"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

reasons are given (based on the study of the faunas themselves) for thinking the Chouteau was later than the Chemung. From a similar study, the author concludes that there is not at hand sufficient evidence of the composite origin of the fauna in question.

North American Graptolites: By R. R. Gurley.

The present paper is a continuation of one in the January-February number of the *Journal.* The vertical range of graptolites is quite fully discussed and tables are given showing the horizon and geological range of each species so far as the facts are known. The value of these tables is much enhanced by references to the original sources of information in a large number of cases. The author finds that graptolites may be clearly traced to the beginning of the Carboniferous period, and he thinks it likely that allied genera lived through the Paleozoic.

Deformation of Rocks, II., An Analysis of Folds: By C. R. Van Hise.

Folds are divided into simple, composite and complex. The author compares a rock fold to a wave of the sea, each large wave having superposed on it waves of the second order, these having waves of the third order, etc. Thus while the forces producing them are different, the complexity of the two are comparable. Various forms of folds are figured, and the relation between them clearly stated. Simple folds may be united to produce a great variety of composite structures, anticlinoria and synclinoria. These may be normal or abnormal and upright, inclined or overturned. As to abnormal composite folds, several factors modify the result. (1) Readjustment between the beds; (2) the great strength of the older rocks; (3) decreasing lateral stress with depth; (4) the position of the fold in the group of rocks folded. Complex folds are folds considered in three dimensions. This complexity may be due to differences in thickness and strength of beds in different places, unequal thrust on different parts of the border of an area, and to the fact that thrust may be in two or more directions. A number of practical directions are given for discovering and interpreting in the field the structure of complex folds.

C. R. Van Hise continues the 'Summary of Current Pre-Cambrian North American Literature.' S. Weller contributes a review of Williams' 'Geological Biology.' A long list of the publications recently received closes the number.

D. P. N.

SOCIETIES AND ACADEMIES.

GEOLOGICAL CONFERENCE OF HARVARD UNIVERSITY, APRIL 28, 1896.

(1) *April recess excursion to the Middle Susquehanna, Pa:* By W. M. Davis.

The special object of this excursion was to study on the ground the deflected tributaries of the Susquehanna in Union and Snyder counties, Pa., and to determine their bearing on the hypothesis that the Susquehanna was superposed by flood plaining on the two synclines of Pocono sandstone in Dauphin county at a late stage in the Cretaceous cycle of denudation. (See Rivers and Valleys of Penna., Nat. Geogr. Mag., I, 1889, 241.) Spruce run and Buffalo creek, Penn's creek and Middle creek were examined; Penn's creek being the most significent, as it abandons a well-defined limestone and shale valley and turns south through ridges that surmount by a moderate measure the Tertiary peneplain of the region. These various streams cannot be regarded as antecedent to the time of mountain folding, for they are systematically placed with respect to the Susquehanna; they cannot be regarded as adjusted to the structures of the region, for they stand in most diverse relation to resistant and weak strata and to anticlines and synclines; their systematic southward deflection suggests the influence of an ancient flood plain of the Susquehanna that was formed on a peneplain of the past, of just the same kind as the influence exerted by the growing flood plain of to-day at Selin's Grove, where Penn's creek, after approaching within half a mile of the main river, has to flow four miles southward along the inner border of the plain before mouthing. Admitting that the deflection of the several streams was caused by flood plaining, this is shown to have been ancient, not only by the relation of Penn's creek to the low ridges that surmount the dissected Tertiary peneplain, but also by the imminent readjustment of some of the deflected streams by longitudinal subsequent streams that are growing along weak