TABULAR VIEW
OF THE
ORDERS & FAMILIES
by P.H. Gosse OF
FISHES.

PRINTED FOR THE SOCIETY FOR PROMOTING CHRISTIAN
KNOWLEDGE;

Sold at the Depositories, Great Queen Street, Lincoln's Inn Fields; 4, Royal
Exchange; and 16, Hanover Street, Hanover Square.

And by all Booksellers.

Price, mounted to fold in Book, or on Canvas and Roller,
varnished, 6s.

J. TENNANT, GEOLOGIST, 140, STRAND, LONDON.

307

This is the first edition [1856], published by SPCK,
there is a latter one c 1863 by Edward Stanford.
Inserted eds, one dated May 1857

RB6/353

Library
of the
University of Toronto

TABULAR VIEW OF THE ORDERS AND FAMILIES OF FISHES.

Fam 1. Percidae - Perches

FRANKS & CO. N. Y.

Order I - ACANTHOPTERYGII

Fam 2. Sphyrenidae - Sea Pikes

Fam 3. Mullidae - Surge wrasses

Fam 4. Triglidae - Gurnards

Fam 6. Sparidae - Sea Breams

Fam 5. Sciaenidae - Sea Sheeps

Fam 7. Menidae - Menhaden

Fam 8. Chaetodontidae - Surge wrasses

FRANKS & CO. N. Y.

Digitized by the Internet Archive
in 2018 with funding from
University of Toronto

<https://archive.org/details/tabularviewoford00goss>

Fam 9. Scombrida - Mackerels

Order 1. ACANTHOPTERYGII

Fam 11. Tetraodontidae - Spine-tails

Fam 13. Mugilidae - Mullets

Fam 14. Gobiidae - Gobies & Blennies

Fam 12. Ophichthidae - Eel-throats

Fam 15. Lophiidae - Frog-fishes

Fam 16. Labridae - Wrasses

Fam 17. Fistulariidae - Spiny-nosed Pipe-fishes

Fam. 1. Cyprinidae. Carps.

Pseudorasbora parva Fishytail

Anabropsis anabropsis Four eyed Loach

Melanocheilichthys argenteus

Cobitis barbatula Stone Loach

Fam. 2. Esocidae. Pike.

Esox lucius Pike

Hemirhamphus intermedius Parrotfin Half-pike

Esox lucius Pike

Esox lucius

Esox lucius Common Pike

Leptocottus armatus

Order 2 MALACOPTERYGII

Fam. 4. Salmonidae. Salmon.

Cyprinus carpio Common Carp

Cyprinus carpio Common Carp

Cyprinus carpio

Cyprinus carpio Cold-water

Oreochromis mossambicus

Salmo salar Salmon

Salmo gairdneri Argentine

Thymallus thymallus Grayling

Salmo gairdneri

Salmo gairdneri

Coregonus hoyi Whitefish

Fam. 5. Clupeidae. Herrings.

Clupea harengus Herring

Clupea harengus

Alosa vulgata Shad

Engraulis mordax Anchovy

Chirocentrus dorsalis

Leptocottus armatus Bony Fish

Fam. 3. Siluridae. Catfishes.

Ampelisca elongata

Platypharodon heterodon

Silurus asotus Catfish

Ambloplites rupestris

Silurus glanis Sheat fish

Pseudorasbora parva

Fam. 6. Gadidae. Cods.

Merlangius merlangus Pollack

Gadus morhua Cod

Merlangius merlangus Lesser white hake

Merlangius merlangus Three spotted hake

Lota lota Lingcod

Brachymerluccia setacea Torsk

Fam. 7. Platycephalidae. Flat fishes.

Platichthys stellatus Turbot

Monacanthus tomentosus

Solea vulgaris Sole

Fam. 8. Cyclopteridae. Sticks.

Fam. 9. Echinulidae. Remoras.

Remora remora

Cyclopterus lumpus

Order 2 MALACOPTERYGII

Fam 10 Ophidiidae Blade eels

Fam 11 Muraenidae Eels

Fam 12 Syngnathidae Sail finned Pipe fishes

Order 3 PLECTOGNATHI

Fam 1 Tetraodontidae Puffed toothed fishes

B. DINEY

Fam 2 Balistidae File fishes

PLECTOGNATHI—Continued

Order 4 CARTILAGINEI

Fam 1 Acipenseridae Sturgeons

Fam 2 Chimaeridae Chimaeras

The outline figures represent vertical views of the fish upon which they stand

Fam 3 Squalidae Sharks

Order 4 CARTILAGINEI

Fam 4 Rajidae Rays

Fam 5 Petromyzontidae Stone Suckers

BOOKS FOR THE COUNTRY.

In fcap. 8vo, fancy cloth covers, with numerous Illustrations by the best Artists, Price One Shilling each (unless specified).

21

NEW VOLUME.

Price One Shilling, bound in boards,

OUR WOODLANDS, HEATHS, AND HEDGES.

(A COMPANION TO "WOOD'S COUNTRY OBJECTS.")

By W. S. COLEMAN.

ILLUSTRATED BY THE AUTHOR.

CONTENTS OF THE SERIES:—

1. ANGLING;
Or, How to Angle, and Where to Go. By ROBERT BLAKEY.
2. PIGEONS AND RABBITS.
Wild and Domesticated. By E. S. DELAMER.
3. SHOOTING,
In all its Varieties. By ROBERT BLAKEY.
3. SHEEP.
Our Domestic Breeds, and their Treatment. By W. C. L. MARTIN.
5. FLAX AND HEMP.
Its Culture and Manipulation. By E. S. DELAMER.
6. THE POULTRY YARD.
Including all its Varieties. By Miss E. WATTS.
7. THE PIG.
How to Choose, Breed, Feed, Cut-up, and Cure. By MARTIN and SIDNEY.
8. CATTLE.
Their History, Various Breeds, Management, Treatment, and Diseases. By MARTIN, and W. and H. RAYNBIRD. Price 1s. 6d.
10. THE HORSE.
Its History, Management, and Treatment. By YOUATT and CECIL.
11. BEES.
Their Habits, Management, and Treatment. By the Rev. J. G. WOOD.
12. CAGE AND SINGING BIRDS.
How to Catch, Keep, Breed, and Rear. By H. G. ADAMS.
13. SMALL FARMS.
A Practical Treatise on their Management. By MARTIN DOYLE.
14. THE KITCHEN GARDEN;
Or, Open-ground Culture of Roots, Vegetables, etc. By E. S. DELAMER.
15. THE FLOWER GARDEN;
Or, Open-ground Culture of all Flowers. By E. S. DELAMER.
16. RURAL ECONOMY.
A Treasury of Information on the Horse, Pony, Mule, Ass, Cow-keeping, Sheep, Pigs, Goat, Honey-Bee, Poultry, etc. By MARTIN DOYLE.
17. FARM AND GARDEN PRODUCE
A Treasury of Information upon the Principal Farm and Garden Plants; to which is added a Cottage Gardener's Calendar. By MARTIN DOYLE.
18. COMMON OBJECTS OF THE SEA-SHORE.
With Hints for an Aquarium. By the Rev. J. G. WOOD. With many Illustrations by W. Sowerby.
19. COMMON OBJECTS OF THE COUNTRY.
By the Rev. J. G. WOOD. With many Illustrations by Coleman.
20. AGRICULTURAL CHEMISTRY.
(Price 1s. 6d.) A Familiar Explanation of the Chemical Principles involved in Farm Operations. By A. SIBSON, of the Royal Agricultural College, Cirencester; with a Preface by Dr. A. Voelcker.

