

**Descriptive catalogue of the teratological series in the museum of the  
Royal College of Surgeons of England / [by] Benjamin Thomson Lowne.**

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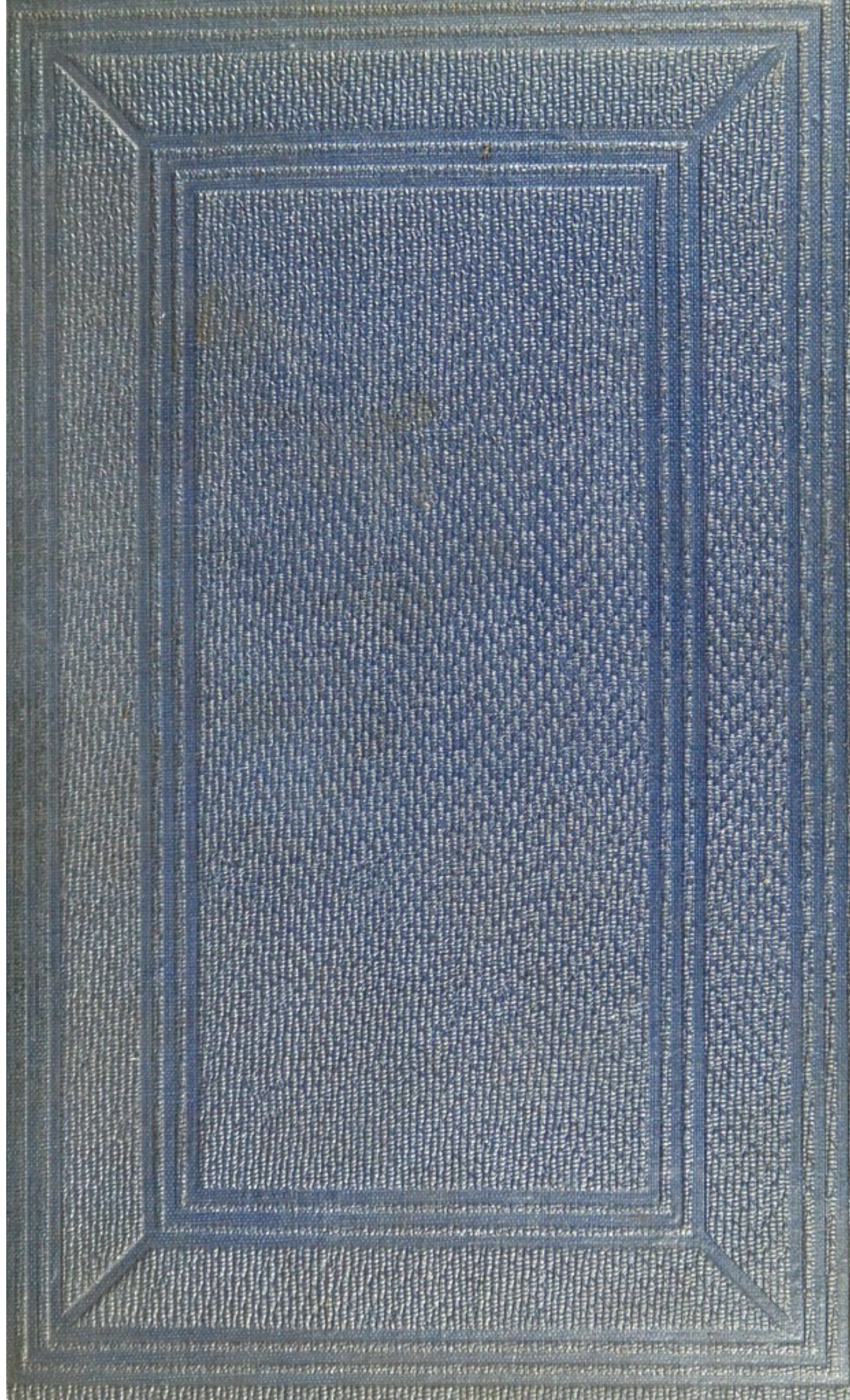
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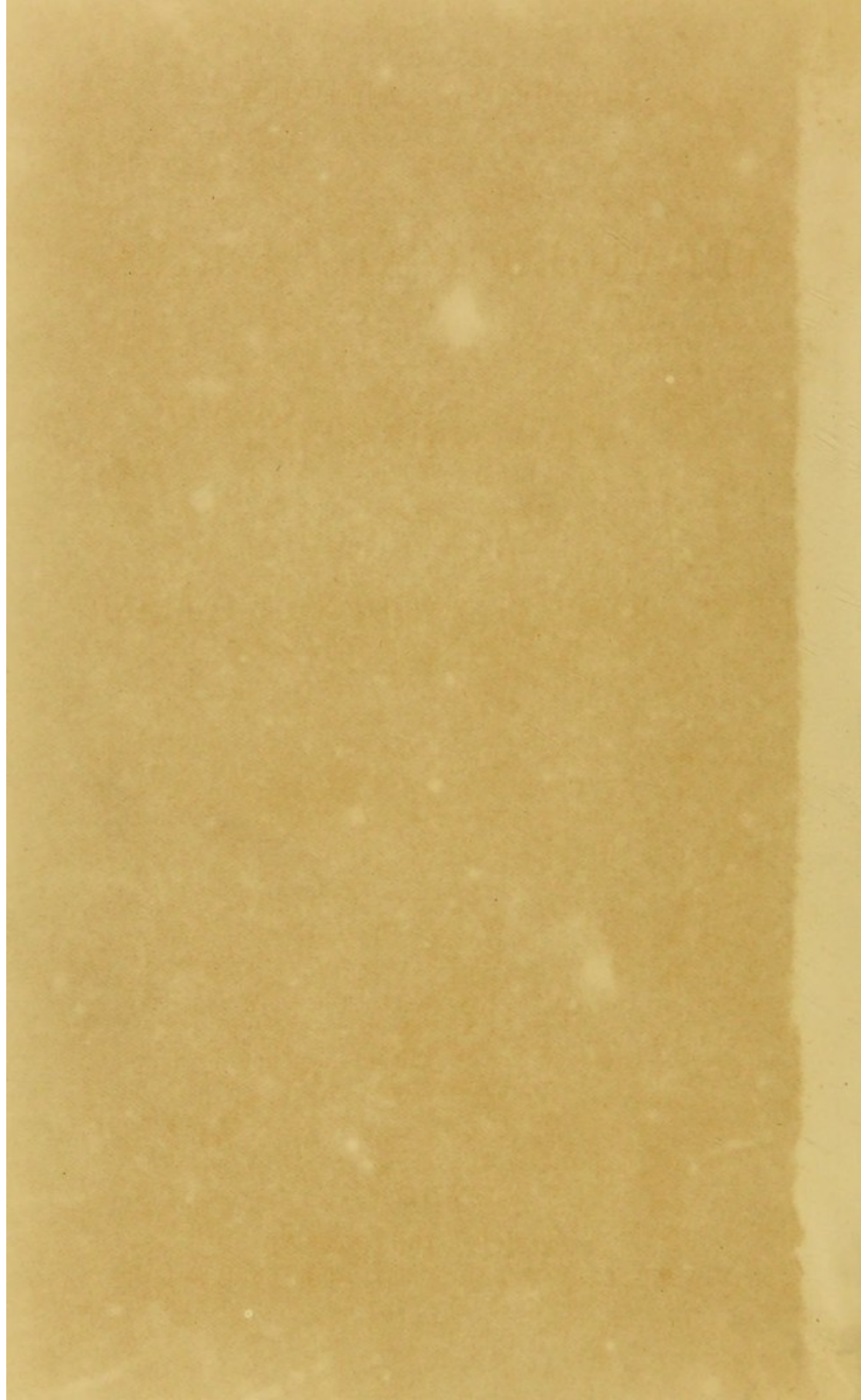


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OF THE

*Edward Jenner  
Esq.*

# TERATOLOGICAL SERIES

IN

## THE MUSEUM

OF THE

## ROYAL COLLEGE OF SURGEONS OF ENGLAND.

BY

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INTRODUCTION.

THE present Catalogue contains a description of the Specimens in the Museum formerly described in the 'Catalogue of the Contents of the Museum, Part V. comprehending the Preparations of Monsters and Malformed Parts, 1831,' as well as of the Specimens of a similar nature which have been added to the Collection since the publication of that work. The whole have been rearranged and redescribed by Mr. Lowne, to whom this duty has been entrusted by the Council of the College.

W. H. FLOWER,

*Conservator.*

October 1st, 1872.



The present Catalogue contains a description of the 250  
specimens in the Mineral Bureau deposited in the 1854  
issue of the Catalogue of the Mineral Bureau, 7 copies  
being the property of the Bureau and the National  
Academy of Sciences, as well as of the Academy of Sciences  
which have been added to the Collection since the  
publication of that issue. The whole has been arranged  
and reclassified by Mr. Lacroix, to whom this duty has  
been assigned by the Council of the Academy.

W. H. KILGORE

October 10, 1855

## INTRODUCTION.

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“By the classification of any series of objects, is meant the actual or ideal arrangement together of those which are like, and the separation of those which are unlike; the purpose of this arrangement being to facilitate the operations of the mind in clearly conceiving and retaining in the memory the characters of the objects in question”\*.

In the animal and vegetable kingdoms there is a marvellous interconnexion of organisms, perhaps genetic in its origin, which enables us to classify them into groups based upon purely structural considerations. Such a classification has been well termed “morphological.”

Amongst malformations there is no such interconnexion. Parts of organisms which have no morphological relation with each other are affected by causes which are very different in their nature and working. In such cases we must not seek for a morphological classification; we have to deal with phenomena which may or may not be connected with or dependent on each other, and the only satisfactory method of arrangement must be physiological.

The classification of malformations on these principles, to be entirely satisfactory, would require an intimate acquaintance with the laws of abnormal development, and the causes producing deviations from the normal standard. At

\* Huxley, ‘Lectures on the Elements of Comparative Anatomy,’ p. 1.



present we possess no such knowledge as this ; but what is known affords sufficient data for a physiological classification, which, if not entirely satisfactory, nevertheless approximates sufficiently nearly to a satisfactory arrangement to fulfil the objects of classification to a very considerable extent. Although the causes producing malformations are themselves hidden in the deepest obscurity, their effects are sufficiently definite to admit of a very clear diagnosis and arrangement, whenever the first deviation of structure can be perceived and studied apart from the various modifications which succeed and depend upon it.

The primary deviation from the normal type may be looked upon as the immediate cause of the malformation. All the successive changes and aberrations which depend upon it bear a distinct morphological relation to each other and to the primary deviation. Hence when malformations belong to the same group (that is, when the primary deviations are the same), they bear a distinct morphological relation to each other and admit of a morphological classification.

From these considerations it is evident that malformations due to the same cause affecting morphologically similar parts may be arranged in groups, the members of which are morphologically related, although the groups themselves can only be arranged in classes by a knowledge of the physiological relation which they bear to each other. Such an arrangement is possible in many cases, because analogy leads to the belief that the causes determining the occurrence of the malformations included in these groups are similar. In some the first deviations from the normal type are clearly of the same nature, or due to identical or nearly identical causes ; we are then able to class the resulting forms with certainty in one class ; but a number occur in which the primary deviation is too obscure to admit of this. Hence Bischoff argued that no satisfactory classification could be drawn from any but purely anatomical grounds, and many authors have followed this principle



strictly ; every day, however, the difficulties of a physiological classification will become less, and it may confidently be predicted that in a few years this subject will emerge from the darkness in which it has hitherto been involved.

**PATHOLOGY** has for its domain the consideration of the abnormal conditions of nutrition which occur in living bodies. Every disease may be looked upon as an abnormal condition of nutrition, using that term in its widest sense, whether the deviation be structural or apparently only functional.

**TERATOLOGY** has for its domain the consideration of abnormal conditions of development. In so far as the function of development is separable from the functions of maintenance and repair, Teratology is separable from Pathology ; but there are a large number of intermediate conditions in which it is impossible to distinguish between aberrations of nutrition and of development. Again, there are various abnormal conditions of growth which may be considered to belong to either class of phenomena. Hence, by common consent, all the diseases peculiar to intra-uterine life, together with certain abnormal congenital conditions of growth, producing dwarfs and giants, have been assigned to the Teratologist.

As we know that all the functions and parts of the living body are prone to vary within certain limits, so we are justified in believing that the process of development is liable to a certain amount of variation. In some few cases it can be shown that slight variations may occur in different stages of the developmental process. Thus the occurrence of transposition, or situs mutatus, of the non-symmetrical viscera is not very unfrequent ; and we owe to Von Baer the following interesting theoretical explanation of its occurrence :—

“The embryo of a bird during the first thirty-six hours lies with its abdominal surface downwards ; but in the course of the third day of incubation in the egg of the



common Fowl a change of position occurs, so that the left side of the embryo comes to be laid on the adjacent surface of the yolk. Von Baer had remarked, in very rare instances in the bird's egg, more frequently in the ovum of the Pig, the embryo lying with its right side towards the yolk; and he has ingeniously supposed that the reversion of the viscera is connected with this malposition of the embryo"\*. If such be the case, transposition of the viscera may be fairly regarded as a mere variation of the developmental process. Again, the aortic arches are liable to vary somewhat in the manner and period of their obliteration.

It may be fairly assumed that variation is liable to occur in the developmental process at any stage, and disease is undoubtedly liable to do so. When either occurs in the later stages, there is usually no difficulty in tracing the resulting malformation to its proximal cause; but when the first deviation arises from variation in the process of development or disease in the earlier stages of development, the resulting malformation is often exceedingly complex, so that it is only by a careful examination of a large series of allied malformations that we can obtain any clue to the nature of the original deviation.

Whatever the causes of embryonic disease and variation may be, there can be no doubt that these conditions react upon each other. Variation is extremely liable to occur as an accompaniment to disease, probably because new conditions arise; and, on the other hand, disease frequently results from variation. Again, disease passes by insensible degrees into variation, and hence no definite line can be drawn between malformations and varieties on the one hand and diseases on the other. Ordinary varieties, as well as the more marked degrees, of variation may be fairly looked upon as the result of variations in the developmental process; they have therefore been grouped together

\* Allen Thomson, Lond. & Edinb. Med. Journ. 1844.



into a single Class. Other deviations of form arise undoubtedly from intra-uterine disease, and certain abnormal forms of nutrition give rise to dwarfs and giants; these have been arranged in three Classes—Diseases, Arrests, and Excesses of Growth. Two great Classes of malformations remain—Arrests of Development, which are connected with variations on the one hand and with diseases on the other; and Double Conditions, either of the whole organism or of a limb or part, concerning the nature of which much difference of opinion exists.

The following six Classes have therefore been adopted in the arrangement of the Teratological Collection :—

- Class I. Variation.
- II. Duplicity.
- III. Excess of Growth.
- IV. Arrest of Growth.
- V. Arrest of Development.
- VI. Disease.

These great divisions, as has been already indicated, are by no means to be looked upon as certainly fixed; they are convenient groupings together of phenomena which are apparently related to each other. Analogy leads us to suspect that the causes in each Class are similar; but further investigation may lead to a redistribution of some groups, and perhaps to some alterations in the number and nomenclature of the classes themselves.

Although the above-enumerated Classes are used as the basis of classification in this Catalogue, it has been found convenient to make them subservient to an artificial grouping of the preparations in the following order :—

- Series I. Abnormal conditions in Plants.
- II. Abnormal conditions of the Axis in Animals.
- III. Abnormal conditions of the Limbs.
- IV. Abnormal conditions of the Skin and its Appendages.



Series V. Abnormal conditions of the Osseous and Muscular Systems\*.

VI. Abnormal conditions of the Sensory Organs.

VII. Abnormal conditions of the Heart and Vessels.

VIII. Abnormal conditions of Blood-glands.

IX. Abnormal conditions of the Digestive Organs.

X. Abnormal conditions of the Urinary and Generative Organs.

XI. Abnormal conditions of the Oviduct and Ova of Birds†.

There are many practical reasons why the malformations of each set of organs should be arranged in a separate Series; it facilitates comparison and reference, and is in accordance with the general plan of arrangement of other parts of this Museum.

The following considerations on the character and extent of each of the six Classes which have been adopted may be most conveniently discussed in the present portion of this work.

### Class I. VARIATION.

*Syn. Hémitéries, Geoff.*

The term variety is used by naturalists to designate the result of gradually accumulated individual differences, which are themselves slight variations. Some variations are, from their very nature, of a more marked character than ordinary

\* Abnormal conditions of the osseous and muscular systems are so intimately connected with each other that they have been arranged in a single Series.

