The solid state of the coal is analogous to the similar state of the slate in the small quarry near Siegfried, where workable slate is quarried immediately under glacial gravel. Both are on the line of farthest ice extension—of earliest extension—and speak of its recency.

EDWARD H. WILLIAMS, JR.

LEHIGH UNIVERSITY,
May 11, 1896.

A METEOR.

TO THE EDITOR OF SCIENCE: A few days ago I observed a meteor of such size as apparently to merit record. At 7:30 p. m. of May 9th the object was first seen in the twilight descending in a straight course toward the northwest at an angle of about 20° with the plane of the horizon, moving rather slowly and shining brilliantly with a greenish light. It very soon after burst into numerous fragments, the position at rupture bearing about 30° west of south from the end of the Norfolk and Washington steamboat pier at Alexandria, Va., and being at an elevation of about 10° above the horizon.

THOS. L. CASEY.

X-RAY PHOTOGRAPHY BY MEANS OF THE CAMERA.

I HAVE recently succeeded in producing X-ray pictures, reducing them in their linear dimensions to one-fifth the size of the object. The method used was to produce on a tungstate of calcium screen the shadows of the object, the screen with its contents being then photographed by means of the camera in the ordinary way.

The photographs thus obtained reveal the details more clearly than the eye can see them on the screen, and, in fact, reveal details not visible to the eye.

There is some advantage in this method over that usually employed. The photographic plates may be made of reasonable size for large objects. The pictures gain somewhat in definition, as penumbral effects are reduced. The disadvantages are the difficulty of accurately focussing the faint images on the ground glass of the camera, and the longer time of exposure needed to bring out the picture. I think it probable that these difficulties may not be very serious to those possessing the best facilities for making further study in this direction.

FRANCIS E. NIPHER.

WASHINGTON UNIVERSITY,
ST. LOUIS, May 11, 1896.

THE ROTATING CATHODE.

SINCE writing an account of my observation on the rotation of the cathode disc (p. 750) it has occurred to me that a circular or elliptical vibration of the cathode wire might possibly account for the observed effect. The tube on which the observation was made has been cracked, and now ceases to give the result, nor am I able to impart rotation in one direction only to the disc by familiar mechanical means that could have existed in the tube. The observation is one of such great interest that I think I should suggest the above possible explanation, which had not sooner occurred to me, in order to prevent experimenters from going on what may be a wild-goose chase. FRANCIS E. NIPHER.

MAY 13.

SCIENTIFIC LITERATURE.

The Principles of Museum Administration. By G. BROWN GOODE, LL. D. (Reprinted from the Annual Report of the Museum Association, 1895.) York, 1895. Pp. 73.

"The degree of civilization to which any nation, city, or province has attained, is best shown by the character of its public museums and the liberality with which they are maintained." The above sentence—the concluding sentence of the paper before us—sets forth in striking phrase the importance of the subject with which the paper deals. Superlatives are in general things which a cautious man views with suspicion, and it may well be doubted whether any one index of the state of civilization can be said to be the best. But that museums afford one of the most trustworthy indices of the progress of civilization cannot be doubted. The indication which they afford is decidedly flattering to our generation; for this is certainly preëminently the age of museums. In the number of museums, large and small, general and special, in the munificence with which they are sustained and endowed, in the knowledge,

taste and skill displayed in their housing and installation, the latter half, and especially the last quarter, of our century marks a prodigious advance.

It is rather remarkable that, while so much of thought and labor has been expended upon museums, and so much has been written upon various special questions connected with their administration, hitherto no attempt has been made to give a compact, systematic and comprehensive formulation of the principles of museum administration. That desideratum is admirably supplied by Dr. Goode's little treatise. No more competent hand could have essayed the task. Graduated from Wesleyan University a quarter of a century ago, Dr. Goode served an apprenticeship of a few years in the administration of the little museum of that institution, and displayed from the beginning the scientific and administrative ability which was soon to find an adequate field in the National Museum. To his genius is largely due the rapid advance in methods of installation, labeling and general administration, which has given the United States National Museum a rank among the foremost, not only in the wealth of its material, but also in the excellence of its arrangement. In the study of museum administration, Dr. Goode has made himself familiar with most of the great museums of the world, and with many of the most important of the great expositions of the last quarter-century. On this subject, therefore, he speaks 'as one having authority.'

Within the compass of about three score and ten pages he has formulated the general principles of the relation of the museum to other institutions and to the community, the classification of museums, the preservation, preparation, installation, labeling and use of the materials of which the museum is the custodian. These principles are often stated in the sententious form of aphorisms, many of which deserve to become maxims for the guidance of museum workers. The author finds room, however, to illustrate the subject by brief but exceedingly interesting notes on many of the leading museums.

The sections of the paper treating of the general relations and classification of museums have been published in SCIENCE, August 23, 1895, and January 31, 1896. It is therefore superfluous to give any criticism on those portions of the work. The more technical parts of the work, referring to the treatment of specimens, labeling, and installation in general, are of special interest to museum workers.