POPULAR NATURAL HISTORY.

Messrs. Routledge, Warnes, & Routledge

Have much pleasure in announcing that they have purchased from
Mr. LOVELL REEVE his series of works on

POPULAR NATURAL HISTORY,

And in order to make them more generally known, they have
published them, bound in cloth, at per volume,

Seven Shillings and Sixpence, coloured.

CONTENTS OF THE SERIES.

1. <i>British Birds' Eggs.</i>
By R. LAISHLEY. Twenty Plates. 7s. 6d.
coloured, 5s. plain.	13. <i>History of the Aquarium.</i>
By G. B. SOWERBY, F.L.S. Twenty
Plates. 7s. 6d. coloured, 5s. plain.
2. <i>History of British Crustacea.</i>
By ADAM WHITE, F.L.S. Twenty Plates.
7s. 6d. coloured, 5s. plain.	14. <i>History of Mollusca.</i>
By MARY ROBERTS. Eighteen Plates.
7s. 6d. coloured, 5s. plain.
3. <i>Popular Greenhouse Botany.</i>
By AGNES CATLOW. Twenty Plates.
7s. 6d. coloured, 5s. plain.	15. <i>Popular Garden Botany.</i>
By AGNES CATLOW. Twenty Plates.
7s. 6d. coloured, 5s. plain.
4. <i>Popular Field Botany.</i>
By AGNES CATLOW. Twenty Plates.
7s. 6d. coloured, 5s. plain.	16. <i>Popular Economic Botany.</i>
By T. C. ARCHER. Twenty Plates. 7s. 6d.
coloured, 5s. plain.
5. <i>Popular Geography of Plants.</i>
Edited by Dr. DAUBENY. Twenty Plates.
7s. 6d. coloured, 5s. plain.	17. <i>History of British Ferns.</i>
By T. MOORE, F.L.S. Twenty-two Plates.
7s. 6d. coloured, 5s. plain.
6. <i>History of British Mosses.</i>
By R. M. STARK. Twenty Plates. 7s. 6d.
coloured, 5s. plain.	18. <i>History of British Lichens.</i>
By W. L. LINDSAY, M.D. Twenty-two
Plates. 7s. 6d. coloured, 5s. plain.
7. <i>History of Palms.</i>
By Dr. B. SEEMANN, F.L.S. Twenty
Plates. 7s. 6d. coloured, 5s. plain.	19. <i>Popular Physical Geology.</i>
By J. B. JUKES, F.R.S. Twenty Plates.
7s. 6d. coloured, 5s. plain.
8. <i>History of British Seaweeds.</i>
By Dr. LANDSBOROUGH. Twenty Plates.
7s. 6d. coloured, 5s. plain.	20. <i>History of Zoophytes.</i>
By Dr. LANDSBOROUGH. Twenty Plates.
7s. 6d. coloured, 5s. plain.
9. <i>Popular British Conchology.</i>
By G. B. SOWERBY, F.L.S. Twenty
Plates. 7s. 6d. coloured, 5s. plain.	21. <i>Popular British Entomology.</i>
By MARIA E. CATLOW. Sixteen Plates.
7s. 6d. coloured, 5s. plain.
10. <i>Popular British Ornithology.</i>
By P. H. GOSSE. Twenty Plates. 7s. 6d.
coloured, 5s. plain.	22. <i>Popular History of Birds.</i>
By ADAM WHITE, F.L.S. Twenty Plates.
7s. 6d. coloured, 5s. plain.
11. <i>History of the Mammalia.</i>
By ADAM WHITE, F.L.S. Sixteen Plates.
7s. 6d. coloured, 5s. plain.	23. <i>Popular Scripture Zoology.</i>
By MARIA E. CATLOW. Sixteen Plates.
7s. 6d. coloured, 5s. plain.
12. <i>Popular Mineralogy.</i>
By HENRY SOWERBY. Twenty Plates.
7s. 6d. coloured, 5s. plain.	24. <i>The Woodlands.</i>
By MARY ROBERTS. Twenty Plates.
7s. 6d. coloured, 5s. plain.

"A series published by Mr. Reeve, exceedingly well adapted for winning the sympathies and directing the observation towards natural objects."—*Athenæum*.

"A popular series of scientific treatises, which, from the simplicity of their style, and the artistic excellence and correctness of their numerous illustrations, has acquired a celebrity beyond that of any other series of modern cheap works."—*Standard*.

MESSRS. ROUTLEDGE, WARNES, AND ROUTLEDGE

HAVE THE PLEASURE TO ANNOUNCE THAT THEY INTEND TO ISSUE,

IN FORTY-EIGHT SHILLING MONTHLY PARTS,

SIMILAR IN SIZE AND APPEARANCE TO "ROUTLEDGE'S ILLUSTRATED SHAKSPEARE,"

A Completely New Natural History,

TO BE ENTITLED

ROUTLEDGE'S

ILLUSTRATED NATURAL HISTORY,

BY THE

REV. J. G. WOOD, M.A., F.L.S., ETC.

ILLUSTRATED WITH DESIGNS BY

WOLF, HARVEY, HARRISON WEIR, COLEMAN, ETC., ETC.

ENGRAVED BY DALZIEL BROTHERS.

Each Part will contain 48 pages of matter, printed in elegant type, on fine paper, super royal 8vo, with the average number of thirty exquisite Wood Engravings.

Part I. will be ready for delivery on the 1st of April, 1859.

PROSPECTUS.

In consequence of the kind patronage that the Public have awarded to the "Illustrated Shakspeare," the Publishers have determined to gratify the wish of numerous Correspondents, by issuing a comprehensive NATURAL HISTORY, treated in a Popular Style, with the view of supplying a want that has long been felt.

It is needless to enlarge upon the importance of a Work, undertaken upon this liberal scale on so delightful a branch of knowledge, which becomes the more attractive the longer it is pursued. It is sufficient to say that the ILLUSTRATED NATURAL HISTORY will embody all the leading facts with which the most eminent Naturalists have enriched the stores of this interesting science; and that the Illustrations will be designed by the best Artists of the present day, pre-eminent for their skill in this branch.

