Synopsis of the physiological series in the Christ Church Museum : arranged for the use of students after the plan of the Hunterian collection, and chiefly under the divisions of the Hunterian catalogue.

SYNOPSIS

OF

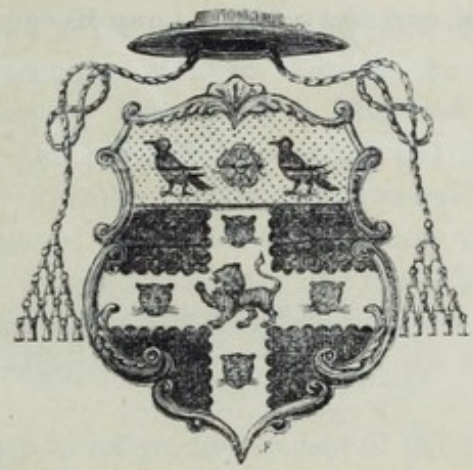
THE PHYSIOLOGICAL SERIES

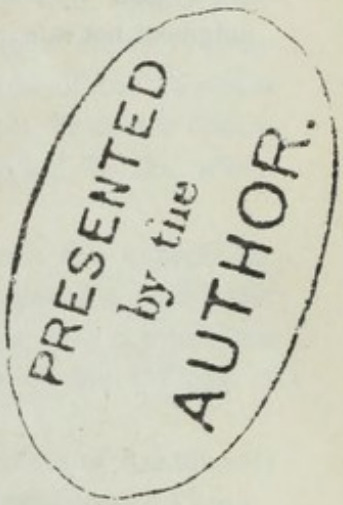
IN THE

CHRIST CHURCH MUSEUM.

ARRANGED FOR THE USE OF STUDENTS

AFTER THE PLAN OF THE HUNTERIAN COLLECTION, AND CHIEFLY UNDER THE DIVISIONS OF THE HUNTERIAN CATALOGUE.





OXFORD:

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M.DCCC.LIII.

"Thus there are two books from whence I collect my divinity; besides that written one of God, another of His servant Nature, that universal and public manuscript, that lies expansed unto the eyes of all."—Sir Thomas Browne.

"Wherefore by the contemplation of Nature to induce and inforce the acknowledgment of God, and to demonstrate His power, providence, and goodness, is an excellent argument."—"But on the other side, out of the contemplation of Nature, or ground of human knowledge, to induce any verity or persuasion concerning the points of faith, is in my judgment not safe: 'Da fidei, quæ fidei sunt.'"—Lord Bacon.

IN the middle of the last century, Dr. Matthew Lee bequeathed an annual sum, in trust to the Dean and Chapter of Christ Church, that a member of Christ Church might be appointed to read annually two courses of Lectures on Anatomy and Physiology.

In the present century, the office of Reader was held successively by Sir Christopher Pegge, and Dr. Kidd. Various preparations were made by them, and were augmented by purchases at the sale of Brook's Museum, as well as by some illustrations for Lectures, by the present Regius Professor of Medicine, and other persons.

Convinced of the great value of a knowledge of the Principles of Physiology for the purpose of General Education, and acting in the spirit of the Founder, on my appointment to the Readership, in 1845, I decided on forming a more systematic Physiological Collection for the use of the Ch. Ch. Students, and others who might wish to avail themselves of permission to study in it.

It seemed to me that, in a substantial plan for such an Educational Institution, it would be proper to represent, on however small a scale, the whole range of Anatomical and Physiological Study. My first object was therefore to obtain, in the course of time, a number of dissections sufficient to be arranged on the plan of the Museum of the Royal College of Surgeons of England. I hoped by this method, as well, to introduce the learner, from the outset of his studies, to the great Philosophical views of John Hunter, and to the representation of these views, in the Catalogue of the Museum of the College of Surgeons, by John Hunter's illustrious exponent Professor Owen, as to make the study of the excellent Anatomical and Physiological Works, which the present age has produced, both convenient and profitable.

I have accordingly arranged the preparations already made, with few exceptions, under the headings of Mr. Owen's Catalogue; and it will be found that the series and subseries, and the headings of the MS. Catalogue and the Synopsis now printed, are generally taken from the Quarto Catalogue, or from the Synopsis of the College of Surgeons.

It is intended in this way to inform the student of the salient points of Anatomical inquiry; to point out to him some of the best and most recent Anatomical and Physiological works; to make him familiar with the Hunterian Collection; and to induce him to use the opportunities there afforded him, as occasion may offer during his studies here, or in after life, in visiting London.

I am greatly indebted to Professor Owen for personal kindness and countenance; and, however unworthy of his or their notice this Educational effort may be, I must be

allowed to record, that to the encouragement afforded by him, and to the friendship which has been permitted me with Sir Benjamin Brodie, Dr. Alison, and Mr. John Goodsir, as well as to the constant confidence of the Very Rev. Dr. Thomas Gaisford, the Dean, and of the Chapter, of Christ Church, the Members of Christ Church and of the University generally are mainly indebted for whatever of convenience they may find, in access to even a miniature Physiological Series. Only they must bear in mind, that there is provided for them, not a University Collection, but what it is, a Collegiate Educational Series; a distinction which the critical Scientific Visitor will at once understand.

I have much pleasure in recording how much the Physiological Series owes to Dr. Melville, now Professor of Anatomy in Queen's College, Galway, who, for the first year of my undertaking, aided me with the knowledge, industry, and ability for which he is distinguished.

At a later period, Dr. Lionel Beale, now Professor of Physiology in King's College, London, and afterwards, for nearly two years, Dr. Victor Carus, now Professor of Comparative Anatomy in Leipzig, devoted their energies to the service of the Museum. Of them I cannot refrain from saying that their residence in Oxford gave me as much pleasure as it certainly conferred advantage on the departments intrusted to them. The manuscript Osteological Catalogue was wholly arranged by Dr. Carus.

I have derived assistance also from my valued friend William Ormerod; from Mr. T. K. Stewart; and from the Rev. J. Wood, by whom various dissections of Insects have been made.

Mr. Mitchell, the accomplished Secretary of the Zoological Gardens, with ready kindness has, by favour of the Council of the Society, furnished several exotic species for dissection; and my gratitude is due, as to him especially, so to the Council of the Royal College of Surgeons, to Mr. and Mrs. Charles Hoare, of Luscombe, and other friends* who have assisted me either by their labour or their contributions.

Should any distinguished person whose name is here recorded feel the occasion to be scarcely worthy, he may reflect that no object is insignificant which tends, however humbly, to promote a knowledge of the created and visible Works of God among large bodies of the future Clergy and Gentry of England.

Oxford, July 14, 1853.

HENRY W. ACLAND,
Lee's Reader in Anatomy.

* Among these may be particularly mentioned, Dr. W. P. Alison, the Rev. Dr. Ashhurst, W. Cotton, Esq., Sir Thos. Deane, Professor Goodsir, Professor W. Gregory, J. S. Harford, Esq., Dr. Handfield Jones, J. Martin, Esq., M. M. Milne Edwards, Shaw Stewart Nicolson, Esq., Professor Quekett, W. Rusher, Esq., F. Symonds, Esq., Sir Walter C. Trevelyan, Bart., and John F. Wood, Esq.

REGULATIONS OF THE MUSEUM.

The Museum is open to Visitors daily from 10 to 4.

Persons who desire to study in the Museum, during these or any other hours, are requested to apply for Orders to Lee's Reader in Anatomy, at his house, on any day at 2 p. m. All the Books referred to in the Synopsis (except D'Urville), and many other Anatomical Works, may be consulted in the Museum.

Visitors and Students are earnestly requested not to move the Preparations. They are placed in the position in which it is intended that they should be studied. The contents of the cases that are locked may be examined by Students on application to the Porter.

Visitors and Students would greatly assist the completion of the Series, if they would kindly furnish specimens of which they may ascertain the want; especially all those where no number is appended to the Name in the several subseries; as, for instance, Protopteri, Ganoidei, (p. 38.) Many British Invertebrata are required; as are Histological preparations and Pathological specimens.

INTRODUCTION.

TO facilitate the study of those who attend the Anatomical Lectures in Ch. Ch., dissections have been prepared for the purpose of illustrating many facts and principles in Anatomy and Physiology. These dissections are mainly arranged on the plan of the Hunterian Museum, and a Synoptical view of them is now printed for the use of Students.

In this Synopsis a brief statement is prefixed to each subdivision of the Series, explaining the essential nature of the Functions or Organs illustrated by it. The headings of the different series (taken chiefly from the Hunterian Catalogue) are appended to these notices, together with their place in the Museum: opposite to each subseries are numbers, which correspond to numbers on the specimens, and to those in the Manuscript Catalogue.

Each subdivision is followed by references to works in which the Student will conveniently find the subject of it carefully treated.

In the following Introduction the general nature and objects of Physiological study are stated, as a key to the facts and questions illustrated or explained either by the Museum or in the Synopsis; and as a means of exciting thought and inquiry in the mind of the student, or of the casual visitor.

THE student of Anatomy and Physiology should make it his object *to acquire a knowledge of the changes, and of the causes and purpose of the changes which Matter undergoes in its passage through Living Bodies.*

Whatever therefore enables him to ascertain the nature and kinds of the Matter so employed, the combinations and transformations it undergoes, the circumstances of time and of place, by which these changes are or have been influenced, is of importance to him, and may not be disregarded.

He will on reflection perceive, that while, on the one hand, this extended view of the subject of his inquiry compels him to enter on a work which neither his own, nor the combined labours of his generation, can complete, yet, on the other hand, by no lower aim can the yearnings of his mind be satisfied.

Incomplete as is the knowledge that has been attained by others, or that he can hope to reach himself, it is his business first to inform himself which of the Elements composing the Atmosphere and the Earth's crust pass into living bodies; to ascertain as far as is known by what agencies they are combined, whether by ordinary Physical Forces*, or by special Vital Affinities†; what products they form in the simpler kinds of organisms; to trace them, in other words, from their inorganic condition, into those states which are capable of exhibiting the Phenomena of Life; to ascertain in what order the ascent is made from the lowest living beings to the higher and more complex; to distinguish between Vegetable Life—life wholly unattended by consciousness—and Animal Life, or that which is in the higher kinds always attended by consciousness, together with emotions of pleasure and pain, and in the lower by certain actions apparently dependent, not on sensations attended by consciousness‡, but on physical impressions, through whose agency the bodily functions are carried on.

He must endeavour to understand what changes take place in the living beings themselves, by what means they are formed, what changes they undergo during this process of formation, by what means they are nourished when fully formed, in their several parts and in their whole, through what combinations and by what means the matter which has performed its work in the living being is eliminated from it, and also to what extent these changes are necessary in individual parts of the organism, for the maintenance of the whole; what forces—external to the organism, or internal, whether physical or vital—are engaged in maintaining this continuance of life; how far injuries, and

* See Matteuci's Lectures on the Physical Phenomena of Living Beings.