† This Series consists of preparations of eggs which are evidently the result of abnormal conditions or functional derangement of the oviduct, and which throw little or no light upon the more remarkable deviations which occur in the other Series. It may be looked upon as supplemental to Series X., and it has therefore been placed last in the collection. Specimens of abnormal condition of the oviduct have also been arranged in this series, although, in strict conformity with the general plan of the Catalogue, they should have been placed in Series X.: this has been done because they elucidate, in some instances, the condition of the eggs.



individual differences ; such are variations in the number of organs : organs which are often repeated in an organism are extremely prone to vary in number, and such variations are clearly nearly allied to ordinary individual differences. The effect of altered conditions frequently produces variation by a definite action, certain conditions always producing similar variation ; such variation is usually more considerable than ordinary individual differences. Variations sometimes arise suddenly, it may be by reversion to an anterior type ; but in most cases it is either extremely difficult or impossible to distinguish between reversions and well-marked variations produced by other causes. Variations are frequently transmitted from generation to generation, and the abnormality sometimes increases, sometimes diminishes in intensity in each succeeding generation. The more marked forms of variation are, however, rarer and less truly transmitted than those which exhibit less considerable deviation from the usual type.

The following principal groups of malformations have been included under this Class :—

1. Variations in the position of parts. *Situs mutatus*, or transposition of the viscera, a condition already adverted to.

2. Variations in the number of parts which are normally repeated several times, such as cases of an additional or deficient rib, or pair of ribs, or vertebra ; or, in plants, of additional or deficient carpels, stamens, &c.

The various forms of polydactylism have also been included under this Class, although some are evidently very different to others in their nature. Any division founded on the few specimens which are available would, however, have been far too hazardous : it has therefore been thought best to place all the specimens in one group ; and as the greater part may probably be looked upon as variations, the whole have been included in this Class.

It is a well-known law that multiple organs are more prone to vary in number than those which are not repeated.



At an early stage of development the digits may fairly be looked upon as multiple organs, as they differ in no way from each other; it is not therefore surprising that the number should frequently vary. As development proceeds, however, and each digit becomes differentiated to its peculiar characters, there is apparently a stronger and stronger tendency for supernumerary digits to disappear. The disappearance of these abnormal digits takes place according to a well-defined law, which appertains not only in all such cases, but also occurs normally in the Mammalia, where the typical number of digits is less than five and rudiments of the absent digits remain.

The metacarpal or metatarsal bone is the first to disappear, and the phalanges remain loosely attached to the skin and neighbouring bones by ligamentous tissue; the basal and median phalanges are lost next in order, and the ungual phalanx in a rudimentary condition, or the extremity of the digit or nail, only remains to mark the former existence of a digit. Sometimes, but very rarely, a normal functional digit disappears in the same manner (see No. 327). Many ruminants exhibit this condition in rudimentary outer and inner digits.

Additional digits are occasionally developed, and usually exhibit the characters of the next normal digit more or less closely, oftener, however, resembling that of the opposite hand or foot than the corresponding digit of the same limb. It occasionally, but very rarely, happens that the number of digits in the opposite limb is deficient; and this has given rise to the erroneous belief in compensation of growth, *loi de balancement* (Geoffroy), between the two extremities.

It is by no means rare in such cases for an additional carpal bone to be intercalated between the normal bones; it usually resembles the trapezoid bone in the hand and the second cuneiform bone in the foot.

It is worthy of careful consideration that the addition of digits is far more frequent in hoofed than in ungiculate



animals, and is often so excessive in them that the whole manus or pes becomes doubled and usually exhibits the appearance of a right and left manus or pes united together. This condition is excessively rare in the Unguiculata; one case only is recorded in man\*.

Another kind of polydactylism, confined to animals with less than five toes, arises from the redevelopment of some of the absent digits: No. 302 exhibits this condition in the Horse†. A similar condition perhaps occurs in the domestic Dog, where the inner toe of the pes is frequently developed: it appears, however, to be abnormal in having three phalanges instead of two; at least if there are only two the metatarsal bone is removed from its normal and very constant position. In the St. Bernard Dog this inner toe is double, that is, six toes characterize the pes; so that in this case the supernumerary toes may probably be looked upon as entirely additional, as they are in the Dorking Fowl, where such digits characterize the breed (see Nos. 294 and 295). Lastly, sometimes a digit or a whole limb exhibits unmistakable dichotomy: No. 307 presents this condition, and the Musée Dupuytren contains a similar human foot. It is not possible, however, to distinguish dichotomy of a digit in all cases from mere addition; it is probable, however, that the conditions are really very distinct. The theory that such additional parts originate from the fusion of twin embryos may be looked upon as entirely superseded‡.

3. Variations in the lobulation of the spleen. The number of transitional states between an entire spleen and one much lobulated or divided render it probable that the most marked cases of lobulation and division of that organ are properly considered as mere varieties.

4. Variations in the form and arrangement of muscles; reversions to anterior types in the muscular and osseous systems.

\* J. J. Murray, Med.-Chir. Trans. vol. xlv. p. 29.

† Wood-Mason, Proc. Asiat. Soc. Beng. 1871, p. 24.

‡ Schultze, Virchow's Archiv, Bd. xvii. p. 484.



5. Variations in the disposition of the blood-vessels, and especially of the large trunks given off from the aorta.

## Class II. DUPLICITY.

This Class contains a vast number of very remarkable conditions, at first sight extremely dissimilar, but clearly, on closer study, intimately related in their mode of origin. The forms included in this Class have been divided into three Subclasses :—

Subclass I. *Dichotomy*.

II. *Homologous union*.

III. *Heterologous union*.

I. *Dichotomy*, or fission as it is frequently called, consists in the formation of two growing points in the place of one, in such a manner as to produce a dichotomously divided embryo or part, each half of the doubled portion being complete in itself. This process occurs normally in the production of a branching axis in plants, and is not unfrequent in the multiplication of Coelenterates, in the division of Coral-polypes and certain branched Hydrozoa. The use of the term fission to designate this condition is unfortunate, as it implies the division of an already formed part; whilst Dichotomy in both animals and plants, either normal or abnormal, as has been carefully pointed out by Dr. Maxwell T. Masters in his 'Vegetable Teratology,' consists in the simultaneous production of two points of growth. Fission amongst coral-polypes is of this kind, a fact strongly insisted on by Milne-Edwards. The term has, indeed, been used to designate a totally distinct phenomenon in the Infusoria, where an already formed organism undergoes division. Dichotomy may probably arise from a cleavage of the original cells, out of which a part is developed; but we know nothing certainly on this point.



Amongst the Vertebrata dichotomy of the axis is by no means unknown ; it may occur at either extremity, but the posterior extremity is most frequently affected. This condition originates in dichotomy of the primitive groove and notochord. Many discussions have been held and much difference of opinion exists as to its origin. That there is but a single germinal area is undoubted\* ; but the question at issue is whether there were originally two grooves and two notochords arising from *independent sources* (*i. e.* possibly from two vesicles of Purkinje being present in a single ovum† or from the original fusion of two yolks) or from an originally simple ovum. The former hypothesis is unsubstantiated, since the occasional presence of two vesicles of Purkinje, or the fusion of two yolks in an ovum, which we do not know will produce a double embryo, cannot be regarded in the light of evidence ; and the hypothesis entirely fails to account for the presence of a single blastoderm, a single germinal area, or a dichotomous embryo : on the other hand, the view that excess of formative power or nutriment produces a tendency to the complete or partial doubling of the embryo upon a single blastoderm, by the formation of two points of growth in the place of one, is borne out by numerous facts.

The doubling of a single limb, although excessively rare, occurs at times (see No. 307), bearing out the view that a double axis is the result of dichotomy. The observations of Lereboullet on the ova of fishes points to the same conclusion. He says :—

“ Le bourrelet en effet constitue le véritable germe embryonnaire, germe toujours simple, unique comme le vitellus que le blastoderme recouvre, mais susceptible quand le développement se déränge, de végéter comme la substance dont se compose le corps des polypes, et de produire des formes variées qui montrent toujours une tendance manifeste

\* Vrolik, Allen Thomson, and others have placed this matter beyond doubt.

† M. Coste, *Comptes Rendus*, 1855, p. 931.



à revenir au type primitif de l'espèce"\* . Lereboullet states that this condition of the germinal disk gives rise to the formation of a more or less completely double primitive groove and notochord, although the tendency to revert to the primitive type often causes the two grooves to coalesce at one or both extremities, or throughout their entire length.

II. The second Subclass, *Homologous union*, consists of monsters formed by the union of two distinct embryos adherent by the fusion of homologous parts ; each rib of the one, for instance, becomes fused with the corresponding rib of the other, and the other organs are all similarly united. The fact that such embryos originate in all cases upon a single yolk has been strongly insisted upon by most teratologists since the time of Vrolik, and double embryos on one yolk have been observed in numerous instances. Whenever the structures formed from the inner layer of the blastoderm, the intestinal canal and liver, are continuous, as they are in every case in the collection as well as in nearly if not in all the cases on record, it is impossible to conceive that the embryos could have originated in any other manner, since the adhesion of the parietes of the embryos by their external surfaces could not account for the continuity of the alimentary canal. M. Camille Dareste believes, however, that cases of homologous union occur between embryos formed on separate yolks, occasionally at least.

In homologous union the dorsal groove, instead of being only partially double, as in dichotomy, is completely double, and the two embryos are formed so close to each other that the visceral laminæ become united. As union takes place before the differentiation of distinct organs occurs, these are formed in continuity with each other. The differentiation is probably gradual ; the ribs, for instance, instead of growing forwards from the spine and meeting in the mesial line, are probably gradually evolved from the cells of the visceral laminæ. This evolution is continuous

\* Comptes Rendus, 1855, pp. 885 and 1029.



throughout their entire length, but proceeds most rapidly in the dorsal region, so that they appear to grow forwards. The so-called affinity of "soi pour soi" of Geoffroy is probably quite imaginary; for organs, when differentiated before union, probably in no case become united to homologous parts. This is well seen in preparations Nos. 120 and 123 to 130, 138, &c.

It may be said to be a well-defined law that structures which are united before differentiation become double by the development of homologous structures in continuity with each other, a symmetrical double organ being formed; whilst structures which are first developed and then united become fused irregularly with each other, giving rise to deformed and unsymmetrical structures. In such cases bone usually unites with bone, from the absorption of all intermediate tissues being effected by the pressure to which they are subjected between the two growing bones. Large portions of structures so united are commonly deficient from absorption or atrophy.

III. Cases of *Heterologous union* form the third subclass. In these the parts of the two embryos are irregularly united, the adhesion resulting from the union of unlike structures. In most cases, at least, these malformations result, like those in the two previous subclasses, from the formation of a double embryo on a single yelk. Several extremely complicated results occur from heterologous union; but they are best studied in individual cases. In some few instances of heterologous union it is possible that the second embryo may result from a second ovum, impregnated at a later date, finding its way into the cavity of the membranes of an earlier impregnation. No evidence can, however, be adduced in support of this view.

Twins united in a common chorionic or amniotic cavity are probably the normal result of the formation of a double embryo upon one yelk. There is a continuous and unbroken series of forms commencing with dichotomous and double monsters, passing through twins with a common cord and



placenta, or a common amnion and distinct cords, to those which have separate amniotic sacs but a common chorion.

It is almost as difficult to conceive that two amniotic sacs from distinct yolks should unite by their edges as it is that two embryos should unite by their visceral laminæ when enclosed in distinct amnia. Moreover, the yolk-capsule is probably persistent, and a seam at least would be apparent if the amnia were fused at a later period of development by the absorption of those portions by which they are in contact. M. Dareste believes that the amniotic sacs produced from distinct yolks become fused together occasionally by their edges, and M. Broca has recorded several cases in which two amnia formed from distinct yolks communicate or form a single amnion\*. It would be of extreme importance to discover whether, in such cases, some traces at least of the primitive septum do not remain.

The formation of double monsters may probably be looked upon, therefore, as an arrested attempt at something very like zooid reproduction, perhaps due to the germinal disk in its earliest state undergoing division, analogous to that which occurs as a normal mode of reproduction amongst the lower forms of life by a kind of reversion to a primitive type. This view will doubtless commend itself to some minds on mature consideration, although it may perhaps appear improbable to others.

If two complete primitive grooves occur, any arrest in the growth of the blastoderm between them, or their too close approximation at their first formation, would obviously give rise to the subsequent union of the resulting embryos. These views are ably expounded by Dr. B. Schultze, in his essay 'Ueber anomale Duplicität der Axenorgane'†, where he proposes a subdivision of double malformations on theoretical grounds, which is essentially the same as that adopted in the following pages.

\* C. Dareste, "Sur les œufs à double germe," Ann. Sc. Nat. 1862, t. xvii. pp. 48 & 49.

† Virchow's Archiv, Bd. xvii. p. 479.



The fusion of distinct buds in plants, as in syncarpy (Prep. Nos. 6 to 14), is clearly a condition analogous to the union of embryos originating on a single yelk : in both cases the united growths probably originate by a similar process, the formation of two centres of growth in the place of one. A similar mode of union occurs normally between contiguous zooids in the Gorgonidæ, or fan corals.

In the eggs of birds three distinct conditions occur :—First, there may be two yelks enclosed in a single shell ; this condition may give rise to two young, and if they become united they only adhere by heterologous parts, or possibly by the integument of the umbilicus\*. Secondly, there may be two cicatrices on one yelk : in this case the yelk is virtually equivalent to two mammalian yelks, as the cicatrix is the homologue of the mammalian yelk, the great food-yelk being absent in this Class†. Or, thirdly, two embryos may be formed on the same cicatrix : this condition is the most frequent, and gives rise either to twin chicks (?) or to double monsters.

Dichotomy, as already stated, very rarely affects a limb or digit ; it is liable to occur in the kidneys.

Doubling of the cavities of the heart, bladder, and uterus are malformations totally unlike those arising from dichotomy. The latter organ is certainly doubled by arrest of development.

### Classes III. & IV. ARREST AND EXCESS OF GROWTH

Include, first, dwarfs and giants, which are either the effect of variation of nutrition or development ; and, secondly, cases of partial excess or arrest, which are more nearly allied to ordinary disease : these may be considered as cases of intra-uterine hypertrophy or atrophy.

\* There is no improbability in such union, and it appears to have been observed. M. Camille Dareste thinks this adhesion occurs.

† E. van Beneden, 'Recherches sur la composition et la signification de l'œuf.' Bruxelles, 1870.



## Class V. ARREST OF DEVELOPMENT.

The most numerous and complicated groups of abnormal conditions are included in this Class ; but as it is extremely comprehensive and well defined, and as two or more forms of arrest are sometimes united in a single malformation, it is extremely doubtful whether any good would arise in the substitution of several Classes in its place, at least with our present knowledge of the subject.

The various forms of arrest may be epitomized in the following manner :—

I. The normal evolution of an embryonic structure may fail, although its growth continues, so that an enlargement of the embryonic condition results. It occurs in the external generative organs of the female, giving rise to a similarity to the male. The condition has the appearance of excessive development, but it is clearly due to the absence of the usual developmental change. Doubling of the female uterus by a septum, and the growth of the Müllerian duct and genital cord into an enormous organ in the male, are examples of this phenomenon. Some of the various kinds of atresia may probably be of a similar character.

II. The second form of arrest of development is apparently due to an early arrest of growth in the lateral halves of such organs as are formed by the union of two symmetrical halves ; in extreme cases there is usually great accompanying defect of development in the lateral parts. Persistence of a cleft only, inasmuch as it is the persistence of an earlier condition, is an arrest of development. Fissure of the sternum, abdominal wall, palate, iris, &c. are of this kind, as are also the states known as *ectopia vesicæ*, *epispadias*, and *hypospadias*.

III. The third form also arises from, or is at least accompanied by, arrest of growth and atrophy, so that an organ or part may be rudimentary, minute, or entirely absent. When median structures fail in this way in the axis of the body, the lateral parts coalesce at too early a period and



fusion results, with the absence of the parts which normally intervene. The axis of the skull may fail to a greater or less extent, a condition accompanied by fusion of the eyes (cyclopia) and absence of the median structures of the nose, and usually accompanied by an arrested condition of the brain, in which, although growth has continued, evolution has not; it probably arises from defective nutrition or atrophy of the axis of the skull, and may be considered as the result of very early embryonic disease.

The various forms of facial fusion (*Cyclopia*, *Ethmocephalus*, &c.), certain defective conditions of the limbs (*Peromelia*), fusion of the limbs (*Sympodia*), and deficiencies of other parts are also probably of this kind.