GENERAL FEATURES OF THE WORK.

The original intention of the Author was to include the entire Animal Kingdom, from Mankind downwards. But the single subject of Man is so vast and so important that it would demand a much greater space than could be here afforded to it. With the exception, therefore, of a few allusions to the human form in comparison with the structure of various animal organizations, the description of Mankind will not be included in the present Work.

ROUTLEDGE'S ILLUSTRATED NATURAL HISTORY.

This comprehensive Work will commence with the Monkey Tribes, and descending through the scale of animated beings, will conclude with those curious creatures whose animal life is scarcely distinguishable from that of the vegetable. In the course of publication, several thousand Animals will be brought before the Reader, and he will be enabled, by reference to its pages to ascertain the relative position of any member of the Animal Kingdom, and to form some idea of the part which it plays in the great drama of Nature.

IN THE TEXT

will be found a general outline of the Animal Kingdom, together with special accounts of its most important members. The chief characteristics that distinguish one order of Animals from another will be briefly noted, and in many instances illustrative diagrams will accompany the descriptions.

It will be the endeavour of the Author to avoid as far as possible the crabbed and repellent vocabulary that deters so many from the pursuit of that beautiful study of Natural History, and to present to the Reader in simple language the many wondrous and varied forms in which Animal Life manifests itself. The scientific names of each animal will necessarily be retained in order to prevent the confusion which may be caused by the exclusive use of the popular titles. But such terms will be explained, and their pronunciation accented.

The Author of the "ILLUSTRATED NATURAL HISTORY,"—The Rev. J. G. WOOD, M.A., F.L.S.—has long been known to the public as the writer of "My Feathered Friends;" the "Common Objects of the Country," and "Sea-shore;" "Sketches and Anecdotes of Animal Life;" and other volumes on Natural History. He has for some years past been assiduously engaged in the preparation of the present Work, and sincerely trusts that the results of his labours will meet with the same kind reception from the Public as has been granted to his previous productions.

THE ILLUSTRATIONS.

In order to render the subject of Natural History more intelligible to the Reader, this work will be copiously illustrated by the best qualified Artists and Engravers. The names of WOLF, WEIR, HARVEY, and COLEMAN are already so favourably known to the public as to render it unnecessary to make any comment here on their merits; while the reputation of the BROTHERS DALZIEL as Engravers is a sufficient guarantee that their part of the task will be executed with the utmost skill and fidelity. Each Part will be embellished with the average number of

THIRTY ELEGANT WOODCUTS.

Wherever practicable, the drawings will be made from the living animal, and in every instance the greatest pains taken to secure accuracy of detail as well as pictorial effect.

The more important anatomical peculiarities of Animals will also be illustrated by Engravings, and many examples will be given of the various structures as seen through the microscope.

The Publishers, in thus announcing the plan of an undertaking in which they have confidently embarked an enormous outlay, and to the adequate carrying out of which they will devote their unremitting attention, have no hesitation in affirming that their

ILLUSTRATED NATURAL HISTORY

will be unequalled for beauty of illustration, elegance of typographical execution and paper, and lowness of price. For a sum which brings it within the reach of all the reading classes, the Publishers offer to the Public the only Work yet written in a style at once popular and scientific, which embraces the entire Animal Kingdom, and is illustrated in a manner worthy of the subject.

They specially recommend this Work to Schools, Public Libraries, Mechanics' Institutes and Families generally, to whose bookshelves its handsome appearance will make it an ornament, while its low price will render it easy of attainment.

Specimen of the Work, with the Woodcuts, may be had Gratis on application to the Publishers.

London: Routledge, Warnes, & Routledge, Farringdon Street.

HALF HOURS WITH THE BEST AUTHORS.

In Sixpenny Fortnightly Parts.

On the First of March will be ready, PART I., price SIXPENCE

OF

HALF HOURS WITH THE BEST AUTHORS,

SELECTED AND EDITED

BY CHARLES KNIGHT.

WITH SHORT BIOGRAPHICAL AND CRITICAL NOTICES.

This Work will be completed in Twenty Sixpenny Parts, and will be embellished with steel portraits of sixteen of the most celebrated authors, and fifty-two wood engravings by William Harvey.

Each part will contain fourteen pieces of a sufficient length to occupy half an hour's ordinary reading; two of the subjects, the seventh and fourteenth in each part, will be selected from some theological writer of universal acceptance and authority.

The complete work, forming a Circle of English Literature, comprises Imaginative, Descriptive, and Dramatic Verse; Remarkable Adventures; Moral and Religious Exhortation—taken from the best works—gems from the rich treasury of instruction and amusement, of which the master minds of the world, and especially of our nation, have laid up an exhaustless and imperishable store.

Part I., price 6d., with Steel Plate and Two Illustrations,

WILL COMPRISE THE FOLLOWING:—

INFLUENCE OF SCIENCE, by Sir JOHN HERSCHEL.	ROGER ASCHAM AND LADY JANE GREY, by LANDER.
DEATH OF THE SON OF GASTON DE FOIX, by FROISSART.	ON DEJECTION, by COLERIDGE.
SCENES FROM "THE CITY MADAM," by MASSINGER.	APOTHEGMS, by Various Authors.
THE SACK OF MAGDEBURG, by HARTE.	SPEECH AT PLYMOUTH, by GEORGE CANNING.
A TALE OF TERROR, by COURIER.	SIR ROGER DE COVERLEY, by ADDISON.
THE OPENING YEAR, by the Poets.	THE BAROMETER, by ARNOTT.
A GOOD MAN'S DAY, by Bishop HALL.	SUNDAY, by GEORGE HERBERT.

The Complete Work in Four Vols., price 14s., or bound in Two, price 12s., may be now obtained of the Publishers.

London: Routledge, Warnes, & Routledge, Farringdon Street.

BOSWELL'S JOHNSON—ILLUSTRATED.

In Sixpenny Fortnightly Parts.

On the 1st of March will be ready, Part I., with Twenty Illustrations,
price Sixpence, of

BOSWELL'S LIFE OF JOHNSON:

TO BE COMPLETED IN TWENTY-TWO PARTS;

COMPREHENDING

An Account of his Studies and numerous Works, in chronological order, and his Correspondence and Conversations with many eminent Persons: the whole exhibiting a most accurate and entertaining sketch of the state of Literature, with a vivid portraiture of its brightest ornaments, in Great Britain, during the period in which he flourished, extending over nearly half a century.

Illustrated with numerous Portraits, Views, and Characteristic Designs, Engraved from authentic sources.

EXTRACT FROM THE PREFACE.

