tor of the Lalor Foundation, the present plan of the foundation is now to discontinue its regular program of fellowship awards until the demobilization of scientific personnel at the end of the war. Thus it is planned that the usual fellowship awards of the foundation will go into a reserve to form an accumulation for post-war assignment. To date fifteen such awards will be made available at that time for post-doctorate research in chemistry. The standard annual stipend of a Lalor Foundation award is $2,000.

THE AMERICAN SOCIETIES OF AGRONOMY AND SOIL SCIENCE

THE annual meeting of the American Society of Agronomy and Soil Science Society of America will be held on November 11, 12 and 13 at the Hotel Statler in Saint Louis. Particular attention will be given to the part which agronomists can take in the war effort. The general meeting will be held on Thursday morning, November 12, at which time Dr. O. S. Aamodt, of the Bureau of Plant Industry, will discuss "The Seed Situation and the War," and Dr. F. W. Parker, of the Bureau of Plant Industry, will speak on "Fertilizer in the War Program." Following these papers a round-table discussion will be held on "The American Society of Agronomy and the War." The business meeting of the society will be held after the round-table discussion.

The Crops Section will have a general program on Wednesday afternoon and sectional meetings on Wednesday morning, Thursday afternoon and Friday, both morning and afternoon. The Soil Science Society will have its general program on Thursday afternoon and sectional programs on Wednesday and Friday. The American Society of Agronomy will hold its annual banquet on Thursday, November 12, at which time Dr. Richard Bradfield, president of the society, will give the presidential address entitled "Our Job Ahead." The Soil Science Society will hold its annual banquet on Wednesday with D. Howard Doane, Doane Agricultural Service, St. Louis, as the principal speaker. His subject will be "Soil Science and its Practical Application."

On Monday and Tuesday, November 9 and 10, the Fertilizer Committee of the society will hold its annual meeting, the meeting of the Joint Committee on Fertilizer Application and an organization meeting of the National Joint Committee on Nitrogen Utilization.

EXPEDITION OF THE DEPARTMENT OF TROPICAL RESEARCH OF THE NEW YORK ZOOLOGICAL SOCIETY

THE New York Zoological Society's forty-third expedition of the Department of Tropical Research has just come to an end. Dr. William Beebe with a staff of three—Jocelyn Crane, research zoologist, George Swanson, artist, and Henry Fleming, entomologist—left New York for Venezuela on February 12 and returned on September 20, flying both ways on Pan-American planes.

Invaluable assistance and support were given by a grant from the Committee for Inter-American Artistic and Intellectual Relations; by the Standard Oil Companies of New Jersey and Venezuela, and by the following trustees of the Zoological Society: Laurance Rockefeller, Childs Frick, Herbert L. Satterlee and George C. Clark.

The field work was carried on in the jungles about Caripito, Venezuela. The objects were to conclude life history studies begun in British Guiana ten years ago; to secure a representative record of wild life in colored motion pictures; to record the reactions of animals to the very distinct dry and wet seasons; to investigate the night life of jungle organisms; and to make observations through very high power binoculars (12, 20 and 40 diameters).

In the course of the seven months, upwards of 40,000 insects were collected and 150 color plates completed, while Jocelyn Crane took 6,000 feet of color motion picture film and more than 1,000 stills, both black-and-white and colored. The great amount of observational data obtained will be evident in forthcoming technical and popular contributions. Substantial foundations were laid for a future source of supply of living, neotropical vertebrates and invertebrates for the Zoological Park. There seems to be no reason why there should not be a continuous flow of animals suitable for exhibition, when the end of the war again permits the safe passage of oil tankers.

Five lectures with motion pictures were given in Caripito and Caracas, and constant, constructive relationships initiated and maintained with Venezuelan scientists and institutions.

SCIENTIFIC NOTES AND NEWS

DR. ARTHUR B. LAMB, professor of chemistry and director of the chemical laboratory at Harvard University, has been awarded the 1943 William H. Nichols Medal of the New York Section of the American Chemical Society.

