their talent would in the future undoubtedly be able to succeed in Germany."

In Baden, all Jewish physicians have been dismissed from the public health service and from the sickness insurance organization. In the hospitals they are permitted to treat only Jewish patients and to perform postmortem examinations only on Jewish patients who have died. A similar regulation has been established in Munich.

In Munich, S. Obendorfer and O. Neubauer requested a leave of absence from the Schwabing Hospital. The following Jewish physicians of the main office of public health in Berlin were given leave of absence: Professor Seligmann, Drs. Borinski, Cohn, Wolff, Nussbaum and others. The Jewish physician-in-chief of the cripple welfare station VII in Charlottenburg, Dr. Böhm, was replaced by Dr. Kniekamp of the orthopedic clinic.

The business director of the Berlin ambulatory clinic, Max Edel, and Dr. Friedeberger were placed under protective arrest.

The editor of the *Deutsches Aerzteblatt,* San.-Rat. Vollman, was given a leave of absence by the chairman of the Deutscher Aerztevereinsbund. Dr. K. Walder, of Potsdam, takes his place.

The Committee on Therapeutics of the German National Society of Physicians has made public a list of pharmaceutic preparations manufactured by concerns under Jewish ownership or control with the request that physicians in general do not prescribe such preparations.—*Journal of the American Medical Association.*

THE NATIONAL ACADEMY OF SCIENCES

ABSTRACTS OF PAPERS PRESENTED AT THE WASHINGTON MEETING. II.

(Continued from page 460)

The Woods Hole Oceanographic Institution: HENRY B. BIGELOW. A report is presented to the academy on the history and present activities of the Woods Hole Oceanographic Institution, giving the events leading to the establishment of the institution; reasons for the choice of Woods Hole for the site for its headquarters; descriptions of the laboratory, of the scientific equipment and of the research ship *Atlantis;* the general organization, staff, facilities for visiting investigators, cooperation with other institutions and plans for publication; the reasons for adopting a directed and coordinated program of research; and a summary of investigations now in progress and of the cruises of *Atlantis.*

The bearing of genetics on the theory of evolution: THOMAS HUNT MORGAN.

Phenomena associated with cosmic rays: W. F. G. SWANN (by invitation). Certain of the investigations in progress at the Bartol Research Foundation in the field of cosmic rays have been summarized by the author and in particular the following were described: (1) Observations of cosmic ray atomic disintegration made simultaneously by ionization methods and by counter methods. (2) Experiments dealing with the detection of individual cosmic rays by direct measurement of the ionization which they produce. These experiments lead to the determination of the ionization per centimeter of path in different gases. (3) Certain possibilities as to the origin of cosmic ray energies, particularly in relation to the origin of electronic cosmic ray energies as a result of electric fields produced by electromagnetic induction in the stars. (4) Observations on electrostatic deflection of secondary cosmic rays.

Cosmic ray intensities in the stratosphere: I. S. BOWEN and R. A. MILLIKAN. By sending up recording electroscopes, barographs and thermometers with the aid of sounding balloons in accordance with the technique which we first used in 1922, we have, during the past summer, made three successful flights, one of which reached an altitude at which the pressure had fallen to 16 millimeters of mercury—about 99% of the way to the top of the atmosphere—a second flight reached a height of 21 kilometers and the third the height of 16 kilometers. On two of these flights we obtained reliable records of the cosmic ray intensities as a function of altitude up to 18 kilometers, 92% of the way to the top by weight. At this altitude the cosmic ray intensities are approximately 100 times greater than at sea-level, and the intensity altitude curve is of such a shape as to indicate that the rays entering the atmosphere have not yet got into equilibrium with their secondaries. Three flights thus far made, two by ourselves and one by Regener, are in reasonably good agreement.

The penetrating power of cosmic rays as a function of altitude: R. A. MILLIKAN and H. V. NEHER. We have made accurate airplane observations with our new electroscopes, so designed as to give as accurate readings on moving platforms as in a laboratory, reaching altitudes above 29,000 feet. Up to this altitude we have taken readings both without lead shields and with a lead shield, and have thus obtained direct measurement of the penetrating power of the cosmic rays existing in different levels. These rays show a rapid softening with altitude, and essentially the same softening in temperate latitudes as in equatorial latitudes. The observed behavior seems to us to be best interpreted in terms of cosmic ray photon bands of widely differing penetrating power, the less penetrating bands coming into play at the higher altitudes.

The magneto-optic method of analysis and some recent applications: FRED ALLISON (introduced by Arthur L.

