning predictions. When theory lags behind the facts, we are dealing with the pseudoscience of a miserable, degenerating research programme.

Notes

1. Ampere, A.M. Mathematical Theory of Electrodynamical Phenomena Unequivocally Deduced from Experiment.
2. Cordes, C., "Unit of National Council Backs Use of Animals in Health Research," The Chronicle of Higher Education, 5 Oct 2988: A1 and A30.
3. deKrief, P. (1953) Microbe Hunters. New York: Hancourt Brace.
4. Der Deutsche Arzt (1971), vol. 19, p. 1007; Medizinische Welt (1972), No. 23 p. 758.
5. Der Deutsche Arzt (1972), Vo. 3, p. 158.
6. Dubos. R. (1968) Man, Medicine, and Environment. New York: Praeger, p. 107.

7. Hume, D. (1966) Enquiries Concerning the Human Understanding and Concerning the Principles of Morals. L.A. Selby Bigge (ed.). 2nd ed. Oxford: Clarendon Press.
8. Pegis, A. (1948) Introduction to St. Thomas Aquinas. The Summa Theologica and Summa Contra Gentiles. New York: Random House, Inc.
9. Poppler, K.R. (2934). Logik der Forschung. Vienna: Springer. Expanded English edition: Popper (1959).
10. Reidman, S. (1960) Shots without Guns. New York: Rand McNally & Co.
11. II Tempo, 25 April 1976.
12. Time Magazine, 31 December 1974.
13. Time Magazine, 27 December 1976.
14. Vie et Action, Mar. - Apr. 1966, p.9.
15. Wilson, G. (1967) The Hazards of Immunization. London: University of London.
16. National Zeitung, 1 August 1975.
17. International Herald Tribune, 7 Feb. 1973.
18. Reusch, H. (1983) Slaughter of the Innocent. New York: Civitas.



BOOKS RECEIVED

Carol J. Adams
THE SEXUAL POLITICS OF MEAT
A Feminist-Vegetarian Critical Theory
New York: Continuum, 1990
190p, notes, bibliography, index
\$22.95 hardcover

Michael W. Fox
THE NEW EDEN
For People, Animals & Nature
Santa Fe: Lotus, 1989
75p
\$8.95 paper

Walter E. Howard
NATURE'S ROLE IN ANIMAL WELFARE
Herts, England: Universities Federation
for Animal Welfare, 1989
14p
\$1.25 paper

Clay Lancaster
FIGI
Salvisa, Kentucky: Warwick, 1989
63p, 29 illus.
\$16 hardback

Jay B. McDaniel
EARTH, SKY, GODS & MORTALS
Developing an Ecological Spirituality
Mystic, Connecticut: Twenty-Third,
1990
186p, appendix, notes, bibliography,
index
\$12.95 paper

Jay B. McDaniel
OF GOD AND PELICANS
A Theology of Reverence for Life
Louisville: John Knox, 1989
145p, notes, bibliography, index
\$11.95 paper