Since then they have been found in many parts of the country, no less than 106 localities being now known whence they have been obtained. All of these localities are naturally not equally good, and many of them are not now worked at all.

Some useful hints are given by Mr. Griswold in Chapter iv. on the purchase and care of whetstones, and especially that little-understood matter, the use of lubricants; and in Chapter v. the subject of manufacture of stones is discussed. This dates back to the beginning of the Christian era at least, for definitely-shaped hones are found at Pompeii. At present, in America, the stones mostly come from Indiana, Arkansas, New Hampshire, and Vermont; although there are other States producing them. The total out-put is small, and $75,000 would represent the value of the manufactured product in 1880.

Of the Arkansas stone proper, considered a typical novaculite, only about 60,000 pounds are quarried annually. The most of this goes to New York to be manufactured, whence it is largely shipped back to Arkansas. The blocks are laid in plaster of Paris in the bed of the gang-saw, and the saws are so arranged as to waste as little as possible. The sawing is slow, "saws going at the rate of 80 swings per minute will only penetrate the stone in the gang-bed at the rate of 1½ inches in 10 hours. Marble is sometimes sawed at a rate of nearly 8 inches per hour, though for dense marble 2 inches per hour is a closer estimate." After the first cutting the slabs are sorted, and the useless pieces thrown away, this being done again and again as the pieces are reduced in size until only 25 per cent of the original amount remains as a marketable product. Of the Ouachita stone, a coarser variety of whetstone, a much larger amount is produced, this being in 1889 1,040,000 pounds. The method of cutting is about the same as for the Arkansas stone, while the waste is about 50 per cent.

Mr. Griswold deals extensively with the petrography of the novaculites, giving descriptions of numerous microscopic sections from various localities. The conclusions may be summed up as follows: Novaculite rocks were deposited in deep water as sediments, the carbonate of lime crystallizing as rhombohedrons. Consolidation of the siliceous portions produced a hard, brittle rock, which, being subsequently folded and elevated above the sea-level, was subjected to erosion. During this process the calcite crystals were removed, and subsequently a secondary deposit of silica took place.

In regard to the sedimentary origin of the rocks, Mr. Griswold says:—

"It may be somewhat difficult to conceive of a constant supply of very fine fragmental silica, almost totally without other materials, in sufficient quantity to form beds several feet in thickness with very thin layers of slate between, and making a formation from 500 to 600 feet in thickness, yet this seems to have been the manner in which these rocks were formed. After all, the conception is not so difficult when one considers that the fragmental silica of many of the slates and shales is as fine as that of novaculite, and as the percentage of silica in the sediments forming these rocks is increased, the resulting rock approaches more and more closely the novaculite. Thus with the novaculites are associated very argillaceous shales, grading into siliceous shales and then into transparent novaculites. The almost absolute purity of the novaculites still causes doubt as to the possibility of this mode of origin; but many coarse sandstones are nearly as pure, and if the novaculites can be considered as extensions of the sandstones toward the deep sea, where the finer fragments would settle, then we have at least a close approximation to the sediments forming the novaculites. That the same action which produces the angular fragments of quartz in sandstones must also afford a very large amount of exceedingly fine quartz is evident" (p. 192).

Many pages of the report are devoted to details of the geology of the novaculite area, but it is obviously impossible to enter into any of these here. A brief epitome only can be given of the geological history of the area, which in Mr. Griswold's words is as follows:—

"The sequence of events in this history seems to have been as follows: A deposition of very fine fragmental material on the deep-sea floor to form the Silurian strata, included in the upper part of which are two groups where graptolites abound. At the end of the Lower Silurian deposition, through the periods known as Upper Silurian and Devonian, there was an almost total cessation of the deposition of sediments. There seem to be two possible explanations for this fact: First, there may have been a depression of the sea-bottom which left this area so far from shore that no thick sediments were accumulated over it, and this was followed by an elevation in Lower Carboniferous times renewing sedimentation in perfectly conformable beds; the second explanation is that while upper Silurian and Devonian beds were being deposited elsewhere, the same period was occupied by a deposition in the Arkansas area characterized by Lower Silurian organisms. This continued until a decided change of conditions in Lower Carboniferous times renders necessary a change in the nomenclature of the beds in consequence of the change in the character of the fossils.

"True Coal-Measure strata covered the novaculite area also, for they are found in Texas in a latitude considerably south of 34° 30′, while the trend of the formation is nearly east and west through this part of Arkansas and through the Indian Territory. The south members of the coal strata of northern Arkansas have been worn completely away, and are now buried beneath the Cretaceous and Tertiary deposits which cover southern Arkansas.

