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

credit either explicitly or implicitly to Eratosthenes for the discovery of the method. In particular, this was done in the two histories of mathematics recently published in our country as well as in the excellent work of reference in two volumes on the "History of Greek Mathematics," by T. L. Heath, 1921. It was, however, not done in the extensively revised second edition of the "Geschichte der Elementar-Mathematik" in seven volumes by J. Tropfke, 1921–1924.

It seems desirable to direct attention to this matter in a widely read periodical in order to facilitate the correction of such a widespread error, especially since this correction implies greater harmony in the picture of the mathematical developments due to the Greeks prior to the time of Euclid, about 300 B. C. The given method naturally suggests itself to any one who thinks seriously about the problem of determining all the prime numbers which do not exceed a given limit, and it has probably been rediscovered independently by thousands of students of mathematics. In view of the high mathematical attainments of the Greeks at the time of Euclid one would naturally be inclined to assume that this method could not have escaped being noted by the predecessors of Euclid, and it is therefore interesting to find that such an assumption is now supported by substantial historical evidence. The fact that no explicit reference to the division of the natural numbers into the two classes now known as prime and composite has as yet been found in the literature of those peoples whose civilization preceded that of the Greeks is a striking comment on their mathematical attainments.

G. A. MILLER
UNIVERSITY OF ILLINOIS

ECTOGONY OR METAXENIA?

IN an article entitled "Xenia and Other Influences Following Fertilization"[1] Waller discussed fully the nature of xenia and the proper use of the term and at the same time proposed the word "ectogony" as a suitable term to describe those influences which are due to the developing zygote. Recently Swingle has proposed the term "metaxenia" for "the direct effect of pollen on the tissues of the mother plant outside the embryo and endosperm." This term is open to many objections, since the word "xenia" plainly has come to mean the appearance of ordinary dominant heredity in the endosperm and not the effect of some material which might ooze out of the zygote nor of an irritation produced by its development. The influence exerted on the mother by the developing embryo is a wide-spread phenomenon in both plants and animals and is not at all confined to cases where a xeniophyte is present. Even in the Anthophyta a considerable part of the species have so little endosperm that it can not have much if any influence on the surrounding sporophyte tissues. Any effect that is noticed in such cases presumably comes from the zygote and is thus not "metaxenia." Definite effects from the outside on living tissues are abundant outside of the reproductive processes also, ranging all the way from effects of parasites and gall insects to tight shoes, which presumably produce corns without emitting a special "corn hormone." The term "metaxenia" would, of course, also be inappropriate if applied to gymnosperms and especially in such cases as the higher liverworts where the perigynium or so-called perianth seldom reaches its normal form if fertilization of the archegonium does not take place.

Dr. Waller's term, ectogony, is correct and appropriate from every point of view, since it simply implies an effect following fertilization and thus can be used as appropriately for the effect in a liverwort gametophyte as for one in an angiospermous sporophyte, while the term metaxenia would manifestly be confusing and even absurd if applied to the first case.

If differential effects are present through a specific influence brought in with the paternal heredity they can be designated as differential ectogony. Since this effect is, no doubt, certain to receive considerable attention in the near future, the term ectogony should by all means be accepted by both botanists and zoologists.

JOHN H. SCHAFFNER
DEPARTMENT OF BOTANY,
OHIO STATE UNIVERSITY

[1] *Ohio Jour. Sci.*, 17: 273–284, 1917.

REPORTS

COMMITTEE OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

AT the meeting of the board of directors of the American Institute of Electrical Engineers, held in New York on August 7, President Schuchardt announced the committee appointments for the administrative year commencing August 1, 1928. The chairmen of the committees appointed are as follows:

GENERAL COMMITTEES

Executive: R. F. Schuchardt, electrical engineer, Commonwealth Edison Company, Chicago, Ill.

Finance: E. B. Meyer, chief engineer, Public Service Production Company, Newark, N. J.

Meetings and Papers: H. P. Charlesworth, plant engineer, American Telephone and Telegraph Company, New York.