pretty clear idea may be obtained of the character of the okapi itself, the great lack being detailed comparison of the okapi with other ungulates, living and extinct, and consequently, the absence of information regarding the relationships of the animal. A large number of illustrations are devoted to variations in the striping of the fore and hind legs, practically no two animals being alike in this particular. Some of these figures are from mounted specimens, and some from bandoliers made of okapi skin, including the first two obtained by Sir Harry Johnston, which Dr. Sclater took to be from a zebra and in this belief described the animal as *Equus johnstoni,* on February 5, 1901, the generic name *Okapia* being given by Lankester later in the same year. *Okapia liebrechtsi* was described by Forsyth Major in 1902 and subsequently Lankester based a third species, *O. erichsoni,* on a peculiarity shown in the frontal hair whorls of an individual. There is, however, little doubt that there is but a single valid species.

It was a theory of Professor Marsh that good illustrations were really more important than text, since they showed facts that might be used by any one while the text would consist naturally more or less of the opinions of the writer. From this viewpoint the volume under consideration will be appreciated by all. It is also valuable as a study in individual variation, no two specimens of the okapi being quite alike either in external appearance or internal structure. And while Lankester qualifies his remarks on these points by saying that he has not had the opportunity of examining a similar amount of material of any other species of large wild animal there can be little doubt but what the okapi is really exceptional in the amount of individual variation it presents.

F. A. Lucas

Reproduction artificielle de minéraux au XIXe siècle. By P. N. Tchirwinsky. Kief, 1903–1906. 8vo. Pp. lxxxviii + 638; 117 figures and 11 portraits.

A very comprehensive work on the artificial production of minerals has recently been published in Russia by Professor Tchirwinsky. The work contains 177 figures of various crystals, some fifty of which were produced by the author himself, and also eleven portraits of scientists who have worked on synthetical minerals.

While covering the same ground as the earlier treatises on the subject by Fuchs (1872), Fouqué and Michel Lévy (1882), Bourgeois (1882) and Meunier (1884), as well as the chapters devoted to this subject in the works on mineralogy by Doelter (1890) and Brauns (1896), the writer has not only added a very complete record of the rich and important results of scientific research in this department during the last two decades of the past century, but has revised and rearranged the earlier material, and corrected several errors in the references. The critical remarks with which he accompanies his résumés are to a considerable extent based upon his own experiments.

The work falls into two parts, a general and a special part. At the outset the writer explains that he uses the term "artificially produced minerals" only in regard to those which are produced in the laboratory, and not in reference to such as may be fortuitously produced, as for example, the diamonds which have been found in steel, or minerals formed upon metal ornaments, etc., that have been long buried (pp. 13–15). In this connection the author cites the words of St. Meunier, that the convalescent who two thousand years ago cast a coin into a mineral spring whose waters had cured him, little knew that he was initiating a geological experiment.[1]

The writer then proceeds to describe the more important kinds of apparatus employed in the laboratories for the artificial production of minerals; many of these are figured (pp. 15–24). He next passes to the consideration of the methods used for measuring artificial crystals (pp. 25–27). The fact that in a large number of cases these crystals are exceedingly small and can only be viewed through the

[1] Page 14, note: St. Meunier, "Méthodes de synthèse en minéralogie," Paris, 1891, p. 55.

microscope, makes it very difficult to measure them accurately and to determine their exact form. As the study of artificially produced minerals would be greatly facilitated by having an approximately complete collection in one place, the author expresses the wish that specimens of such minerals produced in various countries might be sent to the Société Mineralogique de France, in Paris; these, added to the large number of such minerals now in the Collége de France, etc., would make an exceptionally complete collection. An atlas of colored plates figuring the most important of them might then be issued by the French society, and this would serve to supply the lack of such material in many collections (pp. 27, 28).

The aims of mineral synthesis are then presented at some length (pp. 28–124). The light thus thrown upon the question of the natural formation of minerals is noted in the case of metalliferous deposits (pp. 30–33), dolomites (pp. 33–37), contact minerals (pp. 37–40), the formation of the diamond (pp. 43, 44), etc. This is followed by sections treating of the physical and chemical conditions influencing the form of crystallization assumed by various minerals and the order of their production, and also of their systematic classification, as explained or furthered by the results attained in artificial reproduction (pp. 49–119). It would be impossible, within the limits of this article, to do more than note the convincing demonstration of the great service rendered by the synthetic method in the solution of many difficult problems. Several mineral forms have been produced in this way in a purer state than that in which they naturally occur; in some instances forms not yet discovered have been produced, thus serving to fill up gaps in the different classes. In other cases where it is difficult or impossible to make an accurate analysis of the natural specimens, the synthetic products have supplied this deficiency, as in the case of the chalcomenit from Argentina which was reproduced by C. Fridel and E. Sarradin in 1881 (p. 104). A very full list of the spinel crystals obtained by E. Ebelman is given (pp. 78–81).

While the scientific value of these artificially produced minerals can scarcely be overestimated, their practical value is very slight (p. 120). As the author notes, only the ruby has been reproduced in a form and size that renders the specimens to a great extent the same as the natural stones, and yet even in this case—apart from the fact that they are not products of nature, but of art—a careful examination reveals certain peculiarities, due to the method of production, which differentiate them from the natural rubies.

