pend, customary tuition and laboratory fees will be paid by the foundation. Conditional upon satisfactory service, the term of the senior or junior fellowship is for twelve months subject to renewal. Thirty days vacation will be allowed. Conditional upon satisfactory service, the term of the scholarship is for the academic year. All communications should be addressed to Edward T. Pickard, Secretary, The Textile Foundation, Commerce Building, Washington, D. C.

THE State University of New Jersey, now operated in conjunction with Rutgers College, at New Brunswick, is the ultimate beneficiary of the bulk of a $128,000 estate left by Edward Randolph Wood, lawyer and business man, who died on February 14 in his ninety-second year. Mrs. Wood receives the income from the estate during her lifetime. Mr. Wood suggested that it be devoted "to the study of the elimination and destruction of animal and vegetable pests." Red Oaks, the Wood summer home at Richland, N. J., near Vineland, is to be held "as a residential, social and educational center or home" for officers, faculty members, students or others connected with the university.

THE annual exhibition of current developments and activities in the field of mechanical and electrical engineering given jointly by the Yale Branch of the American Institute of Electrical Engineers and the Yale Branch of the American Society of Mechanical Engineers was held on March 7. The exhibition, staged entirely by students in the Sheffield Scientific School, gave a comprehensive survey of the part played by the mechanical and electrical engineer in modern civilization. Many of the exhibits were so arranged that the internal operation of the apparatus could be seen. The use and working principle of new machinery was explained by students; public utilities, such as a gas manufacturing plant, was shown working in miniature. Various movements in the development of machinery was illustrated by models; industrial and remote control systems were in operation in various parts of the exposition demonstrating their uses and conveniences. All the exhibits were in operation.

THE will of the late Dr. William H. Nichols has been appraised, and it is announced that half the residuary estate (less certain legacies) bequeathed to New York University, amounts to $3,670,401. Other bequests, amounting to $795,000, include $250,000 to the Polytechnic Institute, Brooklyn, and $50,000 to the American Chemical Society.

DISCUSSION

THE CONTROL OF INJURIOUS ANIMALS

UNDER the caption "The Control of Predatory Mammals," Mr. H. E. Anthony[1] expresses strong disapproval of the injurious-animal control activities of the Biological Survey, U. S. Department of Agriculture. He refers to organized propaganda carried on for several years by a small group, obviously seeking to discredit and obstruct the work.

Some of the opponents of the injurious-animal control policy of the survey are men of high attainment in their professions. Their sincerity and motives are beyond question. Most amazing to me, therefore, has been the apparent willingness of men, who I supposed were trained in the application of the scientific method, to accept as factual evidence misleading half truths and irresponsible criticisms. The attack, with its emotional appeal, is based mainly upon misdirected sentiment and distorted concepts of wild life in relation to human welfare. Its unscientific basis is shown by the absence of evidence that the value of injurious-animal control has been given any serious consideration by the opposition.

Mr. Anthony mentions the appointment by the American Society of Mammalogists at the New York meeting of May, 1930, of a committee, of which he is chairman, on the problems of predatory-animal control, instructed, he states, "to attempt a critical investigation of actual conditions in the field." The report of the committee as read by him at the Philadelphia meeting of May, 1931, consists of sweeping denunciation of the predatory-animal control work of the survey, without presenting any definite evidence obtained either by members of the committee or by its field investigators upon which such drastic conclusions could properly be based. There was an exchange of field reports, and since Anthony has used parts of survey reports that suited his purpose, it is only fair to quote from that of the only committee member who undertook extensive field studies.

Dr. C. T. Vorhies, an experienced field naturalist of the University of Arizona, designated to study field conditions in Arizona, New Mexico and Texas, approached the subject in a scientific spirit and submitted a report of 140 pages, embracing a fair review of the situation. His report was mildly critical of some features of the survey's control work and highly commendatory of others. He says:

> . . . after my own enlightening experience of the past several weeks, I may say frankly that I sincerely wish that all other members might have had the opportunity I have had for field observation *in this particular line* [italics his]. After more than twenty years in the West, and a considerable experience in the field, this was an eye opener for me! One's personal insight into the whole of the problem is so enlarged (perhaps modified)

[1] SCIENCE, 74: pp. 288–290, Sept. 18, 1931.

that I suspect that other members of the Committee will find difficulty in understanding my views and report. For example, one may readily believe from merely reading the reports of the large numbers of animals killed by the Survey that extermination of certain forms will soon result. But weeks of travel over this territory, observation of its great extent compared with the small areas actually worked at any one time or in any one year, and of the actual presence of a plentiful supply of these animals is not only enlightening but reassuring. I am deeply concerned that this committee shall not too readily accept and adopt irresponsible criticisms as their own, through lack of pertinent information, or through lack of actual contact with field conditions of this problem.