† Alison's Observations on the Principles of Vital Affinity, Edinb. Royal Soc. Trans., 1846, '47–'52.

‡ Many living organisms, formerly thought to be Animal, are proved to be Vegetable. Locomotion is no test of Animal Life. See Carpenter's General Physiology, p. 997, 3d Ed.; Papers by Kölliker, in Quarterly Journal of Microscopical Science, 1853, on Actinophrys, and by Siebold, on Unicellular Plants and Animals.

losses of parts, are capable of repair*, and by what circumstances, and through what steps, the cessation of these living phenomena, or death, ensues; and lastly, in what forms the material constituents of these bodies revert from their organic combinations to inorganic constituents in the Earth or in the Atmosphere.

With respect to the mental endowments of Animals, he has first to seek for what is real evidence of Consciousness, and then to trace the modifications exhibited in their sensations, powers of perception, appetites, and instincts; and with respect to the mental powers of Man, as far as he is concerned with them, he should inquire which are different in kind, and which in degree, from similar or analogous powers in Animals; and note what faculties, purely instinctive, and therefore definite and fixed, in Animals, are in Man acquired, and the reward only of the exercise of his higher qualities.

He has then to learn what changes in the organization of the Brain and Nervous System accompany these differences in the mental phenomena, in the several great groups of the animal kingdom.

For these and other purposes, he will find that a knowledge of classification of natural objects generally is absolutely necessary, if for no higher purpose than to enable him to arrange the assemblage of facts presented to his notice; and further, he ought to know the *principles* upon which all true natural classification depends.

In a still more extended view, he learns the relations which exist between the inorganic materials of the globe, and the Vegetable, and the Animal Structures; a relation of the utmost consequence in preserving the general balance of the bodies on the surface of the globe†.

He must learn the general nature of the great cosmical arrangements, in the distribution of land and of water, temperature, climate, air and water currents, and of the causes which regulate these, either in latitude, or altitude, or in other ways, and that of any other circumstances, which are known to influence the distribution and characters of living beings‡.

And lastly, to complete the picture of the relations of Man to the world in which he is placed, he must acquire some notion of the changes which this

* Paget's Lectures on Surgical Pathology, Vol. I.

† See Dumas, Chemical and Physiological Balance of Organic Nature.

‡ See Guyot, Earth and Man; Mrs. Somerville's Physical Geography; Humboldt's Cosmos.

planet underwent in its preparation for Man, and the corresponding modifications of the Fauna and Flora which preceded his Creation*.

Of all these, he must endeavour to obtain general notions, as exact as his time and opportunities will allow; and he may pursue, in accurate detail, such departments as are most adapted to his tastes, or such as most befit his future professional pursuits. A general knowledge of the material history of the world and its inhabitants is useful and ennobling to every man; though a precise and detailed acquaintance with what is known of the portions with which he has to do, must also be obtained by the scientific or professional student, and is that kind of knowledge which is alone honourable to him.

Such is the task which the Physiological student should set before himself; a task which, as has been said, the extent of the subject and the present condition of human knowledge make it impossible *perfectly* to accomplish; but to which there exist now greater aids, in published works and in well-arranged collections, than have been at any previous time available.

The following remarks may help him to the appreciation of certain general truths, which he should keep in view, while seeking a knowledge of the subjects pointed out above.

1st. His object being to ascertain the laws of living beings, he must bear in mind that these laws can only be studied in phenomena, which are not life, but the signs of its presence. The nature of life is wholly unknown, except through certain organizations and certain changes going on in them. Life is to our apprehension inseparably connected in this world with change and movement in less than twenty elementary bodies; these are supposed to be combined into a few highly complex chemical substances, and to obey laws peculiar to living beings; and when the capacity for these changes has ceased, we consider that the life is extinct, and the substances return within the range of chemical affinities, common to substances not part of living bodies.

2nd. The organs or structures by means of which life is maintained and manifested are the special subject of Anatomical or Physiological study; and the varieties of which these organs are found to be capable, together with the manner in which they are combined, form the specific characteristics of living beings, and furnish the data by which they can be arranged and classified.

3rd. The organs and processes capable of manifesting the phenomena of

* See Lyell's Principles of Geology.

life may be of a very simple kind; viz. a membranous spheroid, containing a fluid; and as among Animals we can discover a progressive advance from an absence of consciousness towards the higher mental endowments with which Man is gifted, so a progressive increase of complication may be traced in their material organization.

In the higher kinds of Animals special structures are provided, for seizing, swallowing, digesting, and assimilating the food; for absorbing the useful parts of it, and rejecting the useless, circulating the fluid so prepared to all parts, for the purpose of nourishing them; for purifying this fluid, by contact with the air, and by rejection of chemical substances redundant or hurtful to it; and for separating or secreting chemical products for further use in the economy; all these being parts of the nutritive process. The organs connected with Reproduction, Voluntary Motion, and the exercise of their Senses and Mental Powers, are equally complex and distinct.

In Unicellular Animals, these processes of Nutrition, as well as those of Reproduction, Locomotion, and whatever capacity for receiving impressions, sensations, or perceptions the being may possess, is performed by its simple organization; i. e. a Cell with its contents.

Thus the student will observe the progressive complication in the structure of each individual organ in the same way that he notes that of the structural arrangements of the whole being, and he must note the extent and kind of changes which the organs of the higher Animals undergo in the course of the development of their Embryos.

4th. The highest purpose of classification may be said to be, to represent in the easiest method the truest and most complete picture of the objects classified; the most like being necessarily brought before the mind together, after a full determination of their real likeness to each other; and a subordinate but important end is to make it practicable readily to ascertain the assigned name, if it has been described, and so all the known recorded circumstances of the object in question.

In all classification of Animals, those species are placed nearest each other which are supposed to resemble each other more than they resemble any other species; and the value of the classification will depend on the perfection with which this likeness has been determined.

The great primary groups of the animal kingdom have been formed on resemblances and differences in the Nervous System, assuming that whereas

the great characteristic of the animal series as a whole is the possession of a special apparatus for bringing the living being into conscious relation with matter external to it; so, variation in this apparatus forms the best groundwork for the broad distinctions of animal life.

Of these great groups there are five; i. e. Vertebrata, Mollusca, Articulata, Radiata, Acrita. In each of the four first of these groups, the Nervous System undergoes a gradual degradation from the highest to the lowest. It cannot be said that a regular parallel degradation occurs in the other systems or functions, but that a general harmony or interdependency exists between the several parts of the Animal, rendering it capable of the exercise of its own peculiar mental faculties.

In the lowest group no Nervous System has been detected, or in the case of those Animals in which it has been, it is probable that they will be found to have truer relations with a higher group.

But in many cases, the highest species of a group, lower on the whole than an adjoining group, has some parts of its organization of a far higher degree of complexity than the same parts in the lower species of the superior group; so that the groups may be represented by vertical lines placed upon ascending steps in such a way that the upper part of the lower group is higher than the lower of the one next above it*.

5th. John Hunter arranged his dissections of the several organs together, in an ascending order; they may in this way be most readily studied and compared. A similar plan is followed here. But a reason has just been given why the student must be careful to consider the organs not only separately, but also in their relation to the other organs in the same Animal; inasmuch as organs in appearance structurally similar, may be, by their collocation, Physiologically different†.

6th. A knowledge of the mechanical constituents or textures of Animals, and of the variations in their kind and in their arrangement, is essential to a knowledge of the changes which take place in them. But these changes are

* Any student desirous of pursuing this part of Natural History should decide upon examining, zoologically and anatomically, with any good Work on the subject, some group in the Fauna of the neighbourhood, as the Fish, with their development, or the Reptiles, or some genus of Articulata, or the land or fresh-water Mollusca, or some portion of the Infusoria, in any locality he may select.

† See Owen's Lectures, Vol. I. Lecture I. p. 6.

of a nature too subtle to be appreciated by Anatomical analysis; and their consideration falls under the province of Zoochemistry, or under the domain of pure Inductive Reasoning. It is certain that the most intricate chemical changes occur both in the solids and fluids of living bodies, and in a few of the higher Animals the results of some of these changes have been noted accurately. Yet of the changes themselves, and even of the chemical constitution of most of the fluids or solids, our knowledge is quite incomplete. The most essential fluid in the whole human body, the Blood, and the most important nitrogenous excretion, the Urine, have been the subject of observation for many hundreds of years; and yet, with regard to the former, it may be safely said, that we know next to nothing of the chemical changes which take place in it, and of the latter, that though it has been the subject of the most rigorous investigation, and the knowledge of its properties has been yearly increased, there are many circumstances concerning it which are still involved in obscurity. It is right that the student should understand with how great labour and difficulty that has been acquired which is already known; and that he should be aware, from the outset of his studies, that some things supposed to be certain are at the least doubtful; and that it is far more difficult to observe, experiment, or reason with accuracy, on the Phenomena of living beings than he might have hitherto supposed.

The care which must be taken in isolating particular Phenomena of living beings, as data for reasoning from among the complex manifestations of Life, so as to ensure certainty in the result, is sufficient evidence that many received opinions, and much popular belief, are not worthy of credit without fresh investigation. It is more necessary even to observe this in Pathological than in Physiological inquiry, i. e. in reasoning upon Phenomena of Life as altered by disturbing causes; for even now many persons suppose that nothing is more easy than to observe the circumstances which influence disease: whereas in truth there are none more complex, and from no class of facts is it more difficult to deduce correct conclusions. Much however is to be expected from the combination of chemico-physiological inquiry, and from accurate habits of thought among medical men, and much good to the human race, as from these, so from more rational popular notions of the nature of health and disease.

These few observations may help the student to perceive the educational purpose for which a Physiological Collection is intended; viz. to furnish him

with some examples of the amazing organization of animal beings, and instances of the data by which Natural Philosophers, using the powers which God has implanted in them, have been enabled to read some facts and explain some laws in the circuit of this narrow but favoured spot in His Creation.

In his labour he will find reward; few have delved with simple purpose in the mine of this world's material history, who have not had peace and joy of heart, and have not found to thrill within them the blessed thought—"NATURE IS THE ART OF GOD."

Every one should read the Introduction in Cuvier's Règne Animal, or the first Lecture in Cuvier's Leçons d'Anatomie Comparée; the first Lecture in Owen's Lectures on Comparative Anatomy; and the Introduction to Lehman's Physiological Chemistry.

The student who has leisure for collateral work should read Book IV. in Mill's Logic; Herschell's Discourse on Natural Philosophy; parts of Whewell's History, and of his Philosophy, of the Inductive Sciences; Humboldt's Cosmos; Somerville's Physical Geography; and two most suggestive Works—M'Cullock's Proofs of the Attributes of God, and Herder's Ideen zur Philosophie der Geschichte der Menschheit, translated into English and French.