Day). A very brief outline is given of the magneto-optic method of analysis, the apparatus and its manipulation. The method detects compounds of both inorganic and organic substances. It has proved itself a tool of value in certain problems in qualitative and quantitative analysis, particularly those concerned with compounds existing in very small concentrations, the sensitivity being of the order of several parts in 10^{12} and the results being unaffected by the presence of foreign materials. Observations are made on minima of light intensity, the scale readings of which are characteristic of the compounds and are measures of differential time lags in the reaction of the compounds to the applied magnetic fields. The time lags are functions of the combining weights of both the cation and the anion. The method determines the number and the order of abundance of the isotopes of the cation but not of the anion. The scale readings are reproducible by the same and different observers (including the work during the past five years of some fifteen observers on the same and different sets of apparatus) to within about 3 mm, corresponding to 0.01 scale division and to a time lag of 10^{-11} sec., while quantitative results can be obtained within an error of 10 per cent. The more recent progress of the work is described, namely, the isotopic constitution of some of the radioactive elements; the isotopes of beryllium and zinc; a slight temperature effect on sensitivity; and investigations on the problem of mutual isotopic influence. Mention is made of a new quantitative technique developed by Professor E. R. Bishop and her students and also of the application of the method to a problem in photosynthesis by Dr. A. L. Sommer.

The discovery of the free positive electron: CARL D. ANDERSON (introduced by Robert A. Millikan). During a systematic study by means of a vertical Wilson cloud-chamber of the high energy particles associated with the cosmic radiation, evidence was uncovered which led to the striking conclusion that the free positive electron, heretofore unknown, was present among the cosmic-ray particles. By placing a horizontal lead plate across the center of the cloud-chamber for the purpose of studying the interaction of cosmic-ray particles with matter, photographs were obtained which could be interpreted logically only on the basis of the existence of a particle with positive charge of a magnitude less than twice that of the electron and probably exactly equal to it, and a mass comparable to that of the free negative electron. From the occurrence of the free positive electrons with groups of other tracks it is concluded that they result from disintegration of atomic nuclei. The term positron is suggested to denote the free positive electron when it occurs unassociated with a mass of atomic magnitude. The cloud-chamber, planned in the summer of 1930 by Professor R. A. Millikan and the writer, operates in a uniform magnetic field up to 18,000 gauss. Exposures are automatically taken at the rate of one in 14 seconds. Out of a total of about 25,000 exposures, 1,450 photographs of cosmic-ray tracks have been obtained, which have yielded the following facts. Particles of both positive and negative charge occur in about equal numbers. Their energies range from above a billion volts in a few cases down to energies of a few million volts and less. Groups of associated tracks of both positive and negative particles occur (in our photographs as many as 12 tracks on one photograph) indicating the disintegration of atomic nuclei by the cosmic-radiation; the detailed mechanics of the absorption of the cosmic-radiation is very complex and at present not clearly understood. P. M. S. Blackett and G. Ochialini, using an automatic (tube-counter controlled) cloud-chamber, have obtained additional evidence for the existence of the free positive electron.

Semi-conductors and their electrical properties: R. H. FOWLER. By invitation.

Perfect quality and auditory perspective in the transmission and reproduction of music: F. B. JEWETT. [Printed in SCIENCE for May 12.]

Radioactivity and the light nuclei: R. M. LANGER and R. W. RAITT (introduced by Robert A. Millikan). The fact that the beryllium atom is unstable and disintegrates spontaneously is now established on the basis of the following evidence: (1) Purified Be metal in an ionization chamber produces a current which is about two times as great as that supplied by the thorium family contamination and a hundred times as great as that of the radium family contamination. The Ra and Th measurements were made with the double chamber emanation method capable of detecting an alpha activity one hundred times smaller than that shown by the Be. (2) The range of the particles, assumed to be alpha rays, is about one centimeter, according to Al foil measurements. This range is decidedly shorter than that of any possible contamination. (3) The helium content of beryllium minerals is out of proportion to the uranium and thorium content, but is quite consistent with the rate of decomposition which we have estimated with ionization chamber methods. (4) The excess in mass of Be_9 over the mass of two helium atoms and a neutron indicates on very general grounds that it is unstable. If the current theory of alpha-particle disintegration is applied to the case of Be_9, one finds a decay rate over 10^{30} times larger than that observed. However, this theory is not a general quantum mechanical deduction but depends on a model which pictures the nucleus as a composite of alpha particles. Apparently we must conclude that the Be nucleus is not composed of alpha particles. This is quite in accord with the modern theory of nuclear structure, which has had considerable success with the hypothesis that the structural units of the nucleus are the proton and the neutron.

An ionization spectrometer for long wave-length x-rays: F. K. RICHTMYER and S. KAUFMAN. Much of our knowledge of the x-ray spectrum in the region of wave-lengths longer than 1.5 Angstroms comes from photographic measurements. However accurate may be the values of the wave-lengths of spectrum lines determined by photographic means, such measurements are not very trustworthy in determining the shapes and relative intensities

of lines and in measurements which involve the determination of x-ray energy. Because of the many problems awaiting study in the long wave-length x-ray region, we have adapted the Siegbahn high-vacuum spectrometer for ionization measurements, using the usual single crystal method. The easily attainable resolving power is such as to give observed widths of the K α lines of Cu(29) only a few per cent. wider than when measured by a two-crystal instrument. There seems to be no difficulty in using this instrument to make ionization-chamber measurements up to 5 or 6 Angstroms, or longer.