In the section on specimens, emphasis is placed on the idea of the limitation of every museum to a definite plan and scope. The authorities of a museum, instead of collecting with a dragnet all objects that may be of interest to anyone, should decline to receive specimens or collections of specimens not germane to their plan. In the interest of this limitation and specialization, the policy is advocated of extensive transfers of material from one museum to another by exchange or gift. The doctrine is undoubtedly a sound one, though it is easy to see that, in the case of small museums with limited endowments, dependent for their maintenance and progress on the good will of various benefactors, the doctrine cannot be rigorously put in practice. In the same spirit it is urged that not all the specimens belonging to any museum should be exhibited. The exhibition series especially should be made to conform to a definite plan. The series should be symmetrical, and superfluities should be rigorously excluded. This rule, unquestionably sound in principle, will naturally be subject to some modification in practice. The distinction in purpose and in administration between the exhibition series and the study series is admirably formulated.

The subject of labels is treated very fully and satisfactorily. Emphasis is placed on the value, in the exhibition series, of somewhat elaborate descriptive labels—a means of popular instruction which is admirably exemplified in the National Museum.

We are tempted to copy a few of the pithy aphorisms in which the paper abounds.

"A finished museum is a dead museum."

"It is the duty of every museum to be preeminent in at least one specialty."

"A museum officer or employé should never be the possessor of a private collection."

"An efficient educational museum may be described as a collection of instructive labels, each illustrated by a well-selected specimen."

"To complete a series, any specimen is better than none."

"A copy, model or picture of a good thing is often more useful than an actual specimen of a poor one."

"Restorations made in such a manner that the part restored is not at once distinguishable are unpardonable."

"A label (in the exhibition series) should answer all the questions which are likely to arise in the minds of the persons examining the object to which it is attached."

Dr. Goode's critical notes on various museums, introduced as illustrations of the principles discussed, are so interesting as to suggest that the author would render the scientific public a further service, if he could find time to expand this little pamphlet into a moderate-sized treatise on the museums of the world and their administration.

WM. NORTH RICE.

Spectrum Analysis. DR. JOHN LANDAUER. Brunswick, Fred. Vieweg & Sohn. 1896.

This handbook of some 175 pages is substantially a reprint of the author's article upon Spectrum Analysis, which appeared in the 'Handbook of Chemistry' of Drs. Fehling and Hell. Though now somewhat enlarged, it still treats more particuiarly of the chemical applications of the subject. A brief historical introduction, covering the time from Melville to the present day, is followed by tolerably complete descriptions of instruments for obtaining and examining the various spectra. No attempt is made to develop the theory of any of the instruments considered. The conditions affecting the character of emission and absorption spectra, and the empirical formulæ which have been suggested to express the relation between the lines and groups in the spectra of different elements are also touched upon, and then follow tables of wave-lengths of various metalic spectra. These embody the recent work of Kayser & Runge, Rowland and others, and all wave-lengths are expressed in Rowland's scale. Rowland's (1892) table of solar wave-lengths is also given, and the principal astronomical applications of spectroscopy are briefly treated in some fifteen pages at their end. Throughout the book copious references are given to original papers, etc., the whole forming a fairly complete resumé. The English student will find the German unusually clear and concise.

C. E. M.

SCIENTIFIC JOURNALS.

JOURNAL OF GEOLOGY, APRIL–MAY.

The Magmatic Alteration of Hornblende and Biotite: By HENRY S. WASHINGTON.

It is well known to petrographers that these minerals, under some conditions, tend to alter into a granular mass of augite and magnetite. The causes of this alteration are here discussed. After reviewing current theories, including that of Zirkel, the author proceeds to develop his own views. He finds that this alteration is most common in the intermediate group of volcanic rocks. He also finds it rare in the plutonic rocks. From the latter fact he infers that conditions of slight pressure are favorable to the changes. The theory proposed is that hornblende and biotite crystals are formed at an early (intratelluric) stage of eruption under conditions of great pressure, and probably in presence of mineralizers. As they approach the surface in the course of an eruption the pressure diminishes, leaving the temperature still high until a point is reached where the substance is no longer stable. Here a molecular change is begun which induces a molar change, so that the chemically and physically homogeneous hornblende or biotite becomes the heterogeneous granular aggregate of augite and magnetite. The origin of the augite andesites is then discussed in the light of this theory.

On the Origin of the Chouteau Fauna: BY HENRY SHALER WILLIAMS.

In a former number of the *Journal of Geology* the origin of this fauna was discussed by Stuart Weller. In the present paper the author dissents from two opinions therein expressed (1) that the Chouteau fauna was contemporaneous with the Chemung fauna of New York, and (2) that it arose by the mingling of a fauna which in the Devonian was represented by the Hamilton in New York and the general Devonian fauna of Europe represented by the Middle Devonian of Iowa and British America. Three