able observational data, largely because of delays caused by the late war, were still not as extensive as they are now. The 1920 results had been distinctly designated as *preliminary* ones, which fact Dr. Sanford has apparently overlooked. However, the results of the computations to date, though differing somewhat in detail from those for 1920, support the general conclusions previously drawn. The non-potential system besides being unsymmetrical about the axis of rotation is also found to be unsymmetrical about the equator, hence we must not expect, as did Dr. Sanford, that the computations of magnetic line-integrals along corresponding parallels of latitude on opposite sides of the equator should give identical results. The combination of results for corresponding parallels, north and south, was made with the view of obtaining approximately the system symmetrical about the equator. The difficulties encountered in finding an adequate physical explanation of non-potential effects are minor as compared with those which arise when attempting to explain the origin of the earth's magnetic field in the manner Dr. Sanford has attempted.

LOUIS A. BAUER

WASHINGTON, D. C.

CAVERNS IN THE GUADALUPE MOUNTAIN RANGE

IT is evident from the note on the "Carlsbad Cavern in New Mexico" in SCIENCE for December 14, 1923, that Dr. Lee and Mr. Holley are not well acquainted with the early history of that cavern.

The writer met at Carsbad, New Mexico, in the autumn of 1914, a Mr. Borden, then superintendent for the Los Angeles fertilizer concern then working the guano deposits of the Carlsbad cavern. Mr. Borden described to the writer an exploring trip which he had made in the cave which occupied the time from early one Saturday until the afternoon of the following Monday, the work of exploration being continuous during that interval of time except for the intervals necessary for sleeping and eating.

In the summer of 1918, Dr. N. F. Drake, then state geologist of Arkansas and professor of geology, University of Arkansas, and the writer explored the cavern for a distance of about three fourths of a mile from its main entrance. At that time they were informed that the then superintendent in charge of the guano extraction had succeeded in reaching a distance estimated to be ten miles from the mouth of the cavern, but had not found its end.

There are other notable cavern in this same Guadalupe mountain range. One is found in Slaughter Canyon about two miles from its mouth and was visited by us. In its vicinity there were formerly other great caverns later filled in by travertine deposits. At the time of our examination of the region two wells were being drilled on the eastern flanks of the Guadalupe Mountains. One of them encountered a cavern from which a continuous current of cold air issued. The other well was six miles distant from the first. The driller had his hat sucked down the hole when the drill broke into a cavern in this well. Another large cavern was reported to have been found near where the Carlsbad-Queen road crosses the summit of the Guadalupe Mountains.

Other notable caverns occur in the San Andreas limestone of the Sacramento Mountains, the next range north of the Guadalupe. Three days after the summer rains of 1918 began on the summit of the Sacramento Mountains in the vicinity of Cloudcroft wells in the vicinity of Roswell, some 70 miles distant, which previously it had been necessary to pump, began to flow out at the surface. It is likely that the water derived from the rainfall in the mountain summits reached the wells 70 miles away in three days and travelled a considerable part of the distance through underground caverns.

CHARLES LAWRENCE BAKER

THE FLASHING OF FIREFLIES

THE articles in SCIENCE on "The synchronous flashing of fireflies"[1] might lead one to infer that knowledge of this peculiar phenomenon is a recent contribution to science. I have in my possession a textbook studied by my grandfather. This book, called "An Easy Grammar of Geography," was published in Philadelphia in the year 1810. The author is Reverend J. Goldsmith. May I quote paragraph 187 on Siam?

> The elephants of Siam are distinguished for sagacity and beauty. The trees on the banks of the Meinam River are finely illuminated with swarms of fire-flies, which *emit and conceal their light as uniformly as if it proceeded from a machine of the most exact contrivance.*

The italics are mine.