SYNOPSIS

OF

THE PHYSIOLOGICAL SERIES

IN THE

CH. CH. MUSEUM.

ROOM I.

THE small room first entered contains chiefly models explanatory of Human Anatomy; including one by Dr. Auzoux, and three casts intended to illustrate various aspects and states of muscular action in man. In the adjoining room is a figure, cast under the direction of Professor Goodsir, intended to show the form of the Limbs in Death.

The fighting Gladiator has been Anatomically illustrated in a fine Work entitled 'Anatomie du Gladiateur Combatant, par J. G. Salvage;' and this may be consulted in the Museum. The student may also refer, for the study of the External Form, to 'Anatomy of Expression,' Sir Charles Bell; Flaxman's Lectures on Sculpture; and Haydon's Lectures on Painting.

The case marked 30 contains various examples belonging to the Tegumentary section of the Physiological Series.

In this room also are found the separated and articulated Crania referred to in the Osteological Series; as well as the greater number of the books named in the several subdivisions.

ROOM II.

In the cabinet room marked II. (besides the cast referred to above) are Crania of many varieties of the human race, and a collection of casts of skulls; together with a series of busts, from casts taken in the South Sea islands,

during the famous voyage of the Astrolabe, presented by Professor Milne Edwards.

These Crania form part of the General Osteological Series; and will furnish the student with examples of the modification of form of which the Human Skull is capable. In these forms, sufficient data will not be found for constructing natural groups of the nations; inasmuch as the researches of Ethnologists tend to show, with more and more certainty, that these alliances are to be discovered by linguistic investigations alone. But the study of changes which occur in Anatomical Structure, according to modes of origin, of life, of climate, and of society, will remain among the most interesting problems in the natural history of Man, and of the Animals, his co-tenants of our planet.

See Prichard's Natural History of Man; Researches into the Physical History of Mankind; On the Advancement of Ethnology, British Association Report, 1847; *Owen on the Osteology of the Orang Outang and of the Chimpanzee, Zoological Transactions, Vols. I. and III.; and, for the Polynesian Casts, D'Urville's Voyage de l'Astrolabe, Zoologie, Vol. I., to be seen in the Radcliffe Library.*

ROOM III.

This room is chiefly devoted to examples of Natural History, preserved in spirits. A large proportion of these are the result of dredgings on the coast of Great Britain; and especially of an investigation of the marine Invertebrata of the Isles of Scilly, by Dr. Victor Carus, in the year 1850.

A Catalogue of the species, systematically arranged, lies in the room, together with the Zoological Works which the student will chiefly require for their elucidation. For the British Fauna he may consult Pritchard's Infusorial Animalcules; Johnston's British Zoophytes; Forbes, on British Echinodermata; Bell's History of British Crustacea; Stephens' British Entomology; Forbes and Hanley, History of British Mollusca; Yarrell's British Fishes; Bell's British Reptiles; Yarrell's British Birds; Bell's British Quadrupeds; Fleming's History of British Animals; Jenyns' Manual of British Vertebrate Animals: and, for Zoology and Comparative Anatomy generally, Cuvier's Animal Kingdom; Rymer Jones's Outline of the Animal Kingdom, &c.; Cuvier's Leçons d'Anatomie Comparée;

Owen's Lectures on Comparative Anatomy; Wagner's Comparative Anatomy of Vertebrata; the Catalogues of the Royal College of Surgeons, by Professor Owen; Carpenter's General and Comparative Physiology; Paterson's Zoology; Milne Edwards, Cours Elémentaire d'Histoire Naturelle.

Cases 55 and 56 are filled with Radiata, including many species of Asteriadæ, and several of the Holothuriadæ.

Case 57 has exclusively Annelides.

Case 58 Crustacea; and there are in

Case 59 other Articulata and the lower Mollusca—Bryozoa and Tunicata.

In 60 and 61 are some specimens of the higher Mollusca, and a few special examples of the two lower classes of the Vertebrata, including the Amphioxus Lanceolatus, Lepidosiren, Proteus, Axolotl, and Menopoma.

In cases 62 and 63 are dried Polypidoms of Zoophytes, dried Asteriadæ, a mass of the Nidus of Hermella Alveolata from Bude in Cornwall; and some typical genera of British Insects, prepared, named, and presented by the Rev. J. Wood, of Merton College.

Case 40 displays a series of dissections, intended to show the arrangement and growth of Teeth, being part of the Odontological division of the Physiological Series. (See table-case 1. in the Museum.)

Over the East wall-cases is a cast of Plesiosaurus Hawkinsii, (Owen.) See, in British Association Reports, 1839–41, Owen's Report on British Fossil Reptiles.

In the centre of the room are exhibited a fine skull of Balæna Longimana; the entire skeleton of the Indian Elephant, presented (as well as various other objects) by Charles Hoare, Esq. of Luscombe; and a case containing a beautiful skeleton of the Crocodile of the Nile, prepared, in great part, and presented by Shaw Stewart Nicolson, Esq. of Christ Church; and completed, together with the skeleton of the Cobra-de-Capello, by Mr. Flower.

THE MUSEUM ROOM.

This room contains on the ground-floor most of those parts of the Physiological Series which illustrate the preservation of the individual.

The Physiological Series commences at wall-case No. 1. on the left hand of the door leading from room No. III. From No. 9. it is continued at No. 10. underneath the principal Gallery; and the Series on the ground-floor is carried on, under the same Gallery, to No. 15. The preparations illustrative of Human

Anatomy, prepared for the most part before the commencement of the Physiological Series, though incorporated in it in the Catalogue, are kept distinct in their original cases underneath the principal Gallery. The student therefore wishing to refer to parts illustrative of Human Anatomy will find them numerically arranged under this Gallery, from wall-case 31 to 39, with the exception of dried preparations of Vessels, in case 33 in the North Gallery.

In the East Gallery are ranged examples of the Nervous, Tegumentary, and Connective systems, (wall-cases 16–23.) In the South Gallery are dissections illustrative of the Organs and Processes by which the succession of individuals is maintained (wall-cases 24–30): while the North and West Galleries display Pathological specimens.

The Physiological Series is divided into two great Divisions.

The First Division contains all those structures by which the life of the individual is maintained, and by which, in the case of Animals, they are brought into conscious relation with the world external to themselves.

The Second Division displays the means by which the succession of individuals is perpetuated.

DIVISION I.

ARRANGEMENTS IN PLANTS AND ANIMALS FOR THE SPECIAL PURPOSES OF THE INDIVIDUAL.

SUBDIVISION I.

Constituents of Plants and Animals.

A limited number of the known Elementary Substances enter into the composition of Organic Structures; they combine into various Organic Principles essential to the existence of living bodies. These Organic Principles are formed out of the Inorganic World by Vegetables; when so formed, they may be assimilated by Animals. From these, the various Textures of living bodies are constructed.

The Chemical History of the changes wrought in matter by living bodies (Organic Chemistry) is to be studied in the Laboratory. It is still veiled in much uncertainty. A knowledge of the Textures (Histology) can only be obtained by aid of the Microscope, and of chemical examination simultaneously. It is of much importance to the student to obtain clear and systematic notions

of these Constituents of Animals, and for this purpose a Classification of the Textures by Professor Allen Thomson * is given below; according to this the specimens in the Histological Cabinet are placed.

I. Organized Textures, in which the Cellular form of the Constituent Elements is apparent: not unfrequently also presenting Granules of Molecular deposition.

1. Rounded Simple Cells, floating loose in fluid. *Blood*, *Lymph*, *Chyle*, and *Milk Corpuscles*, &c.
2. Simple Cells massed together, either preserving their Cellular form, and without other parts intervening, or altered in form, and mixed with other solid elements; *Pigment*, *Fat*, *Cuticle*, *Horny Textures*, *Epithelium*, *Crystalline Lens*, *Cartilage*, *Bone*.
3. Simple Cells, or their contents, altered in form; *Ciliated Texture*, *Spermatozoa*.
4. Compound Cells, separate or mixed with other textures; *Ovum*, *Ganglionic Corpuscles*.

II. Textures exhibiting a simply Fibrous Structure:

1. Filamentous Texture, formerly *Cellular Texture*.
2. Fibrous Textures; *Tendon*, *Ligament*, *Fibrous Membranes*, *Fibrous Plates*.
3. *Elastic Fibrous Texture*.

III. Textures exhibiting a Tubular Structure:

1. Containing Moving Fluids; *Blood-vessels* and *Absorbent Vessels*.
2. Containing Muscular Substance; *Striated* and *Unstriated Muscular Fibre*.
3. Containing Nervous Matter; *Primitive Nerve Tubes*.

IV. Textures exhibiting a Membranous Structure:

1. Principally Filamentous; *Serous* and *Synovial Membranes*.
2. Filamentous and Vascular; *Mucous Membranes*, *True Skin*.
3. Membrane and Cells; *Glands*.
4. Membrane and Blood-vessels, &c.; *Lungs*.

* See Outlines of Physiology, by Prof. Allen Thomson, Part I.

WALL-CASE 1. MS. Catalogue, Part I.

	Nos. in Catalogue.
Series I. ..... Elementary substances in Plants and Animals	1–10
Series II. ... Organic principles in Plants and Animals	11–50
Series III. ... Animal Textures	51–81
Series IV. ... Nutrient fluids, as Sap and Blood	82–92

For Animal Chemistry, see Lehman's Physiological Chemistry; Robin et Verdeil, Chimie Anatomique et Physiologique; Bence Jones' Animal Chemistry; Gregory's Organic Chemistry; and Dr. Prout on Stomach and Renal diseases.

For Histology, consult the Systematic Works on Physiology; especially Todd and Bowman's Physiology; Quain and Sharpey's Human Anatomy, Vol. I.; Quekett's Lectures on Histology, and his Histological Catalogue; Kölliker's Microscopic Anatomy; and the specimens of the textures in the Histological Cabinet; Mohl on the Anatomy and Physiology of the Vegetable Cell: but the student should early accustom himself to the examination of recent specimens.

SUBDIVISION II.

Organs of Motion.

Certain parts of all living bodies are endowed with the power of originating Motion. This property appears to reside chiefly in Cells: it exists in the most eminent degree in the higher Animals, and in them in Fibrin arranged in the texture called Muscle. Muscles are capable of Contractions alternating with Relaxations, which are variously related to mental acts, according to the endowments of the nerves connected with them. Thus some muscular movements are attended with sensation, and therefore with consciousness; others, in the healthy state, are not; some are excited by physical stimuli, some by voluntary efforts of mind, and some by involuntary mental acts, viz. certain sensations and emotions; and all are liable, more or less, to modification and control by mental acts of this last character. These kinds may be mixed so as to produce actions partly Voluntary and partly Involuntary.

By means of these Contractions and Relaxations, certain parts of living bodies are altered in their relations to one another, fluids or gases are moved in their interior, or the bodies themselves are transported from place to place.