IV. In the fourth form of arrest, differentiation fails at an early period; this is seen most frequently in the intercostal spaces, a complete layer of bone being formed in the place of intercostal muscles between an adjacent pair of ribs. It usually accompanies severe forms of arrest in other parts. Sometimes no muscles exist, the whole body being formed of dense connective tissue, containing bones and cartilages. Other examples of this kind of arrest, which might fairly be called histological, occur.

V. Lastly, the heart may undergo an arrest of development and atrophy at a very early period, so that an acardiac foetus results. Such malformations always exhibit great histological arrest; many of the organs remain in an embryonic condition, although they may increase in size. Some parts become so altered that they can scarcely be recognized. The head is usually completely absent, or it consists of a mere bony cyst.

Functionally active organs always undergo considerable after modification whenever their development has been arrested: this is especially seen in the heart. Other parts exhibit the conditions in a less degree. The pelvis No. 424 is a good example of this phenomenon: the pubic bones have been arrested in their growth in consequence of their taking no part in the support of the body, and they have



become widely separated by the manner in which the ilia and sacrum supported the weight of the trunk.

With regard to the nature of the origin of arrest nothing is known positively. Like all malformations, some forms appear closely allied to variations, some to diseases. In arrest, however, the variations, if they be such, take the form of reversions. This may be more apparent than real; but in some cases, where growth continues and evolution does not, it appears as if the parts are actually developed in conformity with an anterior type rather than simply arrested in their formation. Bilocularity of the human uterus, the formation of uterine cornua, enlargement of the clitoris, development of the uterus masculinus, hypospadias, the formation of a cloaca, webbing of the fingers, arrest of the ventricular septum of the heart, and the persistence of a spiracle uniting the pharynx and auditory meatus are examples of this kind.

#### Class VI. DISEASE.

The last class of malformations consists of intra-uterine diseases and their results. The most marked forms are those of spinal and appendicular deformity, and dropsy of the central canal of the nervous system, giving rise to hydrocephalus, epicephalocoele, spina bifida, &c.

It will be observed that no class has been formed for malformations from excess of development; for it may well be doubted if any such exist, unless under the forms of variation or duplicity.

There are, however, some cases which might possibly be considered as the result of excess in the developmental process; although, without more evidence, it appears injudicious to erect a class which all observations tend to render more and more hypothetical in its nature. Certain fishes, for instance, occasionally exhibit a very remarkable form of hermaphroditism in which a portion of an ovary is developed as a testis, whilst the remainder becomes a perfect ovary.



It is by no means certain, however, that the testis should be looked upon as an excessive development ; it is equally possible that the ovary is formed by an arrest of a generative gland which would otherwise have been a testicle. Sometimes an additional septum is formed in the heart ; but this may arise from mere hypertrophy of the muscoli papillares.

In conclusion, attention is drawn to the desiderata in this collection ; for although it is a very splendid one, containing many almost unique preparations, it has deficiencies which could easily be supplied. Many forms of the lesser degrees of malformation which possess great practical interest, as hare-lip, hypospadias, &c., are nearly unrepresented ; whilst no collection has hitherto been made of variations in the conformation of muscles, bones, and vessels, which could not fail to possess great value, and to afford material aid in the study of Teratology.







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# CATALOGUE.

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## SERIES I.

### ABNORMAL CONDITIONS IN PLANTS.

THIS small series illustrates very clearly the difference between Variation, Dichotomy, and Homologous union, and throws much light on the nature of similar malformations in the animal kingdom.

#### Class I. VARIATION.

1. A Walnut with three carpels instead of two, the normal number.

This is a true case of variation. The additional carpel has precisely similar relations to each of the normal carpels, and bears no evidence of having arisen from the fission of either of these. In many cases an additional part arises in plants from the development of one which exists at an early stage, but which usually fails by abortion. No third carpel, however, exists normally at any period of development in the fruit of the Walnut.

*Presented by J. Quekett, Esq., 1859.*

2. The fruit of a Pea with three carpels instead of one. The third carpel is very small. There is but a single seed, and this is borne by the largest carpel.

This case differs from the former in several particulars. The two additional carpels are by no means equally developed with the normal one; many of the allies of the Pea (*Leguminosæ*) normally possess three carpels, whilst the Walnut-tribe (*Juglandæ*) either have two or four. The first case is probably one of simple variation; this is possibly one of reversion.



## Class II. DUPLICITY.

Subclass I. *Dichotomy.*

3. A frond of the common Hart's-tongue Fern, dichotomous in its upper part from fission. *Presented by Mr. Clift, 1808.*
4. A dichotomous ear of Wheat, in which the culm is single. *Presented by Mr. Searson, 1871.*

Subclass II. *Homologous union.*a. *Union of stems (Fasciation).*

5. A double head of Cowslip-flowers with the flower-stalks slightly adherent through their entire length. *Presented by Mrs. Scott, 1872.*
- 5a. A triple head of Teasel, probably produced by the cohesion of three axes.

b. *Union of fruit (Syncarpy).*

6. Two Quinces on a single peduncle united by fusion of their sarcocarps. *Presented by W. J. B. Smith, Esq., 1858.*
7. Two Cherries united in the same manner. *Presented by T. H. Stewart, Esq.*
8. A similar specimen. *Presented by Prescott G. Hewett, Esq., 1871.*
9. Two Apples united in the same manner. *Hunterian.*
10. Two Apples similarly united, divided vertically to show the divergence of the axes of the two fruits. The tree from which this fruit was obtained produced a crop of similar fruit every year. *Presented by Sir A. Carlisle, 1829.*
11. Two small Cucumbers on a single peduncle, adherent through their entire length, cut through transversely to show the manner in which they are united. *Presented by W. J. B. Smith, Esq.*
12. Two Cucumbers similarly united throughout two thirds of their length. *Presented by W. Clift, Esq., 1829.*
13. Two Cucumbers similarly united; the growth of one has been arrested, however, at a very early stage. *Hunterian.*



14. Three Spanish Nuts united by their pericarps : union seems to have taken place during the later stages of development, as it is not complete, and the adjacent portions of the pericarps are flattened. A section has been made through the nuts. *Presented by Prof. Flower, 1871.*

c. *Union of seeds (Synspermy).*

15. Two Bean-seeds united by their cotyledons near their hila, which are distinct. The testa is continuous over the two seeds. *Hunterian.*

d. *Union of embryos (Synophy).*

16. Two seedling Orange-plants attached by their cotyledons; they were produced from a single seed. There are four cotyledons, but the two between the embryos are smaller and are closely adherent to one another.

*Presented by B. T. Lowne, Esq., 1871.*

17. Three seedling Orange-plants growing from a single seed. The cotyledons are united between the embryos. The third embryo is very much smaller than the other two.

"It occurs, not unfrequently, in the Orange and Hazel that more than one embryo is developed in a single testa; and this condition is very common in the Coniferæ, Cycas, the Onion, and the Mistletoe. Now and then a union of these embryos takes place." (Lindley's 'Introduction to Botany.')

*Presented by B. T. Lowne, Esq., 1871.*

## SERIES II.

### ABNORMAL CONDITIONS AFFECTING THE AXIS IN ANIMALS.

#### Class I. VARIATION\*.

a. *Situs mutatus (transposition of the viscera).*

This is the only class of phenomena affecting the whole axis which can be regarded as a variation. In the earliest stages

\* For remarks on the nature of Classes and Subclasses see the Introduction.



of the embryo the yelk is on its ventral surface, but soon the left side turns towards the yelk. Transposition of the viscera, as was long ago pointed out by Von Baer, probably arises from this turn taking place in the opposite direction, so that the right side of the embryo comes to lie upon the yelk. It is not a little remarkable that so slight a deviation should be so very rare and so frequently accompanied by grave malformations. In cases of transposition there appears to be a strong tendency in many organs to revert to their normal position; thus transposition is frequently partial. In the Mollusca transposition occurs commonly in some few genera, and has long been considered as a variation; one species of Whelk is constantly reversed.

18. The trunk of a human fœtus with complete transposition of all the viscera. The small intestines have been removed.

*Mus. Heaviside.*

19. An injected and dried preparation of the heart and large vessels, with some of the abdominal viscera of a human adult, in which all the parts are transposed. The preparation includes the stomach, liver, spleen, and cæcum.

## Class II. DUPLICITY.

### Subseries I. IN INVERTEBRATES.

#### Subclass I. *Dichotomy.*

20. An Earthworm with the posterior third of the body symmetrically double. *Presented by W. Clift, Esq., 1810.*

### Subseries II. IN FISHES.

#### Subclass II. *Homologous union.*

21. Two specimens, each consisting of two newly hatched Trout united by the posterior portions of the ventral aspect. The single yelk-sac is attached to the lower specimen, showing their origin from a single yelk.

*Presented by the Duke of Wellington, 1870.*

22. Two small Sharks united in the same manner as the Trout



in the last preparation. The remains of a single yelk-sac (pseudo-placenta) is seen between the pectoral fins.

A female Shark was taken by the donor (mate of a vessel) in the Indian Ocean (34° S. lat., 90° E. long.). When brought on deck and cut up, about thirty living young escaped from its abdomen. The specimen presented lived for two days in a bucket of sea-water.

*Presented by E. Bestard, Esq., 1866.*

### Subseries III. IN AMPHIBIA.

#### Subclass IV. *Heterologous union.*

23. A Frog with a small additional anterior extremity springing from the posterior and lateral part of the sternum.

This preparation has been placed provisionally in its present position, under the theory that the limb in question is the only developed part of a second embryo. Such is probably the case, but there is too little evidence to justify any decided inference. (See also Nos. 47 and 48.)

*Hunterian.*

### Subseries IV. IN REPTILES.

#### Subclass I. *Dichotomy\**.

##### A. Anterior Dichotomy.

*Syn. Cephalodidymi, Gurlt.*

*Monstres doubles monosemiens, Geoff.*

24. A small English Snake with two heads. The axis is distinctly double to about half an inch behind the occipital bone only, although there are traces of duplicity in the ventral region more than an inch further back.

*Hunterian.*

25. A small Snake with two distinct heads and double vertebræ in the anterior portion of the body. One head is slightly lateral and smaller; its neck is shorter than that of the other.

*Hunterian.*

26. A small Indian Water-Snake (*Hydrophis*) with two heads.

*Presented by J. Shortt, M.D., 1866.*

\* See Introduction.



27. A small English Snake with two heads.

*Presented by W. White Cooper, Esq., 1872.*

B. Posterior Dichotomy.

There is no true case of congenital posterior dichotomy in Reptiles in the Collection. The following specimen probably represents an acquired condition, the result of injury and the well-known powers of repair possessed by these animals.

28. A Lizard in which a portion of the extremity of the tail is double. *Hunterian.*

Subseries V. IN BIRDS.

Subclass I. *Dichotomy.*

A. Anterior Dichotomy.

29. A foetal Duck with two heads and necks ; the dorsal vertebræ, the trunk, and its appendages are single.

*Hunterian.*

30. A similar foetal Turkey with the skull and vertebral canal open from arrested closure of the neural arches.

*Presented by Lady Northampton.*

31. A similar foetal Fowl, in which the neural arches of the head are undeveloped. The brain-membranes are exposed.

*Presented by Sir W. Blizard.*

32. A similar foetal Chick with fusion of the heads, so that the approximate eyes have coalesced into a single organ. The neural arches of the head are undeveloped, and the brains are exposed. The spinal cord is deficient, the vertebral canal containing its membranes only. *Hunterian.*

B. Posterior Dichotomy.

33. A Chick with the posterior half of the cerebro-spinal axis double. There are four legs, but the wings are two in number. The abdominal parietes are deficient, and the neural laminæ are undeveloped in the cervical region. There is a slight notch in the upper mandible, as if a tendency to superior dichotomy had likewise existed.

*Hunterian.*

34. A Duckling with posterior dichotomy of the greater part of



the spinal column. There are four legs and wings. The median wings are united into a single organ. There is considerable deficiency in the coverings of the abdomen.

35. The posterior part of a Duck affected with slight posterior dichotomy, laid open to show the pelves and their contents. There are four perfect legs, although two only appear to have been functional. The anus is double. That of the right side is imperforate; it forms a small nipple-like projection externally, and is connected with the cloaca by an imperforate band. The intestine has three cæca instead of two. *Presented by Mrs. Robinson, 1819.*

36. The oviduct, rectum, and cloaca of a Fowl with two external openings. The cloaca is bifurcated below. A single oviduct opens into its left side. This specimen is probably from a bird affected similarly to the last but to a less degree. Mr. Tegetmeier had a similar Fowl in which both openings were functional.

*Presented by Dr. Halford, 1862.*

37. Posterior dichotomy of the spinal column in a Chick, with fusion of the soft parts of the median pairs of legs as far as the knee. *Mus. Brit.*

38. A similar Chick. *Hunterian.*

39. A Duckling in which there is posterior dichotomy of the axis. The left division of the axis is rudimentary in comparison with the right, and the legs of the left side are fused to the toes. There are two distinct femora and seven digits; the condition of the limb is similar to that seen in No. 65. This specimen has been partially dissected to show the connexion of the redundant limbs with the spine. *Mus. Brit.*

40. A Chick with considerable posterior dichotomy of the axis, accompanied with total deficiency of the beak, mandible, and tongue. The posterior nares are completely exposed. The hyoid bone is not deficient. Unfortunately the thoracic and abdominal parietes have been removed, so that it is impossible to discover how far they were defective.

41. Posterior dichotomy in a Duckling extending into the cervical region, and perhaps involving the base of the skull. The neural arch of the skull is open and the brain is



exposed. The upper mandible and maxillary bones are entirely deficient, but there is a slight frontal protuberance.

*Presented by D. Hanbury, Esq.*

## Subclass II. *Homologous union.*

### a. *Pleuropagus*, Förster.

The following preparations exhibit posterior combined with anterior dichotomy ; but there appear to be two axes throughout, although the vertebræ are themselves fused in some part of the spinal column. The condition will be at once understood by comparing Nos. 118 to 121. It is impossible, as has already been stated, to say whether the condition arises from fission or fusion.

42. Twin foetal Pigeons united by the dorsal regions of the spinal column, the median visceral laminæ being absent. The right lamina of one bird and the left of the other form the abdominal and thoracic walls. The heads and necks are distinct. The neural arches in the upper part of both vertebral columns are defective.

*Purchased, 1858.*

43. Twin foetal Guinea-fowls similarly united with fusion of the vertebral columns in their upper part. There is also fusion of the head and necks. The median eyes are fused into a single but abnormally large organ. The lower mandibles likewise form a single organ. The neural arch of the skull is open, and the brain and spinal cord are deficient.

*Presented by E. Belfour, Esq., 1818.*

44. A similar union of twin foetal Ducks. The brain is completely double and without any covering.

### b. *Hypogastrodidymus*, Gurlt.

The two succeeding specimens almost exhibit the characters of heterologous union ; they, however, probably commenced their development by homologous union, and have therefore been placed in this Subclass. (See also Nos. 103 and 104, which present a similar condition.)

45. A Chick with the rudiments of a second Chick occupying the pubic symphysis. The rudimentary Chick consists



of a pelvis, with total deficiency of an axis, and of two posterior limbs fused together above as far as the middle of the femora by the skin and soft parts. *Hunterian.*

46. A Chick with the imperfect wings and legs of a second Chick attached to the abdominal integuments.

*Hunterian.*

Subclass IV. *Heterologous union.*

47. A Duckling with the remains of a second embryo adhering in the superior fontanelle, which has not been closed. It consists of a kind of atheromatous tumour, partially occupied by a hernia of the Duckling's brain, with a small but well-developed leg and foot growing from it.

*Hunterian.*

48. A Pigeon with a small accessory wing growing from the lower part of the sternum. There is no other trace of a second embryo, and the skin has been reflected to show the union of the limb by muscles and ligament with the sternum.

*Hunterian.*

Comparing this specimen with No. 47, and in the complete absence of any other means of accounting for the condition, it has been placed in this series, as it seems probable that the limb may be the remains of a second embryo. (See also No. 23.)

Subseries VI. IN MAMMALS.

Subclass I. *Dichotomy.*

A. Anterior Dichotomy.

\* *In Animals.*

Anterior dichotomy in Mammals rarely extends further back than the basioccipital bone; it occasionally, however, reaches the dorsal vertebræ. In this respect Mammals present a marked contrast to Birds and Reptiles, in which it usually involves some of the vertebræ at least. It is very rare in the human subject.



a. *Diprosopus*, Gurlt.*Syn. Monocranus*, Gurlt.

