that the extreme values of the potential gradient occur at about the same time of the year, hence not at the same season everywhere. The writer in addition has found from a discussion of the *Carnegie* ocean observations, and recent land stations, that nearly everywhere the mean value of the potential gradient for the six months October to March, when the earth is nearest to the sun, is greater than the mean value for the six months April to September, when the earth is farthest from the sun.[6] Accordingly, distance of the earth from the sun, rather than season, appears to be the controlling factor.

If we confine our attention to series of observations since 1900, when more rigorous methods of observing were employed than formerly, two outstanding exceptions from the general rule just stated are found, namely, the observations at Helwan, Egypt, 1907–1914, and those made by Dr. G. Berndt at Buenos Aires, 1911–1912. Dr. Wait, of the Department of Terrestrial Magnetism, has carefully investigated the Helwan series and he has been led to infer that this station may be subject to disturbing influence, owing to the seasonal variation in sand storms. The results at Buenos Aires depend on electrometer readings made three times daily for one year from May, 1911, to April, 1912. It would be highly desirable that additional observations be obtained at these two stations and that the annual variation be derived on the basis of both electrically undisturbed and disturbed days.

On the average, from the Arctic to the Antarctic, the monthly mean values of the potential gradient vary during the year from minimum to maximum to the extent of about 60 per cent. of mean gradient for the year.

Another interesting fact is that the *daily range of the potential gradient* varies during the year, generally in the same manner as has been stated with regard to the gradient itself. In other words, the daily range is a quantity very similar to the potential gradient; the former may be looked upon as counted from the minimum value as the zero, whereas in the case of the usual potential gradient the earth is assumed at zero potential.

And now we come to the consideration of the question of a possible *relationship between changes in the annual values of the potential gradient and changes in solar activity during the 11-year cycle.* In a paper published in 1924,[7] I brought together all the available data through 1923. The chief conclusion was that "the probability is high that the atmospheric potential-gradient and its diurnal and annual ranges, as also the air-earth current, are subject to sunspot influence." For an average increase of 90 in the sunspot number, between minimum and maximum sunspottedness, the increases in the potential gradient and its diurnal and annual ranges were found to be about 30 per cent.

With the aid of fifty-nine series of diurnal-variation observations of the potential gradient made aboard the *Carnegie* in the different oceans during 1915–1921, including the year 1917, of maximum sunspot activity, I again investigated the matter in 1925,[8] reaching once more the conclusion already stated. Dr. Mauchly could not find any adequate cause for the observed changes in the potential gradient, other than the one already mentioned of possible effect arising from varying sunspottedness.

It will probably be necessary to await the completion of another cycle and the accumulation of data at widely distributed stations, not subject to local disturbing influence, before all the questions arising as to the precise nature of any solar-activity influence on atmospheric electricity may be definitely settled. However, renewed interest has been aroused in the problem and it is also gratifying in this connection that beginning in 1928 the observational work in atmospheric electricity aboard the *Carnegie* will be resumed.

Owing to the meagerness of available data, it is not possible at present to state whether, or not, the *electric conductivity* of the atmosphere is subject to cosmic influences.

It will be a long time before the question as to any possible *secular changes* in the atmospheric potential-gradient can be investigated successfully. For example, do the mean values of this gradient for a solar cycle vary from cycle to cycle, as does mean sunspottedness?

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[6] *Researches of Department of Terrestrial Magnetism and Atmospheric Electricity*, Vol. V, Washington, 1926, pp. 382–384.

[7] *Terrestrial Magnetism and Atmospheric Electricity*, Vol. 29 (1924), pp. 23 to 32 and 161 to 186.

[8] See *Researches of Department of Terrestrial Magnetism and Atmospheric Electricity*, Vol. V, Washington, 1926, pp. 361–381.

AWARD OF FELLOWSHIPS BY THE GUGGENHEIM MEMORIAL FOUNDATION

THE award of fellowships totaling $143,000 to sixty-three scholars, writers, musicians and artists has been announced by the trustees of the John Simon Guggenheim Memorial Foundation. Seven of the awards were to enable completion of work undertaken

by fellows appointed last year. The awards, given annually, are made possible by the gift in 1925 of $3,500,000 by former United States Senator Simon Guggenheim and Mrs. Guggenheim in memory of a son who died in 1922.

The committee that made the awards comprised President Frank Aydelotte, of Swarthmore College, *chairman;* President Ada Louise Comstock, of Radcliffe College; President Frederick C. Ferry, of Hamilton College; Professor Charles Homer Haskins, of Harvard University, and Dean Charles B. Lipman, of the University of California.

