various provinces in the islands where those suffering from mild forms of leprosy may be treated.

THE board of directors of the Cottage Hospital, Santa Barbara, announce gifts amounting to more than half a million dollars for research work. Edward L. Harkness, George O. Knapp and Max C. Fleischmann each gave $200,000, Edward Lowe, $5,000, and E. Palmer Gavitt, a new building to be devoted to research. The gifts of Mr. Harkness and Mr. Knapp are to be invested and the income only used for research. The Fleischmann donation, after providing for certain improvements to buildings, will be invested and only the income used.

## UNIVERSITY AND EDUCATIONAL NOTES

DARTMOUTH COLLEGE has received a bequest of $1,619,550 from the estate of the late Edwin W. Sanborn.

BY the provisions of the will of the late George Warren Brown, a shoe manufacturer, the residue of his estate, amounting to not less than $630,000, is given to Washington University, St. Louis.

GIFTS to the University of Chicago announced by the board of trustees are $25,000 from the Milbank Fund, New York, for research on infantile paralysis, under the direction of Dr. Edwin O. Jordan and Dr. Ludvig Hektoen; $449.60 from Dr. Lester E. Frankenthal to cover purchases for the medical library, and $5,000 from Mr. Frederick Bode and $1,000 from Mr. Herman H. Hettler for the Frank Billings Medical Clinic Fund.

DR. E. D. BALL, formerly director of research work in the U. S. Department of Agriculture and assistant secretary of agriculture, recently in charge of celery insect investigations for the Florida State Plant Board, has been appointed dean of the college of agriculture and director of the agricultural experiment station at the University of Arizona. He will assume his new work about October 1. Professor J. J. Thornber, at his own request, has been transferred to his old position of professor of botany and botanist in the experiment station. He will continue his research work on the Flora of Arizona and teach the courses in systematic botany.

PROFESSOR JOSEPH EUGENE ROWE has resigned his position as head of the department of mathematics and director of extension at the College of William and Mary to accept the presidency of the Clarkson Memorial Institute of Technology at Potsdam, New York.

DR. ARTHUR THOMPSON EVANS, since 1920 professor of botany and plant pathology at South Dakota State College, has been appointed professor of botany and head of the department at Miami University.

DR. W. H. BAIR, of Purdue University, has been appointed professor and head of the department of physics at Clarkson College.

DR. H. A. BENDER, of the University of Illinois, has been appointed assistant professor of mathematics at the Municipal University of Akron.

## DISCUSSION

### THE DISCOVERY OF LIVING MICRO-ORGANISMS IN ANCIENT ROCKS

ABOUT one and one half years ago the writer began some experiments which he has carried on since, as time permitted, to determine whether or not living spores of bacteria or fungi or resting bodies of other micro-organisms might still exist inside of ancient rocks. The basis of my decision to start upon such an apparently hopeless quest will be given in a future detailed report on the results obtained. It suffices for the purposes of this preliminary note to state in general terms the startling fact that I have discovered living organisms in a Pre-Cambrian rock from the Algonkian in Canada and in one from the Grand Canyon of the Colorado. I have also discovered other types of micro-organisms in a Pliocene rock which derives from a depth of several hundred feet from which it has recently been uncovered. It is impossible in this note to furnish details of the technique employed, but it may be said that drastic sterilization measures for the outside of the rocks studied were employed. While some of the organisms which appeared in the cultures are doubtless derived from the free air which had momentary access to the rock in the process of the technique employed, certain organisms were found which occur in every plate culture made with the rocks examined and which are of a strikingly different type from any which are usually found in plates made with soils or rocks. These organisms make a very sparse growth on media which support excellent growth of other organisms and seem to belong to the interior of the rocks studied. At least one and perhaps two such singular types of organisms were found which possess many characters of the Actinomyces group. They are spore-bearing rods occurring in chains, and I have become convinced that they are indigenous to the rocks in the spore

form. The question of whether they have relatively recently gained access to the interior of the rock or have always been there remains to be determined by further investigation. Detailed studies with improved technique are now in progress to answer the numerous questions which have arisen as a result of my discovery. Many types of rock will be studied and especially specimens derived from great depths where surface contacts could have played no part in furnishing the results noted. The Pre-Cambrian specimens thus far used were surface samples, but the Pliocene specimen was a deep sample as explained above. The organisms in the Pre-Cambrian rocks and those in the Pliocene rocks are quite different from one another. No algae of any kind, and no nitrifying bacteria have ever been found even in cultures maintained for several months or more.