The principal Organs of voluntary Motion in the higher Animals consist of Muscular Fibre attached to Fulcra and Levers, and these form part of the Skeleton, which is either External or Internal. Motion is produced also or modified in Animal Structures through the agency of Physical Elasticity, and of a property not well understood, sometimes apparently resident in Cilia, sometimes not connected with any texture known to be capable of contraction.

WALL-CASES 1 & 2. MS. Catalogue, Part I. Nos. in Catalogue.

Series I. ..... Moving parts of Plants commonly called sensitive 93–95

Series II..... Moving parts of Animals or Muscles.

Subseries 1. ... Muscular fibre. See the Histological cabinet.

Subseries 2. ... Disposition of muscular fibre 96–100

Subseries 3. ... Tendons 101

Series III. ..... Application of Muscles 102–108

Series IV. ..... Application of elastic matter.

Subseries 1. ... as an antagonist to muscles 109

Subseries 2. ... as a coadjutor to muscles 110–113

Series V..... Substances constituting the Skeletons of Animals ... 114–118

Series VI. ..... Skeletons of Invertebrata.

Subseries 1. ... of Radiata 119–123

Subseries 2. ... or shells of Mollusca 124–129

Subseries 3. ... of Crustaceans..... 130

Series VII..... Structure and growth of Bone.

Subseries 1. ... Constituents of Bone 131–140

Subseries 2. ... Formation of Bone..... 141–156

Subseries 3. ... Formation of Bone as exemplified in the antlers of Deer..... 157–160

Subseries 4. ... Growth of Bone (see also Histological Specimens) 161–164

Subseries 5. ... Texture of Bone (cf. Osteological Series and Histological Specimens).

Series VIII. .... Situation of the Skeleton.

Subseries 1. ... External 165

Subseries 2. ... Internal 166

Subseries 3. ... Mixed 167, 168

Series IX. ..... Composition of the Skeleton.

Subseries 1. ... consisting of one piece 169

Besides the ordinary systematic Works, see the Structure of Muscle, in Todd and Bowman's Physiology; Articles Cilia *and* Motion, *in the Cyclopædia of Anatomy and Physiology; Matteuci, Lectures on the Physical Phenomena of Living Beings.*

The skeletons and other dry preparations of Bone are tabulated elsewhere under the head of the "Osteological Series;" the figures there affixed to them belong to a set of numbers peculiar to this Series.

SUBDIVISION III.

Organs of Digestion.

All bodies capable of exhibiting the Phenomena of Life possess either in a dormant or in an active state the power of appropriating certain matter external to themselves. When in an active state, they constantly part with organic and inorganic substances which are unfit for, or have served their purposes in their economy, and thus require to be replenished with new and appropriate matter.

The processes connected with the reception of this new matter (Digestion, Assimilation, Absorption) may be carried on, in Animals of a lower order, through the agency of a very simple apparatus. As the capability of executing movements consequent on mental acts is extended, the contrivances for acting in obedience to these become more complex; and as the appetites, and means of gratifying them, vary, so is there also great variety in the food, and the organs proper for rendering it harmonious to the existing solids and fluids vary also.

In the higher kinds of Animals, the apparatus requisite for making food proper for the purposes of Nutrition, are those for mechanically reducing, and those for chemically preparing it: the extremely different kinds of aliments, and the diverse chemical constitution of animal fluids, combined with the circumstances under which the food is obtained, necessitate a remarkable variety in the Organs of Digestion.

WALL-CASES 3—9. MS. Catalogue, Part II.

	Nos. in Catalogue.
Series I. ..... Structure and growth of Teeth.	
Subseries 1. ... Parts analogous to Teeth in Invertebrate Animals	227–240
Subseries 2. ... Bills of Birds	241, 242
Subseries 3. ... Structure and formation of Whalebone	243–246
Subseries 4. ... Structure and formation of Teeth, properly so called	247–262
Subseries 5. ... Constituents of Teeth	263, 264
Subseries 6. ... Process of shedding and renewing the Teeth	265–269
Subseries 7. ... Situation of the Teeth—(α) in the Mouth, (β) in the Pharynx, (γ) in the Stomach	270–274
Series II..... Structure of the Stomach.	
Subseries 1. ... Digestive cavity, simple, with one orifice serving as mouth and anus	275–278
Subseries 2. ... Digestive cavity, with mouth and anus distinct ...	279–282

The Systematic Works of Müller and Carpenter; Kirke's Handbook of Physiology, and especially Todd and Bowman's Physiological Anatomy, 23, 24, 25; *Cuvier Leçons d'Anatomie Comparée; John Hunter's Works; Beaumont on the Physiology of Digestion; Prout's Bridgwater Treatise; Liebig, Chemistry of Food; Lehmann's Physiological Chemistry; Paget's Lectures on Nutrition, Hypertrophy, and Atrophy.*

For further information concerning the Teeth, the student is referred to Room III. Wall-case 40; *to Table-case* 1, *and the corresponding part of the MS. Catalogue, (Part XII.)*

SUBDIVISION IV.

Absorbent System.

The Absorption of Nutriment into the structure of the simplest Plants, and of the lowest Animals, may take place probably through any, or a great part of their surface, and by the agency simply of living cells. In all classes of Animals, except a few of the lower kinds, the same result is produced or aided by the agency of the Blood-vessels.

In the Vertebrata, a *special* Class of Vessels is provided for the purpose of Absorption. These Absorbent Vessels are divided into two sets: 1. those that have their origin in the course of the Intestines or the Lacteals; 2. those which originate in other structures of the body, or the Lymphatics.

The contents of the Lacteals and Lymphatics, in the higher Vertebrata, pass through plexuses called Absorbent Glands.

The Lacteals introduce new material from the Intestines into the Blood. The Lymphatics appear to collect matter that has already formed part of the Body, and cast it into the circulation also. It is probable that in either case they further elaborate the material they receive.

Absorption is performed by Blood-vessels as well as by Lymphatics and Lacteals; but the separate office of these distinct sets of vessels is not fully understood.

WALL-CASE 11. MS. Catalogue, Part III.

	Nos. in Catalogue.
Series I. ..... Nutritive Absorbents.	
Subseries 1.... In Plants	548, 549
Subseries 2.... In Animals—	
(a) forming part of the circulating system	550
(b) superadded to the circulating system—Lacteals.....	551–557
Series II..... ... Excretive Absorbents.	
Subseries 1.... Lymphatic Vessels	558–561
Subseries 2.... Lymphatic Glands	562, 563

See Matteuci's Lectures on the Physical Phenomena of Living Beings; Liebig on the Motion of the Juices; the Systematic Treatises on Physiology and Anatomy, and Goodsir's Anatomical and Pathological Observations; John Hunter's Animal Œconomy, edited by Prof. Owen, p. 299.

SUBDIVISION V.

Circulating System.

The Nutrient fluid which is to increase the growth or supply the waste of a Living Being must be conveyed to its several parts, and those portions of it which have to undergo further change either by the absorption of gaseous matter from the Atmosphere, or by the elimination of chemical substances, must be brought to the apparatus destined to effect these several changes.

This motion of the Nutrient fluid is called Circulation. It is probably produced in Vegetables by a process independent of any mechanical impulse; but in the higher Animals by a series of vital Contractions, and perhaps also by virtue of Attractions and Repulsions, equally dependent on vitality.

The course of the Circulation in Animals is directed, so as to secure a proper distribution of blood to all parts of the body, a proper return from those parts, and a due oxygenation of it by means of the Respiratory apparatus, which is a structure exposing it to the action of the Atmospheric oxygen.

For this purpose, in the more complete kinds of Circulation, one or more Hearts, Arteries and Veins, and intermediate Capillaries, in which Nutrition is effected, are in all cases found. But inasmuch as the amount of oxygen proper for Animals varies with the condition in which they are placed, and with the work to which they are destined, there is also great variety traceable in the course of the Circulation and in the structure of the Heart in the different classes of Animals.

WALL-CASES 11, 12. MS. Catalogue, Part III.

	Nos. in Catalogue.
Series I. ..... Circulation in vessels without a heart.	
Subseries 1. ... without superadded sinuses	564
Subseries 2. ... with superadded sinuses	565
Series II. ..... Structure of the Heart.	
Subseries 1. ... Situation of the Heart	566–571
Subseries 2. ... Heart consisting of one cavity or ventricle— (a) without Pericardium, (b) with Pericardium	572–574
Subseries 3. ... Heart consisting of two cavities, which act as a systemic ventricle.	

Alison's Physiology, and the Theory of Inflammation in his Pathology; Article Circulation, *in Encyclopædia of Anatomy and Physiology; Hale's Statical Essays; Draper on the Forces which produce the Organization of Plants; Milne Edwards on the Circulation, in the Annales des Sciences Naturelles*, 1845.

SUBDIVISION VI.

Respiratory System.

In living beings generally, and especially in the more perfect kinds, the Nutrient fluid becomes impure, by parting with some substances for the formation of Textures, and by receiving into its mass some substances which are

inapplicable or have become useless or injurious to the organism. Of all the elements that are necessary to animal beings, none undergo more frequent change of combination than Carbon and Oxygen. The constant parting with Carbon derived from Effete Textures and constant reception of Oxygen from the Atmosphere, are both essential to the very continuance of life in all but the lowest kinds of Animals. And both are performed by an apparatus called Respiratory.

A Respiratory apparatus consists essentially in all Animals of a structure in which the blood is brought into contact with air on a larger or smaller surface, for the purpose of excreting Carbon in the form of Carbonic acid, and absorbing Oxygen.

In aquatic animals the Oxygen is conveyed to the Respiratory surface by means of the water in which they live. In air-breathing animals the air is introduced either into tubes which permeate the body (Tracheæ), or, in all the higher classes, into a concentrated organ or Lung. The simplest Lung is a sac, on the inner surface of which the Blood Capillaries are spread. In the more perfect Lungs this sac is more and more subdivided, and so the Respiratory surface is more and more extended, and the oxygenation of the Blood is more and more complete.

WALL-CASES 13, 14. MS. Catalogue, Part IV.

	Nos. in Catalogue.
Series I. ..... Aëration of Blood by means of Gills, or Branchiæ.	
Subseries 1. ... in Acalephes	669
Subseries 2. ... in Echinoderms	670, 671
Subseries 3. ... in Annelides	672, 673
Subseries 4. ... in Crustaceans	674–676
Subseries 5. ... in Mollusks	677–685
Subseries 6. ... in Fishes—	
(a) where the respiratory currents enter by, as well as escape from, the external branchial apertures	686, 687
(b) where the respiratory currents enter by the mouth, and are expelled by one orifice on each side..... ...	688–697
(c) where the respiratory currents are expelled through five orifices on each side	698–700

Articles Respiration *and* Thorax, *Cyclopædia of Anatomy; Liebig, Animal Chemistry, Letters on Chemistry, Letters* xxi. *et sqq.; Kirke's Handbook of Physiology.*

SUBDIVISION VII.