Other passages from the report of Vorhies show broad grasp of the practical considerations involved and are favorable to the survey, but are ignored by the committee's report.

Passing from predatory animals to injurious rodents, Mr. Anthony reechoes the criticism of others of the use of thallium as a poison based on statements by Dr. Jean M. Linsdale, in *The Condor*.[2] Special Publication No. 109, "The California Ground Squirrel Control Program," issued late in 1931 by the California State Department of Agriculture, presents the other side of the thallium situation and the results of an investigation of Linsdale's "cases." The cases seem to consist largely of unverified reports, which, accepted as facts, prove on investigation to be largely misrepresentations that led to sweeping and erroneous conclusions. According to the state publication, some of the alleged "cases" of thallium poisoning are from areas in which no thallium has ever been used.

Dr. Joseph Grinnell, in an editorial in the same number of *The Condor* (pp. 131–132), indorses Linsdale's "findings," and adds some speculations of his own. The publication of the California Department of Agriculture (*op. cit.*, p. 18) refers to Grinnell's editorial and comments as follows:

> It carries the implication that one third of the area of California is being repeatedly poisoned with thallium, when as a matter of fact, a survey recently completed by the State Department of Agriculture shows that less than 5 per cent of the area of California has ever been treated with thallium grain. . . . The supplementary use of thallium is largely rendering retreatment unnecessary and remarkably reducing the amount of poison used on definite areas.

Assuming the rôle of a statistician, Grinnell indulges in a process of calculation too devious for me to follow, when, apparently multiplying dead animals found by 10,000, he says: "We can figure from this that in the last four years not less than 50 *million* animals *other than* ground squirrels [italics his] have been killed in California through these operations!" One of the conclusions reached by the state publication (*op. cit.*, p. 20) is that "The *Condor* article and editorial, designed to arouse bird lovers, conservationists and the general public against the continuance of necessary pest control work, is replete with misleading information and contains few 'facts concerning the use of thallium.'"

Bubonic plague in California ground squirrels, occasionally assuming the pneumonic form, has become endemic in 14 counties in California. Human cases occur at intervals and new foci of infection are found by the Public Health Service from time to time. In the great plague epidemics of the past, the rat carriers apparently became immune, as the disease receded, after sweeping periodically across Europe, to its original home in Asia. In California, however, it is established in a group of ground squirrels (*Citellus*) of wide distribution, which with our prairie dogs (*Cynomys*) and woodchucks (*Marmota*) are closely allied to Asiatic rodents believed to be natural enzootic hosts. This alone is a sinister phase of the California situation that is ignored by propagandists against the use of thallium, a poison that, after many years of experiments, has afforded the only practicable method of controlling these animals.

The need for control of ground squirrels in California has been well set forth by the same Dr. Grinnell, who now inveighs against the use of poison.[3] Passages relating to the California ground squirrel are quoted (beginning p. 604) as follows:

> A few years ago it came into prominence as a proven disseminator of the dreaded bubonic plague, and it has become notorious for its exceeding destructiveness to cultivated crops.

Then on page 706:

> Ground squirrels breed upon cultivated or waste land, from which they invade the cultivated fields within reach as well as such other lands as are not already fully populated.

On page 704:

> On open range and pasture lands these squirrels feed largely on alfilaria and bur clover, two of the most valuable forage plants in the state. The squirrels are then serious competitors for subsistence against the flocks and herds upon which man depends for his own support. On cultivated ground these squirrels feed upon or destroy in other ways grain and fruit crops to a very large extent where present even in numbers not above those reached on wild land. *The tendency seems to be to increase to*

[2] Vol. 33, no. 3, pp. 92–106, May–June, 1931.

[3] "California Ground Squirrels," by Grinnell and Dixon, Monthly Bulletin, California State Commission of Horticulture, vol. 7, pp. 597–708, Nov.–Dec., 1918.

extraordinary numbers on cultivated lands unless effectively checked by man. [Italics mine.]

