"Portland, and Bath, and Ketton Limestone; Northampton Stone, Sands, Clays; Maidwell Limestone Clay" (p. 114).

"Lias Clay and Limestone Strata" (p. 114).

"Pozolanic, or Water Lime of Barrow-on-Soar, Leicestershire" (p. 114).

"White Lias, Balderton Sand, Red Marl" (p. 115).

Followed by a "Theory of Dislocated and Denudated, or Cut Stratified Masses," which is illustrated by fifty-six coloured drawings.

I do not know why Farey stopped at the Red Marl in giving an account of Smith's knowledge of the Strata, for Mr. Smith certainly had a knowledge that Coal and the Limestone come underneath.

At the end of the first volume of Sowerby's Mineral Conchology is a Supplementary Index,[1] arranging the shells described therein according to the several strata in which they are found imbedded, from the newest towards the oldest in the British series. The strata referred to are those as classified in Mr. Smith's map. This was kept up in subsequent volumes.

The Royal Society Catalogue contains a list of Mr. Farey's papers, to which he signed his name, among them are many on music. But there are many anonymous papers of his besides, such as those in the Monthly Magazine. I shall be glad to know if any one can say whether he did not write some of the articles in Rees' Encyclopædia, *e.g.* "Grand ridge," "Strata," etc.

As he was so warm a supporter of Smith, it seems strange that the memoir in the Monthly Magazine contains no reference to his having received his first geological knowledge from him, but, on the contrary, says he obtained his success from following the proposals of the Duke of Bedford. In many of the writings about this date there seems to have been an intentional suppression of reference to Smith in places where it might justly be expected. Can any explanation for this be offered?

NOTICES OF MEMOIRS.

I.—Geological Survey of India.

1.—Memoirs of the Geological Survey of India, Vol. VIII., Part 1. 1872.

THIS Part comprises an elaborate Memoir by Mr. William King, jun., B.A., on the Kadapah and Karnul Formations of the Madras Presidency. This series of rocks has been hitherto known by such names as the "Diamond Formation," "Clay Slate Formation," and "Old Red Sandstone," names which have proved inapplicable, therefore those of the districts they occupy have been applied for the two formations under which the different groups of rocks can be classed. Mr. King states there are good grounds for believing that they may eventually turn out to be partly representative of the great Vindhyan series of India, and of a possibly underlying

[1] "For this supplementary index I am (says Sowerby) indebted to my indefatigable friend Mr. John Farey."

formation. It is not certain that they are of Palæozoic age; they may even be older than this, but according to present knowledge, they are Azoic, for no traces of life have been found in them. These Kadapah and Karnul rocks rest upon the Crystalline rocks or Gneissic series, which occupy a narrow belt of country all round the outermost boundaries of the newer rocks.

They consist of a great succession of Clay-slates, Quartzites, Limestones, and Shales, with Traps, and constitute two unconformable series, the older of which is largely developed in the Kadapah (Cuddapah) district, while the younger is developed in the Karnul (Kurnool) district.

After pointing out the physical structure of the country, Mr. King describes the two formations in detail.

In the Karnul formation there is a series of Quartzites, Sandstones, Grits, and Pebble-beds, which might be called the Diamond-bearing Group, as until lately there was no knowledge of diamonds having been found in any other set of rocks of either the Karnuls or Kadapahs. The old diamond-workings near Oostapully, on the left bank of the Kistnah, have however been visited by Dr. Oldham, who considers that they were executed in quartzites of the Kadapah series. A local name has, therefore, been adopted for the diamond-series of the Karnul formation—it is called the Banaganpilly Group. This group forms a capping, 10 to 20 feet in thickness, resting unconformably on a much older set of shales and traps. This capping is pierced by shafts 15 feet or less, from the bottoms of which horizontal galleries are driven to get at the seams of diamond gangue. While the rocks of this group are hard and vitreous where exposed to the atmosphere, down in the shafts, owing largely to the confined moisture, the rocks are quite unaltered, and it is in more or less clayey and shaly seams of pebble-beds that the diamonds are found.