“A work so well known as ‘BOSWELL'S LIFE OF JOHNSON,’ needs no eulogy to those who have read it. Hitherto, however, the book has hardly been brought within reach of the great mass of the lovers of literature; and it may interest those who make acquaintance for the first time with this masterpiece of Biography, to know that the most eminent of critics who have written upon the subject since the book first appeared, are unanimous in their opinion, that as a life-like portraiture, not only of the personal appearance and singular habits of a distinguished man, but of his strong prejudices, his vigorous eloquence, his homely common sense, and his ready wit, so strikingly shown in the series of conversations which the industry of Boswell has preserved to us—this book stands unrivalled in the literature of our own or any other nation. It is to be hoped that the present edition will recommend itself, both by its cheapness and by the more sterling qualities of careful annotation and copious and judicious illustration which it will be found to possess, to many thousands of readers who have not hitherto had an opportunity of becoming familiar with the work.”

The Work, complete in Four Vols., price 10s., or bound in Two, price 10s., may be now obtained of the Publishers.

London: Routledge, Warnes, & Routledge, Farringdon Street.

Thomas Harrild, Printer, Salisbury Square, Fleet Street, London.

ABSTRACT OF A LECTURE ON MINERALOGY, & ITS APPLICATION TO GEOLOGY & THE ARTS,

Given at St. Martin's Hall, Long Acre, August 4, 1854, in connection with the

EDUCATIONAL EXHIBITION OF THE SOCIETY OF ARTS,

BY PROFESSOR J. TENNANT, F.C.S.

(Reprinted from the "Journal of the Society of Arts," No. 92, Vol. II., page 680.)

The lecturer commenced by calling attention to the concluding portion of his lecture before the Society of Arts, being one of the series delivered on the results of the Great Exhibition of 1851.

The lecturer said it was desirable "to draw the attention of all persons likely to travel in foreign countries, especially to Australia, Cape of Good Hope, India, and Canada, to the great importance of a knowledge of minerals. There is no country in the world possessing a wider range of territory or greater mineral wealth than Great Britain; consequently, there is none in which the study of mineralogy is more important; yet the ignorance which prevails on the subject is astonishing. I am frequently receiving packages and letters of inquiry from our colonies, containing pebbles of quartz and bits of shining iron pyrites, which a few simple experiments would render unnecessary. A very small amount of knowledge as to the method of testing minerals, especially as to their specific gravity, would save months of anxious suspense, which must occur while waiting a reply from England. But I am not without hope that the ignorance which leads to such mistakes as these will gradually be dispelled."—*Lecture on Gems and Precious Stones, delivered at the Society of Arts, March 24, 1852.**

Members of the Society, by applying for it, might have had a copy of the above lecture referred to, but Mr. Tennant believed upwards of 400 copies were still remaining on the shelves of the Society. Since then the streets of London have been placarded with large papers; first advertising the John Bull "Gold Nugget" from the Victoria diggings, weighing 45lbs. 6oz. This yielded gold to the value of £2,500. Secondly, a piece of gold quartz arrived by the "Sarah Sands" from Ballarat, Australia, weighing 134lbs. 11oz., which was denominated the "Monster Nugget," and was exhibited for some time at the Globe in Leicester Square. Mr. Tennant said he was present at the melting of this piece in July, 1853; it yielded £5,532 7s. 4d. worth of gold, and was the largest yet received. We are informed by the public papers that gold in California has been found in value exceeding 45 million pounds sterling. From our own colonies immense quantities have been received; the exact amount it would be difficult to ascertain. He was informed, by competent persons, that it exceeded twenty millions sterling within three years. When conversing with those who had returned successful in gold collecting from our colonies, he found them unacquainted with the ores of silver, copper, tin, mercury, lead, antimony, bismuth, all precious stones, and many other minerals of considerable value, not only in a commercial point of view, but as a means of relieving the wants of the emigrant anxious to establish himself in a new country. Mr. Tennant doubted whether gold was the only metal worth searching for, and instanced the carboniferous formation of England,

which in iron, coal, lead, limestone, and sandstone yielded more than twenty millions sterling annually. These few remarks would show the importance of the study of mineralogy as a branch of natural history, but yet it is very much neglected in England.

The lecturer then proceeded to enumerate the attempts which have been made in the present century to establish schools for mining. In 1804 Sir John St. Aubyn, Sir Abraham Hume, and the Right Honourable C. F. Greville, each possessed very extensive collections of minerals. That formed by Sir John St. Aubyn is now in the Museum at Devonport, and is rich in metallic minerals; that by Sir A. Hume, which contained many gems, was presented by Lord Alford to the Museum at Cambridge; the Hon. Mr. Greville's collection was bought by the trustees of the British Museum, and is rich in carbonates of lime. These gentlemen endeavoured to raise £4,000 for forming at the Royal Institution a scientific collection of minerals, under the arrangement of a good mineralogist, and of establishing an additional laboratory there under the direction of an eminent chemist, to be exclusively employed on the assay of metals, and for the advancement of minerals and metallurgy. At that time the Royal Institution had the best public collection in London. It had been formed by Davy in 1803, and been added to by Hatchett, Cavendish, Wollaston, Brande, and others. University College and King's College were established about 1831. The former has had the able assistance of Messrs. Phillips, Webster, and Morris; the latter of Sir Charles Lyell, Phillips, and Ansted. Mr. Tennant was appointed lecturer on mineralogy in 1838, and succeeded Mr. Ansted in geology in 1853. King's College possesses a good collection of minerals and rocks, exceeding 2,500 specimens, which are accessible to the students.

In 1838, Sir Charles Lemon made a most liberal offer of £10,000 towards establishing a mining school at Truro, in Cornwall, on certain conditions, which it is to be regretted were not carried out. Some very interesting particulars of this noble offer are to be found in the Rev. H. Moseley's Reports on Elementary Schools, in the Minutes of the Committee of Council on Education, 1851-52. (Vide p. 13.) Parties are again trying to form an Elementary Mining School in Cornwall, and it is to be hoped they will succeed. If all those interested in mining considered the amount of capital lost in fruitless attempts to work mines, they would find it to their pecuniary interest to establish schools in all our mining districts. The engineer and agriculturist might, with our improved mode of transit by railway, introduce superior materials for constructing buildings and improving soils.

In 1851 Sir Henry De la Beehe succeeded in opening the Museum of Practical Geology, and engaging some of the most eminent men as teachers. The collection comprises minerals, such as iron, coal, lead, copper, tin, salt, roofing slate, granite for paving our streets, limestone for constructing our buildings, clay for bricks and pottery, sand for glass, &c., &c. The obtaining of all these materials gives employment to a very large proportion of our popu-

* The public can obtain a copy of the lecture for twopence, by purchasing Nos. 94 and 95 of the "Home Friend," a weekly penny publication, issued by the Society for Promoting Christian Knowledge.

lation, and their value is upwards of thirty-six million sterling per annum.

