Sterling fellowship for research with Professor John F. Fulton in neuro-physiology.

For psychological research, Dr. Helen Peak, of Dallas, Texas, has been awarded a Sterling fellowship to enable her to continue work with Professor Raymond F. Dodge on the speed of reaction of the eyelid in organisms at various phylogenetic levels, while a somewhat related study of eye movements is made possible by the award of an Alexander Brown Coxe fellowship to Dr. Frank H. Couch, of Cromwell, Connecticut, to make it possible for him to carry on his work with Professor James C. Fox.

A special research fellowship in bacteriology has been awarded for the first time this year. Dr. Louis Weinstein, of Bridgeport, Connecticut, is the recipient. He will study the relationship of bacterial flora of the gastro-intestinal tract to the psychological reactions of the animal host.

A Sterling fellowship has been awarded to Charles E. Olmstead, of Roca, Nebraska, to study the effect of year to year differences in climatic conditions on wood structure of native trees. He will work with Professor Nichols at the Osborn Botanical Laboratory.

Paleontological research on the gastropods of the St. Louis, Pennsylvania outlier, has been made possible by the award of a Sterling fellowship to Dr. J. Brooks Knight, of Branford, Connecticut.

Mr. Frederick N. Rhines, of Toledo, Ohio, has been appointed Sterling fellow for research in metallurgy. He will study the rôle of oxygen in some of the common metals.

At the Sloane Physics Laboratory honorary research fellowships have been awarded to Dr. Malcolm Henderson and to Donald Cooksey, who is a candidate for the Ph.D. this June. Dr. Henderson will continue his experiments in the field of radioactivity while Mr. Cooksey works on precision measurements in high frequency spectra.

SCIENTIFIC NOTES AND NEWS

THE meeting of the National Academy of Sciences on the evening of April 25 will be given to the celebration of the hundredth anniversary of the electrical discoveries of Joseph Henry. The addresses will be: "Henry as a Physicist" by Dr. W. F. Magie, professor of physics at Princeton University; "Henry as an Electrical Pioneer" by Bancroft Gherardi, vice-president and chief engineer of the American Telephone and Telegraph Company, and "Henry as an Administrator" by Dr. C. G. Abbot, secretary of the Smithsonian Institution.

THE evening address of the American Philosophical Society will be given on April 23 by Dr. Paul van Dyke, professor of modern European history at Princeton University, who will speak on "The Human Washington." At the annual dinner on the evening of April 23 the speakers will be Dr. James Brown Scott, secretary of the Carnegie Endowment for International Peace; Dr. Howard McClenahan, secretary of the Franklin Institute; Dr. Thomas S. Gates, president of the University of Pennsylvania, and Dr. William B. Scott, emeritus professor of geology and paleontology, Princeton University.

THE annual meeting of the trustees of Science Service will be held in Washington on Thursday, April 28. On the preceding day there will be a round table conference and a dinner to consider how Science Service may further its purpose of making science better known and appreciated by the general public and contribute its share in advancing modern civilization. Those who will take part in the conference include Dr. Karl T. Compton, Massachusetts Institute of Technology; Dr. Edwin G. Conklin, Princeton University; Dr. Simon Flexner, Rockefeller Institute for Medical Research; Dr. Frank B. Jewett, Bell Telephone Laboratories; Mr. A. H. Kirchhofer, the *Buffalo Evening News;* Dr. John C. Merriam, Carnegie Institution of Washington; Dr. A. A. Noyes, California Institute of Technology; Mr. Robert P. Scripps, Scripps-Howard Newspapers; Dr. E. B. Wilson, Harvard University School of Public Health. The speakers at the dinner will be Dr. John H. Finley, *The New York Times;* Dr. Robert A. Millikan, California Institute of Technology, and Dr. H. G. Moulton, Brookings Institution.

DR. ARTHUR P. COLEMAN, emeritus professor of geology, University of Toronto, has been awarded the Victoria Medal of the Royal Geographical Society in recognition of his geographical work in Canada. Professor Coleman celebrated his eightieth birthday on April 4, when he was the recipient of many messages of congratulation from friends and colleagues at home and abroad. He is actively engaged in preparing a report on the glacial geology of southern Ontario for the Ontario Department of Mines.

DR. SELMAN A. WAKSMAN, of the department of soil microbiology, Rutgers University, and the New Jersey Agricultural Experiment Station, has been elected a member of the Imperial German Academy of Sciences at Halle, in recognition of his work on the microbial population of the soil.

PROFESSOR ROGER L. MORRISON, of the highway engineering department of the University of Michigan, has been elected an honorary member of the Institute of Highway Engineers at Cambridge, England.