THE John Fritz Medal has been awarded to Dr. Willis Rodney Whitney, honorary vice-president of the General Electric Company. The medal is given for "notable scientific or industrial achievement, without restriction on account of nationality or sex." The

board of award consists of representatives of the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

GERARD SWOPE, president of the General Electric Company, New York, has been selected as the sixth recipient of the Hoover Medal. The citation reads: "Gerard Swope, engineer and distinguished leader of industry, ever deeply interested in the welfare of his fellowmen, whose constructive public service in the field of social, civic and humanitarian effort has earned for him the Hoover Medal for 1942." The presentation will be made at the winter convention of the American Institute of Electrical Engineers during the week beginning on January 25. The medal is administered by the Hoover Medal Board of Award, consisting of representatives of the four principal engineering societies. It was formally instituted on April 8, 1930, during the celebration of the fiftieth anniversary of the American Society of Mechanical Engineers, "To honor engineers whose preeminent services have advanced the well-being of mankind and whose talents have been devoted to the development of a richer and more enduring civilization, the Hoover Medal is awarded in recognition and appreciation of those principles and ideals of civic obligation and of public service exemplified by the life and work of Herbert Hoover," to whom the first award was made.

DR. GUSTAV EGLOFF, director of research of the Universal Oil Products Company, Chicago, was elected on September 4 an honorary member of the Chemical, Metallurgical and Mining Society of South Africa, Johannesburg.

A TESTIMONIAL banquet in honor of Professor Vladimir Nikolaevich Ipatieff will be given on the evening of November 20 by the American Institute of Chemists to commemorate his seventy-fifth birthday, the golden jubilee of his career in chemistry and his golden-wedding anniversary. The speakers and their subjects will be Professor Frank C. Whitmore, "Ipatieff and His Influence on World Chemistry"; Professor Vladimir Nikolaevich Ipatieff, "My Twelve Years in the United States of America"; Dr. Gustav Egloff, "Ipatieff's Influence on Industry," and Professor Ward V. Evans, "Ipatieff the Scholar."

THE honorary degree of doctor of science was conferred on October 23 at the Founders' Day exercises of Lafayette College on Dr. Carl C. Speidel, professor of anatomy in the University of Virginia.

AT a meeting of the Virginia Chapter of the Sigma Xi on October 29, officers for 1942–43 were elected as follows: Leland B. Snoddy, *President;* Ladley Husted, *Vice-president;* Joseph K. Roberts, *Secretary;* Lawrence R. Quarles, *Treasurer.* With these officers will be F. L. Brown and Alfred Burger to constitute the executive committee for 1942–43.

AT the annual general meeting of the Physical Society, London, held on October 2, the following officers were elected for the year 1942–43: *President,* Sir Charles Darwin; *New Vice-presidents,* Professor C. D. Ellis and Dr. H. T. Flint; *Honorary Treasurer,* Dr. C. C. Paterson; *Honorary Secretaries,* J. H. Awbery (papers) and Dr. W. Jevons (business); *Honorary Foreign Secretary,* Sir Owen Richardson; *Honorary Librarian,* Professor L. C. Martin; *New Members of Council,* E. R. Davies, Dr. W. B. Mann, A. J. Philpot, Professor H. C. Webster and Dr. W. D. Wright.

Museum News states that the British Museums Association, London, elected on July 9 Dr. Douglas A. Allan, director of the Liverpool Public Museums, to the presidency. He succeeds Major S. F. Markham. M. B. Hodge, of the Bankfield Museum, Halifax, was elected honorary secretary, and S. D. Cleveland, of the City Art Gallery, Manchester, was elected honorary treasurer. F. S. Wallis continues as honorary editor of *The Museum Journal.* The association has announced that, owing to the many requests from overseas for duplicate copies of the *Journal* to replace copies lost in transit through enemy action and to the frequent loss of replacements also, it has decided not to send additional copies in future but to conserve stock and make replacements at the end of the war.

DR. ERNEST R. HILGARD, professor of psychology at Stanford University, was recently appointed head of the department of psychology to succeed Dr. Lewis M. Terman, who resigned at the close of the summer quarter. Dr. Hilgard is now in Washington, D. C., conducting morale studies for the government, and expects to remain there this year. In his absence, Dr. Paul R. Farnsworth, professor of psychology, will be acting head of the department.

AT the University of Michigan, Dr. R. V. Churchill, of the department of mathematics, has been promoted to a professorship, Dr. P. S. Dwyer to an associate professorship, and Dr. R. M. Thrall to an assistant professorship.

DR. ARTHUR WILLIAM MICKLE ELLIS, professor of medicine at the University of London, was appointed Regius professor of medicine at the University of Oxford on the retirement of Sir Edward Farquhar Buzzard.

IT is announced in *Nature* that Sir Henry Dale, president of the Royal Society, has accepted the directorship of the Laboratories of the Royal Institution with the Fullerian professorship, in succession to the late Sir William Bragg. Sir Henry has expressed the

wish that his appointment should be limited to a period of three years, so that the managers of the Royal Institution may then be free to consider their future policy.