The lecturer exhibited diagrams of the minerals entering into the composition of metamorphic and volcanic rocks, also those confined more particularly to sedimentary rocks. He pointed out a few instances of the easy method of distinguishing the most common. Thus, on the sides of rivers rounded pebbles of quartz and calcareous spar are frequently to be picked up, exhibiting no crystalline form. If quartz, it will not yield to the knife, and when broken exhibits a curved fracture like a piece of broken glass (see fig. 1). Calcareous spar, on the contrary, when broken, exhibits a rhomboidal form (see fig. 2). The

Fig. 1.

Fig. 2.

faces and angles are as smooth as though they had been polished by the lapidary. Calcareous spar is readily scratched by the knife, and is acted upon by an acid. In this way a student will acquire more information in a dozen or twenty lessons from a teacher who will select a number of minerals having some characters in common, such as schorl and oxide of tin; copper, or iron pyrites, and gold; heavy spar, and calcareous spar; cinnabar, and some varieties of oxide of iron; arsenical iron, and platina; than by reading volumes on geology. He stated that several instances of serious mistakes had come before

him within the last few years, in which one mineral had been substituted for the other in commercial transactions.

To those who have an opportunity of studying our national collection of minerals in the British Museum, which is probably the finest in the world, having cost the government upwards of £30,000 independent of many valuable gifts from the Rev. Mr. Cracherode and others, the following remarks may be found useful:—The Museum is open Mondays, Wednesdays, and Fridays, also on Tuesdays and Thursdays for students, who have little difficulty in gaining access. First purchase a Synopsis, the price of which is only twopence; then, by referring to the index, the case containing particular specimens may be readily found. The collection is arranged in sixty cases, according to the chemical system of Berzelius; the names of the minerals are printed on labels with borders coloured either red, green, blue, or yellow; a thin slip of wood of the same colour surrounds all the varieties of that species. This is particularly necessary to be observed, because of some species there are many varieties, in others probably only one or two specimens. A small written paper accompanies many specimens, giving the locality. By occasional visits of this kind and a good work on Mineralogy much information may be gained. The lecturer contrasted the present facilities afforded to the student with those of fifty years since, and referred to Professor Silliman's late visit to England. Another mode of obtaining a practical knowledge of mineralogy and geology is to visit the mountainous districts of the British Isles; and although not having the high mountains of Switzerland and other countries, the British Isles will yield to none in interest. He had frequently seen the students of Germany travelling in companies, and always recommended the same plan to his own students in the summer vacation, as it brought them back to attend the approaching year's lectures with additional interest, and often induced the careless young man to become one of the most diligent.

At KING'S COLLEGE, London, Lectures on Mineralogy are given on Wednesday and Friday Mornings, from Nine to Ten o'clock, from October to Christmas, to which the public are admitted on paying the College Fees.

MINERALOGY.

The Course commences with a description of the Physical and Chemical characters of Minerals in general.

The principal simple Minerals are next separately considered, and the readiest mode of distinguishing them described.

The course of instruction includes a minute description of all the substances entering into the composition of Rocks, and of those minerals which are also used in the Arts; illustrated by an extensive collection of characteristic specimens, and diagrams of the principal crystalline forms, &c.

GEOLOGY.

THE LECTURES COMMENCE IN JANUARY AND TERMINATE IN MAY.

LENT TERM.—Descriptive Geology.

EASTER TERM.—The practical application of Geology to Engineering, Architecture, Agriculture, and Mining.

The Students are accompanied by the Professor to the Museum of Economic Geology, the British Museum, and other public institutions, and also on excursions into the country.

Mr. TENNANT gives private instruction in Mineralogy and Geology at his residence, No. 149, Strand, London. He can supply Elementary Collections at 2, 5, 10, 20, 50, to 100 guineas each, and every requisite to assist those commencing the study of these interesting branches of Science, a knowledge of which affords so much pleasure to the traveller in all parts of the world.

A collection for Five Guineas, which will illustrate the recent works on Geology, by Lyell, Mantell, and others, contains 200 specimens, in a plain Mahogany Cabinet, with five trays, comprising the following specimens, viz.:—

MINERALS which are either the components of Rocks, or occasionally embedded in them:—Quartz, Agate, Chalcedony, Jasper, Garnet, Zeolite, Hornblende, Augite, Asbestos, Felspar, Mica, Tale, Tourmaline, Calcareous Spar, Fluor, Selenite, Baryta, Strontia, Salt, Sulphur, Plumbago, Bitumen, &c.

NATIVE METALS, or METALLIFEROUS MINERALS; these are found in masses or beds, in veins, and occasionally in the beds of rivers. Specimens of the following Metallic Ores are put in the Cabinet:—Iron, Manganese, Lead, Tin, Zinc, Copper, Antimony, Silver, Gold, Platina, &c.

ROCKS; Granite, Gneiss, Mica-slate, Clay-slate, Porphyry, Serpentine, Sandstones, Limestones, Basalt, Lavas, &c.

PALAEOZOIC FOSSILS, from the Llandello, Wenlock, Ludlow, Devonian, and Carboniferous Rocks.

SECONDARY, FOSSILS, from the Lias, Oolite, Wealden, and Cretaceous Groups.

TERTIARY FOSSILS, from the Plastic-clay, London-Clay, Crag, &c.

In the more expensive collections some of the specimens are rare, and all more select. Mr. TENNANT bought at the Stowe sale the Duke of Buckingham's collection; for this he asks 1000 guineas. It contains upwards of 3000 specimens, many of which are of great interest. He has refused £25 for one specimen and £30 for another.

On the 1st of July, PART I. of

BRITISH WILD FLOWERS.

ILLUSTRATED

BY

JOHN E. SOWERBY,

ILLUSTRATOR OF THE FERNS OF GREAT BRITAIN,

THE GRASSES OF GREAT BRITAIN, ETC.

DESCRIBED,

WITH AN INTRODUCTION AND A KEY TO THE NATURAL ORDERS,

BY

C. PIERPOINT JOHNSON.

AN illustrated Manual of British Botany has long been a desideratum. While the few works hitherto published containing coloured figures of all the English Wild Flowers are far too voluminous for use in the fields and woods, and too costly to be within the reach of many, the excellent books of Hooker, Lindley and Babington, however well adapted for the professed student of botany, are too technical and elaborate for the purpose of the beginner.

Botany, notwithstanding the popular dogma, is *not* a “science of hard names.” It is the study of the habits and adaptations of the most beautiful of the inanimate works of the Creator—a study that can be pursued with profit only in the open air—on mountain, woodland, marsh and hedge-bank—not by turning over the musty leaves and discoloured straw of an herbarium, or poring over the crabbed technicalities and latinized phraseology which have repelled so many from the threshold of Science.

The present work, while furnishing, it is hoped, a useful field-book for the reference of the *student* of British Botany, will at the

same time enable the less scientific observer to distinguish at a glance the species of any flowering plant found growing wild in our islands.