The main resources of the Karnul and Kadapah formations are diamonds, copper, lead, iron, and building materials. Their mode of occurrence and economic value are pointed out, and where necessary the report is illustrated with sketches and geological sections. It is essentially a volume of practical geology, the total absence of organic remains depriving the formations of a good deal of the interest they would otherwise have to those not specially interested in the economic geology of the district. Nevertheless the field geologist will find much to interest him in the descriptions of the rocks, and in the explanations of the many complications of structure which they present.

2.—The Geology of Mount Sírban, in the Upper Punjáb. By W. Waagen, Ph.D., and A. B. Wynne, F.G.S., Geological Survey of India.

THIS mountain, which has an elevation of 6243 feet, with an elongated oval base, is one of the most lofty of the Hazára Hills, a portion of those which form the outer spurs of the north-western

Himalaya, bordering the Upper Punjáb. The geological structure is interesting, as it affords an epitome of much of the geology of the north-west frontier of British India, nearly the whole series known being present; those unrepresented being chiefly the older crystalline and the newer portions of the Tertiary rocks.

The following is the succession in descending order :—

6.—Nummulitic.	Thick limestones with some shales—fossils in places.
5.—Cretaceous.	Thin-bedded limestones — apparently without fossils. Impure ferruginous sandy limestone, weathering rusty —fossils.
4.—Jurassic.	Black Spiti shales.
	Unconformity.
3.—Triassic.	Thin-bedded limestones and slaty shales. Dolomite limestone; fossiliferous (*Megalodon* and other) beds.
2.—Below the Trias.	Hæmatite, dolomite, quartzite, sandstone, and breccia.
	Unconformity.
1.—Semi-Crystalline.	Attock (?) slate.

Two, if not more, unconformities have been observed—one between the Jurassic and Triassic series, and the other between the semi-crystalline rocks and the beds above them.

1.—The lowest or Attock slate series are unfossiliferous, but may possibly be of Silurian age.

2.—The succeeding series is also unfossiliferous, and is totally unconformable to the beds below them. They consist chiefly of red sandstones, shales, and Quartzitic Dolomites in the lower part; the upper being composed of Dolomites often siliceous, and above which are a third group composed of Hæmatitic rocks, sandstones, shales, and breccias.

3.—The Triassic series comprises two divisions, which are either dolomites or limestones; the lower one containing *Megalodon, Dicerocardium, Chemnitzia,* and *Gervillia;* and the upper one with *Nerinœa, Neritopsis, Astarte, Opis, Nucula,* etc.

4. The Jurassic beds of Sírban are represented by black shaly clay-beds, well known in Himalayan geology as "Spiti shales." They are not rich in fossils, but fragments of *Belemnites, Inoceramus,* and *Corbula* have been found.

The unconformity of these shales to the underlying Triassic series is marked by the erosion of the limestones, which are also pierced by the crypts of boring Mollusca.

5. The Jurassic series are overlain, apparently conformably, by hard, rusty, calcareous sandstone, with Cretaceous fossils, chiefly Cephalopods, and a few Gasteropods. The Ammonites belong chiefly to the *Cristati* and *Inflati* groups, besides several species of *Ancyloceras, Anisoceras,* and *Baculites,* as well as numerous large *Belemnites.*

These fossiliferous beds are considered to be the representatives of the Middle and Upper divisions of the Cretaceous rocks.

6. Overlying these is a massive grey and blackish Limestone alternating with zones of dark shale, and referred to the Nummulitic formation. It is of great thickness and much contorted, and its physical features are deeply-excavated gorges and ravines, high

cliffs, and great subsided masses, producing much complication of slippage often exceeding in amount the throw of genuine faults.

The fossils are not well preserved, but some beds are largely composed of *Nummulina* and other Foraminifera, together with some Mollusca more or less imperfect.