*Diprosopus* is the term applied to those forms of anterior dichotomy in which fission does not extend to any of the vertebræ. This condition often accompanies posterior dichotomy. Examples are seen in Nos. 90 to 94. In its lesser forms it is called *Monocranus* by Gurlt.

49. A Kitten with dichotomy of the anterior part of the face ; one mouth is very imperfect. There is a single pair of eyes. *Hunterian.*
50. A Kitten with dichotomy of the head extending further back than in the last, so that there are four eyes. The eyelids of the median eyes have no inner commissures, but are united and bound in a single fissure. *Hunterian.*
51. A foetal Kitten with more considerable anterior dichotomy. The laminæ of the vertebræ and spinal cord are deficient in the lumbar region. *Hunterian.*
52. The head of a foetal Pig with dichotomy of the anterior part of the face ; the mandible, tongue, and the anterior portion of the maxillary bones are double. There is a considerable fissure in the palate, from which a fibrous band extends to the united mesial rami of the mandible. A portion of skin covered with hair, representing the median cheeks, is lodged in the fissure in the palate. *Hunterian.*
53. The head of a foetal Pig with considerable dichotomy of the lower, and slight dichotomy of the upper jaw, dissected to show the accessory masseter muscles. The tongue is double ; the other parts are single. This specimen before dissection exhibited only what appeared to be a second mouth in the cheek.
54. An anencephalous foetal Pig with more considerable anterior dichotomy than the last, producing a single median eye. *Purchased.*
55. The head of a Calf with anterior dichotomy extending as far back as the presphenoid bone. The muzzles are united by a thick fold of integument almost to their extremities.



There is a single median eye situated behind a triangular opening formed by the fusion of two pair of eyelids.

*Hunterian.*

56. The skull of a similar Calf, in which the fission has extended somewhat further back, so that there are two distinct median orbits. The median malar bones are fused into a single bone; they support a small mass of bone, which articulates by a very imperfect joint with the median rami of the mandibles. The median rami of the mandibles are united by suture, and are much thickened and distorted. The base of the skull exhibits a single basioccipital and a bifurcated basisphenoid with its two median alisphenoids united. The exoccipitals, supraoccipital, and temporals are single, except that there are traces of median squamosals. The other bones of the head and face are completely double.
57. A similar skull, in which, however, dichotomy extends as far back as the basioccipital. In this skull there are two supraoccipital and a median external auditory meatus; the periotic bones of the median ear are double; both faces are distinct and well formed. *Hunterian.*
58. The brain of a Calf with anterior dichotomy, probably from No. 55. All the parts in front of the pons are double. The pons, medulla, and cerebellum are single. *Hunterian.*
59. A portion of the brain of a Calf double as far back as the foramen magnum, probably from the same animal as No. 57. It is stated in Hunter's MS. dissections that all the cerebral nerves were double, that the eighth pair were double at their origin, but that the median eighth pair became fused and terminated in their passage through the skull in connective tissue. *Hunterian.*
60. A portion of the skull and the brain of the Sheep with dichotomy extending as far back as the basioccipital bone.
61. The tongues, hyoid bones, larynx, trachea, and œsophagus of a double-faced Calf, probably from the same animal as Nos. 55 and 58, dissected. The double hyoid arch has its median cornua distinct, close together, and cartilaginous. The median pair of tonsils are seen fused together between the two tongues. It is stated in Hunter's



MS. dissections that there was a third median carotid in front of the trachea, which divided in the head into two vessels having the usual branches and distribution.

*Hunterian.*

b. *Dicephalus*, Gurlt.

In dicephalus the dichotomy extends beyond the base of the skull, and involves the anterior portion of the vertebral column.

62. The cervical and some of the dorsal vertebræ of a dicephalous Calf, in which dichotomy extends as far as the anterior dorsal vertebræ. The atlas and axis of the right neck are unfortunately lost. The dorsal spines below the dichotomous region are bifurcated. There are two ossific centres in the bodies of the dorsal vertebræ, a condition seen in almost all malformations of the spine. A number of small ossific centres occur between the bodies of the vertebræ at the point of bifurcation. There is a piece of cartilage in the angle of bifurcation.

*Presented by J. B. Stauffer, Esq., 1867.*

63. The brains and a portion of the spinal cord of a dicephalous Lamb. Dichotomy extends to an inch and a half below the foramen magnum.

64. The œsophagus of a dicephalous (?) Lamb bifurcated to within about 4 inches of the stomach.

*Presented by R. Partridge, Esq.*

B. Posterior Dichotomy.

- \* *In Animals.* (This condition is almost confined to quadrupeds, and is very rare in the human foetus. Human foetuses affected with dichotomy have been placed together at the end of the series: see Nos. 87, 88, and 89.)

a. *Dipygus*, Gurlt.

Dichotomy of the posterior portion of the axis is far more common in Mammals than of the anterior portion. There are three distinct forms of posterior dichotomy. In the first the pelvis alone is double and the second axis is wanting; hence it is doubtful whether such forms should be included in this class.



It is probable, however, that the axis was originally dichotomous, but that development of one portion is arrested at an early stage. Another hypothesis is that the second pelvis originates in the process of repair consequent on an injury to the embryo. Valentin injured the posterior extremity of an embryo and produced this condition. It is impossible with our present knowledge of the subject to decide on the merits of these two hypotheses. Without Valentin's experiment analogy would lead us to adopt the former view unreservedly. The term dipygus has been restricted in this Catalogue to such forms.

65. The skeleton of a dipygous Kitten.

The axis deviates to the right side, and the laminæ of the vertebræ are deficient in the lumbar region. The right innominate bone of the right axis and the left innominate bone of the left axis are united by the pubic symphysis; each bears a perfect limb. The other innominate bones are rudimentary, and their ilia and acetabula are fused together. The tuberosities of the ischia of these median imperfect bones are ankylosed with those of the more developed fellow bones. The left femur of the right axis and the right femur of the left axis are fused into a single broad bone with two heads; this articulates with a single median tibia and two fibulæ. There are two perfect feet to this median limb.

66. A dipygous bitch Pup with the abdomen laid open to show the viscera.

The innominate bones and additional posterior extremities are precisely like those of No. 65. The rectum bifurcates about an inch and a half from its extremity; the right portion is blind. The external sexual organs are double. There are two vaginæ and two bladders. The right bladder is smaller than the left. The right kidney is very small; its ureter becomes impervious about a line from its inferior extremity, where it is connected with the left vagina. The left kidney is very large; its ureter opens into the left bladder. A bristle points to the right kidney. The vaginæ and anus are also marked with bristles.

*Hunterian.*

67. The external and internal generative organs and a portion of the double pelvis of a large Dog, dissected.

There is no history of the preparation; but it is probably from a dipygous animal very similar to the last, except that the posterior



innominate bones are less developed, so that the median leg was probably either rudimentary or wanting.

The accessory innominate bones consist chiefly of the tuberosities and posterior rami of the ischia; these are united below by ossified fascia, which extends to the arch of the pubis. There are two penes, urethræ, and bladders, and but two testes. Each bladder has a single ureter opening into its outer side. The right kidney is reduced to a hard fibrous button-shaped mass, about three quarters of an inch in diameter; the right bladder is much thinner than the left, and its cavity is occupied by a fungous mass of granulations. The muscles of the bulbs of the urethræ arise partly from the additional and partly from the normal pelvic bones. The right prostate is very small, and the urethra of this side is impervious where it passes between the pelvic bones.

b. *Schizorhachis*.

Under this term all cases of posterior dichotomy of the spinal column have been included, except those in which the malformation extends to the head and appears externally, and those already described as dipygus. Dichotomy almost always extends to the occiput, and usually affects the basioccipital bone slightly. A single preparation shows dichotomy of the lumbar region only.

α. *Unsymmetrical Schizorhachis*.

68. The posterior portion of a foetal Pig, with posterior dichotomy of the spinal column commencing in the lumbar region. The right half of the double axis and its limbs are much smaller than the left. This preparation has been dissected to show the viscera.

The intestine and stomach are drawn up. There are two urinary bladders; that belonging to the accessory axis has two ureters and two minute kidneys. There is a large suprarenal capsule on the right side. The left axis has only a single, much elongated kidney on its left side. The aorta bifurcates to supply the second axis.

β. *Symmetrical Schizorhachis*.

69. A foetal Pig with dichotomy of the whole spinal column and four distinct anterior extremities. The thoracic and abdominal cavities have been opened to show the heart and



main arterial trunks. The heart consists of two left hearts united; there are no pulmonary hearts. Each ventricle gives off an aorta which crosses to the opposite side, so that the heart on the left side supplied the right inferior extremities, and that on the right the left. The carotids, two in number, are given off together from the arch of the right aorta. The trachea is single. The lungs are very small and imperfect; they probably consist of a single pair. The vessels of the right heart are injected. The palate is deeply cleft. *Hunterian.*

70. A similar foetal Pig with the skull and spinal canals laid open to show the brain and cords. The adjacent lateral tracts terminate by joining each other, the outer ones alone pass to the brain. *Hunterian.*

71. A similar but anencephalous foetal Pig. The base of the skull is exposed; the cerebral nerves are, however, quite distinct at their point of exit from the skull.

*Hunterian.*

72. A foetal Mole with dichotomy of the whole spinal column.

*Hunterian.*

73. A foetal Puppy with dichotomy of the spinal column. The median pair of anterior extremities are represented only by a tubercle. It is probable that the dichotomy does not extend into the upper part of the cervical region.

*Hunterian.*

74. A foetal Kitten with dichotomy of the axis and four complete anterior extremities.

*Hunterian.*

75. A similar Kitten.

*Hunterian.*

76. The skeleton of a similar Kitten, in which the occiput is slightly cleft, so that there are two exoccipitals.

This specimen belongs strictly to the following subdivision, *Schizocotis*; it is probable, however, that some of the preceding specimens are similarly affected. It has therefore been thought expedient to separate those forms only as *Schizocotis* in which the cleft condition of the skull is apparent externally. These divisions are not separated by any distinct lines of demarcation and are purely artificial. The manner in which the median ribs are depressed and united in animals affected with dichotomy is well seen in this preparation.

*Presented by J. Burton, Esq.*



77. A similar foetal Kitten, with the skull and spinal canal opened to show the brain and the double medulla and cord.

*Hunterian.*

78. A similar Kitten, with the thorax and abdomen opened to show the viscera. There is slight anterior dichotomy affecting the lower lip, mandible, and tongue, with fissure of the palate. The alimentary canal is double from the lower portion of the ileum downwards.

*Hunterian.*

79. A similar Kitten, with the thorax and abdomen opened and the viscera raised to show the kidneys, of which there are but two, the urinary bladders, and hypogastric arteries.

*Hunterian.*

80. A similar Kitten, in which the median pair of anterior extremities are united as far as the carpus. The upper lip and palate are deeply cleft.

*Hunterian.*

*c. Schizocotis\*.*

Under this term those forms have been classed in which, in addition to complete dichotomy of the trunk, dichotomy of the posterior part of the skull is apparent externally. A pair of more or less developed external ears exist between the two axes, exhibiting variable degrees of fusion with one another in a manner analogous to that seen in extreme cases of anterior axial deficiency.

81. A foetal Rabbit with slight dichotomy of the base of the skull. The approximate external ears are of small size; they are very defective, and are fused together.

*Hunterian.*

82. A foetal Rabbit with somewhat more considerable dichotomy of the base of the skull. There are a distinct pair of additional ears. The roof of the skull has been removed to show the extent of the dichotomy. This was one of a litter of six, the remainder were normal.

*Presented by C. R. Bree, M.D., 1871.*

83. A foetal Cat with dichotomy extending to the base of the skull, and involving only part of the basioccipital bone.

\* *Korîs*, the occiput.



The additional external ears are very defective and are fused together. *Hunterian.*

84. A similar dichotomous foetal Pig.

d. *Schizocephalus.*

*Syn.* Iniops, *Geoff.*

*Synkephalus asymmetros, Förster.*

*Janus-Bildung.*

This condition depends, apparently, on an extension of posterior dichotomy still further forwards, so that it involves the greater part of the base of the skull. An accessory face is formed in the angle between the two axes. This face is deficient in its axial parts, and hence it exhibits the phenomena of axial arrest or deficiency, as fusion of the eyes and ears, agnathia, &c. (See Class VI.)

85. A foetal Pig with dichotomy of the axis extending forward into the basisphenoid region. The accessory face has the eyes fused together as far as the edges of their irides. There is a frontal proboscis above, and a pair of closely approximated ears below; a condition precisely similar to that seen in cases of epencephalic deficiency, *i. e.* deficiency of the epencephalic region and all the parts anterior to it. (See Nos. 187 to 190.) *Hunterian.*

86. A similar foetal Pig with the eyes of the accessory face distinct, but so obliquely placed that the fissures of the eyelids are almost vertical.

*Presented by J. Winterbottom, Esq.*

\*\* *In the Human foetus.*

a. *Schizorhachis.*

*Syn.* Dipygus, *Förster.*

*Déradelphus, Geoff.*

87. A female Human foetus with complete dichotomy of the spinal column, probably affecting the basioccipital region, although there is no external indication of dichotomy extending to the skull. There are two perfect trunks united by the thorax. One of the right arms is distorted at the wrist. *Hunterian.*



b. *Schizocotis*.

*Syn.* Synkephalus asymmetros, Förster.

Janiceps, Geoff.

Janus-Bildung.

88. A female Human foetus with posterior dichotomy extending into the base of the skull, probably as far forward as the posterior part of the basisphenoid. There is a pair of well-formed external ears behind fused together below, with a single meatus between them. A small circular fossa above these, with a depression in its centre from which a minute tuft of hair is growing, probably represents a rudimentary Cyclops-eye. *Mus. Brit.*

89. A similar female Human foetus with the dichotomous condition extending a little further forwards, so that a transverse fissure corresponds to the position of a Cyclops-eye. Brought from the East Indies in 1805.

*Presented by Sir E. Home, Bart., 1807.*

## C. Antero-posterior Dichotomy.

*Syn.* Hemipagus, Geoff.

Anterior and posterior dichotomy often coexist in the same embryo. In animals there can be no doubt that this condition is distinct from *Homologous union*; when it is extreme, however, as in No. 94, a human foetus, it is impossible to determine to which Subclass the phenomenon should be referred\*.

90. A foetal Kitten with complete dichotomy of the trunk, and a slightly double condition of the tongue and mandible.

*Hunterian.*

91. A similar foetal Kitten with more considerable dichotomy of the mandible and tongue, accompanied by cleft palate.

92. A similar Kitten with the median anterior limbs fused as far as the carpus.

93. A foetal Pig with posterior dichotomy (*Schizorhachis*) combined with anterior dichotomy of the lower jaw and tongue. There is a considerable cleft in the palate connected with the median rami of the jaw by a fold of mucous membrane. (No. 52 exhibits a similar condition.)

*Hunterian.*

\* See Introduction.



94. A female Human foetus with posterior dichotomy (Schizorhachis) combined with anterior dichotomy, producing considerable doubling of the face. There are four eyes, but the inner ones are contained in a single orbit. The axes diverge, both in front and behind, from a point in the basisphenoid bone. *Hunterian.*

Subclass II. *Homologous union.*

A. Prozygosis\*.

*Syn.* Somatodidymus, *Gurlt.*

Monstres Syncephaliens, *Geoff.*

Synkephalus symmetros, *Förster.*

Janus-Bildung.

In Prozygosis there are two perfectly distinct axes united at their anterior extremities, so that at an early stage there must have been two distinct embryos. The foetuses arising from such embryos are united by the visceral arches and laminæ above the umbilicus. The right side of one axis unites with the left side of the opposite one.

95. Female Human twins, about the seventh month of gestation, united by prozygosis. The faces are opposite to each other, and at right angles to the normal position; they are much flattened, the eyes are closely approximated, and the ears are very low down. The two embryos were probably distinct at first, and became united by the fusion of the anterior extremities of the investing mass of each with that of the other, so that the trabeculæ became united in the same manner as the other facial arches are joined, the right arch of one embryo being fused with the left arch of the other.

The following history is recorded:—"Labour lasted forty-eight hours, delivery followed without instruments. The mother, a negress, had convulsions. The foetuses lived five minutes, a very unusual occurrence in such cases. There was one funis and one placenta."

*Presented by T. Sharp, M.D., 1820.*

96. A similar twin-birth about the sixth month of gestation,

\* *Πρὸ* before, *ζυγῶν* to unite.



except that the two faces are not perfectly symmetrical, the mouth of one being a small circular opening.