And finally, page 707:

It is hoped the facts and inferences set forth will convince the reader that the problem is not a simple one [referring to ground squirrels], and can not be solved by casual, half-hearted measures.

Contrast the foregoing with some of Grinnell's *Condor* editorial expressions (*op. cit.*), as:

There is a certain administrative type of mind to which the human "use" of all natural resources and the correlated elimination of anything which looks to be detrimental, or even not immediately and clearly of value, loom as the only "practical" aims.

And:

In our mind, at the present moment, the wholesale poisoning of wild animal life (birds, carnivorous mammals, rodents) on uncultivated terrain, ought to cease; not only that, but it should be prohibited by law.

In 1918 Grinnell pointed to ground squirrels on uncultivated land as a source of invasion of cultivated fields, and now he would prohibit poisoning them there by law. In such a view, obviously, not only the public health but economic considerations are to be entirely ignored.

The principal organizer of the campaign against effective injurious-animal control operations appears to be Mr. A. Brazier Howell, whose wide-spread propaganda and narrow view-point, plausibly presented, have undoubtedly misled many. An example of his methods in arousing prejudice against the work is his assertion, founded on the fact that certain carnivores and rodents eat grasshoppers, that he can predict outbreaks of these insects by the course of injurious-animal control operations.

Mr. Howell[4] elaborates on theories that seem to be based on his lack of understanding of wild-life conditions and the use of poison. He says:

I venture to state that it is universally believed by biologists that as rodents are now being virtually exterminated over large areas by means of poison, their places will be taken by other, and possibly more destructive, forms of life. . . . Under modern methods of poisoning, the mortality of rodents may approach 100 per cent. . . . On the surface, then, it seems that all rodents and all carnivores are gone, and everything should be lovely.

These quotations and the context show that Howell bases his absurd grasshopper predictions and other contentions on the theory that the injurious-animal control work nearly exterminates all rodents and carnivores. He has elsewhere referred to the "broadcasting of poison bait," apparently assuming that poison for rodents, at least, is regularly distributed in that way instead, as is really the case, of being placed at the holes where it is known to be consumed mainly by the animals for which intended. Many acres of unpoisoned ground, well populated by rodents of many kinds, commonly separate the holes of the injurious species where poison is placed. Any scientific investigation will reveal that the general rodent population is little disturbed by such poison operations. Upon such erroneous and misleading premises Howell bases his case against effective control of injurious species, and asks the country to accept his conclusions.

For those who do not have to bear the burden of responsibility in the solution of wild-life problems, often almost baffling in their complexity, it is easy to criticize. Some criticism must be expected and some may be deserved, but when criticism comes from professional zoologists it should be fair and made only with broad knowledge tempered with appreciation of all the difficulties that may be involved. Charges of any kind should be based upon definite scientific evidence, and such evidence has been singularly lacking throughout the obstructive campaign in progress. In my judgment one of the greatest handicaps to the real conservation of wild life in America to-day is the lack of harmony and concerted effort that results when individuals or groups who may be sincere, but misinformed and misguided, becloud issues and adopt a captious and dictatorial attitude toward those charged with carrying on wild-life administrative work.

E. A. GOLDMAN

BIOLOGICAL SURVEY,
U. S. DEPARTMENT OF AGRICULTURE

[4] SCIENCE, vol. 74, p. 632, Dec. 18, 1931.

THE GASTRIC EROSION OF METAL

DR. C. T. HURST, who recently[1] reported a case of gastric erosion of a fishbook swallowed by a fish, concluded that it may have taken about a year to reduce the former metal to a mere filament. A rapid gastric erosion of pieces of steel, iron or aluminum was sometimes observed in rabbits and guinea-pigs during a study of the rate of passage of inert materials through the digestive tract,[2] but the precise amount of metal dissolved was not then determined. At present, in an attempt to analyze the mechanism of the production of peptic ulcers in rats by diets low in protein,[3] a study is in progress in which the amount of metal dissolved (weight lost) is being determined in the belief that it serves as an index of gastric

[1] SCIENCE, Nov. 20.
[2] F. Hoelzel, *Amer. Jour. Physiol.*, 92, 466, 1930.
[3] F. Hoelzel and Esther Da Costa, *Proc. Soc. Exper. Biol. and Med.*, 29, 382, 1932.