IT is reported in *Nature* that in view of the conferring of the honorary degree of D.Sc. by the University of the Witwatersrand, Johannesburg, on Mr. N. E. Brown, in recognition of his work on the South African flora, Sir Arthur Hill presented Dr. Brown to his old colleagues in the Herbarium of the Royal Botanic Gardens, Kew, on March 19. In the course of a short address, Sir Arthur said: "Dr. Brown was on our staff for forty-one years, from 1873 until 1914. He was elected an associate of the Linnean Society in 1879, and in 1921 he received the Senior Captain Scott Medal for scientific research in South Africa from the South African Biological Society. I need not detail his many contributions to South African botany, as they are so well known to all botanists, but it is interesting to record that the following eminent South African botanists warmly supported the proposal that Dr. Brown should be honored by South Africa: General J. C. Smuts, Dr. I. B. Pole Evans, Professor J. W. Bews, Professor R. S. Adamson, Professor R. H. Compton and Dr. John Muir."

DR. FREDERIC H. LAHEE, chief geologist of the Sun Oil Company, Dallas, Texas, who has been for three years third vice-president of the American Association of Petroleum Geologists, was elected president at the annual meeting.

AT the ninth annual meeting of the Alabama Academy of Science, held at Howard College, Birmingham, on March 11 and 12, the following officers were elected: *President,* Dr. J. F. Duggar; *Vice-presidents,* Dr. J. L. Brakefield and Dr. H. C. Heath; *Secretary,* Dr. B. P. Kaufmann; *Treasurer,* Mr. A. G. Overton; *Editor,* Dr. E. V. Jones; *Councillor to the American Association for the Advancement of Science,* Dr. E. B. Carmichael. Birmingham-Southern College was selected for the 1933 meetings.

AT the annual business meeting of the Royal Philosophical Society of Glasgow, held on March 23, the following officers were elected: *Vice-president,* Dr. Henry L. G. Leask; *Honorary Librarian,* Dr. James Knight; *Honorary Treasurer,* Sir John Mann; *Secretary,* Mr. John A. Buyers; *Members of Council,* Mr. John P. Heslin, Miss M. A. Hannan Watson and Mr. George B. Wishart.

PROFESSOR FRANK A. WAUGH, who for the past thirty years has directed the horticultural work of the Massachusetts State College, will retire on September 1 as head of the horticultural division in order that he may devote his entire time to the department of landscape architecture, of which he will continue as head. Dr. Ralph A. Van Meter, professor of pomology and a member of the staff for fifteen years, was promoted to head of the division. Professor Waugh is now on a six-months' leave in Japan for the purpose of studying Oriental gardening methods.

MR. ROBERT L. NUGENT, until recently physical chemist at the Gladwyne Research Laboratory and instructor in biochemistry in the Graduate School of Medicine of the University of Pennsylvania, has become assistant professor of chemistry at the University of Arizona.

DR. EDWIN O. JORDAN, of the University of Chicago, has been appointed a member of the Chicago Board of Health.

THE first Joseph A. Capps Prize for medical research of the Institute of Medicine of Chicago has been awarded to Dr. Warren B. Matthews, assistant resident in surgery at the University of Chicago clinics, for his paper on "Studies on the Etiology of Gastric and Duodenal Ulcer." This prize of five hundred dollars, established through the generosity of an anonymous donor, is awarded in alternate years for the most meritorious medical research by a graduate of a medical school in Chicago completed within two years after graduation.

THE award of the J. T. Baker Chemical Company Eastern Analytical Fellowship for 1932–33 has been made to Mr. Eugene Wainer, a graduate student at Cornell University. Mr. Wainer has worked with Professor Papish in research for Element No. 87 (*Journal of American Chemical Society,* 53, 3818, 1931). He plans to make a study of x-ray spectroscopy as a means of quantitative analysis under the direction of Professor Papish.

IN a letter written at Iquitos, Peru, on March 18, M. W. Stirling, chief of the Bureau of American Ethnology, states to the Smithsonian Institution that he had just completed an 800-mile trip on a raft via the rivers Yangtse, Santiago, Maranon and Amazon. His ethnological collection of Jivaro and Aquaruna material came through in good shape. Mr. Stirling hopes to reach Washington early in May.

DR. MARGUERITE LEFEVRE, chef de travaux in the University of Louvain, who as the holder of a fellowship under the Commission for Relief in Belgium Educational Foundation, has been prosecuting studies in geomorphology at Columbia University, is devoting a month to the study of ancient marine levels in South Carolina, Georgia and Florida.