*Mus. Brit.*

97. Twin foetal Hares united by the anterior extremities of the axes. The anterior portion of each axis has been arrested in development, so that the faces exhibit the characters of epencephalic deficiency, cyclopia, agnathia, fusion of the ears, &c. *Presented by Sir W. Blizard, 1811.*

98. Twin foetal Hares in a similar condition. There is a frontal proboscis on one face.

#### B. Opisthozygosis\*.

*Syn. Hypogastrodidymus, Gurlt.*

*Ischiopagus, Geoff.*

In Opisthozygosis two distinct axes are united at their posterior extremities, or at some point near their posterior extremities. The embryos remain completely separate above the umbilicus, but unite below by the visceral laminae. One foetus is generally very defective. Sometimes the axes are bent at right angles, in opposite directions, at the point of union. Opisthozygosis is very rare in animals, and the pelvic bones and posterior limbs only of the second axis are usually developed in them, as in No. 103. A similar condition in birds is seen in Nos. 45 and 46.

99. Human female twins united by opisthozygosis about the sixth month of gestation. The viscera had been removed and the spinal columns and pelvis much damaged by a hasty examination. The viscera were fortunately preserved, and are seen in No. 100.

The sacrum of one side only has been developed. It is situated at right angles to the two spinal columns, which are placed end to end, the bodies of the vertebræ being united without any perceptible break. The sacrum is entirely cartilaginous, no traces of the second sacrum exist. The pelves are otherwise perfect; but the right innominate bone of one foetus is united with the left innominate bone of the other, and *vice versa*. The ilia are united to the lumbar vertebræ by elongated transverse

\* "Οπισθεν behind, ζυγῶω to unite.



processes. The upper pair of limbs (in the present position of the preparation) belong to the upper and the lower pair to the lower foetus. Each foetus may be considered as having its pubic symphysis open and its pubic bones united with those of the other. The axial parts posterior to the point of union in the upper foetus turn to the right, those of the lower to the left side of the preparation.

The upper foetus is well formed, except in the pelvic region. The lower foetus is very imperfect. Its face is misshapen, and the upper cranial bones are altogether wanting. The superior extremities are thick and defective, and the fingers are very short, owing to the imperfect condition of the terminal phalanges. The nails are scarcely perceptible. No history has been preserved.

100. The viscera and generative organs of the same. The viscera of the upper foetus are seen upon the right hand, those of the lower upon the left-hand side of the preparation.

The heart, liver, and lungs of the upper foetus are normal: the development of the intestines seems to have been somewhat arrested; they terminate in a very capacious thin-walled rectum, which was much stained with meconium. There is a small anal opening marked by a white bristle; it is probable, however, that the dilation of the rectum arose from atresia at an earlier stage.

The heart, lungs, and liver of the lower foetus are much smaller; the intestines are about equal in development to those of the upper one; there is much less enlargement of the lower part of the bowel, but it opens into the enlarged intestine of the upper foetus near the anal opening. The most remarkable character in these viscera is that they do not exhibit "*situs mutatus*." The kidneys in both foetuses exhibit the condition known as horseshoe kidneys; they unite below with their fellows across the mesial line. The four ureters open into a single large urinary bladder, which is laid open; the openings of the ureters are marked by black bristles. The urethra is likewise laid open. The uteri are both equally developed; both vaginae are well formed, but they both open with the urethra on the right (upperside in this preparation); their openings are marked with black bristles. The labia majora, minora, and clitoris are well formed on this side.



The external generative organs of the other side are very ill-formed, and are only connected with the internal organs by the right round ligament of the uterus of the lower fœtus. There is no indication of either urethra, vagina, or anus on this side. There is a small swelling, about as large as a pea, at the anterior extremity of the left labium.

101. Human female twins, about the sixth month of gestation, united by opisthozygosis. The second fœtus is excessively malformed, and possesses neither heart nor brain.

The axes are united near the lower part of the dorsal vertebræ by ordinary intervertebral cartilage and ligaments, exactly like those between the consecutive vertebræ. The remainder of both vertebral columns is wanting as far as the sacral vertebræ. There is a large sacrum on the left side, placed at right angles to and behind the united vertebral columns. The sacrum on the right side is very defective, consisting of a mere ring of bone articulated with the base of the left sacrum by cartilage and ligament.

The neural arches of the vertebræ are open behind at the point of union between the sacra and vertebral columns. The laminae of both columns form a continuous series with those on the adjacent sides of the sacrum on the left side, and of the rudimentary sacrum on the right; a large lozenge-shaped opening is thus left in the neural canal.

The neural canal of the sacrum is continuous with that of the vertebræ, and this makes a sharp bend backwards from either axis to meet the sacral neural canal.

The following facts were recorded by Drs. Marcet, Roget, and Mr. Lawrence from an examination made when the fœtus first arrived in England:—"The interval between the lamina of the vertebra was occupied by a strong membrane; on the division of this, the medulla spinalis was seen running across from one spine to the other, and distributing its nerves laterally to the two lateral pelves."

From a careful consideration of the above conditions, it appears that the axes of two embryos came into contact at a very early period of development, so that the neural cords and the proto-



vertebræ in the dorsal regions were developed in a continuous series; and the caudal extremities of the axes became displaced and partially absorbed, so that the axial portion of the sacrum has been developed from the remains of one of these displaced axes. The neural arches appear to have followed the same law of development as the visceral arches at the point of union between the fœtuses, those of the one axis tending to unite with those of the other instead of with their fellows.

A comparison with other specimens of a similar malformation renders it probable that the upper pair of legs and the corresponding pelvic bones were developed from the visceral laminae of the upper, and the lower pair from those of the lower fœtus.

The thoracic viscera of the upper fœtus are normal. The aorta in the abdomen turns off to the left pelvis and gives off a pair of large hypogastric arteries, of which the upper is the larger. At the point where the aorta turns off to the left it gives origin to two large vessels: one runs straight into the thorax of the lower fœtus and terminates in two innominate arteries, the other supplies the right pelvis and lower limbs.

The whole of the anterior walls of both fœtuses are extremely defective. The ribs of the lower fœtus are developed behind only. A slip of muscle crosses its body-cavity from the left axilla to the right pubis. Its thorax was chiefly occupied by a large sac, the greater part of which has been removed with the viscera, and is seen in the next preparation. This sac communicated with the intestines above and with the mouth below. It is referred to in M. Maunoir's original description of this monster (*Med.-Chir. Trans.* vol. vii. p. 257) as a "kind of cloaca," of which he says, "On opening the cloaca it was found to contain the rudiments of a lower jaw and of a tongue, which were immersed in meconium, with which the cavity was filled." The cranial and facial bones are only represented, in the inferior head, by irregular masses of cartilage. There is a very rudimentary and misshapen external ear. The brain was represented by a large cyst filled with blood, a condition usual in anencephalic conditions: this was removed before the fœtus was sent to England.

The following history is recorded (*Med.-Chir. Trans. l. c.*):—"A girl of 16 or 17 gave birth to this fœtus in Geneva; it lived a few minutes. There was no difficulty in the labour; the perfect head was born last."

*Presented by the Medico-Chirurgical Society, 1816.*

102. The abdominal viscera of the same, except the liver, and the kidneys which were contained in the left pelvic portion of the twin-birth; these parts had been removed.



The following viscera are seen in this preparation :—The stomach of the superior foetus is displayed at the upper part of the mica, with the duodenum, the remains of the liver, the jejunum, and ileum. Near the middle of the latter, and connected with it by about three quarters of an inch of intestine, is a portion of the large cloacal sac from the inferior foetus.

The accompanying description of the liver occurs in M. Maunoir's paper (*l.c.*):—"An enormous liver covers the whole intestinal mass, and appears through the transparent membranous abdominal wall, between the laminae of which a single umbilical cord [probably the umbilical vein only is here alluded to] passes in a serpentine course and enters the liver." The liver, anterior abdominal wall, and cord have unfortunately not been preserved.

The ileum bifurcates about an inch from its inferior extremity and opens into two distinct caeca, each having a short vermiform appendix. The large intestines are double: that on the right side of the preparation belongs to the right side of the monster; it is opened to show its blind termination above the uterus. The left large intestine belonged to the left inferior portion; it terminates in an anus.

The kidneys of the right side are preserved; they are adherent throughout their entire length. The left kidneys are wanting, but are stated to have had but one ureter between them. The bladders, urethras, and external sexual organs on both sides are normal. There is a uterus on each side, the right one being considerably larger than the normal foetal uterus.

*Presented by the Medico-Chirurgical Society.*

103. The skeleton of a half-grown female Cat, with an imperfect accessory pair of innominate bones occupying the pubic symphysis; an accessory pair of limbs are attached to them.

Although the axial parts of this pelvis and all the remainder of a second animal are absent, there can be little doubt but that these bones were developed from a second embryo. If the axis had been developed an opisthozygous twin monster would have resulted.

The second pair of limbs are short, distorted, and ankylosed to the pelvis, probably from disuse. Their patellae are absent.

The Cat was caught in a trap in a wood, where it had been living in a wild state.

*Presented by W. B. Tegetmeier, Esq., 1867.*

104. The bones of the pelvis and inferior extremities of a Sheep, with the pelvic bones and posterior extremities of an im-



perfect twin similarly attached. In this preparation the parasitic limbs are fused as far as the metatarsus. A comparison of these limbs with the dichotomous limb of a monkey, No. 307, shows the difference between malformation from fission and fusion in a marked manner.

*Hunterian.*

C. Parazygosis\*.

In Parazygosis twins are united, by the visceral laminæ of the trunk, above the umbilicus. They are usually placed face to face, and have the laminæ on each side equally developed; rarely they are placed side by side, and have the laminæ of the adjacent sides very deficient. Parazygosis is extremely rare in animals, although it is the commonest form of duplicity in the human foetus.

a. *Xiphopagus*, Geoff.

The least degree of parazygosis. The union is by the xiphoid cartilages of the sterna and by the abdominal walls, above the umbilicus.

105. A wax model of the band of union of the "Siamese Twins" made in 1830, when they were 19 years of age. In childhood the band was proportionately much larger and shorter, so that the twins were much closer together. The xiphoid cartilages of the sterna pass across the upper edge of the band. The condition of these twins at the age of 19 and their history is given in the Phil. Trans. 1830, p. 117.

*Presented by G. B. Bolton, Esq., 1830.*

b. *Thoracopagus*, Förster.

*Syn. Sternopagus, Geoff.*

In this form the thoracic cavities are united by the visceral laminæ; the foetuses are placed symmetrically face to face.

106. Female Human thoracopagous twins, 3 inches long (about the third month of gestation).

*Presented by Sir E. Home, Bart., 1804.*

107. A similar twin-birth, 3 inches long (about the third month of gestation).

The relation of the foetuses was disturbed when this specimen was first put into spirit, so that it does not apparently conform with

\* Παρά by the side of, ζυγίω to unite.



the above description of thoracopagus. Naturally the foetuses would face each other in this and in the preparations Nos. 109 and 110.

*Presented by W. Parry, M.D., 1870.*

108. A Human female thoracopagous twin-birth, 8 inches long (probably about the end of the fourth month of gestation). *Presented by Sir W. Blizard, Bart., 1811.*

109. A Human female thoracopagous twin-birth, about  $10\frac{1}{2}$  inches long (probably at the end of the fifth month).

*Presented by Sir Joseph Banks, Bart., 1819.*

110. A Human female thoracopagous twin-birth, about 12 inches long (about the end of the sixth month of gestation).

*Hunterian.*

111. Human female thoracopagous twins about full time of gestation. The deficiency of the anterior abdominal wall above the umbilicus is very considerable, the viscera being covered by membrane only. *Hunterian.*

112. A similar twin-birth, with the visceral cavities laid open to show the disposition of the viscera. The diaphragmata and pericardia are united. The hearts are quite distinct. The livers are completely fused: there are, however, two transverse fissures and two ductæ venosæ. The intestines of the two communicate by a short capacious gut near the lower part of the ileum. The single cord has been laid open, and is seen to contain two distinct umbilical veins (injected) and five umbilical arteries, one foetus having a small additional one. The foetus on the left-hand side of the preparation has the disposition of the viscera reversed.

The following is the history of the birth:—The first foetus presented by the face and the head was not expelled until about four and twenty hours after the commencement of labour; the abdomen of the second child was then discovered. The feet of the first and afterwards those of the second child were then brought down, and so the mother was delivered, but not without considerable difficulty.

In five labours this woman had malformed births three times,—these twins, a child with the feet growing from the nates, and a child with undeveloped forearms, so that the hands appeared as if growing from the extremity of the humerus; all were still-born. The above particulars are extracted from a letter from Mr. G. W. Friend to the Curator of the Hunterian Museum.

*Presented by G. W. Friend, Esq., 1815.*



113. Human thoracopagous twins of small size, with the viscera removed to show the union of the thoracic and abdominal parietes from within. The disposition of the ribs is well seen in this preparation.

114. The heart and lungs of the same.

The heart is formed of the united hearts of both foetuses; it is much elongated in the direction of a line joining the two spinal columns. There are two distinct ventricles, and a single auricle extending the whole length of the upper part of the ventricles. There is a rudimentary auricular septum. There are two auriculo-ventricular openings, each guarded by a bicuspid valve.

The cavities of the heart have been laid open. The ventricle on the right-hand side of the preparation has two arterial openings at its base, an aorta and a pulmonary artery, the latter indicated by a blue glass rod. The ventricle on the left-hand side has a single artery or aorta, which gives off three pulmonary arteries near its origin. This vessel is laid open to show the orifices of the pulmonary vessels. There are four lungs, two on each side of the preparation. Neither set exhibits situs mutatus.

115. The livers, stomachs, and duodena of the same. The livers are united along their whole anterior edges. The stomachs and spleens are seen one on either side of the liver. The gall-bladder and the ducts of each liver are distinct. The duodena open into a common pouch just below the entrance of the gall-ducts. The intestine was single from the confluence of the duodena to the termination of the jejunum.

116. The lower portion of the small and the commencement of the large intestine of the same. The jejunum terminates in a large pouch, on the extreme left of the preparation, from which two ilea arise. There are two cæca, and each has a distinct vermiform appendix. The large intestine was completely double.

117. Human female thoracopagous twins about the end of the sixth month of gestation. One of the foetuses has syreniform fusion of the posterior limbs, and there is complete ectopia of all the abdominal viscera. The thoracic cavities have been opened to show the hearts, which are very abnormal; one is above the other. The upper heart consists



of an auricle and ventricle. The ventricle gives an aorta to either foetus, and is fused with the base of the ventricle of the lower heart. The lower heart has two auricles. The apices of both ventricles are turned towards the front of the preparation. The specimen was so brittle that the exact distribution of the vessels could not be made out.

c. *Pleuropagus*, Förster.

*Syn.* Dicephalus, Gurlt.

Monstres doubles Sysomiens, Geoff.

In *Pleuropagus* two axes are adherent side by side. Such abnormal twins have hitherto been called dicephalus, from their external resemblance to dichotomous conditions of the anterior extremity of the axis. In these forms, however, the whole axis is double. They are transitional between anterior dichotomy and parazygosis. The median limbs are frequently fused together, and are sometimes reduced to mere tubercles.

118. A Human pleuropagous twin-birth, about the end of the third month (length  $4\frac{3}{4}$  inches), with the mesial (posterior) arms and legs fused together as far as the carpus and tarsus. It is apparently female, but the organs of generation are very imperfectly formed. This specimen is transitional between thoracopagus and the more marked forms of pleuropagus. *Purchased, 1870.*

119. Human male pleuropagous twins. The median (posterior) arms form a mere tubercle upon the back. There are no median legs, although there are two axes even to the extremity of the sacrum. The median innominate bones are absent.

120. The bones and ligaments of the united mesial arms of an exactly similar foetus.

A small portion of the broad sternum, formed by the union of two sterna, supports a pair of clavicles closely pressed together; distinct and flattened in front, but united behind. These articulate with the two acromia of a very remarkable double scapula, and are also united with the glenoid cavity by ligament, a piece of cartilage intervening. The scapula is symmetrical, and presents two spines and two acromia; one of the latter has been cut through and turned back to show the manner in which



the glenoid cavity is articulated with the clavicles. The cartilage already mentioned, situated between the clavicles and glenoid cavity, is the only rudiment representing the anterior median limbs.

121. The viscera of the same; these are double, but those of the right fœtus are considerably smaller than those of the left; the latter are reversed. The hearts were situated in distinct pericardia. The heart of the left is three times the size of that of the right fœtus. The latter gives off a small aorta, which joins the descending aorta of the left fœtus just below its arch. The livers are intimately united; the œsophagi, stomachs, and duodena are distinct as far as the orifice of the bile-duct, where the intestines unite in a sacculate dilatation; below this point the intestine is single but reversed, the cæcum being on the left side.

d. *Ischiopagus*, Förster.