It will contain carefully coloured figures of every British flowering plant, drawn upon a reduced scale from Sowerby's English Botany, including those published in the three volumes of Supplement to that work. The specific descriptions will necessarily be concise, but will be rendered as clear and intelligible as possible, while for the assistance of the student references will be given to the more elaborate works above mentioned. A short introduction to the Natural Orders and Genera will be added, with a glossary of botanical terms.

The book will comprise eighty plates, each containing twenty figures, forming, with the letter-press, a complete illustrated Manual of the British Flora.

Part I. will be ready on the 1st of July.

PROSPECTUS.

The work will be completed in Twenty Parts, Monthly, each Part to contain Four Plates of Twenty Figures each and their descriptions.

Coloured, 3s. per Part.

Plain, 1s. 6d. per Part.

The Introduction, Key, and Glossary will appear in portions at intervals of two or three months.

The Colouring having to be done by hand, it is desirable that Subscribers' names for the Coloured Copies be sent to the Publisher as early as possible, in order that a sufficient supply be prepared.

To be had through all Booksellers, or of the Publisher,

JOHN E. SOWERBY, 3 MEAD PLACE, LAMBETH. S.

ON VISUAL EDUCATION AS APPLIED TO GEOLOGY.

ILLUSTRATED BY

DIAGRAMS AND MODELS OF THE GEOLOGICAL RESTORATIONS AT THE CRYSTAL PALACE.

Read before the Society of Arts,

BY B. WATERHOUSE HAWKINS, F.G.S., F.L.S., May 17, 1854,

And reprinted from the *Journal of the Society of Arts*, No. 78.

It has been truly said, that the highest function of the Society of Arts must be its endeavour to promote the general advancement of education; and in the belief that such are the practical views of this Society, I presume, that its members cannot view with indifference any part of that great undertaking at the Crystal Palace, which may be so justly called a grand-child of the Society of Arts. It was here that the Great Exhibition of 1851 first saw the light, and which, under the happy auspices of our Royal President, was brought to maturity—a giant, born of peace and good-will to men; of such parentage how much is to be hoped for!

In this the 100th year of our existence as a Society, it is most happily conceived to lay before the whole world an exhibition of all the materials of education collected from all nations; therefore, in the hope that you will consider my attempt at least seasonable, I shall endeavour, very briefly, to lay before you this evening a slight sketch of part of one of those great efforts in an educational direction which the Crystal Palace Company are making for the benefit of their fellow-men of all classes; and no less is it a benefit to their fellow-men because it is being done commercially, which, if properly analysed, will be found to be the most truly independent system and most congenial to the feeling of every right-minded Englishman.

The whole of the great scheme now working to completion, known as the Crystal Palace, might be properly described as one vast and combined experiment of visual education; and I think it would be easy to show that its educational powers and design constitute its legitimate claims to the support of all civilised Europe; but like its great parent, the Exhibition of 1851, it is too extensive to allow of even a short catalogue in the brief space of one hour; I therefore confine myself to a hasty sketch of part of the attempt to apply the active principle of teaching directly through the eye that branch of the truths of creation upon which I have been engaged for the last year and half.

This direct teaching through the eye has been recognised as a principle and a facility of education for some years past, even in the limited sphere of schools; and I believe the name of Pestalozzi deserves the most honourable mention in connection with its first enunciation as a recognised facility upon principle. His, and his followers' lessons on objects were urged upon the public some twenty years ago, and a writer who was quoted at the time, in support of the principle, shrewdly observed, that "we daily call a great many things by their names, without even inquiring into their nature and properties, so that in reality it is only their names, and not the things themselves, with which we are acquainted." If this remark be so applicable to our superficial knowledge of every-day objects, how much more literally true does it become when applied to that branch of science and truth (for science is only a synonyme for truth) which the Crystal Palace Company have so boldly undertaken to lay before the multitude; there we shall reverse that order of teaching which is described as the names and not the things with which we become acquainted; it will be the things with their names that we shall present to the people; and not only the people in the restricted sense of the word, but to the million, including the well-informed and those above the average in education and acquirements; to the majority, these geological restorations will present all the novelty of a first acquaintance, for, with reference to the true form and size

of the extinct animals, little more than the name was known to many who had an earnest desire to acquire some knowledge of geology, but whose scanty leisure would not allow of their pursuing their inquiries sufficiently far to realize that life-like interest which becomes almost essential for the successful continuance of any pursuit. Our natural sympathies are with life. That which does or has lived will always be found to interest far beyond any inorganic object, however brilliant or beautiful.

Of course it is not my intention to offer you on the present occasion a lecture on Geology, or Palæontology, but only simply to describe in a few words the foundation upon which I have constructed and restored these great animals, and how I have obtained that truth and accuracy which may entitle my restorations of the extinct animals to be viewed as useful and trustworthy lessons to all classes, and which we hope will render the appearance and names of the ancient inhabitants of our globe as familiar as household words.

Geology and Palæontology, though deeply interesting to all who have had the opportunity for study, have hitherto been restricted to the professed anatomist, or to those whose great resources enabled them to make collections and to bring around them the costly requisites of their enthusiastically followed pursuit. Sir Philip Egerton, Lord Enniskillen, Sir Roderick Murchison, Dr. Mantell, Mr. Bowerbank, and other distinguished names illustrate the limited number to whom the study of Geology and Palæontology was practically within reach. We have public museums, it is true, but even our national collection at the British Museum, though containing some of the finest fossils that have been collected throughout the world, from their detached state, there being only two or three skeletons for comparison, offers little more than objects of wonder, literally only dry bones, or oddly-shaped stones, to the majority who see them. The inevitably fragmentary state of such specimens of course left much to the imagination, even to those who looked at them with some little knowledge of comparative anatomy, and, as that amount of knowledge is not found among the average acquirements of the public at large, it was a fallow field, which nothing less than the great enterprise and resources of the Crystal Palace Company could have attempted for the first time to illustrate and realise—the revivifying of the ancient world—to call up from the abyss of time and from the depth of the earth those vast forms and gigantic beasts which the Almighty Creator designed with fitness to inhabit and precede us in possession of this part of the earth called Great Britain.

Geology has been aptly called the science of nature's antiquities, for, however fresh, renewed, and vigorous in all her operations, yet even nature has had her olden time; her early days must have seen fierce struggles, contentious storms, fire and water, like the modern theories, struggling for the mastery; then her epoch of calmer subsistence and gentler rule, each state leaving its indestructible monuments, with their carvings and inscriptions, for man to decypher. Nature's pyramids are mountains of granite, slate, and limestone; her aqueducts majestic rivers, leaving gigantic boulders for land-marks; but more to our immediate purpose, the geologist, like the modern antiquarian, finds his richest stores of information in nature's cemeteries, where the bones of bygone generations lie embalmed with proofs of how they lived and where they died.