DR. CHARLES E. SPEARMAN, of the University of London, will deliver on April 23 the principal address at the annual meeting of the University of Kentucky chapter of Phi Beta Kappa. His subject is "The Abilities of Man."

THE annual lecture of the James A. Gibson Ana-

tomical Society at the University of Buffalo was given on April 8 by Dr. G. Carl Huber, professor of anatomy and dean of the Graduate School at the University of Michigan. The subject of Dr. Huber's address was "The Kidney."

DEAN GEORGE F. KAY, of the State University of Iowa, gave the address at the annual Phi Beta Kappa, Sigma Xi Convocation at Washington University, Saint Louis, on April 7. His subject was "Scientific Discovery and Human Outlook." While at the university, Dean Kay also gave a lecture before the faculty and students of the science departments on "The Glacial History of Iowa and Adjacent States."

DR. R. A. EMERSON, head of the department of plant breeding in the New York State College of Agriculture, Cornell University, gave the third series of annual lectures under the Frank Azor Spragg Memorial Fund, from April 5 to 8, at Michigan State College. This memorial is in honor of Professor F. A. Spragg, who was in charge of plant breeding work at the Michigan Agricultural Experiment Station from 1906 until his death in 1924. The subjects dealt with in the lectures were: "Cooperation in Plant Breeding"; "Heredity and Environment" (a non-technical lecture); "Breeding White Beans for Disease Resistance, Yield and Canning Qualities"; "The Present Status of Corn Genetics and Cytology," and "The Solving of a Genetics Problem—the Inheritance of Variegated Pericarp in Corn."

TWO lectures will be given on May 3 and 5 under the Edward K. Dunham Lectureship for the Promotion of the Medical Sciences at the Harvard Medical School by Dr. Ludwig Pick, professor of pathology, University of Berlin, and director of the Pathological-anatomical Institute Municipal Hospital, Friedrichshain, Berlin. The lectures will be given each day at 5 o'clock. The subjects will be " A Classification of the Diseases of Lipoid Metabolism and Gaucher's Disease" and "Niemans-Pick's Disease and other Forms of so-called Xanthomatosis."

SIGMA PI SIGMA, honorary physics fraternity, installed its twenty-first chapter at the University of Richmond on March 16. The installation ceremonies were held in the physics lecture room of Richmond Hall with Dr. Marsh W. White, the executive secretary of the society, and Dr. R. C. Young, former president and member of the executive council, as installing officers. Nineteen charter members, including Dr. R. E. Loving, head of the physics department, and Dr. C. L. Albright, were initiated as charter members of the Chi chapter. After the installation dinner the first open meeting of the chapter was addressed by Dr. White, who spoke on "Energy Relations in X-ray Tubes."

THE thirteenth annual meeting of the American Geophysical Union will be held in the building of the National Academy of Sciences, Washington, on April 28 and 29. Dr. William Bowie is chairman of the union. Dr. L. H. Adams is vice-president and Dr. J. A. Fleming general secretary. The chairmen of the sections are: Geodesy, W. D. Lambert; seismology, N. H. Heck; meteorology, G. W. Littlehales; terrestrial magnetism and electricity, D. L. Hazard; oceanography, A. H. Clark; volcanology, A. L. Day, and hydrology, O. E. Meinzer.

THE second International Congress of Tropical Medicine, which was to have been held in Amsterdam next September, has been postponed until financial conditions are more favorable.

DEFINITE plans have been made for the removal of the North East Forest Experiment Station from Amherst to New Haven. Three specialists moving with the station are Dr. Perley Spaulding, forest pathologist of the bureau of plant pathology; Harvey MacAloney, entomologist of the bureau of plant entomology, and Paul Miller, of the bureau of biology.

THE Eugene Littauer Memorial Laboratory for diagnosis and research was recently presented to the Nathan Littauer Hospital in Gloversville, N. Y., by Lucius N. Littauer. The laboratory is a memorial to Mr. Littauer's brother and the hospital, built several years ago, to his father. Among guests at the dedication were Drs. James Ewing and Emanuel Libman, New York; Elliott P. Joslin, Boston; Edward Francis, Washington, D. C.; Milton C. Winternitz, New Haven, and Harrison S. Martland, Newark, N. J., all of whom made addresses. The building has two floors; on the first are the diagnostic laboratories and the second is planned for research, while the basement contains the necropsy, histologic and photographic rooms.

Nature reports that Lord Wakefield has given a sum of £25,000, spread over seven years, as a contribution to the British Imperial Institute. The institute is financed by annual grants from the Treasury, the Dominions, India and the Colonies, and was faced with the prospect of curtailment of its activities, owing to temporary reduction of some of its supporting grants. It is hoped that Lord Wakefield's gift will enable the institute to tide over the period of difficulty.