"Following the formation of the Coal Measures, and probably synchronous with the Appalachian uplift, came the elevation of Arkansas above sea-level. The time following this post-Carboniferous elevation of Arkansas has been one of erosion, though we have evidence of some periods of accumulation as well as denudation. The three periods of accumulation were the Cretaceous, Tertiary, and Pleistocene, during which there were partial and perhaps complete submergences of the area" (pp. 206–207).

The final chapter of the volume deals with the fossils of the area. These, it is true, are few in number, but seem to be sufficient to justify the assertion of the Lower Silurian age of the deposit. Dr. R. R. Gurley contributes some remarks upon the graptolites found in shales both underlying and overlying the novaculites. His conclusion is that two horizons are represented, one of Calciferous, the other of Trenton age. Comparisons are drawn between the Arkansas beds and those of Point Levis in Canada, Calciferous in age, and those of Norman's Kill in New York, of Trenton age. A number of new species or varieties are described by Dr. Gurley.

JOSEPH F. JAMES.

Washington, Aug. 11.

Outlines of Theoretical Chemistry. By LOTHAR MEYER. New York, Longmans, Green, & Co.

THE author of this volume is well known by the successive editions of his "Modern Theories of Chemistry" and by the share that he took in developing the periodic law of the elements. The larger work was translated some years ago by Professors Bedson and Williams; and the same translators have put this volume into good, readable English.

The author says (in view of the various works already published on theoretical chemistry): "I have not considered the requirements of students alone, but have been desirous of offering something to those friends of scientific investigation who have neither the intention nor the time to concern themselves with the details of chemical investigation, but wish to become acquainted with the general conclusions arrived at. With this object in view, I have abstained from too large a use of the numerical results of observations and measurements, and have avoided giving detailed descriptions of experimental methods. . . . The general — I may say the philosophical — review of the subject has been my chief aim, to which the details should be subordinated."

The author's purpose, as thus expressed, has been in good measure carried out. Chemists will prefer his "Modern Theories of Chemistry," if they would become really proficient in this aspect of the science; and to such this work may seem superfluous. But many, who are chiefly interested for practical reasons in chemical analysis or manufactures, may be glad to find so good an "Outline," compressed into 216 clearly-printed pages. The work is not made up of distinct chapters, but the sections seem to succeed each other in natural order, giving some prominence to the following topics: Atomic theory, the several methods of determining

molecular and atomic weights, the periodic law, valency, the constitution of chemical compounds, physical isomerism, density, fusion, refraction, solution, crystallization, diffusion, evaporation, constitution of gases, relations of heat to chemical change, dissociation, electrolysis, migration of ions, speed of chemical change, action of mass and avidity. The following sentences are from the concluding paragraph: "We have gradually receded from the idea of a static state of equilibrium of the atoms, brought about by their powers of affinity, and we now consider the atoms and the molecules, which are built up of atoms, as particles in an active state of movement. Their relations to each other are essentially determined by the magnitude and form of their movements. Chemical theories grow more and more kinetic."

Some Americans, at least, will dissent from the judgment of the author in still making the atomic ratio H : O equal to 1 : 15.96; but it may well be hoped that this well-balanced compend of leading theories, in its English dress, will widen the interest already shown in the philosophical aspects of this science. R. B. W.

Deafness and Discharge from the Ear. By SAMUEL SEXTON, M.D. Assisted by Alexander Duane, M.D. New York, J. H. Vail & Co. 89 p.

THE object of the writers of this small volume is to bring before the profession the merits of the operation of excision of the drum membrane and ossicles in cases of chronic deafness from catarrh. The theory of the operation is stated at length, and a number of cases in which it has proved successful are reported. It would have been more satisfactory if a complete tabulation of all cases had been offered, so that a more accurate estimate could have been formed as to results. From what is stated, however, the procedure is clearly one of much service in some instances.

Human Origins. By SAMUEL LAING. Illustrated. London, Chapman & Hall, 1892.

THIS is an exceedingly well-written and interesting summary of all the theories, facts, and mysterious questions connected with the origin of mankind on earth, by a somewhat remarkable man, whose previous works, "Problems of the Future" and "Modern Science and Modern Thought," met with a wide circulation in England. The author, Mr. Samuel Laing, the son of the translator of the Norse Sagas, comes of a good old Scottish family and was second wrangler of his year. Well-known in the House of Commons as "the member for the Orkneys," Mr. Laing twice served in Mr. Gladstone's administrations, as finance minister to India and financial secretary to the treasury, and is now the president of a prosperous English railroad. This veteran of finance and affairs has always found solace and delight in the study of abstruse scientific problems of the day. His various publications present the results of wide and discriminating reading and research, in a logical, concise, yet comprehensible style for the benefit of those who have not the time to look into such matters for themselves.