Urinary System.

All vital properties have the essential peculiarity of being transient, i. e. granted only for a time, to every particle of matter which acquires them. Hence all living matter loses those properties, or becomes effete, long before the death of the entire structure, of which it forms a part. The Retention in the economy of such effete textures, or of substances introduced into, but not fitted for the Circulation, is in all cases injurious, and in some rapidly fatal.

Carbon, Nitrogen, Oxygen, Hydrogen, in very various combinations, and with one or more of the other elements proper for a living body, enter most largely into the composition of the Animal Textures, and are therefore most largely parted from by them.

The first (C) is eliminated chiefly by the Lungs; the second (N) by the Kidneys. The non-elimination of the first (C) is followed by instant death; the retention of the second (N) by rapid dissolution.

Various saline substances, whose elements have passed through the circulation, are also removed by the Kidneys, and in the mammalia, water (H O) is largely excreted: but the Urine varies in fluidity, being nearly solid in Reptiles, and not fluid in Birds.

It does not appear that Kidneys exist in the lower Invertebrata.

In some animals, and to a certain extent, the Skin acts a complementary part to the Kidneys.

CASE 15. MS. Catalogue, Part V.

	Nos. in Catalogue.
Series I. ..... Kidney.	
Subseries 1. ... Situation of the kidney	798–802
Subseries 2. ... Structure of the kidney in Oviparous Vertebrates	803–809
Subseries 3. ... Structure of the kidney in Mammals—	
A. Renal Vessels	810–819
B. Renal Ducts—	
(a) Tubuli uriniferi, terminating on a concave surface in the pelvis	820
(b) Tubuli uriniferi, terminating on one mamilla	821–828
(c) Tubuli uriniferi, terminating on a ridge ...	829–834
(d) Tubuli uriniferi, terminating on many mamillæ	835–840
(e) Kidney subdivided into distinct lobules or renules	841–844
Series II..... Ureters and Urinary Bladders	845–849
Series III. ..... Suprarenal Glands	850–853

Article Ren, *Cyclopædia of Anatomy; Lehmann's Chemistry; Prout on Stomach and Renal Disease; Muller's Physiology, or Carpenter's Works; Articles in the excellent British and Foreign Medico-Chirurgical Review*, 1853.

SUBDIVISION VIII.

Nervous System.

That part of an animal which brings it into conscious relation with the world external to it, and through whose agency its mental operations are rendered in this world possible, is called the Nervous System.

The Nervous System consists essentially of central structures, recipient of impressions, and originators of motor power; and of structures acting as conductors between these centres and other parts of the organism. The functions, therefore, of the Nervous System are, to receive impressions, to transmit them to the central organs, where they excite sensations; to act in connection with and in obedience to the mental acts of the animal; to transmit the mandates of the will to the organs capable of acting in obedience to it; to convey the power by which emotions act involuntarily upon parts of the system; when injured or diseased, and perhaps in certain other cases, to carry various impressions, and produce various actions entirely removed from consciousness or will; and, finally, generally to coordinate various simple or complicated structures and actions connected with the life and functions either of parts or the whole of the individual.

The higher the mental endowments of an animal, the more complicated therefore, it might be presumed, would be some parts of the central organs of the Nervous System. In Man therefore, the only strictly reasoning being on earth, the only one that to the highest sense of responsibility adds the emotions belonging to worship, and the duty to worship his Maker, that portion of the Nervous System, proved by experiment and pathological observation to be connected with the higher workings of mind, is proportionally more extensive and more complicated than in any other known being; so that not only in his spiritual nature, but in the organization immediately connected with it, he transcends all other earthly creatures.

By a series of steps, conducted along parallel lines, may be traced the progressive degradation of this complex Nervous System in Man, to those lower portions of the animal world, in which no traces of a distinct Nervous System have been detected by the most rigorous observation. It may be generally stated, that the central organs consist of vesicles, and the conducting organs of tubules or fibres, and that in all cases where vesicles occur, it is to be presumed there resides a power of receiving impressions or of originating nervous

force. The form of the animal, its mental endowments, and its physical necessities, are therefore in all cases intimately connected with the position and development of the nervous masses.

The growth or mode of formation of the Nervous System in the embryo demands particular attention. As in the ascending scale of animal beings the arrangement of the nerve matter proceeds from the more simple to the more complex, so in the higher animals the first traces of the nerve centres have but little similarity to their perfect proportions. The Brain of the highest animals passes during its growth through a series of gradations, not the same as, but bearing a resemblance to, those which are permanent in inferior parts of the animal series.

From these and other considerations it may be deduced, that of all parts of the body the Nervous System affords the best clue to the determination of the great natural affinities of the animal kingdom.

EAST GALLERY. WALL-CASES 16, 17, 18. MS. Catalogue, Part VI.

	Nos. in Catalogue.
Series I. ..... Nervous System in the Protoneura.	
Subseries 1. ... in Echinoderms	854, 855
Subseries 2. ... in Helminths	856
Series II..... Nervous System in the Homogangliata or Annulosa.	
Subseries 1. ... in Annelids	857
Subseries 2. ... in Insects	858–863
Subseries 3. ... in Arachnidans...	864, 865
Subseries 4. ... in Crustaceans	866, 867
Series III. ..... Nervous System in the Heterogangliata or Mollusca.	
Subseries 1. ... in Acephala	868–870
Subseries 2. ... in Gasteropoda.....	871–875
Subseries 3. ... in Cephalopoda.....	876
Series IV. ..... Nervous System in the Myelencephala or Vertebrata.	
(A) Brain—	
Subseries 1. ... in Fishes	877–896
Subseries 2. ... in Reptiles.....	897–907
Subseries 3. ... in Birds	908–919
Subseries 4. ... in Mammals	920–970
(B) Membranes—	
Subseries 5. ... Pia Mater.....	971–973
Subseries 6. ... Dura Mater	974–980

Alison's Outlines of Physiology; Carpenter's Human Physiology; Introduction to Vol. III. of the Catalogue of the College of Surgeons; Articles NERVOUS CENTRES *and* NERVOUS SYSTEM, *Cyclopædia of Anatomy and Physiology; Mayo's Anatomical and Physiological Commentaries; Sir Charles Bell on the Nervous System; Marshall Hall on the Nervous System; Alison's Article on Sympathy, Edinburgh Medical and Chirurgical Transactions, Vol. II.; Guillot, Exposition Anatomique de l'Organization du centre Nerveux, &c. Flourens, Recherches, &c.; Longet sur le Systême Nerveux.*

SUBDIVISION IX.

ORGANS OF SENSE.

What intimations from the external world are conveyed to the limited apprehension of inferior Animals, it is impossible for us exactly to discover; but of Animals of the higher orders, we know that they possess—marvellously modified indeed according to their particular use, and their opportunity for action—*special* nerve-structures for the production of the sensations of Sight, Hearing, and Touch. One nerve alone, on either side, can convey the impression of odour; two, probably, that of taste. These nerves are distributed in a simple manner, at the points designed for contact with the matters fitted to impress them. The sense of touch, as well as the sense of muscular action, is a property of the sensory nerves in general; but touch, in a restricted sense, is preeminent only in special organs. Only one nerve can transmit, in the healthy state, impressions from the undulations of light, or subjectively produce to the mind the sensation of light. One nerve only can communicate impressions from undulations of air, or convey the sensation of sound: and in the higher Animals certainly, a complex apparatus is necessary, to receive the undulations of light, or of air (or other body capable of producing the sensation of sound), and transmit them with the required precision and the proper force to the nerve itself. The modifications in the structure of the two last

organs of sense are as numerous, perhaps, as those of any other organs. The acutest senses are not linked with the highest mental endowments, but probably belong to the predatory kinds of all classes of Animals. That sense in each is the most developed which assists the best in catching the prey.

In Man, that part of the nervous system is the most developed, which has to receive impressions from uniformly perfect organs of sense, and act in harmony with his mind, made in the Image of his Maker. At the earliest period of independent being, the organs of sense produce sensations in his mind. Notions and Experience result; these, with advancing life and new sensations, evoke his Powers, call out his Emotions, excite his Imagination, obey his Reason, and are modified by his Will.

To what, if any, restricted portions of the ganglionic vesicles of the brain these several properties belong, is still unknown.

Physiology is wholly unable to trace the origin of instincts in Animals, and does not attempt to explain the powers and means by which the Mind of Man is brought into conscious communion with Him who made him.

EAST GALLERY. WALL-CASES 18, 19, 20. MS. Catalogue, Part VII.

	Nos. in Catalogue.
Series I. ..... Organ of Touch.	
Subseries 1. ... in Invertebrata	1008, 1009
Subseries 2. ... in Fishes	1010
Subseries 3. ... in Reptiles	
Subseries 4. ... in Birds	1011
Subseries 5. ... in Mammals	1012–1022
Series II..... Organs of Taste.	
Subseries 1. ... in Echinoderms	
Subseries 2. ... in Insects	1023
Subseries 3. ... in Mollusks	1024, 1025
Subseries 4. .. in Fishes	1026
Subseries 5. ... in Reptiles	1027–1029
Subseries 6. ... in Birds	1030–1034
Subseries 7. ... in Mammals	1035–1052
Series III. ..... Organs of Smell.	
Subseries 1. ... in Fishes	1053, 1054
Subseries 2. ... in Reptiles	1055
Subseries 3. ... in Birds	1056
Subseries 4. ... in Mammals	1057–1062

Read especially either Müller's Physiology, or Carpenter's General Physiology, and his Human Physiology. Consult the larger Anatomical Works in the Museum, Swan, Bourgery, Quain, Hirschfeld; the Models in Room I.; the Articles on the several Senses, in the Cyclopædia Anat.; Alison's Physiology, Chaps. 13, 14; *Brown, Philosophy of the Human Mind.*

SUBDIVISION X.

Connective System.

In the arrangement of the Hunterian Collection the Connective System has a special place. It there consists of two great divisions, the Fatty and Cellular Substances. The importance of the fatty substances to many animals, the chemical changes which those elements undergo in their passage through the system, the tendency to the morbid production of some form of fat or oil, and the extent to which the cellular substance aids in the arrangement of other textures of the body, demand special attention. But neither on account of their structure, or from their chemical relations, should the study of them be severed from those of the other tissues of the body.

EAST GALLERY. Wall-case 21. MS. Catalogue, Part VIII.

	Nos. in Catalogue
Series I. ..... Adipose Substances, in the state of	
Subseries 1. ... Oil	1150–1152
Subseries 2. ... Marrow	1153
Subseries 3. ... Lard	1154–1156
Subseries 4. ... Tallow	
Subseries 5. ... Spermaceti	1157, 1158
Subseries 6. ... Adipocire	1159–1166
Series II..... Cellular Substance	1167–1170

Liebig's Organic Chemistry; Gregory's Organic Chemistry; Brodie on Wax, Philosophical Transactions, 1848; *Lehmann's Physiological Chemistry; Hunterian Catalogue, Part III.; Todd and Bowman's Physiology; and the Systematic Physiological Treatises.*

SUBDIVISION XI.