DR. FRANK C. WHITMORE, research professor of organic chemistry and dean of the School of Chemistry and Physics at Pennsylvania State College, an investigator for the National Defense Research Committee, is serving on the referee board of the Chemical Division of the War Production Board.

DR. ROBERT A. KEHOE, of the Kettering Laboratory of Applied Physiology of the University of Cincinnati, has been appointed a member of the Sectional Committee on Allowable Concentrations of Toxic Dusts and Gases of the American Standards Association. The scope of the committee is to determine and promulgate the allowable concentration limits of harmful gases, fumes, vapors, dusts and mists in the atmosphere of working places, from the viewpoint of occupational disease prevention.

DR. H. C. OBERHOLSER, curator of birds at the Cleveland Museum of Natural History, is on leave of absence until January 1. He has undertaken war emergency editorial work with the U. S. Fish and Wildlife Service. W. Earl Godfrey, research associate in ornithology, will serve in Dr. Oberholser's absence.

DR. EMORY W. MORRIS, of the Kellogg Foundation, has been made chairman of the recently established council on dental health of the American Dental Association.

Museum News reports that the State Legislature of Virginia has created a commission to consider the establishment of a state museum of science. Members of the commission are Henry S. Johnson, Goochland, appointed by the Speaker of the House of Delegates; Robert K. Brock, Farmville, appointed by the president of the Senate; and W. T. Sanger, Medical College of Virginia, Richmond, and George W. Jeffers, of the department of biology of the State Teachers College, Farmville, both appointed by the Governor.

THE Iowa State College has received a grant of $10,000 from the Rockefeller Foundation for the study of national farm production and food distribution policies. The study will be under the direction of the Agricultural Experiment Station. A committee, of which Dr. T. W. Schultz is chairman, will direct the work. Other members of the committee include Dr. Margaret Reid, Dr. Walter W. Wilcox and Dr. A. G. Hart, all members of the department of economics and sociology.

DR. N. P. BEKKEDAHL, of the National Bureau of Standards, has been appointed by the Brazilian Government to organize and direct a rubber laboratory.

DR. GEORGE A. SARTON, of Harvard University, delivered on October 13 the Averill Lecture at Colby College, Waterville, Maine. The lecture was entitled "The History of Science."

JAMES S. THOMPSON, executive vice-president of the McGraw-Hill Book Company, will deliver on November 19 the seventh Bowker Lecture to be held under the auspices of the New York Public Library. His subject will be the development of the publication of technical books in the United States during this century.

FACULTY members of the Massachusetts State College at Amherst now on war leave of absence and serving with the Army Sanitary Corps are Ralph L. France, research professor of bacteriology, commissioned captain on July 27, now serving at Fort Meade, Md.; Dr. Ernest M. Parrott, instructor in chemistry, commissioned first lieutenant on September 1, now serving at Camp Devens, Mass.; Dr. Arthur S. Levine, assistant professor of food technology, commissioned first lieutenant on September 2, now serving at Fort Sam Houston, San Antonio, Texas; Dr. Monroe E. Freeman, research professor of chemistry, commissioned first lieutenant on October 10, now serving at Charleston, N. C.; and Dr. Dale H. Sieling, research professor of chemistry, commissioned first lieutenant on October 17, now serving at New Orleans.

THE thirty-fifth annual meeting of the American Society of Animal Production will be held on December 1 and 2 at the Hotel Sherman in Chicago.

THE annual fall meeting of the Industrial Minerals Division of the American Institute of Mining and Metallurgical Engineering was held in Bethlehem, Pa., under the presidency of Dr. Benjamin Miller, professor of geology at Lehigh University, with an attendance of one hundred and seventy-eight.

"THE Utilization of Scientific Apparatus in the War Effort" will be the subject of a discussion to be held by the New York branch of the American Association of Scientific Workers at the Men's Faculty Club of Columbia University on November 18, at 8:15 P.M. Dr. Joseph Greenspan, chairman of the committee on the "lend-lease" of scientific apparatus, will be the main speaker and will report the results of a questionnaire on this subject sent to local laboratories and manufacturers of scientific apparatus.

THE British Institute of Physics held a discussion on the "Education and Training of Physicists" at the Royal Institution on October 12. The discussion was based on the memorandum on the subject prepared by the planning committee of the institute.

THE Association of Special Libraries and Information Bureaux has arranged a conference to be held on November 7 and 8 in the rooms of the Royal Society. The preliminary program, according to *Nature*, includes an address by Sir Richard Gregory on "International Systems and Standards," a symposium on the use of microfilm and papers on library training and on war-time books and periodicals.