Museum News reports that a museum is included in the plans for the building of the Institute of Polar Research to be erected at Cambridge, England. The building is to be a memorial to Captain Robert Falcon Scott, whose navigation book for his last expedition will be one of the exhibits. Specimens of sledging gear, clothing, cooker's instruments and Polar equipment of all kinds will be collected. Material from

Sir John Franklin's expedition will be included. A grant of $200,000 has been contributed toward the building by the Pilgrim Trust Fund, founded by Mr. Edward S. Harkness.

THE Munich correspondent of *The New York Times* reports that another German expedition is being made to the Himalaya this summer. The party, which will be nine or ten in number, consists for the most part of first-class Bavarian mountaineers and members of the Munich Alpenverein, but two or three members of the American Mountaineering Club are on their way from the United States to take part in the expedition. The expedition will attempt the ascent of Nanga Parbat, 26,629 feet, in the Kashmir Himalaya. If successful, the climbers will have reached a summit higher than any yet attained by man, though not the highest point reached—a record held by Mallory and Irvine on Mount Everest. Only one previous attempt has been made to scale Nanga Parbat; this was in 1895, when the British mountaineer, A. F. Mummery, lost his life in the venture. The leader of the German expedition is Herr Wilhelm Merkl, a Munich engineer, who, in 1929, took part in an expedition across the Caucasus which included an ascent (the third on record) of the extremely difficult Uschba Mountain. The expedition will leave Munich on April 26 and will depart from Srinagar, the capital of Kashmir, *en route* for the mountain, early in June.

DISCUSSION

THE ANALYSIS OF ELECTROMYOGRAMS

THE method described by Travis and Hunter[1] in a recent issue of SCIENCE for the study of the human electromyogram calls for comment, since it seems to be almost expressly designed to obscure well-established physiological facts concerning the activity of the central nervous system. Their method consists essentially of determining what percentage of the "output voltage" will pass various electrical filters designed to eliminate alternating current components above a given frequency. The authors offer the method as a means of "reading" the irregular electrical disturbances generated during muscular contraction. The implication is inescapable that they anticipate analyzing the "action current wave" into its components and interpreting variations which may be found under various conditions. They neglect, however, to evaluate their method in the light of the known facts of muscular physiology. The action currents of muscles in voluntary contraction present an irregular and confused picture due to the combined asynchronous activity of many individual units. Each active unit generates a series of electrical pulses or action currents at a rather slow and more or less regular rhythm. The way to clear interpretation does not lie in an analysis of the resulting total disturbance in terms of frequencies as revealed by electrical filters, since this method implicitly assumes that the whole is composed of a variety of alternating current components of various frequencies. The total action current can be described in this way, but the result has little connection with the underlying phenomena, and therefore can only be misleading.

Adrian and Bronk[2] have shown that by means of a hypodermic needle, which contains within it a fine insulated wire, effective contact can be made with a relatively small number of active muscular units. We have repeated their observations and confirmed the fact that the rhythms of individual units appear clearly in the record of contractions of moderate intensity. This method offers a direct analysis of the situation, and demonstrates immediately that the number of impulses per second in each motor unit in voluntary contractions is of the order of ten to fifty or a hundred. The method of Travis and Hunter completely misses this fundamental fact, only 10 per cent. of the total action current being ascribed by them to frequencies below one hundred.

The peak of frequencies represented, according to Travis and Hunter, lies at about 400 per second. This result almost certainly depends upon the time-relations of the individual action currents in the muscle fibers. These rise from zero to their maximum voltage in approximately a thousandth of a second and fall again somewhat more slowly. Waves of these time-relations, whether recurring regularly or irregularly, when confronted by a series of graded electrical filters will not be greatly reduced by those which pass frequencies up to 1,000 per second but will be considerably reduced by those whose limit is 400 and very much so by 200. In other words, these waves will have a large component between 300 and 500 when analyzed by filters, whether the waves occur singly, or at regular intervals or at random. Travis and Hunter's frequency curve therefore depends primarily upon the shape of the individual impulses and not upon the fequency of their occurrence. It is the latter which varies with different degrees of activity of the neuro-muscular system while the former is relatively constant and depends upon the local condition of the muscle itself. If it is desired to study frequency it is now quite easy to obtain a record of a series of indi-

[1] L. E. Travis and T. A. Hunter, SCIENCE, February 19, 1932.

[2] E. D. Adrian and D. W. Bronk, *J. Physiol.*, Vol. lxvii, No. 2, p. 119, 1929.