Tegumentary System.

The external investment of some of the lower Infusorial Animals is probably not more than a homogeneous membrane. This integument is modified according to the habitat and general structure and wants of the animal, from a very simple to a highly complex organization. It may be hard or soft, pliable or fixed, only protective, or destined to play also an important part in the chemical changes of the œconomy; smooth and simple, complex and modified into appendages of nails, hoofs, claws, spurs and spines, horn and beaks, hair, bristle, quills, feathers, scales, bone or shell; one and all exist in great variety,

and furnish in many cases characters suitable for the foundation of Specific distinctions.

The external layer is generally non-vascular; not unfrequently it consists of a more or less developed layer of cells called Epidermis.

Whenever the true skin performs a chemical office, either by physical transudation, or a vital process of excretion and exudation, the epidermis is traversed by the exhalation, and pierced by the mouths of the glandular organs, which secrete the fluid called Sweat.

The skin also, in most of the higher animals, immediately covers the terminations of a great proportion of nerves, to which the property of common sensation belongs, and hence, in ordinary language, the sense of touch is said to reside in it. The susceptibility of this impression, and the structures receiving the terminations of the nerves of common sensation, vary greatly in animals generally, and in the different parts of the same animal.

EAST GALLERY. WALL-CASE 22, TABLE-CASE 11. ROOM I. CASE 64. Nos. in Catalogue.

Series I. ..... Derm or Corium.....1171–1178

Series II..... Substances deposited between the Derm and Epiderm.

Subseries 1. ... Pigmentum.....1179, 1180

Subseries 2. ... Fish-scales.....1181–1190

Subseries 3. ... Bone.....1191

Subseries 4. ... Shell.....1192

Series III. ..... Epiderm or Cuticle.

α) Epiderm in Plants—

Subseries 1 a. as an external covering.....1193

β) Epiderm in Animals—

Subseries 1 b. as an external covering.....1194–1201

Subseries 2. ... lining internal passages.....1202, 1203

Subseries 3. ... in the form of Scales.....1204–1208

Subseries 4. ... — of Hairs.....1209–1217

Subseries 5. ... — of Quills.....1218–1223

Subseries 6. ... — of Feathers.....1224–1249

Subseries 7. ... — of Nails.....1250–1254

Subseries 8. ... — of Hoofs.....1255

Subseries 9. ... — of Claws.....1256

Subseries 10. — of Spurs and Spines.....1256 a

Subseries 11. in the form of Horns.....1257–1260
Subseries 12. — of Baleen 1261, 1262
Subseries 13. — of Beaks 1263, 1264
Series IV. ..... Chitinous Tegument 1265, 1266
Series V. ..... Crustaceous Tegument.....1267

The Hunterian Catalogue, Vol. III. Part 2; Quekett's Histology, and Histological Catalogue; Cyclopædia of Anatomy and Physiology, Article Shell; *and ibid., Article* Aves, *p.* 349; *Todd and Bowman's Physiology; Lehman's Physiological Chemistry, Vol. II. p.* 378 *et sqq.*

SUBDIVISION XII.

Peculiarities.

"The parts peculiar to certain animals are all such as are not in general necessary, but relate to some peculiar circumstance in the economy of those animals, and therefore may be considered as parts superadded for particular purposes."—*Hunterian Catalogue.*

EAST GALLERY. Wall-case 23. MS. Catalogue, Part VIII. Nos. in Catalogue.

Series I. A. ..... in Plants.....1268, 1269
B. ..... in Animals .....
Series I. ..... Peculiarities of the Tegumentary System.....1270, 1271
Series II..... Peculiar Organs of Adhesion.....1272, 1273
Series III. ..... Air-bladders 1274
Series IV. ..... Peculiar Organs of Secretion.
Subseries 1. ... Glands opening above the Tail 1275
Subseries 2. ... Glands opening within the Prepuce 1276
Subseries 3. ... Glands opening at the Anus.....1276 a
Subseries 4. ... Peculiar Secretions 1277–1286
Subseries 5. ... Poison Glands 1287–1289
Series V. ..... Animals which exude an urticating fluid 1290
Series VI. ..... Animals which exude a phosphorescent fluid.....1291
Series VII. ..... Reproduction of parts of the Body.
Subseries 1. ... Reproduction of the external tegument 1292
Subseries 2. ... Reproduction of extremities 1293, 1294

Consult the Hunterian Catalogue, and the Indices of the Works of Comparative Anatomy, for the several subjects of this subdivision; Paget's Lectures, Vol. I.

DIVISION II.

ARRANGEMENTS FOR THE CONTINUATION OF THE SPECIES IN PLANTS AND ANIMALS.

SUBDIVISION I.

Organs of Generation.

The methods appointed for the perpetuation of a succession of living Beings have been esteemed most mysterious in their nature, and have been found most difficult to be traced. But no subject has been elucidated in the present century with greater success than this, nor has the microscope added more to any other department of human knowledge than it has to an insight into the processes of Development.

Of every living Being it is believed, that it was produced mediately or immediately only by the detachment of some portion of a similar Being, and by the growth of it under definite conditions of air, temperature, moisture, locality, and nutriment.

It is probable that in the simplest kinds of living Beings no distinct organs of generation exist; in such no sex can, in the present state of knowledge, be assigned to any individual. In some vegetables also, consisting of a single cell, a new being of the same species is produced by a change in the interior of the single cell. But in most, the germ is produced by the united action of two individuals of the same species.

Some Animals of the simpler kinds are capable of spontaneous division into two or more similar beings—fissiparous generation; or of throwing off buds either from their internal or their external surface, in a state of development more or less similar to the complete parent—gemmiparous generation. In these cases generally the capacity for development resides in many parts of the organism, and not in narrowly restricted portions only.

But in all Animals not of the lowest kinds, '*a germ cell*' (the source, as it would seem, of the vital actions of the ovum) is formed by the female in an *ovary*. A '*sperm cell*,' containing *spermatozoa*, is formed by the male in a *testis*.

In the evolution of the vital actions of the germ cell, the spermatozoa must come in contact with the ovum.

The organs for preparing the germ cells and the sperm cells, for transmitting them, for bringing them into contact with each other, the means for nurturing their joint product, are of various degrees of complexity, and are variously combined.

The male and the female organs, and their products, the germ cells and the sperm cells, may exist in the same individual (Hermaphrodites), and may then be so placed that impregnation can take place in one individual, or so that two are necessary for the act.

In all the higher Animals, the germ cells and the sperm cells are prepared in different individuals; impregnation may take place within the body of the female by coitus, or externally to it with or without coitus.

Difference of sex is attended by various distinctions besides those of the sexual organs—of size, strength, colour, instincts, and habitudes.

SOUTH GALLERY. WALL-CASES 24, 25. MS. Catalogue, Part IX.

Nos. in Catalogue.

A. Fissiparous and Gemmiparous Generation.

Series I. ..... In Plants 1295

Series II..... In Animals 1296

B. Monœcious Generation.

Series III. ..... Heautandrous Hermaphroditism.

Subseries 1. ... in Plants 1297

Subseries 2. ... in Entozoa 1298

Subseries 3. ... in Cirrhipeds 1299–1300

Series IV. ..... Allotriandrous Hermaphroditism.

Subseries 1. ... in Annelides 1301–1303

Subseries 2. ... in Gasteropods 1304–1306

C. Dicœcious Generation.

Series V. ..... Male Organs.

Subseries 1. ... in Plants 1307

Subseries 2. ... in Entozoa 1308

Refer especially to Carpenter's General Physiology; the Articles Generation *and* Ovum, *by Prof. Allen Thomson, Encyclopædia Anat.; Owen's Lectures on Generation, in Medical Times*, 1849; *Owen on Parthenogenesis; Wagner's Icones Zootomicæ; Mohl on the Vegetable Cell; Carpenter's Human Physiology. Copious references to Monographs are given in Carpenter's Work, and in Prof. A. Thomson's Article.*

SUBDIVISION II.

Products of Generation and Development of the Germ.

An unimpregnated Ovum generally consists of a 'germ cell' (germinal vesicle) imbedded among smaller cells (yelk cells), inclosed in an external vesicular membrane or cell (vitelline membrane).

An impregnated Ovum consists of such a structure, which has come in contact with the contents of a 'sperm cell' (containing spermatozoa) of the same species, in a healthy state, and under certain appropriate conditions.

Impregnation consists in calling into operation those vital actions of which the Ovum is capable. The Ovum was part of a living Body: it was destined to undergo a series of spontaneous changes operating to a determinate end. This end is in every case to attain the Form, the Mechanical Structure, Chemical Constitution, and, in some cases, the Mental Habitudes of the parent or parents, subject to certain conditions, through various modifications, and within certain limits of departure from the specific type. This end is reached by consecutive spontaneous vital changes within the Ovum; operating in connection with ordinary physical forces, combining organic principles out of inorganic elements, and forming organic structures found only in living Beings.

To the Ovum belongs also the property, not only of originating these series of changes, but of conferring on the organism so made the power of maintaining itself through a certain period appointed to it by the Creator; subject, however, to the possibility of injury and destruction from without, and of disturbed action or disease from within; but still capable, to an extent greater in some of the lower, and less in the higher Animals, of repairing the effects of those injuries and the disturbance of that disease.

The changes which the Ovum undergoes immediately on impregnation, is in most Animals probably as follows.

The germ cell (germinal vesical) disappears: another cell, embryo cell (embryonic vesicle), takes its place. This last divides into two; the two become four; the four become eight; the eight sixteen; and so till a countless multitude of descendants of the embryo cell, have each derived nutriment from the surrounding yelk cells, and have filled the whole external (vitelline) membrane.

Or—the embryonic vesicle divides into two: the whole surrounding yelk cleaves also, and becomes two. These two masses (divided vesicle and yelk) become four: the process continues, as in the former case, till by innumerable subdivisions every part of the yelk is related to, if not the progeny of, the embryonic cell.

Or—if as in Birds the chief nutriment of the embryo till an advanced period is inclosed within the external envelope of the Egg (by the presence of a large yelk mass, albumen, air, and additional coverings), then the yelk cells in the

neighbourhood of the germinal vesicle alone take part in the 'cleaving' process.

The cells, all now impregnated, mark out the first traces of the new being. A special layer, of more or less extent, is formed on the surface of the yelk (the germinal membrane): in the area of this membrane, itself divided into two or into three layers, are seen the looming forms of the future structures. Organs and textures are educed by modifications in the chemical constitution, form, nutrition, and relation of the cells; and temporary membranes and organs are made to aid in the nutrition of the fœtus.