The science of Palæontology (or, as the literal transla-

tion of the name indicates, the study of ancient beings) treats of the history of fossils; and its principal end is to make known the forms and the zoological relations of the beings which have inhabited the globe at divers epochs anterior to our own. It has also to fill one of the most remarkable pages in the history of the earth, by retracing the successive phases of the organization of the animals that have peopled it. It has two principal applications:—1st to Zoology, by making known those new or rather unknown forms and conditions of existence which are often wanting in living nature. It may, sometimes, by offering new transitions, demonstrate natural relations of which we were ignorant; it reacts also upon the general laws of comparative anatomy, and has contributed much to its researches and discoveries, and it is connected with all the questions relative to the origin and development of organised beings. 2ndly to Geology:—Palæontology again supplies geology with the only certain basis for the determination of the stratified rocks, and by clearing up several essential points relative to the ancient limits of Seas and Continents. The study of fossils is destined to throw a great light upon the determination of the order of succession of the beds or strata, and of their relative age. The study of fossils may also enlighten questions of detail. Certain sorts of fish and of mollusca are known to be essentially belonging to rivers, and others to inhabit the seas. If the fossils of a stratum belong to the fresh-water species, we may legitimately conclude that such stratum has been deposited by rivers or by lakes of fresh water. If, on the contrary, the fossil remains belong to the marine species, it may be presumed that the deposit in which they occur owes its origin to the waters of the sea.

In latter years fossils have revealed remarkable facts concerning the state of the globe at various epochs. Some authors have sought to make use of them to define the shores and the configuration of the ancient seas; at least, we know that in the deep sea we find fewer molluscs than near the coasts; the depth and absence of vegetation cause the greatest part of the species to avoid the centre of the seas; the shores, on the contrary, which furnish a more abundant nourishment, and the rocks near the surface, serve as shelter to a much larger number of individuals. The presence of numerous fossils, and above all that of species which belong to the kinds essentially fluviatile, may then serve to indicate the shore of ancient estuaries, whilst rare fossils of species from the deep sea prove, on the contrary, that the strata have been deposited far from the coasts of seas at divers epochs. Thus it will be seen that geology would be but a barren study without some knowledge of the fossil remains of those beings who apparently first peopled the waters of the earth.

An inspection of the various strata in which fossil remains have been imbedded serves to prove that, in general, a constant order has existed in their formation. The sea, by which the entire earth appears to have been covered, having rested in certain situations a sufficient length of time to collect particular substances, and to sustain the life of certain genera and species of animals, has been afterwards replaced by another sea, which has collected other substances, and nourished other animals, whose remains are found in each stratum, and are generally limited to one formation, or, if reappearing in a successive stratum, much modified in size or structure. I have prepared here a diagram (page 3) which will give you an idea of the succession of epochs; each epoch containing a succession of periods and formations, which, though often found to have been disturbed by some vast convulsive force, can yet be retraced to its natural order of succession and super-position.

The diagram (page 3) shews those formations which constitute the secondary epoch, or, if described in ascending order, the commencement of that vertebrate existence which left unequivocal evidence of its inhabiting the earth, by leaving the imprint of its footmarks, which, at one time, was all we knew of the extraordinary inhabitants of the New

Red Sandstone. This animal was called *Chirotherium*, from the hand-like shape of the foot-marks, until the mighty genius of Professor Owen placed the teeth and head before us, with such indisputable characters as united them to the footmarks, and thus, by induction, the whole animal (*Labyrinthodon*) was presented to us.

Next, in ascending succession, we have the *Ichthyosaurus platyodon*, *tenuirostris*, and *communis*, the *Plesiosaurus dolichodeirus*, as restored by Dean Conybeare, the *Plesiosaurus macrocephalus* and *Hawkinsii*, the latter named by Professor Owen after Mr. Thomas Hawkins, who with great enthusiasm cleared it from its matrix of lias, and who made the first great collection of fossils of the lias which were purchased by the trustees of the British Museum, where they now form the most striking features of the national collection of fossils.

It next illustrates the upper portion of the lias, sometimes known as the alum shale, so well developed at Whitby in which remains of the *Teleosaurus* have been frequently found. This animal will be recognised by its near resemblance to the crocodile of the Ganges called *Gavial*, or *Garrial*, as it should be termed: to the casual observer the principal difference consists in its greater size. The next formation above the lias is the oolite, of which at present that singular reptile, the *Pterodactyle*, represents the inhabitants, while one of the oolitic formations, called the Stonesfield slate, bears the great discovery of Buckland, the *Megalosaurus*, or the great lizard. This and the strata of the upper oolite bring us to the formation called the Wealden, which Professor Owen, in one of his elaborate descriptions of the British fossil reptiles, calls the metropolis of the Dinosaurian order, which I have here represented by the best known and most typical species, the *Hylæosaurus* or lizard of the weald, with its extraordinary dermal covering and long range of dorsal scutes, of which the bones were first discovered by the celebrated Dr. Mantell, whose persevering researches in Wealden formations first gave the idea to science of the former existence of the *Iguanodon*.

These restorations of the *Iguanodon* I made from the measurements of the great Horsham specimen, as the largest is called, from its having been found and carefully preserved by Mr. Holmes, surgeon, at Horsham, who has bestowed much care and attention on the development of the great fossils found in his neighbourhood, among which are the largest known specimens of the bones of the *Iguanodon*, having also the greater value of being found altogether, evidently belonging to one individual. These he kindly placed at my service for comparison with the better known Maidstone specimen now in the British Museum, which was so admirably extricated from its matrix and preserved by Mr. Bensted and Dr. Mantell.

This *Iguanodon* was the animal the mould of which I converted into a *salle à manger*, and in which I had the honour of receiving Professor Owen, Professor E. Forbes, and twenty of my scientific friends to dinner on the last day of the year, 1853. This circumstance will best illustrate the great size of these animals, the restoration of which has involved some of the greatest mechanical difficulties that can come within the sculptor's experience; and, if it will not be considered out of place, I will briefly state the process by which I have constructed these large models.

In the first week of September, 1852, I entered upon my engagement with the Crystal Palace Company to make the *Mastodon*, or any other models of the extinct animals that I might find most practicable; such was the tenour of my undertaking, and being deeply impressed with its important and perfectly novel character, without precedent of any kind, I found it necessary earnestly and carefully to study the elaborate descriptions of Baron Cuvier, but more particularly the learned writings of our British Cuvier, Professor Owen. Here I found abundant material collected together, stores of knowledge from years of labour, impressing me still more with the grave importance of attempting to present to the eye of the

DIAGRAM OF THE GEOLOGICAL RESTORATIONS AT THE CRYSTAL PALACE, BY B. W. HAWKINS, F.G.S., F.L.S.

Chalk.
Pterodactyle.
1.

Wealden.
Iguanodons.
2.

Hylaeosaurus.
3.

Megalosaurus.
3.

Oolite. (Stonesfield Slate.)
Teleosaurus.
Pterodactyle.