Sírban is of special interest, as being a locality south-west of the first great crystalline axis of the Himalaya; of which region the palæontological geology is as yet little known, and affords a means of comparing the formations on both sides of the above-mentioned axis. In order to do this, it will be useful to abstract from the papers of Dr. Stoliczka a tabular *résumé* of the Himalayan formations placed in comparison with those of Sírban:

Sírban.		Dr. Stoliczka: Spiti.	
Nummulitic		.....	
Cretaceous ...	Unfossiliferous limestone	Chikkim shale / Chikkim limestone	Cretaceous.
	Fossiliferous zone ...	... ... ?	... ...
	... ... ?	Gieumal sandstone	Jurassic.
Jurassic	Spiti Shales	Spiti Shales ...	
Unconformity.			
Triassic	Thin-bedded limestone and slaty shale... ...	Tagling limestone	Triassic.
	Dolomite and *Megalodon* limestone	Para limestone	
Below the Trias	Siliceous Dolomite ...	Lilang series ? ?	
	Red Sandstone and shale	... ... ?	
Unconformity.			
	... ...	Kuling series ? ...	Carboniferous.
		Muth series ?	
Slate Series....	Attock Slates	Babeh series ? ? ...	Silurian.

It is apparent that though there is a general similarity, the two regions on opposite sides of the crystalline axis show several points of difference, though not so great as to deprive us of hope that they may be brought into closer accordance by subsequent researches. At present the main differences are rendered greater by the occurrence of marked unconformities in one region unrecorded in the other. The area around Sírban has been subjected to great and continuous disturbance during long periods of time, and it would be highly interesting, if possible, to find out whether these periods of disturbance coincide with the eruptions of the volcanic rocks known to exist in the interior of Cashmere.

3.—On the Occurrence of *Ammonites*, associated with *Ceratites* and *Goniatites* in the Carboniferous Deposits of the *Salt Range*. By William Waagen, Ph.D., Geological Survey of India.

In this Memoir, Dr. Waagen announces his discovery of the association of *Goniatites*, *Ammonites*, and *Ceratites* in the same bed with *Productus*, *Athyris*, etc., and referred provisionally to the

Upper division of the Carboniferous formation. The locality of these fossils is near Jali, north of Shabpoor, on the southern slope of the Salt-Range. Although the associated fossils, such as *Athyris Roissyi, A. subtilita, Productus costatus,* and *P. longispinus,* indicate a Carboniferous aspect, other fossils, as *Strophalosia Morrisiana* and a *Terebratula,* closely resembling *T. elongata,* are Permian forms. Dr. Waagen is inclined to place the strata containing these fossils at the limits between the Carboniferous and Permian periods. The occurrence of these three Cephalopodous genera was first observed by Münster in the St. Cassian Beds of Triassic age.

II.—A Book about William Smith and the Somersetshire Coal Canal, with an Account of the Origin of Stratigraphical Geology in England. By W. Stephen Mitchell, LL.B., F.L.S., F.G.S.

MR. MITCHELL announces that he is about to publish by subscription a work on William Smith and his discoveries in Somersetshire, which led to the rise of the science of stratigraphical geology in England.

The book will form a useful addition to geological literature, as it is designed to bring together into one record all the information that can be obtained of the geological work of the "Father of English Geology."

The way in which his discoveries along the Somersetshire Coal Canal Valley are illustrated deserves special commendation.

The reader has laid before him, in a series of consecutive photographic views, the physical features of the valley, and in a series of coloured lithographs the arrangement of the strata. Those not accustomed to field-work can with this *coup d'œil* understand the stratigraphical arrangement better than by trudging over the ground itself. The facts are presented so simply that there is no difficulty in understanding them. Doubtless it will be a book of great service to those commencing the study of geology. In these days of cramming for competitive examinations there are many who learn off "tables of strata," and commit to memory "characteristic species," who have very erroneous ideas of what these strings of names really mean.

