SCIENCE NEWS

Science Service, Washington, D. C.

A NEW VALUE OF THE ELECTRON

HAILED by mathematical physicists as ranking in importance with the newly published Einstein paper, Dr. A. S. Eddington, Plumian professor of astronomy at the University of Cambridge, recently announced to the Royal Society the results of research upon the charge of the electron.

Basing his work both on the theory of relativity and the quantum theory of light, Professor Eddington has found a formula which enables the charge of electricity in the electron, the electrical "atom" and building-stone of which atoms are made, to be calculated from two other values. He proves that the value should be a whole number. As a result of these purely theoretical considerations, the famous Nobel prize experiment of Dr. R. A. Millikan, physicist of the California Institute of Technology, in determining this value, may be proved to be slightly in error.

According to the most recent form of the quantum theory, which supposes that light travels as separate bursts of energy rather than as a continuous emission, the electrons are not tiny particles. They either consist of, or are associated with, waves, in some peculiar manner. About this concept has grown the branch of physics known as "wave mechanics."

The two figures that Professor Eddington has used in computing the electric charge of the electron are the speed of light, which has been determined with extreme precision by Professor A. A. Michelson, of the University of Chicago, and what is known as Planck's quantum constant. The physicist represents it by the letter h. Light, and other forms of radiation, like radio waves, differ in frequency, or the number of vibrations per second. The faster the vibration, the more energy there is in a single quantum, or "bunch," of the radiation. This energy is equal to the frequency multiplied by the quantum constant, which is named after Max Planck, the originator of the theory. The numerical value of h is 6.55.

Professor Eddington pointed out that it has long been known that a formula for calculating the electron's charge from the velocity of light and the quantum theory must exist, but this is the first time that it has been found. According to the results of his reasoning, the charge is a whole number, 136. In his famous experimental determination of the same value, Dr. Millikan obtained the value 137.1. Although this is less than one per cent. greater, the difference is too much for scientists to be entirely satisfied.

"I must hope that in this case theory has succeeded in beating experiment," said Professor Eddington in an explanatory statement to *Science Service*, "and that newer experimental determinations will confirm my value. If this theoretical value should prove right in the end, that does not, of course, disparage the brilliant experimental work which has given a value at any rate close to the truth."

That his hopes may be justified is indicated by a very recent measurement of the experimental value by Dr. K. M. G. Siegbahn, a famous Swedish physicist, and that is very close to 136. Professor Eddington's work is based largely on what is known as the "exclusion theory," which was developed largely by Dr. P. A. M. Dirac, another English physicist, but which has never been explained in non-mathematical language.

"My result is a suggested mathematical theory, which, if it can be accepted, will form one step in the development of the subject," said Professor Eddington. "Our ideas about the quantum theory will need to become much clearer before physicists generally (including myself), are quite satisfied about it. But that applies to much modern progress in quantum theory. We are working very much in the dark and the most one can say about any suggested step forward, such as this, is that it looks a bit hopeful."

RESEARCH ON THE CAUSE OF DEAFNESS

THE unsolved problems of deafness and a broad program of research directed toward their solution were under discussion by a group of scientific men meeting in Washington on February 1 and 2 for a conference on problems of the deaf and hard of hearing. The Vice-president of the United States, General Charles Dawes, was the opening speaker of the conference, and Surgeon-General Hugh Cumming, of the U. S. Public Health Service, made an address at the dinner which closed the conference.

The conference was held under the auspices of the division of anthropology and psychology of the National Research Council. The proposed program of research, which has been worked out by a committee of scientists, would provide scientific facts to replace much guesswork in aiding the deaf and hard of hearing to surmount their handicaps. There is urgent need for such research, according to the report, and the efforts of the psychologist, physicist, neurologist and physiologist are all needed to uncover facts and methods.

"It is to be emphasized, moreover," the report continues, "that this labor, in its full extent, is Herculean in its proportions, requiring a considerable period of time, large sums of money, and the fullest cooperation of scientists with the educators of the auditorily defective."

Among the lines of research outlined in some detail by the committee are surveys of teachers of the deaf, their methods and the results obtained by the different methods; an investigation into the industrial training given in schools as compared with the occupations that the deaf are actually engaged in to see how school training can be effectively directed; an experimental survey of typical city and farm population groups to provide facts and figures on the incidence and types of auditory deficiency in the population of the country.

The proposed research gives much attention to the deaf child and the causes of deafness. "The auditorily de-

ficient child, from birth to seven years, is at the present time virtually a closed book. With but few exceptions, schools for the deaf take children at the age of seven or eight. When we consider the stress now being placed upon the significance of the early years in general development, it seems astounding that there should be such a great gap in our knowledge.''