*Syn.* Pygodidymus, Gurlt.

Pygopagus, Geoff.

In *Ischiopagus* the twins are united by the lower extremity of the axis only, and are placed back to back, so that the visceral cavities are distinct. Judith and Helena, "The Hungarian Sisters" (Phil. Trans. vol. 50, p. 311), and Millie-Christine, the "Two-Headed Nightingale," exhibited in London in 1871 (Lancet, 1871, i. p. 725), are examples. No specimen occurs in the Museum.

122. A wooden model representing two ischiopagous infants.

The anus is represented as single, and the vaginæ are united at their posterior commissures,—the usual disposition of these parts in such malformations.

Subclass III. *Homologous union with dichotomy.*

The so-called triplex human fœtus described in the 'Atti dell' Accadem. Gioen.' t. viii. p. 203, is undoubtedly an example of pleuropagus combined with anterior dichotomy of one axis. Several cases are recorded by Gurlt as having occurred in animals.



Subclass IV. *Heterologous union.*

## A. By Impaction.

*Syn.* Heterodidymus, *Gurlt.*

A second embryo may become wedged in between the visceral arches or laminae of another before they unite. In such cases the impacted foetus usually exhibits great deficiency, and is called a parasite. Most frequently it has neither a heart nor a head; sometimes it becomes converted into a more or less amorphous tumour, with one or two organs only developed in a normal manner. The supporting foetus is called the autosite.

a. *Between the lateral halves of the sternum.*

*Syn.* Thoracopagus Heterodelphus, *Geoff.*

The upper part of the parasite is wedged in between the thoracic laminae of the autosite, and lodged in the middle of a fissured sternum. The parasite is usually very defective; the axis may be entirely wanting, the limbs only being developed. More frequently there is a rudimentary abdominal cavity in the parasite, communicating with that of the autosite above the umbilicus, as in ordinary thoracopagus. The abdominal cavity of the parasite is sometimes distinct from that of the autosite, and has a separate umbilicus. A perfect series of transitional forms exist between this condition and ordinary thoracopagus; hence it has been called parasitic, or heterodelphous thoracopagus.

123. A female foetal Pig with a headless acardiac parasite united to the thorax and abdomen. The cervical region of the parasite is attached to the sternum of the autosite. The body-cavities of the two are continuous. The parasite has a single large kidney, a urinary bladder, and a pair of hypogastric arteries. There is also a small piece of intestine connected with that of the autosite by a long narrow gut. The abdominal cavities have been laid open to show their continuity. *Hunterian.*

124. A foetal Kitten with a similar parasite. *Hunterian.*

125. A foetal Kitten with a parasite attached to the sternal region. The body-cavity of the parasite is very small and distinct from that of the autosite. There are two distinct cords



for a short distance at least from the umbilicus. The parasite appears to have no spinal column; but the posterior limbs are well developed, and the anterior limbs are small but clearly recognizable.

*Presented by E. Belfour, Esq.*

126. A similar specimen, in which the anterior extremities of the parasite are fused with the left anterior extremity of the autosite.
127. A similar specimen, except that the anterior extremities of the parasite are wanting.
128. A specimen similar to No. 125, with the body-cavities laid open to show that they are quite distinct. That of the parasite contains a single large kidney and a urinary bladder: it has no alimentary canal. *Hunterian.*
129. The skeleton of a similar Kitten and parasite. The sternum of the autosite is divided by a wide oval fissure, in which the four limbs of the parasite are seen. The parasite has no vestige of an axis, unless a band of ligament in the centre of the sternal fissure represent its remains. The anterior pair of parasitic limbs are fused as far as the carpus. The Kitten was one of a litter of three, the others were normal.
130. A clay model of the Chinese lad Ake, aged 16, with an acephalous parasite attached to the lower part of the sternum. The model was made from memory by a Chinese artist. The following extracts from a letter from J. Livingstone, Esq., Surgeon to the British factory at Hong Kong in 1804, give the history of the case:—

“Ake was born with another male child of nearly the same size united to the pit of his stomach by the neck, as if his brother had plunged its head into his breast. The mother died from the effects of the labour.

“Since birth the parasite has not increased much in size. The shoulder-bones are remarkably prominent. Here the model is faulty, since it presents the roundness of infancy; but all the plumpness had disappeared from the original, and the bones seem only covered with skin. The manner in which the thighs appear is quite happy; but the feet, particularly the left, are not sufficiently clubbed. In the original the feet and toes are less perfect than in the model; the toes adhere, and one or two are wanting.



"I have the authority of Lieut.-General Wood for stating that the trunk and neck measure 11 inches, and the longest limb 13 inches.

"The attachment of the neck of the parasite admits of a semi-rotatory motion, and Ake shows that his brother's arms can be moved freely. The thighs and legs remain stiffly bent, the femora being ankylosed to the innominate bones and tibia. The genital organs are too perfect in the model, since no vestige of testes and very little scrotum can be seen in the original. The penis is, however, large in proportion, with the glans about half covered by the prepuce; it was subject to occasional erections. The kidneys seem to perform their function perfectly; the anus is wanting. Ake is now about 4 feet 10 inches high, of feeble frame and sickly appearance. Except in the incumbrance above described, he is in all respects perfectly formed. Ake's respiration is commonly laborious; to relieve it, he frequently supports the parasite with his hands; his pulse is commonly quick and small. Mr. Gomez felt the pulsation of the carotids in the neck of the parasite distinctly; he also felt feeble pulsation at the wrists."

The condition of Ake, as far as can be judged from the model, seems precisely the same as that of the Kittens, Nos. 124 to 128.

*Presented by H. L. Thomas, Esq., 1822.*

b. *Impaction between the facial arches.*

In such cases the palate is most frequently the seat of impaction, and the parasite is modified excessively.

131. The injected head of a Human foetus with a large lobulated vascular tumour, the remains of a second foetus, growing from the median fissure of the palate, which has been kept open by it. The tumour projects from the mouth, which it dilates considerably. It is adherent to the right commissure of the lips, and entirely invested the superior maxillary bone of the foetus, which has been removed and is seen in No. 133.

The lobulated tumour presents a widely extended mouth in front. A piece of purple glass rod is placed in its cavity, extending between the commissures of its lips. A long tongue-shaped projection is seen in the mouth-cavity; but it is covered with lanugo, so that it does not probably represent the tongue. The lips and alveoli are very distinct; they are divided into two lateral portions by large lobules of fatty tumour. A single nostril, marked by a blue glass rod, appears above the left half of the upper lip;



at the inner side of the nostril is a deep fissure, probably the remains of the nasal cavity; this fissure is marked by a purple glass rod. The left upper alveolus has been exposed by the removal of the gum, and is very distinct.

One of the largest of the fatty lobes, which make up the bulk of the tumour, has been cut through to show its structure. It consists of firm vascular fat with an atheromatous centre. A small cyst appears at its upper part. On the right side there is a piece of adherent placenta, and just below it is a loose, pendent, lobulated mass about an inch and a half in diameter. As one of its lobes felt very hard it was opened, and was found to contain a compact mass of bones, fifty-nine in number (see No. 132). The skin of the tumour is soft, vascular, and covered with lanugo. The lobe which contained the bones presents three indistinctly separate hard white papillæ, something like aborted digits.

The most remarkable point in this specimen is that lips and alveoli only are well developed upon the tumour, as if its position had determined the nature of the part developed. There can be no reasonable doubt that the tumour consists of the remains of a second embryo.

132. Fifty-nine ossicles from the tumour in the last preparation. They are most complex in form, and were closely packed together. There is but one which resembles any normal bone, the first of the series; it appears like the lamina of one of the cervical vertebræ.
133. The superior maxillary bone and a portion of the malar bone from the same, taken from the right side of the tumour. These belonged to the foetus and not to the parasite growth. It is normal, although it supported a portion of the tumour.

#### B. By Inclusion.

*Syn. Cryptodidymus, Gurlt.*

Fœtus in Fœtu.

Sometimes instead of a second embryo becoming impacted in the visceral arches of another, it becomes enclosed within its abdominal cavity. The included embryo in these cases is contained in a cyst, and connected with it by an imperfect funis. Under these circumstances it may live and grow for many years. It is always excessively defective and much deformed. Both the including subject and foetus are usually male.



It is probable that such included fœtuses owe their origin to very nearly the same conditions as those which give rise to other forms of doubling. It is not easy to understand how a second ovum could enter the body-cavity of an embryo, whilst there is no difficulty in understanding how a second embryo on a common yolk could be so included. The cyst under such circumstances would owe its origin to a portion of the common amniotic sac, which the included embryo must necessarily carry before it. It is true no connexion has been observed between the cyst and the umbilicus; but all things considered, the above is the least improbable means of accounting for the phenomenon. The disappearance of a portion of the amnion in several years is by no means inexplicable, especially when it is remembered that the membrane must have been extremely thin at the time of its induplication.

134. A portion of a cyst (which contained the fœtus No. 135) from the abdomen of a well-formed male child aged between 9 and 10 months. The preparation includes a portion of large and small intestine of the child.

The case is described by Mr. G. W. Young in the 'Med.-Chir. Trans.' vol. i. p. 234. The cyst is recorded to have contained 78 ounces of fluid, and to have discharged a portion of its contents several times into the peritoneal cavity; it is further stated to have been placed between the layers of the transverse mesocolon. The same thing was also believed in M. Dupuytren's case\*; but much difficulty arises in the explanation of the phenomenon if such really be the fact. In the present instance it will be seen that the mesentery is likewise adherent to the cyst, and the whole mass is so matted together that it would be impossible to determine whether the cyst is between the layers of the mesocolon or not; it is much more probable that the cyst was originally placed between the mesocolon and mesentery. The portion of the cyst which has been preserved consists of a number of layers, a fact quite in consonance with the opinion that it was originally formed by an induplication of the amniotic sac. It is very thick, and presents a villous surface within. The upper part of the cyst, which was covered by the omentum, has not been preserved. It is stated to have been very thin and transparent.

*Presented by G. W. Young, Esq.*

135. The imperfect fœtus from the same, divided vertically to

\* Bulletin de la Soc. de la Faculté de Méd. Paris, an 13, no. 1, p. 4. Himly, Fœtus in Fœtu, p. 18.



show its internal structure. It has no head, its trunk is very much curved, and possesses four misshapen limbs. It was connected with the cyst by a large funnel-shaped umbilical cord, which contains a coil of intestine.

Mr. Young states that "when the foetus was taken from the cyst it was covered with sebaceous matter, and when this was removed, it appeared as rosy and healthy as if it were alive." At the upper extremity of the trunk a fibrous mass is seen with a portion of the cyst adherent to it; this is said by Mr. Young to have been "of a dark-red colour when first taken from the cyst, and abundantly supplied with blood." It is exactly similar to the mass usually representing the brain in anencephalous foetuses. That part of the foetus which corresponds to the frontal region bears a narrow line of fine hair upon it; this forms a long lock on either side. The vertebral column consists of eleven blocks of bone, representing as many vertebral centres. The posterior aspect of these is covered by a membrane; there are no remains of the spinal cord, and no traces of laminae. The skin on either side of the vertebrae is covered with short fine black hairs. The sacrum is rudimentary, and entirely formed of cartilage. One of the vertebral bodies in the dorsal region seems also to be entirely formed of cartilage. The vertebral column is surmounted by several masses of bone and cartilage, which probably represent the base of the skull and facial bones. The axis is doubled almost at right angles in the dorsal and lumbar regions. A small opening, in which a bristle is inserted, is seen in the mesial line at the most anterior part of the foetus; it is apparently a vessel, probably a median carotid.

In front of the hair, at the anterior part of the foetus, is a frontal proboscis, considerably enlarged and perforated at its free extremity: it is extremely similar to the same structure in cases of cranial arrest. (See Nos. 162 *et seq.*)

The body-cavity is not divided by any diaphragm, and is almost filled by a saccular dilatation of the intestine, which forms a blind sac in front of the sacrum; there is no anus. A blind coil of intestine fills the cavity of the umbilical cord and communicates with the main intestinal cavity at the umbilicus. The whole was filled, according to Mr. Young, with a dark fluid resembling meconium, although there is apparently no vestige of a liver. In the upper part of the trunk the lungs may be distinctly seen, compressed against the vertebral column. No other internal organs have been developed. The external generative organs are probably those of an imperfect male. The penis is rudimentary, perforated at its



extremity only, and having a blind urethral pouch immediately beneath its root. There is no bladder.

*Presented by G. W. Young, Esq.*

136. A cyst with a portion of the stomach and jejunum from a lad between 15 and 16 years of age. The cyst contained the imperfect male foetus preserved in the next preparation, No. 136. The case was described in a pamphlet by N. Highmore, Esq., in 1814.

The cyst in this case is intimately and extensively connected with the duodenum and jejunum. A portion of the stomach, which is excessively elongated, is seen on the left of the preparation; it has been filled with horsehair. The duodenum is seen opening on the left into the upper part of the cyst; from this point the intestine forms part of the wall of the cyst as far as the right extremity of the preparation, where the opening of the jejunum is seen; a piece of glass tube has been inserted into this opening. The intestine was below and not above the cyst when it was *in situ*. The interior of the wall of the cyst, except that portion of it which was formed by the intestine, is covered with ragged processes of membrane, so that it has a villous appearance. The funis arose from the posterior and upper part of the cyst (the lower part in the preparation). The whole was very vascular, and the lad died of hæmorrhage into its interior.

*Presented by N. Highmore, Esq.*

137. The foetus from the same. There is no head, but some slips of membrane unite the upper part of the vertebral column with the funis; they represent the membranes of the brain. A quantity of long, thick, matted hair is seen growing from near the same point, probably from what should have been the frontal region. The limbs are very ill proportioned and are violently flexed. The hands are at right angles to the arms. The whole of the left leg has apparently been absorbed, a large denuded surface on the side of the pelvis being the only indication of its ever having existed. The right foot is bent inward as in talipes varus. The sharp angles of the joints have undergone absorption, the bones being denuded and partially removed at these points. The upper part of the body has a long fleshy papilla growing from it, enlarged and hollow at its extremity; it is undoubtedly a frontal proboscis. In Mr. Highmore's original description it has



been mistaken for a nipple, and hence the fœtus was erroneously described as a female. The generative organs are those of an imperfect male, consisting of a rudimentary penis invested by a very voluminous circular prepuce.

The funis is short and thick, and when recent the fœtus was covered with sebaceous secretion.

*Presented by N. Highmore, Esq.*

C. By Adhesion.

This is a much less intimate mode of union, and probably takes place at a much later stage of development. It occasionally happens that both fœtuses are well developed, especially when they adhere by the skulls, the brains and their membranes remaining separate; much more frequently one fœtus is very defective; it often forms a mere tumour, especially when adherent to the nates of the other.

a. *Craniopagus.*

138. The skull of a Bengalee child, with a second imperfect skull attached to the anterior fontanelle, which is widely extended. The base of the second skull is much contracted, the foramen magnum being almost closed. All the bones of the face are much smaller than those of the supporting skull. The faces are turned in almost opposite directions, so that the left frontal bones of one skull articulate by suture with the right parietals of the other, and *vice versâ*.

The history of this skull and an account of the child are given in the Phil. Trans. vol. lxxx. p. 296, from which the following particulars are extracted:—

The child was a male, it was more than four years old at the time of its death, which was caused by the bite of a cobra. It was very emaciated, a fact attributed to the parents having used it as a show, always keeping it covered up, except when payment was made for its exhibition. The woman who acted as midwife was terrified at the appearance of the additional head, and tried to destroy the child by throwing it on the fire: it was rescued after one eye and ear were considerably burnt.

There was no trunk to the second head; but it was surmounted by a short neck terminating in a rounded tumour, which is stated by one observer to have been quite soft at the age of two, and by another to have been quite hard and cartilaginous at the age of four. Its external ears were represented by mere folds of skin, and



there was no auditory meatus. The normal face and head were not malformed. The brains were distinct, each invested in its own membranes; the dura mater of each adhered to that of the other at the point of contact. The chief supply of blood to the upper head was by a number of vessels passing from the membranes of one brain to that of the other. The movements of the features of the upper head appear to have been purely reflex, and by no means to have been controlled by the feelings or desires of the child. The movements of the eyes of the accessory head did not correspond with those of the child, and the eyelids were usually open, even during sleep.

*Hunterian.*

b. *Ischiopagus.*

A second foetus, or more generally an amorphous tumour of connective tissue containing bones, cartilage, and other remains of a second foetus, adheres to the gluteal region.