In the present volume Mr. Laing deals first with the abundant evidences of the existence of civilized man upon earth at least a thousand years before the date of the creation of the world as given by theological chronologists. A clear outline is presented of the condition of religion, art, science, and agriculture of "Old Time," as revealed by the earliest monumental records and inscriptions of ancient Egypt, Assyria, and Chaldea. These alone afford convincing proof of the great antiquity of civilized man and of the existence of a high grade of culture at the earliest dawn of the historical period, which was preceded by legendary ages of less duration and by the long-forgotten antecedent neolithic era and remoter epoch of palæolithic man.

The evidences of science are then considered as revealed in geological and palæontological records of the past. The effects of the glacial period, Croll's theory of its cause, and Quaternary, Tertiary, post-glacial, and inter-glacial and pre-glacial man are discussed in turn. The geological data from the Old and New Worlds, favorable and opposed to the antiquity of man, are stated with clear impartiality. The author seems well acquainted with the works of American scientists such as Abbott, Morton, Brinton, Wright, Whitney, and Shaler. He shares, however, in the prevalent confusion with regard to the Toltecs. His main argument is governed by the force of the logical postulate of continuous evolution. "No one now believes," he writes, "in a multiplicity of miracles to account for the existence of animal species. Is man alone an exception to this universal law, or is he, like the rest of creation, a product of what Darwinians call evolution, and enlightened theologians 'the original impress?'" He is therefore led to the conviction of the great antiquity of the human race. He would seek for human origins at least as far back as the Miocene period, and search in the earliest Eocene strata for the collateral ancestors both of the existing races of mankind and surviving species of anthropoid apes. "With this extension of time," he concludes, "the existence of man, instead of being an anomaly and a discord, falls in with the sublime harmony of the universe, of which it is the dominant note."

The volume is well illustrated from varied and modern sources. There are a few obvious misprints, such as Tyler for Tylor, trilateral for triliteral, Mortillot for Mortillet; which will doubtless be corrected in the forthcoming second edition. The first is already exhausted. AGNES CRANE.

Brighton, England, Aug. 1.

Essays upon Heredity and Kindred Biological Problems. By DR. AUGUST WEISMANN. Authorized translation by Messrs. Poulton, Schönland, and Shipley. New York, Macmillan & Co. 2 vols. 8°.

THOSE who have followed the active discussion of the remarkable investigations and stimulating hypotheses of the author of these volumes will not expect in this place a review of the works which have made his name famous even among those who have not been willing to accept all his conclusions. Such a review would be inadequately accommodated in a volume as large as either of those which are mentioned here. It would amount to a summary of existing biologic theory, which is being added to daily, almost hourly, and from which the teaching effect of time daily dissolves away some misconception or superfluity. In common with the great body of American naturalists we believe that the most talked-about strand in Weismann's woof of hypothesis — the assertion of the non-transmission of acquired characters — is not only an erroneous but an entirely unnecessary assumption, an assumption which, carried vigorously to its necessary conclusions, may well be termed the key-note of a genuine "gospel of despair." This assumption at present is upheld chiefly by a sort of circular argument which explains the "acquired character" to be one acquired by the body solely, exclusive of the reproductive plasma, while any character which is shown to be transmitted is put out of court as having been acquired by the "whole organism." But whatever be the fate of any of these special views, either of Weismann or his opponents, there can be no question as to the great importance of the questions involved, or of the scientific, honorable, and impartial spirit in which the great German naturalist has discussed them.

While many of the problems concerned are strictly scientific and to be adequately discussed by trained naturalists alone, some of the questions, and the conclusions which result from all, are of the utmost importance to every philosopher, theologian, and sociologist. It is therefore a matter for general congratulation that the essays in question have been put into English in a form which excludes all doubt as to the adequacy of the translation or the faithfulness with which his ideas have been presented.

The work appears with the well-known elegance of the Oxford Press, and should find a place in every working library.

Darwin, and after Darwin, an Exposition of the Darwinian Theory, and a Discussion of Post-Darwinian Questions. By GEORGE JOHN ROMANES. I. The Darwinian Theory. Chicago, Open Court Publishing Co. xvi., 460 p. 8°.

This treatise, the first of two contemplated volumes, has grown out of a series of lectures delivered before the University of Edinburgh, and is devoted to the general theory of organic evolution as Darwin left it. As these lectures were delivered to learners, and in their present form are intended for the general reader, the author states that he has been "everywhere careful to avoid assuming even the most elementary knowledge of natural science"