DISCUSSION

RECENT EVIDENCE REGARDING THE NATURE OF VIRUSES

SINCE Stanley[1] discovered that highly purified tobacco mosaic virus may be obtained in a crystal-like state most workers have apparently believed that the particles of certain viruses are protein macromolecules that may multiply in their hosts by a process of autocatalysis. Bawden and Pirie[2] provided further evidence for this interpretation when they discovered that tomato bushy stunt virus particles composed of nucleoprotein may come together to form strikingly symmetrical bodies which certainly have the appearance of true crystals.

Although many workers have apparently accepted this interpretation, others[3, 4] have questioned it and have considered it more probable that the virus particles are organisms, each composed of numerous molecules, that multiplication occurs by growth, followed by division and that these small organisms may exhibit electrical phenomena similar to those of molecules which cause them to aggregate in an orderly arrangement to form crystal-like structures. Further evidence favoring this interpretation was provided by Kunkel,[5] who reported that he was able to culture certain filterable organisms and that these organisms produce birefringent colonies that resemble spheroid crystals.

As Lauffer[6] and Frampton[7] have indicated, one would expect that if each virus particle were a macromolecule, all the particles of a given virus should have the same size and form. The electron micrographs[8] of viruses having spheroidal particles, although not as clear as desired, have indicated a certain amount of uniformity in the size and form of the particles of a given virus. However, viruses having rod-shaped particles, although showing a marked uniformity in width, have shown great variation in length.[8, 9] Frampton[7] has reported measurements of the length of the tobacco mosaic virus particles shown in the electron micrographs of Stanley and Anderson[8] and Anderson and Stanley.[10] He implied that the lengths show sufficient regularity to indicate that the virus particles may be composed of units 37 mμ long, joined end to end. We can not agree with this interpretation of the results. It appears to us that his measurements do not show sufficient regularity to warrant this interpretation. We have accordingly also made measurements of the length of the tobacco mosaic particles in Figs. 1 and 2 of Anderson and Stanley[10] and Figs. 3, 4, 5 and 6 of Stanley and Anderson.[8]

The results were treated statistically[11] as follows: It was assumed that the virus particles have a length of K 35, where K = 1, 2, 3, 4, etc., and that the measurements would be normally distributed about these expected values with variance σ determined to be 8 mμ. The unit 35 mμ was chosen because it is a factor of 280 mμ, which has been reported[8] as the most common length of the tobacco mosaic particle and because it is close to the value 37 mμ suggested by Frampton as a unit. $\bar{\sigma}$ is the average of the best unbiased estimates of the σ of the measurements. Each particle was measured 3 times and only clearly defined particles were measured. Small particles resembling those of amorphous material were not measured because we could not be sure that they were virus particles.

The observed measurements were then compared with the theoretical distribution by means of a chi-square test. From this comparison it may be concluded that if the theoretical distribution is proper the chance of obtaining the observed values is less than 1 in 1,000 and that there is, therefore, no significant evidence of tobacco-mosaic virus particles being composed of visible uniform units around 35 mμ long.

A frequency curve of these length measurements is shown in Fig. 1. It is also evident from visual inspection as well as statistical treatment of the curve that there is little evidence of the larger particles being composed of shorter visible uniform units joined end to end. If the particles were composed of units 37 mμ long one would expect peaks at 111, 148, 185, 222, 259, 296, etc. Although some of the peaks occur near some of these points, this does not occur with sufficient regularity to be significant.

[1] *Am. Jour. Bot.*, 24: 59, 1937.
[2] *Brit. Jour. Exp. Path.*, 19: 251, 1938.
[3] T. E. Rawlins and W. N. Takahashi, SCIENCE, 87: 255, 1938.
[4] R. A. Gortner, SCIENCE, 87: 529, 1938.
[5] SCIENCE, 91: 422, 1940.
[6] *Report New Eng. Assoc. Chem. Teachers*, 4, 1941.
[7] SCIENCE, 95: 232, 1942.
[8] W. M. Stanley and T. F. Anderson, *Jour. Biol. Chem.*, 139: 325, 1941.
[9] F. O. Holmes, *Phytopath.*, 31: 1089, 1941.
[10] *Jour. Biol. Chem.*, 139: 339, 1941.
[11] We greatly appreciate the advice of Mr. Mark W. Eudey, of the Statistical Laboratory, regarding the statistical work and the help of Miss Barbara M. Kennedy, who has done much of the work reported.