A test of the "momentum transfer" theory of accommodation coefficients of ions at cathodes: K. T. COMPTON and E. S. LAMAR. In a recent paper, read before the National Academy of Sciences, it was suggested that the accommodation coefficient for positive gas ions on a metal cathode should be less than unity only if the mass of the metal atom exceeds that of the ion. In order to test this hypothesis, experiments already reported for helium ions on molybdenum have been continued for argon ions on molybdenum and on aluminium. The cathode to be studied was the molybdenum or aluminium bob of a glass pendulum, whose deflection gave a measure of the pressure acting, and was immersed in the positive column of a low voltage argon arc. The pressures on the cathode were due to the recoil of those ions which retain some of their kinetic energy after neutralization and to radiometric effects resulting from heating of the cathode by ion bombardment. From an analysis of the data, it was possible to compute an accommodation coefficient for the positive ions. The results indicate an accommodation coefficient of about .79 for argon ions on molybdenum, and an accommodation coefficient of unity on aluminium.

Evidence that acidosis is not caused by acids: YANDELL HENDERSON and LEON A. GREENBERG. In recent years acidosis has been one of the most largely discussed topics in relation to illness. This condition, or group of conditions, is important. But the explanation that is now generally accepted is shown by the investigations to be reported in this communication to be erroneous. It is now supposed that the condition called acidosis arises from an excessive formation of acids in the body. This increased formation of acids is supposed to explain the great decrease of sodium bicarbonate and other alkalies in the blood. The acid chiefly concerned is lactic acid. The amount of this organic acid is increased under severe deficiency of oxygen, as in carbon monoxide poisoning, in which an asphyxial "acidosis" develops. It has recently been shown by Lundsgaard in Denmark that animals which are given a small dose of the drug monoiodoacetic acid are rendered incapable of producing lactic acid. Accordingly, in the investigations to be reported to the academy animals were first treated with this drug, and then subjected to such conditions (deficiency of oxygen) as have been found to induce a state of so-called acidosis. The result was that all the features of that state, particularly the diminution of bicarbonates in the blood, were developed, but without the formation of any increased amount of lactic acid. The conclusion that the state called "acidosis" is not due to intoxication by excessive formation of acid in the body is in accord with the fact that the administration of alkalies to patients with acidosis, as in diabetes, has not been found beneficial and has been generally abandoned. The theory that "acidosis" is intoxication by acid is an apparently logical deduction from the conception now prevailing as to the nature of the acid base equilibrium of the blood. It is, however, definitely contradicted by facts, and some other theory will have to be developed.

Cellular reactions to lipoids from acid-fast organisms: FLORENCE R. SABIN and KENNETH C. SMITHBURN. The lipoids in acid-fast organisms can be separated into three classes, phosphatides, fatty acids and wax-like materials. The phosphatides are an important factor in the production of the lesions of tuberculosis. They are readily dispersed in water, a property which makes it easy to test their biological reactions. They are phagocytized by monocytes which, in dealing with them, become epithelioid cells. The fatty acids, represented largely in the acetone-soluble material, stimulate all types of connective tissue cells, cause vascular dilatation and hemorrhage and induce adhesions. The wax-like materials have long been considered of great importance because they are responsible for the acid-fastness of the organisms. The wax-like material of the human tubercle bacillus is an alcohol, $C_{94}H_{188}O_4$; the corresponding material from an acid-fast organism isolated from a case of leprosy is a glyceride. These materials can not be wet with water, a property which may account for the fact that the cells deal with them in a manner different from phagocytosis. The purified substances injected in the form of a dry powder cause a multiplication of young connective tissue cells around the particles. These cells are simpler than monocytes and show no signs of being able to phagocytize the wax-like material, but rather they fuse to make foreign body giant cells to surround it. There are then signs of a change in the material which, at first opaque and granular, becomes globular and translucent. If the phosphatide has not been completely removed from the material injected, the monocytes are able to separate it from the wax. These cells then show signs of phagocytosis and become epithelioid cells. Since a single lipoidal substance gives only one type of cellular reaction, the biological tests offer a check on the degree of separation of the lipoids. Although foreign body giant cells occur in tuberculosis, it is probable that they are an accessory phenomenon in the progress of the disease and that the wax-like materials by which they are produced may be classified as biologically inert.

(*To be concluded*)

BOOKS RECEIVED

JOCHELSON, WALDEMAR. *History, Ethnology and Anthropology of the Aleut.* Pp. v + 91. 27 figures. Carnegie Institution of Washington.

NEAVE, S. A. and others. *History of the Entomological Society of London, 1833–1933.* Pp. xlvi + 224. The Society. 10s. 6d.