Nearly all our classificatory geology is based on the method of William Smith, and a clear understanding of his observations and deductions is the surest way to understand the subsequent modifications and to trace the reasons for opinions now held. The work will also prove of interest to the general geological reader, and the illustrations alone have an attraction for those who may not care for the subject-matter. We expect it will be well received in Somersetshire, for it cannot often happen that there is an opportunity of obtaining so many views at so small a sum (21*s.*).

We know that at the price proposed the work can only be issued by securing a large number of subscribers, which we trust the author may succeed in obtaining.

III.—Geological Diagrams and Models.

Table of British Sedimentary and Fossiliferous Strata. By Henry William Bristow, F.R.S., F.G.S., Director of the Geological Survey of England and Wales. With a Description of Life Groups and Distribution, by R. Etheridge, F.R.S. (Stanford.)

Geological Models of England and Wales. By William Topley, F.G.S., Geological Survey of England and Wales; and J. B. Jordan, Mining Record Office. (Stanford.)

WHILE the progress of geology is revealed in one way by the numerous manuals and text-books, it is shown in another way by the charts, tables, maps and models, which are from time to time constructed and published, in accordance with the advancement of the science. Appeals made to the eye are always appreciated by the student, and they are indeed essential as a method of instruction. A glance at a geological map or section will explain more than many pages of print; but properly to understand these, a good table of strata is necessary. Of course our small geological maps of the British Islands give tables of all the stratified rocks, showing their order of succession, but these cannot furnish much detail, and when we take maps on a larger scale, of course we cannot have representations in them of the whole series of strata. A table showing, not only the minor divisions of the British sedimentary and fossiliferous strata, but also the local divisions which have been made, as in the Inferior Oolite of Gloucester, the Midland counties, and Yorkshire; or in the Silurian rocks of Wales and the Lake district; is an essential diagram in the hands of all geologists. Such a table has just been prepared by Mr. Bristow, which is published by Stanford. In it are embodied all the latest modifications in our classification of strata, and it is as a table of classification that it will be most appreciated, because it does not furnish the notes on the economic uses of the rocks or their characteristic fossils, which are to be met with in other geological charts. It contains, however, a very useful summary of the life groups by Mr. Etheridge, arranged zoologically, and then giving their geological distribution. This table will be found of great service to the student while reading a geological manual; and in illustrating the succession of our rocks as they are depicted on our geological maps it will be found of great aid.

A geological map is, however, rarely understood, save by the geologist; for among those who are not adepts much ambiguity prevails as to the reason of the irregular shapes of the many colours on our maps. The relation between the form of the ground and its geological structure is one of the great doctrines of geology, and a knowledge of this adds greatly to the interest and understanding of a map. The small models long ago published by Mr. Sopwith were admirable as methods of instruction; but now we are not satisfied with these—a grander work must be accomplished—the whole of England shall be modelled, we are told, by Mr. Topley and Mr. Jordan. This undertaking is to comprise about sixteen blocks,

measuring each twenty-five inches by seventeen inches, and on the scales of four miles to an inch horizontal, and 2000 feet to an inch vertical. They are to be constructed from the published information of the Ordnance, Admiralty, and Geological Surveys, etc., and they will clearly indicate by relief the principal physical features of the country, and being coloured geologically, according to the different rocks exposed at the surface, they will show the relation between geological structure and physical features, and at the same time exhibit in a way unequalled at present, the meaning of our geological maps. Editions will be issued, showing by colour the river basins, rainfall, registration districts, etc., so that they will prove most useful not only as educational models, but will also be very serviceable to military men, engineers, and even medical men, for the relation between health and geology is occupying a great deal of attention at the present day. Special models of the Wealden district, and of the Thames basin, are to be ready early in January.