HESTER L. VAN VLECK

MADISON, WISCONSIN

JOSEPH LEIDY

DR. OSBORN, in his address at the Leidy Centenary (SCIENCE, Feb. 22, 1924), referred to Dr. Leidy's breadth of knowledge. This was shown in his ready comments upon the varied papers read before the Academy of Natural Science in Philadelphia. I recall one evening in the early eighties one of the members read an elaborately prepared paper upon the origin of the name of the arbor vitae, taking the accounts of the early Canadian pioneers, and their use of the arbor vitae branches for their beds, and of the

[1] SCIENCE, Vol. LIII, p. 485 (1921); LIX, 163 (1924).

health-giving qualities of the tree, as possibly having suggested to them the name arbor vitae, tree of life. When the speaker had sat down, Dr. Leidy, in his quiet manner, said that such and such a Latin physiology published some time in 1600, refers to a small filament at the base of the brain, which from its tree-like form was called arbor vitae, the tree of life, and that he had always assumed that the great similarity of this filament to the form of the arbor vitae had led to the tree's name. Thus it was that Leidy from his broad and profound knowledge would bring out some such point which the writer of an elaborate paper had overlooked. In this case the writer being *only* a botanist was not aware of the filament at the base of the brain.

R. C. CANBY

EXHIBITION OF THE ROYAL PHOTOGRAPHIC SOCIETY

THE Royal Photographic Society of Great Britain are holding their sixty-ninth annual exhibition in September and October of this year. This is the most representative exhibition of photographic work in the world, and the section sent by American scientific men heretofore has sufficiently demonstrated the place held by this country in applied photography. It is very desirable that American scientific photography should be equally well represented in 1924, and, in order to enable this to be done with as little difficulty as possible, I have arranged to collect and forward American work intended for the scientific section.

This work should consist of prints showing the use of photography for scientific purposes and its application to spectroscopy, astronomy, radiography, biology, etc. Photographs should reach me not later than Saturday, June 14. They should be mounted but not framed. There are no fees.

I should be glad if any worker who is able to send photographs will communicate with me as soon as possible so that I may arrange for the receiving and entry of the exhibit.

A. J. NEWTON

EASTMAN KODAK COMPANY,
ROCHESTER, N. Y.

SCIENTIFIC BOOKS

A Comprehensive Treatise on Inorganic and Theoretical Chemistry. Vol. IV.—Ra and Ac Families, Be, Mg, Zn, Cd, Hg. By J. W. MELLOR. 1074 pages. Longmans, Green and Co., London, 1923. Price, $20.00.

VOLUME IV of the "Comprehensive Treatise" represents an important addition to the volumes already published. (For review of Vols. I–III, see SCIENCE, Vol. 58, No. 1500, (1923)). This is particularly true because of the fact that the treatment of the radioactive elements is expanded to include a discussion of the modern theories of atomic structure and valence, which were omitted entirely from the chapters on valence and similar subjects in Vol. I. The first chapter deals with the structure of matter, treated broadly and historically; the second treats the radioactive elements; and the third is entitled "The Architecture of the Atom." A very considerable amount of data is given, and the references are full and apparently up to date. The author makes no attempt to correlate conflicting theories, a task which is, after all, better left to monographs on the subject. The student will find in these chapters much to interest and stimulate him.

The remaining chapters are devoted to an exhaustive study of the elements listed on the title page. Beryllium and magnesium are treated separately; zinc and cadmium together; mercury separately. The method of treatment is similar to that employed in the earlier volumes. Each element is taken from the most remote reference to it in literature, and is brought down to quite recent dates, with abbreviated statements of apparently almost all the work that may have been done, and with very full references. In the opinion of the reviewer the book would have been improved if a somewhat more critical attitude had been taken, more space being given to apparently reliable data, and less to some of the older data. Nevertheless, these abbreviated statements must arouse the interest and curiosity of the student perhaps even *because* of their failure to give full information, and the frequent absence of logical sequence. Thus, " . . . , the electric sparking of cadmium under liquid argon produces a voluminous olive-green powder, which . . . is thought to be a nitride. According to O. Sackur, the catalytic activity of the following metals on the combustion of hydrogen decreases in order Ag, Pt, Cu, Pb, Zn, Ni, Sn, Fe, Cr." Altogether, Volume IV maintains very satisfactorily the standard set by the earlier volumes.

GRAHAM EDGAR

UNIVERSITY, VIRGINIA

SPECIAL ARTICLES

A SIMPLE METHOD FOR QUANTITATIVE STUDIES OF IONIZATION PHENOMENA IN GASES

DIRECT measurements of the free paths of electrons in gases and a great deal of other quantitative information regarding the mechanism of ionization may be obtained from a simple type of tube which contains no grid. A straight tungsten *filament, f,* is mounted