The conditions under which these changes take place vary much. The impregnated Ovum may be hatched without the aid of the parent; or with its aid, but external to its body; or within the body, without organic connection with it; or organically united to the body within a uterus, there retained till fit for life external to the parent, but for a time dependent on her.

In some of the lower Animals the immediate independent product of an Ovum is not always a being similar to its parents. From it may be produced an individual unlike its parent, capable of maintaining active independent existence—a larva, but incapable of propagating its kind until it has been developed into the form of its parent: this mode of growth is that by Metamorphosis.

Or—the Ovum may produce a being unlike its parent, which itself, *without sexual intercourse,* gives origin to another individual unlike its parent, and either like or unlike the grandparent. After one or more generations of such dissimilar offspring (produced without sexual intercourse), a perfect being, capable of coitus and its results, is born like the original parent. This is the process of Alternate Generations—Parthenogenesis—Metagenesis.

Among the most important questions that arise concerning the development of the Germ, are the respective influence of the male and of the female on the offspring, and the limits of variety of species within which fruitful intercourse may occur.

SOUTH GALLERY. WALL-CASES 26—29. MS. Catalogue, Part X.

	Nos. in Catalogue.
Series I. ..... In Plants	1433
Series II..... In Polypes	1434
Series III. ..... In Entozoa	1435

Series IV. ..... In Acalephes
Series V. ..... In Echinoderms
Series VI. ..... In Cirrhipeds
} These are desiderata for the Microscopical Cabinet.

Series VII. ..... In Annelides 1436
Series VIII. ..... In Insects 1437–1477
Series IX. ..... In Arachnidans 1478
Series X. ..... In Crustaceans 1479
Series XI. ..... In Mollusks 1480–1486
Series XII. ..... In Fishes 1487–1494
Series XIII. ..... In Reptiles 1495–1504
Series XIV. ..... In Birds 1505–1516
(For 1507—1515, see Table-case II. Compartment 5.)
Series XV. ..... In Mammals.
Subseries 1. ... Implacental species.
Subseries 2. ... Placental species (except) 1517–1565
Subseries 3. ... Human Subject.
(a) Modifications of the Uterus and Maternal Membranes 1566–1569
(b) Fœtal Membranes and Placenta 1570–1573
(c) Progressive growth of the Fœtus 1574–1585
Series XVI. ..... Corpora lutea 1586, 1587
Series XVII. ... Fœtal peculiarities 1588–1599
Series XVIII. ... Mammary organs 1600, 1601
Series XIX. ..... Marsupial pouch mammæ and mammary Fœtus 1602–1604
Series XX. ..... Nidamental Structures 1605–1627

Consult especially the Article Ovum, *Carpenter's General Physiology; Owen's Lectures on Parthenogenesis; the 5th vol. of the Hunterian Catalogue; Martin Barry's papers on Embryology, in Royal Society's Transactions,* 1839,'40,'41; *Paget's Lectures on Nutrition, &c.; Agassiz and Gould's Physiology; Wagner's Physiology, by Willis; Prichard, Physical History of Man, Vol. I.; Erdl, Die Entwickelung des Menschen und des Hühnchens; Coste, Developpement des Corps Organizés; Bischoff, Developpement de l'Homme, &c.; Vrolik de Embryogenesi; Vogt, Embryologie des Salmones; and the numerous plates in Wagner's Icones Physiologicæ.*

OSTEOLOGICAL SERIES.

Of all the subjects brought before the Anatomical Student, none is more important, none more interesting, than the Structure and Arrangement of Bone.

Not only are its composition, and the methods of its formation, preservation, and repair, of great beauty and of classical interest; not only is it applied to as great variety of office as any other texture; not only have the durability of its nature and the diversity of its forms caused it to be among the surest and most important chroniclers of the revolutions of the globe; but philosophic minds have wrested from it, and none so vigorously as Owen, evidence of design more vast than has been won from any other department of Physiological Truth.

On these accounts the Osteological Series may furnish any who fix on a special department of study with a subject at once restricted and fitted to exercise the highest capacities.

PART I.

Structure and General Arrangement of Bone.

In most Animals, though not in all even of the relatively larger kinds (Acalephæ), there exist, besides the soft tissues connected with the nutrition and consciousness of the being, hard tissues for their support and protection. These hard tissues for the most part constitute the Skeleton.

The skeleton may be internal or external, or both; may be composed of bone, cartilage, shell, or epidermic crust, of various chemical composition, and different degrees of hardness.

True Bone is found only in the Vertebrate classes. It is composed of animal and earthy matter in proportions that differ in different animals, and with the age of the same animal, more or less vascular, capable of growth and

repair, in most cases formed in cartilage, in some in membrane, and of intricate arrangement.

The intimate structure of bone, the arrangement of its vascular canals, of the laminæ that surround them, and of the cells and tubes which convey the nutrient plasma, show great diversity among the Vertebrate animals.

The skeletons of Invertebrata are not true Bone. In the Mollusca and Articulata, they are principally external, and are part of the Tegumentary System; the muscular apparatus in them derives its attachment from the interior of this, which is therefore called an external skeleton.

In some of the Radiata the hard support is external, in some internal. It is developed between layers of the Integument in the Echinodermata. Among the Zoophytes, it has the consistency and texture adapted to their mode of life and external conditions—horny and pliable, chiefly of animal matter, or hard, and almost wholly calcareous.

The endo-skeleton of Vertebrata protects and incloses the chief central masses of the Nervous System (cerebrospinal axis). It is divided into a series of segments called Vertebræ. According to the dimensions of the Nerve mass, at any given point, must be the size of the bony case which incloses it. Where the Nerve mass expands in the Brain, part of the Cranial Vertebræ expand to receive it.

But Vertebræ have other relations. They protect the Circulatory, as well as the Nervous, system; and therefore parts of certain Vertebræ are largely developed, to inclose the Heart and the Lungs, or to protect the principal Blood-vessels. They afford also fulcra for the organs of locomotion, which are ordinarily appendages to a Vertebral arch, specially developed for their support.

The various modifications of the Vertebræ and their appendages, and the investigation of their respective Homologies, or "the sameness of parts under every variety of form and function," will ever form a most interesting branch of Osteological study. The works of Professor Owen give not only the result of his search after the Type or Archetype on which all Vertebrate skeletons are constructed, but also much historical information on the progress of the questions that have arisen concerning the essential nature of various parts of the skeleton.

The preparations that are enumerated in the present section are intended to illustrate and to further this difficult study.

TABLE-CASE 1. Divis. 1, 2, 3. MS. Catalogue, Part XI.

The Cranium, as has been stated, is composed of modified Vertebræ. The number of Vertebræ entering into it have been estimated by various Anatomists as three, four, six, and seven. Mr. Owen considers that they are four, and he names them the Epencephalic or Occipital, the Mesencephalic or Parietal, the Prosencephalic or Frontal, and the Rhinencephalic or Nasal.

As the component parts of the Vertebræ are relatively more modified in the skull than in any other part of the body, so the determination of the several Neural Arches, Hæmal Arches, and other parts of the Typical Vertebræ with its appendages, are severally further departures from the central type, and are consequently more difficult to be deciphered.

For the furtherance of rigorous Anatomical inquiry, it is proposed by Professor Owen to assign numbers, as permanent formulæ instead of names, to the several Elements of the skeleton, that the Homologies in every animal, when once ascertained, may always be recorded by the same term, and that comparison and description may be thereby facilitated.

This plan has been applied by him to the Cranial Vertebræ, and is represented in the table that follows.

Table of the Names and Arrangement of the Bones of the Disarticulated Skulls, according to Prof. Owen.

OCCIPITAL SEGMENT.

Centrum . . . . . 1. Basioccipital.

Neural arch . . . . 2. Exoccipital.
3. Superoccipital.

Parapophysis . . 4. Paroccipital.

Hæmal arch . . . . 50. Suprascapula.
51. Scapula.
52. Coracoid.

Hæmal appendage 53. Humerus.
54. Cubitus.
55. Radius.
56. Carpus.
57. Metacarpo-phalanges.
58. Epicoracoid.

PARIETAL SEGMENT.

Centrum . . . . . 5. Basisphenoid.

Neural arch . . . . 6. Alisphenoid.
7. Parietal.

Parapophysis. . . . 8. Mastoid.

Hæmal arch . . . . 38. Stylo-hyal.
39. Epi-hyal.
40. Cerato-hyal.
41. Basi-hyal.
42. Glosso-hyal.
43. Uro-hyal.

Hæmal appendage 44. Branchiostegals.

FRONTAL SEGMENT.

Centrum . . . . . 9. Presphenoid.

Neural arch . . . . 10. Orbitosphenoid.
11. Frontal.

Parapophysis. . . . 12. Postfrontal.

Hæmal arch . . . . 28A. Epitympanic.
28B. Mesotympanic.
28C. Pretympanic.
28D. Hypotympanic.

Hæmal arch . . . . 29. Articular.
29′. Surangular.
30. Angular.
31. Splenial.
32. Dentary.

Hæmal appendage 34. Preopercular.
35. Opercular.
36. Subopercular.
37. Interopercular.

NASAL SEGMENT.

Centrum . . . . . 13. Vomer.

Neural arch . . . . 14. Prefrontals.
15. Nasal.

Hæmal arch . . . . 20. Palatine.
21. Maxillary.
22. Premaxillary.

Hæmal appendage 23. Entopterygoid.
24. Pterygoid.
25. Ectopterygoid.
26. Malar.
27. Squamosal.

DERMAL BONES.

71. Supratemporal.
72. Superorbital.
73. Lachrymal or first suborbital.
73′. Smaller suborbitals.
74. Labial.

SPLANCHNIC BONES.

Branchio-pharyngeal System.

Branchial arches 45. Basi-branchial.
46. Hypo-branchial.
47. Cerato-branchial.
48. Epi-branchial.

Pharyngeal bones	49. Pharyngo-branchial.	SENSE CAPSULES.	
	47. Last cerato-branchial or Inferior Pharyngeal bone.	*Acoustic capsule* .	16. Petrosal.
		Optic capsule	17. Sclerotal.
		Nasal capsule . .	18. Ethmo-turbinal. 19. Turbinal.

D. Dermal Bones 147–150

The several segments of the Crania are numbered on coloured paper: the Occipital, yellow; the Parietal, green; the Frontal, yellow; the Nasal, red. Most of the Separated and Articulated Crania illustrative of Mr. Owen's Homologies are in Room I. The remainder are in Table-case II.

Quain and Sharpey's Anatomy; Todd and Bowman's Physiology; Quekett on Structure of Bone, Transactions of Microscopical Society, Vol. II; Carpenter on the Structure of Shells, British Association Reports, 1844, '47; Microscopical Cabinet; Owen's Homologies of Vertebrate Skeleton; Owen on Nature of Limbs; Owen's Lectures on Comparative Anatomy, Vol. II; An excellent summary in Carpenter's General Physiology, §. 320.