It need hardly be said that the significance of the facts stated above is extremely great from the physiological standpoint and also from the evolutionary standpoint.

I am indebted for rock specimens to Dr. David White, of the U. S. Geological Survey, and to Dr. G. D. Louderback, of the University of California. I am glad to acknowledge also my obligation for assistance in some of the culture work to Mr. Herbert Copeland, of the Sacramento Junior College.

CHAS. B. LIPMAN

UNIVERSITY OF CALIFORNIA

## NOTE ON THE RADIAL MAGNETIC GRADIENT OF THE SUN

DR. HALE and his collaborators at Mt. Wilson Observatory have studied the general magnetic field of the sun by spectroscopic measurements of the Zeeman effect. These researches established the fact that at any given level the distribution of the magnetic field was very similar to the terrestrial distribution. A study of the radial distribution showed that the field decreased radially several thousand times as fast as would be expected if the sun were uniformly magnetized. This rapid radial variation has made it very difficult to obtain a consistent view of the general magnetic fields of the sun and earth.

In a recent paper[1] the writer pointed out that under certain conditions of ionization, temperature, pressure and magnetic field, a true diamagnetic effect exists which is due to the motion of ions or electrons spiralling about an impressed magnetic field. On the earth the conditions in the Kennelly-Heaviside layer satisfy the requirements and it was shown that the diamagnetic effect of this layer would account for the solar component of the diurnal variation of terrestrial magnetism.

[1] *Physical Review*, Vol. 32, p. 133 (1928).

Such data as are now available from spectroscopic studies indicate quite definitely that conditions on the sun at altitudes corresponding to regions of large radial magnetic gradient are precisely those most favorable for a large diamagnetic effect. Preliminary calculations appear to show that the intensity of magnetization of the diamagnetic layer of the sun is quite ample to account for the observed gradient. Moreover, the type of variation of the diamagnetic effect with the altitude above the surface of the sun is of such a nature that it appears quite possible that the magnetic field at the surface proper is much greater than has been generally accepted. This possibility is theoretically of great importance since it may shed considerable light on the origin of the magnetic field. A quantitative and more detailed study of the effect is now being undertaken.

NAVAL RESEARCH LABORATORY, ANACOSTIA, D. C. ROSS GUNN

## THE SO-CALLED SIEVE OF ERATOSTHENES

FEW mathematical developments due to the ancient Greeks are now more widely known or more frequently referred to than the so-called Sieve of Eratosthenes for finding all the prime numbers which do not exceed a given number $n$. Such references appear sometimes even in the somewhat popular literature as a result of the fact that the use of the method represented by this sieve involves only very elementary mathematical considerations. The method may be illustrated by writing the natural numbers in order of magnitude, beginning with 2 and ending with the arbitrary number $n$, and then canceling every second number after 2 in the list. After this has been accomplished every third number of those which follow 3 is canceled and then every fifth number of those which follow 5. In general, after the multiples of any number $k$ have been canceled the multiples of the first uncanceled number among those which follow $k$ are canceled. The numbers which remain uncanceled after completing these operations constitute the list of the prime numbers which do not exceed $n$.

In 1911 E. Hoppe directed attention in his "Mathematik und Astronomie," page 284, to the fact that this method was known to the Greeks long before the time of Eratosthenes, and hence that the common term Sieve of Eratosthenes is actually a misnomer. Before this time all writers who referred to this subject seem to have credited Eratosthenes with the discovery of this method, which is the only one found in the mathematical literature of the ancients for determining all the prime numbers which do not exceed a given number. In fact, nearly all the writers who referred to this subject since 1911 have also given