Lias.
Plesiosaurus.
4 & 5.
Ichthyosaurus.
6.

New Red Sandstone.
Labyrinthodon.
7.

Mr. TENNANT, Geologist, 149, STRAND, London, is now able to supply the various Educational Institutions, Museums, and the Public, with these very instructive Models. Mr. WATERHOUSE HAWKINS has prepared for casting entire Restorations of those extraordinary British animals, carefully constructed to scale from the form and proportions of the fossil remains, and in strict accordance with the criticism and sanction of the highest scientific authorities. (See Mr. Hawkins's paper read before the Society of Arts, May 17, 1854, and published in *Journal*, No. 78.) Sold in sets of 7 Figures (from 1 to 7 as above), made to scale of one inch to a foot, illustrating the inhabitants of the Secondary or Reptilian Epoch, including the New Red, the Lias, Oolite, Wealden, and Chalk. Price of the set, £5 5s., or single figures at proportionate prices. Packing Case, 8s.; if wanted for the country, 8s. 6d.
149, Strand, May, 1857.

world at large a representation of the complete and living forms of those beings, the minutest portion of whose bones had occupied the study and research of our most profound philosophers; by the careful study of their works, I qualified myself to make preliminary drawings, with careful measurements of the fossil bones in the Museum of the College of Surgeons, British Museum, and Geological Society; thus prepared I made my sketch-models to scale, either a sixth or 12th of the natural size, designing such attitudes as my long acquaintance with the recent and living forms of the animal kingdom enabled me to adapt to the extinct species I was endeavouring to restore. These sketch-models I submitted in all instances to the criticism of Professor Owen, who with his great knowledge and profound learning most liberally aided me in every difficulty. As in the first instance it was by the light of his writings that I was enabled to interpret the fossils that I examined and compared, so it was by his criticism that I found myself guided and improved, his profound learning being brought to bear upon my exertions to realise the truth. His sanction and approbation obtained, I caused the clay model to be built of the natural size by measurement from the sketch-model, and when it approximated to the form, I with my own hand in all instances secured the anatomical details and the characteristics of its nature.

Some of these models contained 30 tons of clay, which had to be supported on four legs, as their natural history characteristics would not allow of my having recourse to any of the expedients for support allowed to sculptors in an ordinary case. I could have no trees, nor rocks, nor foliage to support these great bodies, which to be natural, must be built fairly on their four legs. In the instance of the *Iguanodon*, it is not less than building a house upon four columns, as the quantities of material of which the standing *Iguanodon* is composed, consist of 4 iron columns 9 feet long by 7 inches diameter,

600 bricks,

650 2-inch half-round drain-tiles,

900 plain tiles,

38 casks of cement,

90 casks of broken stone,

making a total of 650 bushels of artificial stone.

These, with 100 feet of iron hooping and 20 feet of cube inch bar, constitute the bones, sinews, and muscles of this large model, the largest of which there is any record of a casting being made.

I have only to add that my earnest anxiety to render these restorations truthful and trustworthy lessons has made me seek diligently for the truth and the reward of Professor Owen's sanction and approval, which I have been so fortunate as to obtain, and my next sincere wish is that, thus sanctioned, they may, in conjunction with the visual lessons in every department of art, so establish the efficiency and facilities of visual education as to prove one of many sources of profit to the shareholders of the Crystal Palace Company.

DISCUSSION.

The Dean of Hereford said he had listened, as he was sure every one present must have done, with great interest to the admirable paper of Mr. Waterhouse Hawkins, who had brought before them many animals to most of them probably unknown, and so perhaps they would have remained, had they not been represented in this way. He should be glad to see those models multiplied at a price which would enable them to be introduced into village and ordinary schools, as every one could not visit the Crystal Palace, and he therefore hoped that specimens

like those before them might be rendered attainable by those in remote and secluded districts, who would not have the advantage of witnessing the splendid and gigantic illustrations of the extinct creation of the early ages of the world which would be there exhibited. He would also express a hope that specimens like those might be introduced in connection with the approaching Educational Exhibition of the Society, as it would be of great importance in an educational point of view, that schoolmasters and teachers of the young might thereby have an opportunity of seeing what had been done, and what they might do for themselves, if they could purchase those models at a moderate price. It would be doing for the extinct world what they had not done for the existing one, because, in many of the rural districts the young were taught the nature and habits of elephants, lions, and tigers, and yet had never seen either a living specimen or even an accurate model of those animals. He should now be glad to hear the observations of any gentleman upon the subject of the paper which had been brought before them that evening, and as he saw Professor Tennant present, perhaps he would favour the meeting with a few remarks upon a matter with which he was so intimately acquainted.

Mr. TENNANT observed, that he had but little to say after what had been stated in the paper, because to go through the various models exhibited in detail would occupy several hours. Having had on more than one occasion an opportunity of witnessing the process of building up the models of these monster animals, it was astonishing to see the skill with which Mr. Hawkins built up, piece by piece, those gigantic and extraordinary representations. When they looked at the bones on the table, and compared them with the thigh-bones of the largest animals with which they were now acquainted, they were taken by surprise, and it required the learning and erudition of a Conybeare, Buckland, or Owen to re-create these extinct animals from detached fossil remains. Most persons present had, no doubt, seen the fossil *Ichthyosaurus* in the British Museum, which was 22 feet in length; but these beautiful models carried the mind back in time to the periods when these creatures were living in the seas which washed our own coasts. We are now standing upon an ancient sea-bottom, and the race of animals which then existed had been brought to light, for the most part, only in a fragmentary state, like the fossil remains upon the table. Owing to the facilities which now existed of visiting all parts of the country, and collecting fossils on the spot, and afterwards going to the Crystal Palace, and seeing the restoration of the animals, a more accurate knowledge of those wonders of creation was obtained than could be communicated by lengthened scientific details. They were not looking at the anatomical structure only, but they saw them clothed as it were in their original armour, many of them with gigantic scales, and formidable spines.

Mr. HARRY CHESTER said — That a great service would be rendered to education by multiplying the casts and illustrations before them. * * * * * No doubt much important service might be rendered if these models were put into a form in which they would be easily attainable by those engaged in education. He thought it would be highly desirable that a stall should be occupied by these casts at the approaching Educational Exhibition of the Society, and it would be of great service if Mr. Hawkins would, at a convenient period, deliver a lecture or read a paper upon them, for the benefit of the large number of schoolmasters and schoolmistresses who, he hoped, would be attracted to that exhibition.

An extensive assortment of Minerals, Shells, and Fossils, together with all the recent Works relating to MINERALOGY, GEOLOGY, CONCHOLOGY, and CHEMISTRY, Geological Maps, Hammers, Blowpipes, Acid Bottles, &c., can be supplied by

JAMES TENNANT, Mineralogist to Her Majesty, 149, STRAND, LONDON.

May, 1857.