The committee recommends, among other projects, the establishment of a nursery school for deaf children; the development of adequate tests of hearing for young children; development of tests to prevent the unfortunate confusion of deafness with feeble-mindedness; a study of pathological factors leading to auditory defects in young children.

A central institute for the study of social and emotional problems of auditory defectives is another part of the proposed research.

COLLEGE COURSES IN METEOROLOGY

THE scientific study of the weather, meteorology, should be offered as a well-developed college course. There should be three different types of instruction, one of the highly technical nature demanded by candidates for professional work in meteorology, one less technical but still highly practical, designed for agricultural students, and finally a purely cultural course for persons who would not expect to make practical use of it, but would study the weather as they now study botany or geology, just for the satisfaction of knowing about it.

This is the program advocated by Dr. W. J. Humphreys, physicist of the U. S. Weather Bureau. The courses in meteorology offered in many of the universities and colleges at the present time, he says, are quite inadequate, being taught, as a rule, as a side-line in the geology department by a professor who is not trained as a professional meteorologist. They are, however, frequently misnamed, being called meteorology when they should be called climatology, which is the study of ''past weather.''

''Meteorology, on the other hand, treats of the weather of the very present, especially why it is, what it is, and from that in turn deduces what it next must become. Climatology integrates the past and infers the general average for years to come. Meteorology analyzes the present and deduces the exact state of the future, but as yet in terms only of hours to come, or days at most. Meteorology, then, as a science, is the physics of the air, and as such draws from every major branch of general physics, and from some of them very heavily. It can not be profitably studied at college without at least a working knowledge of that basic subject and a corresponding preparation in mathematics. Whoever, therefore, presumes to teach it should have a very wide and intimate knowledge of physics, with all the mathematical training such knowledge implies. Even then, he will be confronted daily, if wide awake, with problems that he will be unable to solve.

''This recognition of the difficulties of the subject is not offered as a deterrent to those who might wish to study it, but as a warning that adequate preparation is an essential to the successful study of meteorology as it is to the mastery of anything else. It is hoped, too, that it may make clear the fact that meteorology in its every phase is physics pure or applied, and, therefore, in educational institutions should be either classed independently or else assigned to an important place in the department of physics. To allocate it to any other department would be to foredoom it to failure so far as any useful results are concerned, unless indeed that department had on its staff, for this work, a really competent physicist trained in a knowledge of the air and its ways.''

SWEET CLOVER HAY

KINGS in ancient times made their cupbearers taste the food as it was served them for fear that it was poisoned. Now the modern Northwest farmer who feeds sweet clover hay uses rabbits to test the hay for sweet clover poison before he feeds it to his valuable livestock.

Thousands of tons of sweet clover hay are harvested and fed on farms in the Northwest every year. Most of this hay is wholesome and nourishing but some is deadly poisonous. The baffling thing about it is that no one is able to tell by the appearance of the hay whether it is good or bad. The sweetest, best cured hay sometimes kills cattle when they eat it for a period of time.

''How can we protect our stock?'' asked farmers in many states. They had their hay analyzed and found nothing apparently wrong with it. But when they fed it to their cows for a month some of the animals died from hemorrhages both internal and external. The rest of the cows were weak and sick. The blood had lost its ability to coagulate and eventually passed through the vessel walls. By putting the sick animals on different hay some of them were saved.

The poisonous hay was tried on tame rabbits at the North Dakota Agricultural College and it was found that the rabbits reacted to the poison in an average of eleven days, much sooner than horses, cattle or sheep. So they recommended that rabbits be fed the same sweet clover hay as the stock. If the rabbits die there is little loss compared to a horse or cow. Then there is still plenty of time to switch the livestock to a different hay.

This method is recommended where the farmer has nothing but sweet clover hay to feed. If timothy or prairie hay is fed alternately with sweet clover the stock will show no symptoms of what is called sweet clover poisoning.

The persistent use of sweet clover in spite of the occasional poisoning from the hay is due to the facts that it grows better than any other legume in the Northwest, adds much nitrogen to the soil, and is an excellent pasture.

THE INFLUENCE OF DISEASE ON MAYA HISTORY

WHETHER disease or war or famine primarily caused the downfall of the great Maya empire has never been satisfactorily determined. Now an expedition of doctors and public health experts is setting out for Chichen Itza, capital city of this old American civilization, to find out,

if possible, whether it was disease that ruined it and if so, what diseases in particular.