In the special part of the work (pp. 127–496) the very rich and complete material has been arranged in approximately chronological order, all the minerals produced by a given experimenter being grouped together under his name. This arrangement has its advantages, although it obliges the reader to seek in different parts of the book for information regarding any one mineral. This search is, however, facilitated by very complete indexes. A supplement (pp. 497–638) contains material omitted for one reason or another from the main work; here the arrangement is according to mineralogical classification.

Tchirwinsky has never been sympathetic with Moissan at any time or in this work. He has said, for excellent reasons.

The volume contains nine excellent portraits, the list of which is here added.

Eilhard Mitscherlich. Professor of chemistry in the Berlin University; member of the Berlin Academy of Sciences; d. 1863.

Henri Sainte-Claire Deville. Professor of chemistry in the École Normale and in the Sorbonne; member of the Académie des Sciences; d. 1881.

L. Troost. Professor of chemistry in the Sorbonne; member of the Académie des Sciences.

F. A. Fouqué. Professor of the natural history of inorganic bodies in the Collége de France; member of the Académie des Sciences. Paris.

A. Michel Lévy. Member of the institut; general inspector of mines. Paris.

Charles Friedel. Professor of mineralogy and of organic chemistry; d. 1900. Paris.

Etienne Stanislas Meunier. Doctor of Sciences; laureate of the institut. Paris.

Constantine Demetrius Chroustchoff. Professor of mineralogy, crystallography and petrography in the St. Petersburg Academy of Medicine. St. Petersburg.

A. B. Fr. af Schultén. Professor of chemistry in the Alexander University at Helsingfors.

SCIENTIFIC JOURNALS AND ARTICLES

THE December number (volume 17, number 3) of the *Bulletin of the American Mathematical Society* contains the following articles: Report of the September meeting of the San Francisco Section, by C. A. Noble; "A new proof of the theorem of Weierstrass concerning the factorization of a power series," by W. D. MacMillan; Review of Kowalewski's Determinantentheorie, by Maxime Bôcher; Review of Wright's Invariants of Quadratic Differential Forms, by L. P. Eisenhart; Review of Volume 4 of Sturm's Geometrische Verwandtschaften, by Virgil Snyder; "Notes"; "New Publications."

The January number of the *Bulletin* contains: Report of the October meeting of the Society, by F. N. Cole; Report of the Königsberg meeting of the Deutsche Mathematiker-Vereinigung; "On the saddlepoint in the theory of maxima and minima and in the calculus of variations," by R. G. D. Richardson; "Note on identities connecting certain integrals," by Louis Ingold; Review of Poincaré's Göttingen Lectures, by G. D. Birkhoff; Review of Lorentz's Theory of Electrons and of Wien's Elektronen, by E. B. Wilson; "Shorter notices": Lilienthal's Differentialgeometrie, Volume 1, by E. J. Wilczynski; Boehm's Elliptische Funktionen, Part 1, by L. W. Dowling; Dingeldey's Sammlung von Aufgaben zur Anwendung der Differential- und Integralrechnung, by E. W. Ponzer; Murray's Calculus, by W. B. Carver; Crabtree's Theory of Spinning Tops and Gyroscopic Motion, by E. W. Brown; Loney's Dynamics of a Particle and of Rigid Bodies, by W. R. Longley; "Notes"; "New Publications."

The *Journal of Experimental Medicine* begins its thirteenth volume with the announcement that it will hereafter be issued once a month instead of once in two months as heretofore. Two volumes will thus be issued each year. No change is made in the price of subscription. Dr. Benjamin T. Terry takes the place of Dr. Eugene L. Opie as the associate of Dr. Simon Flexner in the editorial control of the journal.

SPECIAL ARTICLES

VISUAL SENSATIONS FROM THE ALTERNATING MAGNETIC FIELD[1]

THE experiments reported by S. P. Thompson in the *Proceedings of the Royal Society*, B, 82 (557), pp. 396 ff., are of great importance, especially in view of the negative results which have been obtained in the several earlier attempts to arouse sensations by subjecting the head to the influence of a magnetic field. Previous experimenters seem, however, to have used direct current, while Thompson used alternating current.

Thompson obtained his magnetic field from a coil of 32 turns of stranded copper conductor of .2 square inch equivalent cross section, the coil having an internal diameter of nine inches and a length of eight inches. This coil was supplied with 50-cycle alternating current, the maximal amperage being 180. The subject's head was inserted in the coil, and under these conditions Thompson and several others were able to obtain flickering light sensations which were especially conspicuous in the peripheral part of the visual field. The flicker was noticed even when the eyes were open. Certain subjects reported sensations of taste also.

It occurred to me on reading Thompson's report that the visual phenomenon might well be due to idio-retinal light, under the suggestion of the hum of the coil due to the alternating current, and as Thompson mentions no specific checks or precautions in his procedure, it seemed worth while to repeat the ex-

[1] I am indebted to the persons mentioned in this paper for their interest and participation in the experiments, and especially to Professor J. B. Whitehead and Mr. Henry C. Louis, without whose cooperation the experiments would have been impossible.