nature under the three headings—variation, phylogeny and parallelism.

The chapter on phylogeny brings together a number of pertinent examples from the facts of vertebrate paleontology, while variation and parallelism are illustrated by both the Invertebrata and the Vertebrata.

Under the subject of heredity over thirty pages are devoted to the defense and proof of the reality of transmission of acquired characters, and for this purpose are cited a goodly array of evidences from both embryology and paleontology.

The particular memory theory of heredity, of which the general principles were stated by Sedgwick as early as 1863, and elaborated by Cope in 1889, formulated by Herring in 1870 and named 'Mnemnogenesis' by Hyatt in 1893, is adopted as best expressing the authors view. The following passage presents a characteristic definition of this factor of evolution.

"It appears to me that we can more readily conceive of the transmission of a resultant form of energy of this kind to the germ-plasma than of material particles or gemmules. Such a theory is sustained by the known cases of the influence of maternal impressions on the growing fœtus. Going into greater detail, we may compare the building of the embryo to the unfolding of a record or memory, which is stored in the central nervous organism of the parent, and impressed in greater or less part on the germ-plasma during its construction, in the order in which it was stored. This record may be supposed to be woven into the texture of every organic cell, and to be destroyed by specialization in modified cells in proportion as they are incapable of reproducing anything but themselves. The basis of memory is reasonably supposed to be a molecular (or atomic) arrangement from which can issue only a definite corresponding mode of motion." (P. 451.) "The somatic cells retain only the record or memory of their special function. On the other hand, the reproductive cells, which most nearly resemble the independent unicellular organisms, retain first the impressions received during their primitive unicellular ancestral condition; and second, those which they have acquired through the organism of which they have been and are only a part." (P. 453.)

To the question what are the primary factors of organic evolution from a causative point of view, the author's answer in brief seems to be as follows: *Bathmism* an intrinsic energy of living matter; *consciousness*, a guiding influence, 'intrinsic in the evolving matter,' but preceding organization; *molecular and molar forces* from without reacting upon bathmism in the processes of Physiogenesis and Kinetogenesis; and the effects of these interactions preserved and perpetuated in heredity through the agency of *memory* in the process called Mnemnogenesis. Viewed as a series of phemonena the author has summarized the particular form of doctrine defended in his book in the following words:

1. Variations appear in definite directions.
2. Variations are caused by the interaction of the organic being and its environment.
3. Acquired variations may be inherited.
4. Variations survive directly as they are adapted to changing environments (natural selection).
5. Movements of the organism are caused or directed by sensation and other conscious states.
6. Habitual movements are derived from conscious experience.
7. The rational mind is developed by experience, through memory and classification (p. 14).

Most, if not all of the particular views of the author found in this book have been more or less fully elaborated in previous papers; but in their connected systematic form, combined with the views of other workers to constitute a consistent doctrine of evolution, we have in 'Primary factors' a valuable text-book for teachers and students.

Whether they will be helped toward an intellectual comprehension of the true factors of evolution by this attempt to express them in terms of those highest of all, most complex and least understood of organic phenomena, consciousness and memory, may be seriously questioned.

H. S. WILLIAMS.
YALE UNIVERSITY.

The Manufacture of Explosives. By OSCAR GUTTMANN. 2 Vols., pp. 348 and 444 lg. 8vo. New York, Macmillan & Co. 1895.

As the sub-title of this book indicates, the author has sought to produce a theoretical and practical treatise on the history and the physical and chemical properties, as well as on the methods of manufacture of explosive substances, and he has followed for this purpose the plan adopted in the excellent treatises on Gunpowder

by G. Upmann, and on Explosive Bodies and Fireworks, by E. von Meyer, published in Brunswick in 1874, and which were translated, revised and enlarged by E. Désortiaux in the admirable work published in Paris in 1878. Following Désortiaux's plan, Volume I. of Guttmann's work is devoted partly to a description of the sources, methods of production and properties of the raw materials used in the manufacture of explosives, and partly to the manufacture, properties and the chemical and physical tests of 'Black Powder,' while Volume II. treats of gun-cotton, nitro-glycerin, dynamite, blasting gelatine, nitro-substitution explosives, smokeless powders, caps, detonators and fuses; considerable space being given to the description of apparatus for testing the velocity, pressure and power of explosives, and to the discussion of methods for their storage and transportation and the construction of factories. There is in addition some seventeen pages of a bibliography which is far from being exhaustive.

From his occupation, for many years past, as a builder of works and inventor of apparatus for use in the manufacture of explosives, Mr. Guttmann has had unusually good opportunities for becoming familiar with the art, but owing to his confidential relations with his clients, it is not to be expected that much will be published that has not already been made accessible in periodical literature or patent publications, so that the work is to a large extent historical and suggestive. As a consequence of his occupation there is a lack of perspective in the work, his own inventions being given undue prominence.

Notwithstanding that Mr. Guttmann has been for many years the abstractor in this subject for *Dingler's Polytechnische Journal*, he shows a singular lack of familiarity with American methods and products, which differ materially from those in vogue in Europe, but as a treatise on European practice this work is a sound and trustworthy one. It is probably because of this lack of acquaintance with America that when the author is treating of the history of compressed powders, Professor Doremus, of New York, becomes transformed into General Doremus of Russia.

The chapter on smokeless powders is especially to be commended as probably the most detailed and exhaustive description of the processes of manufacture in use extant, but it is in error as regards indurite.

The style is usually clear but sometimes involved, as when, in discussing the errors of Kopp's Volumenometer and Say's Stereometer, the author says "so that the results obtained with this apparatus only show the atomic weight of the proportions of the various kinds of powder;" there is a lack of uniformity in the use of the chemical nomenclature which is likely to prove confusing; there is an uncertainty at times regarding the constitution of organic substances which is likely to prove misleading; and there are occasional errors, notably where the author after stating that nitro-glycerin freezes at +8° C. (46.4° F.) says "some experiments made by the author showed that pure nitro-glycerin, if suddenly exposed to a temperature of 25° C. (13° F.), produced by a freezing mixture, was not frozen even after some hours," yet on the whole the work is a very good one, and it is most liberally illustrated with 328 well executed cuts.

Charles E. Munroe.
Columbian University.

NEW BOOKS.

Humphrey Davy, Poet and Philosopher. T. E. Thorpe. New York, The Macmillan Co. 1896. Pp. vii+236. $1.25.

Elements of Geology. Joseph Le Conte. 4th edition, revised and enlarged. New York, D. Appleton & Co. 1896. Pp. xiv+670. $4.00.

Biological Lectures Delivered at the Marine Biological Laboratory of Wood's Holl, in the Summer Session of 1895. Boston and London, Ginn & Co. 1896. Pp. 188.

The Nursery Book. A complete guide to the multiplication of plants. L. H. Bailey. 3d edition. New York and London, The Macmillan Co. 1896. Pp. xi+365. $1.00.

Report of the Commissioner of Education for the Year 1893–1894. Volume I. Washington, Government Printing Office. 1896. Pp. xlvii+1061.