The expedition is from the department of tropical medicine of the Harvard Medical School and School of Public Health and the Carnegie Institution of Washington. It is in charge of Dr. George C. Shattuck and includes Dr. Joseph C. Bequaert, entomologist; Dr. Jack H. Sandground, parasitologist; Dr. Kenneth Goodner, bacteriologist, and Byron L. Bennett, laboratory technician.

Nothing is now left of beautiful Chichen Itza but ruins. However, in some of the neighboring villages the population consists of practically pureblooded Maya Indians. A study of the diseases that afflict these people now may throw light on the diseases that their ancestors suffered from. Such is the object and hope of the present expedition.

The case for disease as the destroyer of this famous old civilization, which collapsed about the time of the Spanish conquest, is particularly good when one considers what a hotbed of disease Middle America has been, so far as our knowledge of it goes. The various fevers carried by parasites and insects may or may not have existed before the white man came to America. Of course, if they did, the Indians probably had acquired an immunity to them, in which case the downfall of the Mayas probably resulted from wars with other tribes.

Yellow fever and syphilis are now generally accepted as being of strictly American origin. On the other hand, smallpox, measles, malaria, hookworm, Asiatic cholera and trachoma, all of which have been very deadly for the red man, were introduced by the white man.

Whatever the cause, it is generally conceded that the Mayas were already greatly weakened before the Spaniards arrived. This accounts for their rapid downfall, the Spanish conquest.

PENSIONS FOR SCIENTISTS

THE bill granting a pension of $125 per month to Mrs. Mary Goldberger, widow of the late Dr. Joseph Goldberger, of the Public Health Service, has been favorably reported out of the House Pensions Committee, and is expected to be passed before the close of this congressional session.

The terms of the pension read, "in special recognition of the services of Dr. Goldberger in discovering the causes of pellagra and the means of its cure."

Mrs. Goldberger helped in the experiments, according to the report to be rendered by the committee, and allowed herself to be inoculated with what was at that time thought to be possibly pellagra bacteria. Partly as a result of her participation in the experiments, Dr. Goldberger was able to demonstrate that a dietary factor P–P is the cause of pellagra and that yeast will cure and prevent.

There seems little chance that Mrs. Goldberger will receive more than $125 per month, although Senator Reed Smoot, Republican, chairman of the Finance Committee in the Senate, has asked that a bill granting Mrs. Goldberger a pension be referred to his committee, and has stated that he will not let it go out for less than $150.

Representative Harold Knutson, Republican, chairman of the House Pensions Committee, however, has stated definitely that if such a bill comes over from the Senate it will be amended on the floor of the House and cut down to $125.

Just recently a bill which would have increased pensions of the widows of General George Gorgas and Major Walter Reed, army surgeons, was so amended on the floor of the House by Representative Knutson that the monthly allowance of $150 now being received by these women will be continued. Furthermore, Knutson so amended the bill that widows of other men who assisted in the yellow-fever work carried on by General Gorgas would receive monthly not $150, as provided by the bill, but $125.

In the House Pensions Committee there was considerable discussion relative to the suitability of granting a pension of $125 a month to the widow of Dr. Rudolph H. Von Ozdorf, late of the U. S. Public Health Service. Dr. Von Ozdorf's work had to do with yellow fever. The Surgeon-General, Dr. Hugh Cumming, has recommended the pension to Mrs. Von Ozdorf. No decision has been made relative to the Von Ozdorf pension, but it appears doubtful that a favorable report will be made on this bill.

ITEMS

THE word "decibel" is the name that has been adopted by the engineering staff of the Bell System to designate what has previously been known as the "transmission unit." It refers to the efficiency of telephone circuits. The new name was adopted after a conference between the representatives of the Bell System and the International Advisory Committee on Long Distance Telephony in Europe. The actual unit decided on was the "bel," named after Dr. Alexander Graham Bell, inventor of the telephone. The bel, however, is larger than is needed in practice, so the unit one tenth as large, and therefore called the decibel, has been adopted.

THE strategy used in the United States in warfare against crop-devouring insects will find application in Australia, as the result of the visit of W. B. Gurney, government entomologist of New South Wales, in America, following the Fourth International Congress of Entomology at Ithaca, N. Y., last summer. Mr. Gurney has visited experiment stations in a number of the western states, whose agricultural and horticultural problems are more or less similar to those of New South Wales. In Utah he found that the poisons used against the alfalfa caterpillar were like those employed in Australia, but that the American farmers were finding it possible to use a much higher concentration than had hitherto been considered safe in Australian practice. Western American attacks on the grasshopper plague also yielded useful information. Citrus growers at the Riverside Experiment Station in California are using Australian parasitic insects in their campaign against the mealybug. It is expected that these parasites will save California orchardists many thousands of dollars annually if they can be thoroughly established in their new home.