PART II.

Structure and General Arrangement of Teeth.

Teeth are hard structures usually developed at the commencement of the alimentary canal, in the mouth, and form part of the so-called splachno-skeleton of higher animals. Their use is to seize, divide, or triturate food, in some cases to aid in articulation, to act for defence, and for other purposes in the life of the animal.

They are found throughout the animal series. Among the Radiata, the Echini have a beautiful and complex dental apparatus. Gastric Teeth, moved by muscular apparatus, are found in Rotifers, in some of the Gasteropoda, and of the Articulata.

Perfect osseous Teeth belong exclusively to fishes, reptiles, and mammals. In some genera in each of these classes they do not exist. In birds, the horny bill performs some of the functions of Teeth, and a horny substance takes their place in the tortoise, and the ornithorhynchus. In some Cetacea, whalebone is substituted for them.

In true osseous Teeth, three substances exist—Dentine, Enamel, Cement.

The intimate structure of all these textures varies greatly; and they are variously combined in different animals. On this account, and on account of their durability, of the variety in their form and number, and from their intimate connection with the conformation and mode of life of animals, they have furnished to philosophers, and especially to Cuvier and Owen, a principal means of constructing the history of many extinct beings.

The Teeth of Mammalia are developed either once, or twice, during the life of the individual. Mr. Owen, in respect of the dentition, has divided them into Monophyodonts, and Diphyodonts. The Teeth of fishes and reptiles are more frequently renewed, and they are here classed by Dr. Victor Carus under the third head, Polyphyodonts.

As in every other department of Osteology, so in this of the teeth, Mr. Owen has traced, from all the circumstances of its history, the essential nature and relation of every member of the series, and thus been able to affix to it a precise numerical symbol, by which the Homology of each developed Tooth may be recognized.

TABLE-CASE 1, Divis. 4, 5, 6. and Wall-case 40, Room III.

MS. Catalogue, Part XII.

Subseries 3. ... Monophyodonts.

A. Monotremata 361
B. Bruta.....362–368
C. Cetacea 369–373

See Article TEETH, *Cyclopædia Anat., especially pp.* 903 *and* 935; *and Owen's Odontography; also Cuvier's Ossemens Fossiles; John Goodsir, Edinburgh Medical and Surgical Journal, Vol. LI.; Tomes on the Teeth; and the Systematic works on Anatomy and Physiology.*

PART III.

Series VI. ARRANGEMENT OF BONE IN THE SKELETONS OF VERTEBRATE ANIMALS.

The skeleton of the Vertebrata is essentially an endo-skeleton. It may be wholly or partially cartilaginous. The exo-skeleton is represented in some mammalia, reptiles, and fishes, by more or less fully developed osseous casing; and in less marked instances, by horn, scales, and other epidermic appendages.

To these are to be added, parts which are not referred to either system, constituting the splanchno-skeleton,—of this the Teeth are the most remarkable example. The study of the modifications of the Vertebrate-skeleton is co-extensive with that of the Genera, and often with the species of Vertebrata.

It must be examined at every period of development, with a view to a comparison of the modes of origin of the several parts, to the determination of the transitions through which the higher forms are conducted, and to their comparison with permanent arrangements in the lower. The cause of the modifications to be noticed must be sought, not only in adaptation of the parts to their several mechanical uses (Teleological inquiry), but in respect of the relation they bear to a general preconceived design, as apart from any other known utility (Morphological, Analogical, Homological investigation).

Sexual distinctions, and the modifications wrought by race, domestication, and other causes, are to be particularly regarded; inasmuch as they have an important bearing on comparisons instituted for the determination of species;

and inasmuch as it is important to know, for economic purposes, by what circumstances and in what manner the osseous, as the other organic systems, may be altered from their normal type.

WALL-CASE 41. MS. Catalogue, Part XIII. Nos. in Catalogue.

Subseries 1. ... The skeleton of Fishes.

Dermopteri.

Malacopteri, Apodes.

Abdominales.....374

Pharyngognathi.

Anacanthini, Apodes.

Thoracici 375–378

Acanthopteri 379–386

Plectognathi .....387, 388 a

Lophobranchii 389, 390

Ganoidei.

Protopteri.

Holocephali.

Plagiostomi.....391–406

WALL-CASE 42.

Subseries 2. ... The skeleton of Reptiles.

Batrachia 407–416

Ophidia 417–420

Sauria 421–434

Chelonia 435–447

WALL-CASE 43.

Subseries 3. ... The skeleton of Birds.

1. Palmipedes.....448–468

2. Grallatores 469–472

3. Cursores 473–480

4. Gallinæ 481–484

5. Scansores 485–489

6. Passeres 490, 491

7. Accipitres 492–497

Wall-cases 44—48. MS. Catalogue, Part XIV.

Subseries 4. ... The skeleton of Mammalia.

(a) Implacentalia.

Monotremata 498, 499
Marsupialia.....500–507

(b) Placentalia.

Rodentia.....508–535
Bruta 536–541
Ruminantia.....542–582
Pachydermata 583–612
Cetacea 613–637
Carnivora.
Primigrada 638–641
Digitigrada.....642–714
Plantigrada.....715–724
Insectivora 725–732
Cheiroptera..... 733–736
Quadrumana 737–758

Bimana, genus Homo.

Wall-cases 51—53. Room II. MS. Catalogue, Part XV.

a. Crania of the varieties of the Human Race .....759–828 b

Wall-cases 48—50. Museum Room. South Gall. 30.
MS. Catalogue, Part XVI.

b. The Human skeleton.

α. The skeleton in the Fœtus 829–834
β. The skeleton in the Child 835
γ. The skeleton in the Adult.....836–840
δ. The skull in the Fœtus.....841–845
ε. The skull in the Child 846–851
ζ. The skull in the Adult 852–892
η. The Trunk..... 893–897
θ. The Limbs..... 898–918

All the skeletons which can be conveniently placed in systematic order are either in the Wall-cabinets 40 to 50, or in Room III. The separated Crania

are partly in Room I., partly in Table-case II. The Crania and horns of various Ruminants, including a fine skull with the antlers of the Megaceros Hibernicus, or Irish Elk, are on the front of the principal gallery; other parts of the skeleton are in case 44; they were presented by Sir Thomas Deane. Below the Elk there is a skeleton of Balæna Rostrata (Fabricii), or Pterobalæna minor, procured by favour of Professor Eschricht, of Copenhagen. Skulls of other Cetacea are over the Wall-cases under the South Gallery. The skull of the so-called Ziphius Sowerbiensis (Delphinorhynchus Micropterus) is to be seen in Wall-case 47, as are the teeth* in Table-case 1.

On the ground floor, by Table-case II, are casts of the left Femur, Tibia, and Tarso-metatarsal bones of Dinornis Giganteus, presented by the Council of the Royal College of Surgeons of England, through the kindness of Professor Owen. Various bones of several other species are in case 66 on the Staircase. These bones are of special interest as being the subject of a remarkable application, by Professor Owen, of the known laws of Animal structure to the reconstruction of an Extinct Animal; and students are referred to his memoirs as excellent examples of Inductive reasoning. (See Zoological Society's Transactions, Vol. III.) Opposite to the pedestal on which they stand is the skeleton of a full-grown male Giraffe; and on the further side of the room is the skeleton of a well-bred English Coach Horse, and one of the Camel.

Table-case I, above referred to, contains parts of the Osteological Series. In division 1 are examples of the exoskeleton of Invertebrata and of the structure and texture of Bone. In divis. 2 and 3 are some of the preparations which illustrate the general arrangement of the Vertebrate skeleton—typical vertebræ, and examples of their constituent parts. In divis. 4 are dried preparations of Teeth, showing their form and texture, and including some fossil as well as recent kinds. In divis. 5 and 6 are many of the Crania classed in the series of Dentition. The student will find other examples of the process of Dentition, and of the arrangement of Teeth, in cases 3 and 40, and in the Osteological Series generally.

For the study of the Osteological Series generally, see Articles in Cyclopedia of Anatomy on the several Vertebrate classes, and the Bibliographies ap-

* Casts of the Teeth will be given to any scientific person who applies to Dr. Acland for them, and casts of the Cranium will be sold at cost price. See Bell's British Quadrupeds; Zoology of Erebus, Gray's Cetacea; Eschricht's Wallthiere, Part I. p. 27.

pended; Owen's Lectures, Vol. II.; Carpenter's Comparative Physiology and his Human Physiology; Plates in Carus' Comparative Anatomy; Wagner's Icones Zootomicæ; Vrolik on the Chimpanzee, his article Quadrumana, Cyclop. Anat.; Owen on the Osteology of the Orang and Chimpanzee, Zoological Transactions, Vols. I. and III.; British Fossil Mammalia; Melville on the Osteology of the Dodo, in Strickland and Melville's work on the Dodo; Ward's Osteology; Sir Charles Bell's Animal Mechanics; Arnott's Physics. Never use plates if you can see the bones and have careful descriptions.

In divis. 4 of Table-case II. are parts of the Tegumentary series dried; in divis. 5 some dissections of the Nervous System; and, displayed in Cells, preparations of the Incubated Egg of the common fowl, from the second to the eighth day: and dissections of the Embryo of the Dog, taken from the Uterus displayed in prep. 1552, and of the Cat, from 1556. In divis. 6 are preparations of the Digestive Organs, injected and dried, tracheæ of Birds, and sections showing the relative size of the Aorta in different Animals.

On the Staircase ascending to the Gallery in case 66, besides various bones of several species of Dinornis, is the commencement of a small series to illustrate some of the laws of distribution of living beings. Of these may be mentioned especially, as examples of restricted habitat, the Parasitic Sphæria Robertsii of New Zealand, a fungus of considerable size, which finds its appropriate nidus only in the body of a Larva; the Desoria Glacialis, which burrows in the Glaciers, from the Mer de Glace; and, as an instance of the method of dispersion of Animals, the Dreissena Polymorpha, found in the reservoir of the Great Quadrangle of Christ Church; its original habitat appears to be in the rivers of Russia. (See the account of the introduction of this shell into Great Britain, in Turton's British Shells.)

For this subject, the student may refer to Prichard's Physical History of Man, Vol. I.; Ansted's Physical Geography; Mrs. Somerville's Physical Geography; and, incidentally, to Guyot's Earth and Man; Agassiz and Gould's Physiology; Professor E. Forbes in British Association Reports, 1843; in Memoirs of Geological Survey, Vol. I. p. 336; and in Johnston's Physical Atlas.

On the landing-place by the Gallery-door are wax models illustrative of

Human Anatomy; of these the most valuable were presented by John and Philip Duncan, esqrs. of New College.

The parts of the Physiological Series placed in the East and South Galleries have been already stated. An account of the Illustrations of Pathology in the remaining Galleries does not come within the scope of the present Synopsis.