139. A tumour of somewhat conical form, composed of fibrous tissue, fat, and cartilage, which was removed from the nates of a child about 14 months old. A papilla at its extremity appears to represent very obscure indications of a limb. The remains of a portion of intestine, originally blind at each extremity, and about 3 inches long, is seen at its base. It originally contained a fluid resembling meconium. The child recovered quickly from the operation. The tumour has been cut through vertically to show its structure.

*Presented by T. Blizard, Esq.*

Class III. EXCESS OF GROWTH (GIANTS).

*[Arranged in the Osteological Series.]*

Class IV. ARREST OF GROWTH (DWARFS).

*[Arranged in the Osteological Series.]*

Class V. ARREST OF DEVELOPMENT.

Subclass I. *Cranial arrest.*

Two principal forms of arrest of development occur in the cranial region. Either the lateral arches fail in their develop-



ment, giving rise to median fissures, or the cranio-facial axis fails and undergoes atrophy or absorption, and the lateral arches unite prematurely, so that fusion of the lateral organs results. In the first case there is usually some shortening of the cranio-facial axis, at least in extreme cases. In the second form the axis becomes narrowed, or is absent in parts of the skull, and the corresponding nervous and facial structures fail to be developed. The presence of lateral parts corresponding to the several portions of the axial region affords a strong indication that the axial parts are not absent from the commencement of development, but that they fail to be developed and become atrophied at an early stage. The most common form originates in the absence or failure of the parts developed from the investing mass in front of the notochord, the olfactory lobes and nasal capsules are then deficient. When the investing mass fails more posteriorly the eyes and mesencephalon are found wanting. When the investing mass fails in front of the ear-capsules, so that the basioccipital ends in a point between them, the mandible is absent; and in extreme cases, when the structures normally developed in the investing mass in front of the ear-capsules all fail, the tympanic cavities are fused in front. It frequently happens that the mesencephalic or epencephalic region are deficient, whilst the anterior and posterior portions of the cranio-facial axis are developed. The changes which produce these abnormal conditions probably commence in the investing mass, and not in the subsequently formed bones, since failure as frequently occurs between the basioccipital and basisphenoid as in either of these bones. In this case the anterior part of the basioccipital and the posterior part of the basisphenoid are equally arrested. The nerve-centres appear to be always arrested at points corresponding to the deficient portions of the axis, so that it appears improbable that the malformation originates in deficiency of the facial arches. Rarely one lateral half only of a portion of the cranium is arrested, the other being normally developed.

#### IN FISHES.

140. The anterior portion of an eel with complete deficiency of the face in front of the eyes. The mandible extends be-



yond the anterior extremity of the truncated skull. The cranium and part of the spinal canal has been laid open. The four anterior ganglia are much compressed from before backwards. The anterior pair (olfactory) have displaced the second pair, the cerebral hemispheres, and lie partially between instead of entirely in front of them.

141. The head of a young Salmon with a similar truncated face; the maxillæ are placed almost at right angles to their normal position, and lap over the mandible on either side.

*Presented by Mr. Shepherd, 1871.*

142. A vertical longitudinal section of the anterior part of a Carp, with complete deficiency of the face in front of the eyes. The development of the mandible is likewise defective; it does not extend beyond the truncated face.

*Hunterian.*

#### IN BIRDS.

143. A Sparrow with a deep cleft dividing the mandible and lower beak in the mesial line.

*Hunterian.*

144. A foetal Chick in which the anterior portion of the cranio-facial axis is absent. The eyes are fused into a single organ. The upper beak and the maxillary and frontal arches are entirely wanting.

*Purchased.*

#### IN MAMMALS.

##### A. Facial arrest.

Facial arrest in its slightest degree consists in arrested development of the intermaxillaries and maxillary bones, so that a cleft is left between them, constituting cleft palate or Hare-lip. The nasal septum is defective in the more severe forms, or the whole anterior part of the axis, including the ethmoid bone, may be deficient. All the facial bones may be very defective, with shortening of the bones of the base of the skull. Very frequently this shortening appears to be accompanied by an increase of breadth in the axial bones, giving rise to considerable clefts between the arrested parts of the face.

145. A portion of the skull of a six-months' foetus with considerable deficiency of the maxillæ and palate-bones, giving rise to a wide cleft in the palate. The vomer supports



the intermaxillaries, which are separated by a fissure on either side from the maxillæ.

*Presented by Sir W. Fergusson, Bart., 1865.*

146. A portion of the skull of a new-born child, with considerable divergence of the pterygoid process and palate-bones. There is entire deficiency of the bony palate, and the maxillæ are widely separated from each other and from the premaxillaries. *Presented by Sir W. Fergusson, Bart.*
147. A portion of an adult skull in which there is a cleft nearly an inch wide between the lateral halves of the bony palate. The vomer is bent over to the left side, and is united to the left half of the palate. The alveoli are very defective. There are only two teeth on the left side.  
*Presented by Sir W. Fergusson, Bart.*
148. The intermaxillary bones from eight cases of cleft palate in infants. *Presented by Sir W. Fergusson, Bart.*
149. The intermaxillary bones from two cases of cleft palate in children. *Presented by Sir W. Fergusson, Bart.*
150. The intermaxillary bones from a case of cleft palate in an adult. *Presented by Sir W. Fergusson, Bart.*
151. A dissection of the tensor and levator palati muscles and the neighbouring parts in a case of cleft palate in the adult.

The soft palate only is apparently cleft in this case, but the bones are implicated slightly, although to a much less extent than in the foregoing preparations. The preparation is of special interest because it shows the manner in which the levator palati and palato-pharyngei muscles keep the edges of the soft palate apart. The upper fibres of the superior constrictor, which act as their antagonist, are unusually well developed. This is the original dissection on which Sir W. Fergusson founded his operation of Staphylorophy, which consists in dividing the fibres of the levator palati, palato-pharyngei, and palato-glossi. The preparation is minutely described in his original description of the operation, published in 1845, 'Trans. Med.-Chir. Soc.' vol. xviii. p. 273-301.

*Presented by Sir W. Fergusson, Bart.*

152. The head of a young Lion born in the Zoological Gardens, March 1862, with cleft palate and arrested growth of the septum narium. The litter consisted of two, this and another in the same condition. The alveoli of both jaws



are arrested also. Several other Lion-cubs born in the Gardens have been similarly affected. *Purchased.*

153. The skull of a new-born Calf with a cleft between the maxillary bones, and defect of the palate-bones and pterygoid processes. The whole skull is shorter and broader than the normal type. There is considerable shortening and deformity of the mandible. *Hunterian.*

154. The skull of a similar Calf with more considerable shortening of the whole axis, and extreme curvature of the rami of the mandible. *Presented by T. Wormald, Esq.*

155. A portion of the head of a Human infant, with arrested development of the ethmoid bone, absence of foramina in the cribriform plate, of the nasal septum and premaxillaries. There is a single median nostril and a deep cleft between the lateral halves of the upper lip. In this case the foramen ovale of the heart was patent, the testes had not descended, and there were six digits on each hand and one foot. (See Nos. 308-310.)

*Presented by R. Partridge, Esq.*

156. The head of a female Human foetus, with a broad cleft in the upper lip continuous with the nostrils, arrest of the septum narium, and entire deficiency of the bony palate. There is also apparently considerable deficiency of the skull in the occipital region, similar to that exhibited in No. 279. *Hunterian.*

157. The head of a Human foetus with arrest of the ethmoid bone and nasal septum. The eyes are approximated. There is no palate. The nostrils are absent, and the upper lip is deeply cleft in the mesial line. A section has been made through the mandible and tongue to exhibit the condition of the roof of the mouth and the nasal cavity.

*Presented by Sir W. Blizard.*

158. A portion of the head of a Human foetus with shortening of the whole cranio-facial axis. The right eye is abnormally small, and the left is deficient: its eyelids are wanting, and a mere depression marks the position of the orbit. The palate and the upper lip are entirely wanting. The maxillary and naso-frontal processes remain distinct. The external ears present numerous abnormal lobules. The base of the skull has been dissected to show the



imperfect condition of the middle ear and tympanic bones. The right Eustachian tube is marked by a black bristle; it is a mere groove open below.

159. A vertical section of the head of a Human foetus in which the palate is entirely deficient. A groove above the mouth, marked by a bristle, represents the nasal cavity. The cribriform plate of the ethmoid is very small, its vertical plate is absent. The palato-pterygoid and maxillary process (suborbital arch) are absent. The eye is abnormally small. The external ear is represented by a small lobule; there is no meatus. The cavity of the skull occupied by the middle cerebral lobe is much enlarged; the remainder of the cranial cavity is correspondingly contracted.

#### B. Prosencephalic arrest.

*Syn.* Cyclops, *Gurlt.*

Rhinocephalus, Cyclocephalus, Ethmocephalus, *Geoff.*

W. Vrolik\* first ascribed the origin of the following forms to arrest of development of the anterior portion of the investing cartilage of the notochord; and there can be little doubt that this is the most satisfactory explanation yet arrived at. The trabecular arch and the structures arising from it are always absent or defective. The nasal septum is either entirely absent, or is represented by a defective vomer. The whole ethmoid bone is usually wanting. There are traces of inferior spongy bones in the frontal proboscis, a process arising from the union of the naso-frontal processes. There is sometimes a single nostril, sometimes a pair beneath the eyes, between the united subocular arches, when a defective nasal cavity exists between the maxillæ. More frequently the proboscis is perforated by a nostril, and contains a cavity extending back to the skull, in which a pair of cartilaginous spongy bones are situated. In such cases the maxillary bones are very massive and are fused in the median line. The orbits are united into a single cavity, and the eyes are more or less perfectly fused, sometimes forming a single globe. The brain exhibits unmistakable signs of arrest.

\* Over den Aard en Oorsprong der Cyclopie: Amsterd. 1834.  
Müller's Arch. 1836.



The corpus callosum is almost always absent, the fornix is absent or rudimentary, the cerebral lobes are usually very defective and are fused in front with each other; the third and lateral ventricles, in most cases, are opened out into a large cyst, which occupies the greater part of the cranial cavity, a condition which may well induce the belief that the cause of the phenomenon is probably internal hydrocephalus at a very early period of embryonic life. It is certain that hydrocephalus often accompanies this condition: examples are seen in specimens Nos. 185 and 186.

a. *Rhinocephalus*.

*Syn.* Rhinocephalus and Cyclocephalus, *Geoff.*

Cyclops, *Gurlt.*

In Rhinocephalus the naso-frontal processes form a frontal proboscis.

160. A foetal Lamb's head with entire deficiency of the axis in the facial region, a solid frontal proboscis, partially fused eyes, and a pair of imperfect nostrils between the maxillæ. The roof of the skull has been removed to show the complete absence of the ethmoid bone and fusion of the optic foramina. *Hunterian.*
161. The brain of the same showing the fusion of the hemispheres in front, the absence of the corpus callosum, the open condition of the large third ventricle, and the complete absence of the olfactory nerves. *Hunterian.*
162. The head of a foetal Boar, with complete deficiency of the facial axis. The eyes are partially fused. An orifice corresponding to the nostrils is situated at the extremity of the proboscis. *Hunterian.*
163. A similar preparation with the eyes more closely united. *Hunterian.*
164. The head of a foetal Sow, similar to the last two, but with the eyes still more closely united. *Hunterian.*
165. The head of a foetal Sow, in which the frontal proboscis is turned back over the forehead. The eyes are fused as far as the edges of the corneæ.
166. The head of a foetal Pig with the eyes fused into a single globe. The roof of the skull has been removed to show



the brain. The cerebrum is very small; its anterior lobes are completely fused. The middle lobe of the cerebellum and the corpora quadrigemina are proportionately very large; the latter are not covered by the cerebrum.

*Hunterian.*

167. The head of a similar foetal Pig. The roof of the skull has been removed. The cerebral lobes are completely fused in front. The whole brain scarcely fills a quarter of the cranial cavity.

*Hunterian.*

168. A similar preparation, but the eye is apparently very defective. The cornea and lens seem to have been arrested in their growth. The cornea is conical.

*Hunterian.*

169. A similar specimen with the side of the face dissected to show the form of the skull, the superior maxillary bone, and pterygoid processes. The zygoma and the ascending ramus of the mandible have been removed. The prolongation of the frontal bones into the proboscis is well seen in this preparation.

*Mus. Brit.*

170. The head of a foetal Pig with cyclopia, dissected, to show the condition of the brain and nerves. The distribution of the ophthalmic branch of the fifth to the proboscis, and the superior maxillary nerves to the maxillæ, is well seen on the right side of the head. The brain is exposed on the left side. The small hemispheres are fused together. The corpora quadrigemina and the cerebellum are not covered by the cerebrum.

171. A dissection of the head of an Indian wild Boar with similar deficiencies.

The upper preparation consists of a section of the head. The cavity of the proboscis extends back to the cranial bones and contains a cartilaginous fold, probably the inferior spongy bones. The lower preparation shows the maxilla and teeth, the pterygoid and styloid process, the middle ear and its ossicles, together with the gustatory and hypoglossal nerves.

172. A foetal Boar with similar deficiencies. There is considerable inequality of development on the two sides, with consequent dislocation of the eye.

*Hunterian.*

173. A foetal Hare with similar deficiency. The frontal proboscis is comparatively small.

*Presented by A. Newton, Esq.*



174. A foetal Kitten with partial fusion of the eyes and a small frontal proboscis. *Hunterian.*
175. A male Human foetus, about the seventh month of gestation, with deficiency of the facial axis and a frontal proboscis. The eyes are contained in a single median orbit and fused as far as the corneæ. The right external ear and the thumb of the same side are very defective. *Mus. Brit.*
176. The head of a Human foetus similarly affected. A transverse vertical section has been made through the posterior part of the head to show the condition of the brain. The section passes through the corpora quadrigemina, the fourth ventricle, and the cerebellum. The corpus callosum is absent, the fornix is rudimentary. The corpora quadrigemina are very large, the cerebrum is small, and entirely contained in the anterior portion of the skull. The third ventricle, together with the lateral ventricles, forms an enormously dilated cyst, occupying the whole of the back and upper part of the cranial cavity. *Presented by C. H. Welch, Esq., 1868.*
177. The posterior part of the brain of the same foetus. *Presented by C. H. Welch, Esq., 1868.*
178. A longitudinal vertical section of the head of a similar foetus. The cerebral lobes are very small, and exhibit an unmistakable condition of arrest. The corpus callosum is absent, and the fornix is rudimentary. The condition of the ventricles as well as the rest of the brain is similar to that seen in the last preparation. The cavity of the proboscis extends back to the dura mater.

b. *Arhynchus.*

*Syn. Cyclops Arhynchus, Gurlt.*

In the following preparations the frontal proboscis is absent, indicating a still higher degree of anterior facial arrest.

179. The head of a foetal Lamb with the eyes partially fused together. The upper part of the skull has been removed to show the small size of the basisphenoid, the persistence of the trabeculæ cranii, and the absence of the presphenoid and ethmoid bones. The optic foramina are fused



into a single foramen. The mandible projects considerably in front of the united maxillæ.

*Presented by W. R. Gilbert, Esq.*

180. The brain of the same. The anterior cerebral lobes are completely fused together. Behind the cerebrum is a large triangular space, corresponding to the third and lateral ventricles; the fornix is seen crossing this space. The corpus callosum is completely absent.

*Presented by W. R. Gilbert, Esq.*

181. The skull of a similar foetal Lamb. The mandible projects more than in No. 179.

182. The skull of a foetal Horse, with a large median orbit. The axis is entirely wanting in front of the basioccipital. There are traces of a vomer between the solid pterygoid, palatine, and maxillary bones, but there is no trace of a nasal cavity. The mandible projects an inch and a half beyond the maxilla. The cranial cavity is much contracted, and probably only contained a cerebellum.

183. A foetal Kitten with complete fusion of the eyes.

*Hunterian.*

184. A similar Kitten, with the thoracic and abdominal cavities laid open, to show the perfect condition of the internal organs.

*Hunterian.*

185. The head of an hydrocephalic foetal Pig, with deficiency of the facial axis and fusion of the eyes into a single globe. The vertex is occupied by a very large cyst. *Hunterian.*

186. A Human foetus with similar deficiency of the cranio-facial axis and complete fusion of the eyes. The cerebro-spinal canal has been laid open. The whole cavity has evidently been occupied by a large water-cyst. The head is doubled back on the contorted spinal column, so that its axis is almost parallel with that of the vertebral column. There is complete deficiency of the occipital region and extreme spinal bifida. The preparation should be compared with Nos. 278, 279.

*c. Anopia.*

In the following preparations the deficiency extends still further back; the trabecular arch is entirely wanting; and the eyes are rudimentary or absent, although the orbit remains.