IV.—Silliman's American Journal for November last contains the following interesting palæontological discoveries:—

1. Discovery of Fossil Quadrumana in the Eocene of Wyoming. By O. C. Marsh.—An examination of more complete specimens of some of the extinct Mammals already described by the writer from the Eocene deposits of the Rocky Mountain region clearly indicates that among them are several representatives of the lower Quadrumana. Although these remains differ widely from all known forms of that group, their more important characters show that they should be placed with them. The genera *Limnotherium*, *Thinolestes*, and *Telmatolestes*, especially, have the principal parts of the skeleton much like some of the Lemurs, the correspondence in many of the larger bones being very close. The anterior part of the lower jaws is similar to that of the Marmosets, but the angle is more produced downward, and much inflected. The teeth are more numerous than in any known Quadrumana. Some of the species have apparently forty teeth, arranged as follows: Incisors $\frac{2}{2}^{?}$, canines $\frac{1}{1}$, premolars and molars $\frac{7}{7}$. A full description of these interesting remains, the first of the order detected in this country, will be given by the writer at an early day.

2. Note on a New Genus of Carnivores from the Tertiary of Wyoming. By O. C. Marsh.—Additional remains of the large Carnivore described by the writer, on p. 203, *op. cit.*, as *Limnofelis latidens*, show clearly that it represents a genus quite distinct from *L. ferox*. The canine and premolars of the lower jaw somewhat resemble those in the Hyæna, but there were only two incisors in each ramus. One of these is large, and close to the canine. Inside and partially behind this, is a cavity for a second and smaller incisor. The remaining teeth preserved are especially broad and massive. The first lower premolar is separated somewhat from the canine, and is inside the line of the teeth behind it. The remains now known

indicate an animal about as large as a lion. The genus they represent may be called *Oreocyon*, and the type species, *Oreocyon latidens*.

3. Notice of a New Reptile from the Cretaceous. By O. C. Marsh.—An interesting addition to the Reptilian fauna of the Cretaceous shale of Kansas is a very small Saurian, which differs widely from any hitherto discovered. The only remains at present known are two lower jaws, nearly perfect, and with many of the teeth in good preservation. The jaws resemble in general form those of the Mosasauroid reptiles, but, aside from their very diminutive size, present several features which no species of that group has been observed to possess. The teeth are implanted in distinct sockets and are directed obliquely backward. There were apparently twenty teeth in each jaw, all compressed, and with very acute summits. The rami were united in front only by cartilage. There is no distinct groove on their inner surface, as in all known Mosasauroids. The dentigerous portion of the jaw is 41 mm. in length, its depth below the last tooth is 5 mm. and below the first tooth in front 3 mm. The specimen clearly indicates a new genus, which may be called *Colonosaurus*, and the species may be named *Colonosaurus Mudgei*, for the discoverer, Professor B. F. Mudge, who found the remains in the Upper Cretaceous shale of Western Kansas.

REVIEWS

I.—A Treatise on the Building and Ornamental Stones of Great Britain and Foreign Countries. By Edward Hull, M.A., F.R.S. (London: Macmillan & Co., 1872.)

SINCE the valuable Report in 1839 of the Commissioners appointed to inquire into the qualities of the stone to be used in building the New Houses of Parliament, no special treatise has appeared on the subject. Even that very useful Report is to some extent limited in its scope, as it was not considered necessary to extend the inquiry to granites, porphyries, and other stones of similar character, on account of the enormous expense of converting them to building purposes in decorated edifices, and from a conviction that an equally durable and more eligible material could be obtained from among the limestones and sandstones of the kingdom. Hitherto the chief information in this country on building stones has had to be sought for in the works on architecture, engineering, and masonry, or scattered through the journals of societies, or geological manuals, and therefore not systematically or scientifically treated in any separate work. Two important works in French on the subject must, however, be noticed, the "Technologie du Bâtiment," by M. T. Chateau; and "Matériaux de Construction," by M. Delesse. With the view of supplying this deficiency in our own language, Prof. Hull has brought together a vast mass of practically useful and interesting information on the building and ornamental stones, both of our own and foreign countries; the different materials being arranged ac-