The list of awards in the field of science, as announced by the foundation, follows:

Dr. Edward Frederick Adolph, assistant professor of physiology, School of Medicine and Dentistry, University of Rochester, to study the internal factors that control the size of organisms, particularly during growth, principally at the Kaiser Wilhelm Institute, Berlin.

Dr. William Ruthrauff Amberson, assistant professor of physiology, School of Medicine, University of Pennsylvania, to study mechanisms involved in the electrical stimulation of nerve and muscle, principally with Dr. A. V. Hill, at University College, London.

Dr. Richard Bradfield, associate professor of soils, University of Missouri, to investigate the principles involved in the purification of colloids by electro-dialysis, principally with Dr. Herbert Freundlich at the Kaiser Wilhelm Institute, Berlin.

Dr. Ralph Erskine Cleland, associate professor of biology, Goucher College; for studies of the chromosome constitution and behavior of the evening primroses (oenothera), as related to certain genetical problems, in consultation with European authorities.

Dr. Carl Henry Eckert, National Research fellow, California Institute of Technology, for researches concerned with the new quantum theory, with Professor A. Sommerfeld at Munich, and E. Schrodinger, at Zurich.

Dr. William Henry Eyster, professor of botany, University of Maine, for a study of the physiology of the chloroplastic pigments—principally with Professor Richard Willstätter, Munich.

Dr. Philip Franklin, assistant professor of mathematics, Massachusetts Institute of Technology, to study integral equations, orthogonal functions and their relation to almost periodic functions, principally at Göttingen, Germany, and Zurich.

Dr. George Ernest Gibson, associate professor of physical chemistry, University of California, for research in the field of the theory of band spectra, principally at the University of Göttingen, Germany.

Dr. Rodney Beecher Harvey, associate professor of botany, University of Minnesota, to investigate low temperature effects on plants, principally at Cambridge University. Dr. Harvey has discovered that ethylene gas will hasten the ripening of fruits and vegetables. By injecting less than 40 cents' worth of gas into a carload of green bananas they can be ripened within forty-eight hours.

Dr. Lewis Victor Heilbrunn, assistant professor of zoology, University of Michigan, for researches into the colloid chemistry of protoplasm, principally with Dr. Herbert Freundlich, at the Kaiser Wilhelm Institute, Berlin.

Dr. William Vermillion Houston, National Research fellow in physics, California Institute of Technology, to study the most recent developments in quantum mechanics as applied to the explanation of spectra, principally with Professors A. Sommerfeld, at Munich, and Niels Bohr and A. Heissenberg, at Copenhagen.

Dr. Frank C. Hoyt, research associate, University of Chicago, for research into the quantum theory and its meaning for radiation and atomic structure—at Göttingen, Copenhagen and Zurich.

Dr. Victor F. Lenzen, assistant professor of physics, University of California, for a critical study of statistical mechanics at Göttingen and Zurich.

Dr. Edwin Blake Payson, professor of botany, University of Wyoming, for studies in taxonomy in relation to generic phylogenies, principally at Kew Gardens, London.

Dr. Lloyd Hilton Reyerson, associate professor of chemistry, University of Minnesota, for investigations in the field of contact catalysis, principally with Professor Herbert Freundlich at the Kaiser Wilhelm Institute, Berlin.

Dr. Manuel Sandoval Vallarta, assistant professor of physics, Massachusetts Institute of Technology, to study the connection between Schrodinger's wave mechanics and the Einstein theory of relativity, in consultation with European authorities.

Harry Schultz Vandiver, associate professor of pure mathematics, University of Texas, for research abroad on Fermat's last theorem and the laws of reciprocity in the theory of algebraic numbers.

Dr. J. Walter Woodrow, professor of physics, Iowa State College, to study the phosphorescent, chemiluminescent and photoelectric properties of cod liver oil and other substances which either have anti-rachitic characteristics or can be activated by treatment with ultraviolet light, principally with Professor E. Rutherford, of Cambridge University, and Professor J. S. E. Townsend, of Oxford University.

Renewal of grants to the following fellows of the foundation, appointed last year, were announced among others as follows:

Dr. Wallace Reed Brode, Bureau of Standards, Washington, D. C., to continue abroad research on the absorption spectra of simple azo dyes.

Dr. J. Penrose Harland, University of Cincinnati, to continue investigations in the Bronze Age civilizations of the Aegean Basin.

Dr. Linus Carl Pauling, California Institute of Technology, to continue theoretical and experimental researches on the atom.