187. The head of a foetal Pig with entire deficiency of the facial axis, naso-frontal processes, and eyes. There is a V-shaped fissure in the position of the eyelids, which has been enlarged on the right side to show the complete deficiency of the eye. The skull has been opened above, and the cerebellum is seen to be the only portion of the brain it contains. *Mus. Brit.*
188. A portion of the occipital and parietal bones of the same. *Mus. Brit.*
189. The head of a foetal Pig with anterior deficiency of the facial axis and absence of the eyes. The maxillary processes are separated by a deep wide fissure, so that the two halves of the snout are turned outwards and upwards. *Hunterian.*

#### C. Mesencephalic arrest.

##### *Syn. Anopia.*

It sometimes happens that the middle of the cranial axis and cavity are deficient, whilst the anterior cerebral lobes and the anterior facial region are normal. In this condition the eyes are rudimentary or absent. The tentorium divides the cranial cavity, sometimes to such an extent as entirely to separate the cerebral hemispheres from the cerebellum.

190. A vertical longitudinal section of the head of a Lamb, in which the cerebellum is cut off from the cerebrum by the tentorium. The axial parts between the cerebrum and cerebellum are entirely wanting. The eye is very small and rudimentary. There is atresia of the œsophagus, the upper part of which is apparently entirely wanting. The pharynx is wanting and the mouth ends in a pouch behind the tongue.
191. Half the skull of the same. The bones are all present but the orbito-sphenoids, which are represented by membrane only. The frontals are much elevated in front and defective behind; the parietals and all the bones behind the frontals are very small. The eye on this side was exactly like that on the other.

#### D. Epencephalic arrest.

The axis of the skull immediately in front of or between the



ear-capsules is sometimes arrested. In the less marked forms (*agnathia*) only the mandibular arch fails, but the posterior portion of the cranial cavity is contracted. In the more marked forms (*synotia*) the tympanic cavities coalesce, the hyoid arch is constantly present, and the mandibular is always wanting.

a. *Agnathia*.

The brain-case is slightly contracted behind, especially immediately in front of the ear-capsules, the mandible is absent. The eyes and ears are approximated below, but the mouth and pharyngeal cavities are continuous.

192. The head of a foetal Pig with total deficiency of the mandible. The eyes and ears are slightly approximated below.

*Presented by R. Semple, Esq., 1820.*

193. A similar specimen. The roof of the skull has been removed to show the reduced size of the brain-case and cranial axis behind.

b. *Synotia*.

*Syn. Monstres Otocéphaliens, Geoff.*

The tympanic cavities are united below, the tympanic and squamosal bones being fused together, although the periotic capsules retain their normal position. This condition is explained by the view that the tympanic and squamosal bones are integumental ossifications, as has been pointed out by Mr. W. K. Parker. Their position is most variable in malformations, whilst the primitive ear always retains its normal relations with the axis. The external ears are more or less fused together a little above the hyoid bone; there is usually only a single meatus externus, and this communicates with the pharynx by an open spiracle. The mouth is always completely separated from the pharynx by the downward growth of the suborbital (maxillary) arches. The lungs are commonly well formed, and are inflated at birth by the passage of air through the spiracle or spiracles, for there are two when the external meatus is double. Sometimes the cranial and facial axes remain in their normal relation with each other in animals, the cribriform plate of the ethmoid remaining nearly vertical; but sometimes the facial is



bent at right angles to the cranial axis, and the cribriform plate forms part of the floor of the brain-case, the whole brain being pressed forward by the contraction of the posterior portion of the skull.

In cases of this character the ethmoid bone and nasal capsule are also often deficient. These form a connecting link between epencephalic and prosthoecephalic arrest.

194. A longitudinal vertical section of the head of a foetal Lamb, with deficiency of the lower jaw and mouth. The bullæ of the ears and malar bones are fused beneath. The facial and cranial axis are in the same line. The median structures of the brain are all more or less defective behind, and the lateral halves are fused in the median line. The cerebral hemispheres, corpus callosum, and fornix are normal. The eyes were approximated and directed downwards. The pharynx has not been preserved, but was probably similar to that in the following preparations.

*Presented by Sir E. Home, Bart.*

195. The skeleton of the other half of the same head. The fusion of the squamosal bones, zygoma, malar, and superior maxillary bones across the mesial line below is well seen. The basisphenoid and presphenoid bones are absent, and the basioccipital is narrowed in front.

*Presented by Sir E. Home, Bart.*

196. The head and neck of a foetal Lamb, with deficiency of the mandible and fusion of the ears. The facial is at right angles to the cranial axis, so that the ethmoid forms part of the floor of the skull-case.

The side of the skull has been partially removed to show the base from within. A section has been made through the nasal cavity, and the pharynx has been laid open. A purple glass rod marks each of the following:—The optic foramina, foramina rotunda, and the tongue, a hollow organ situated above the anterior part of the pharynx. The only external opening of the pharynx is by the Eustachian tubes and external auditory meatuses. The membrana tympani were absent. Blue glass rods mark the sphenoidal fissure, the foramen ovale, the external auditory meatus, and the anterior condyloid foramen. A white rod has been placed in the jugular foramen.

*Hunterian.*



197. The anterior portion of the brain of the same, showing the entire absence of the corpus callosum and fornix. The remainder of the brain had decomposed before it was removed from the cranial cavity. *Hunterian.*

198. The head of a foetal Lamb with the eyes fused into a single median globe, the whole ethmoid region being absent. The maxillæ are large, and are placed at right angles to the cranial axis. All the internal parts have been removed, so that no accurate description can be given.

*Hunterian.*

199. A vertical longitudinal section of the head and neck of a foetal Lamb, with deficiency of the facial axis and presphenoid, and complete fusion of the eyes. The brain is very defective in front.

The maxillæ are at right angles to the cranial axis; they form large cancellous masses of bone, which are fused together in the mesial line. There is no vestige of a mandible. The ears are fused together, so that there is a single auditory meatus communicating with the pharynx by a spiracle. The other characters are precisely similar to those seen in synotia generally.

*Presented by Dr. E. L. Ormerod, 1864.*

#### E. Prostho-epencephalic deficiency.

*Syn. Stomocéphalie, Geoff.*

The defect of the cranio-facial axis commences between the ear-capsules and becomes gradually more marked in front of this region; the basisphenoid may be partially developed, but the axis is entirely absent anteriorly to it. No arches are developed in front of the hyoid arch. The tympanic cavities and external ears are more or less fused together. The cranial cavity is small and rounded. The face, when present, consists of a frontal proboscis and a pair of more or less united eyes. Sometimes the maxillæ are represented by a small papilla. These parts are placed immediately beneath the skull. The term *cyclocephalus* has been applied to this form.

In a more highly arrested condition the face presents only a pair of external ears, sometimes fused together in the median line. An atrophied median eye sometimes exists, but is more commonly absent. In such cases the frontal and maxillary pro-



bosces are either very rudimentary or wanting. When the ears only are present, the squamosal bones form a shield in front of the skull-case. The term *nanocephalus* has been applied to this form.

The periotic bones always retain their normal position with regard to the axis, and the tympanic bones are usually removed from them. The pharynx always ends blindly above, but often communicates with the exterior by tympanic spiracles.

The brain is either arrested in its development or, in *nanocephalus*, is completely absent, the skull-cavity being occupied by a cyst surrounded by the anterior termination of the medulla. In *cyclocephalus* in the human subject the axis of the skull remains in the same line as that of the vertebral column.

The most extreme form of cranial arrest produces entire absence of the skull, or a cyst between the external ears terminates the axial canal in front. The term *acephalus* has been used to designate this malformation.

a. *Cyclocephalus*.

200. The head of a male foetal Pig with a frontal proboscis and a pair of eyes fused as far as the cornea. The maxillæ are represented by a papilla beneath the eyes. The mandible is absent. The tympanic cavities are united. The external auditory meatuses are not fused together: a black bristle is passed through that on the left side into the pharynx. The pharynx has been laid open. The animal was otherwise normal.

201. A similar preparation in which the eyes are fused into a single globe. The ear, pharynx, and larynx are dissected. The hyoid arch is perfect.

On the right side the anterior wall of the external meatus only has been removed, on the left side the tympanum has also been laid open. There was an external opening beneath the bullæ into two distinct passages which lead into the pharynx; these auditory spiracles are marked by two bristles. The median Eustachian tube is also marked by a bristle. The tympanic membranes were both perfect.

202. The head of a foetal Sow with similar deficiency. In this specimen the median eye appears as if it had been much damaged by inflammatory action.

203. A section through the head of a similar foetal Pig, showing



the total absence of the cranio-facial axis in front of the basisphenoid bone. A bristle marks the external opening of the pharynx. *Presented by Sir E. Home, Bart.*

204. The tympanic bulla and the labyrinth of the left ear from the same.

205. The head of a Human foetus about the end of the sixth month, with a single eye in the mesial line and conjoined tympanic bones. There is no vestige of the mandible or facial axis.

A dissection from behind shows the cavity of the skull and pharynx. The eye and ears are in front of the axis of the skull, which is perpendicular instead of horizontal. The cranio-facial axis is entirely deficient in front of the basisphenoid. The tongue is well formed, and occupies the upper part of the pharynx. The pharynx opens externally by spiracles communicating with the external auditory meatus.

206. The posterior portion of the skull and brain of the same.

The section passes through the cerebellum, pons, corpora quadrigemina, and a portion of the medulla and the fourth ventricle.

207. The lateral half of the head of a Human female foetus with entire deficiency of the facial axis, fusion of the eyes, absence of the mandible, and approximation of the ears. The pharynx opens by the aural passage, through which a black bristle has been passed. A mass of cartilage and several small masses of bone are seen beneath the eye, representing in some degree the deficient facial bones; there is also slight curvature of the cranial axis forwards. *Presented by W. Squire Ward, Esq., 1863.*

208. A longitudinal vertical section of the head and neck of a foetal Lamb with complete fusion of the eyes and ears and absence of all the other parts of the face. The cerebral lobes are hollow, and all the axial structures of the brain were fused in the median line. The pharynx opens by the median external auditory meatus, which is entirely removed from the auditory capsule. The tympani are absent. A bent purple glass rod marks the passage.

*Hunterian.*

209. The opposite half of the same.

*Hunterian.*



b. *Nanocephalus*.

210. The skull of a foetal Lamb with deficiency of the entire axis in front of the basisphenoid region. The mandible and all the facial structures, except a shallow orbit, are absent. The squamosal bones are united beneath the skull. The bullæ of the ears are not fused in this preparation.

*Presented by C. B. Rose, Esq., 1869.*

211. A foetal Puppy with a nanocephalous skull. There is a very imperfect Cyclops-eye, a soft imperforate frontal proboscis, and a similar structure representing the maxillæ. The pharynx opens through the aural tract. The roof of the skull has been removed to show its base from within. The axis terminates in the basisphenoid region, immediately in front of the foramen magnum. All the bones of the skull except those of the ear-capsule are very small; these are of their normal magnitude, and occupy a very large part of the base of the skull. *Mus. Brit.*
212. A nanocephalous foetal Puppy with no eye or orbit; it is otherwise similar to the last. *Hunterian.*
213. A similar foetal Hare, but without any maxillary proboscis.
214. A similar nanocephalous foetal Kitten, but without any proboscis. There is a cæcal foramen representing the orbit. The tympanic bullæ are united. The single meatus externus has been laid open to show the tympana; beneath these is a passage, marked by a bristle, leading into the pharynx. The thoracic cavity has been opened and the thymus removed to show the normal condition of the heart and lungs. *Hunterian.*
215. A microcephalous foetal Pig with fusion of the tympanic cavities. A small bifid tubercle on the face is the only remnant of the united and atrophied eyes. There are no other facial organs except a pair of external ears that are united by their bases. The neck and thorax have been laid open to show the perfect condition of the hyoid arch, larynx, trachea, and lungs. The calvarium has been removed to show the base of the skull. *Hunterian.*
216. The nanocephalous skull of a similar foetal Pig. The squamosal bones are fused together and form a square projecting plate above the united tympanic bullæ. The frontal bones are very defective. The basioccipital is the



- only bone in the cranial axis, and it ends in a point in front.
217. The anterior half of a nanocephalous foetal Kitten. The external ears were united at the base; but the left lateral half of the head has been removed to show the head in section. A bristle marks the external opening of the alimentary and respiratory tracts.
218. A microcephalous Human foetus, in which the face is entirely wanting, its position being occupied by a pair of ill-formed ears fused together above and below, with a small rounded tubercle between them in the place of a meatus. The skull and spinal canal have been laid open from behind.
219. A longitudinal vertical section of the anterior part of a nanocephalous foetal Lamb. The brain in front of the medulla is represented by a cyst only. The pharynx opens externally through the united tympanic bullæ and external meatus. *Presented by Sir W. Blizard.*
220. The atlas and bones of the skull from the other lateral half of the same. The anterior part of the skull is seen to be extremely defective. The bones of the ear-capsule retain their normal position, but the tympanic and squamous elements were united across the mesial line in front of the defective cranial axis. *Presented by Sir W. Blizard.*
221. The left half of a longitudinal section of the anterior part of a nanocephalous foetal Pig. The cranial bones are very thick. The specimen is in other respects similar to the last. *Hunterian.*
222. The right half of the same. *Hunterian.*

c. *Acephalus.*

223. A portion of the spinal column and cord of a foetal Lamb. The medulla ends in a rounded extremity. It is surrounded by a case, partly of membrane and partly of cartilage, which represents the cranium: a pair of imperfect periotic capsules are imbedded in its walls. *Hunterian.*
224. The anterior extremity of a nanocephalous foetal Lamb. The head is represented by a pair of ears and an elongated bladder-like cyst, which projects between and above



them. The pharynx is laid open from the side, and a quill is passed into it through each external auditory meatus.

*Presented by the Prince de Condé.*

225. The anterior portion of a foetal Lamb, in which the head is represented by a pair of ears only at the anterior extremity of the axis. The skin has been reflected to show the tympanic bullæ, and the auditory meatus has been opened on one side to show the membrana tympani. The pharyngeal cavity has been laid open.

*Presented by Sir W. Blizard.*

226. An injected foetal Pig, in which the axis terminates in the same manner. The pharynx is laid open, and bristles are passed on each side from the external meatus of the ear into its cavity.

A circular fold of mucous membrane divides the cavity of the pharynx into two portions. The upper probably represents that portion which is normally above the soft palate. The ring seems to represent the soft palate; it has been slit up in front. The right lung and the liver were removed, it is stated, to show more clearly the position of the remaining viscera. The intestine terminates in a blind sac in the umbilical cord. There is no anus, and the kidneys have coalesced in the median line. The lateral toes of the hind feet are abnormally developed.

227. A male foetal Pig with a pair of ill-developed external ears, and a long thin proboscis with an irregular mass of cartilage in its extremity, as the only representatives of the head and face.

The right side of the back has been dissected to show that the spinal column is truncated above. A minute fistula nearly an inch below the ears communicated with the pharynx, but it has been laid open in front with that cavity. The thoracic and abdominal cavities have been exposed to show the viscera.

*Hunterian.*

#### Subclass II. *Posterior axial arrest.*

*Syn. Monstra Syreniformia, Monopodia, et Syméliens, Geoff.*

Just as fusion of the lateral organs of the face results from arrest of the facial axis, so arrest of the posterior extremity of the spine gives rise to fusion of the posterior limbs, unless their growth is likewise arrested (see No. 328). In posterior axial arrest the development of the viscera of the lower part of the



abdomen is very defective ; the rectum is usually absent, and the colon is greatly enlarged and terminates in a blind extremity. The posterior extremity of the axis is curved back, and has marked indications of arrested growth. The innominate bones are fused below as far as the acetabula, and the femora, when present, are rotated outwards until the knees look backwards; hence the limbs are fused by their external aspect. The lower extremities of the femora may be united into a single symmetrical bone ; the tibiæ are usually fused into a single bone, which may either terminate in a blunt stump or support a compound foot, consisting of more or less of the normal pair united by their outer sides, with the heels turned forward. The united limbs are usually curved, so that they are concave in front. The term *sympodia* has been used to designate this condition ; fœtuses so malformed are said to be syreniform. Sometimes one limb is entirely or partially wanting. When it is wanting or inconspicuous, the term *monopodia* has been used ; the developed limb is usually rotated as in *sympodia*.

a. *Sympodia*.

228. A Human male fœtus at about the seventh month of gestation, with defective development of the posterior extremity of the axis, with rotation and fusion of the lower limbs. The foot is formed of the inner portion of both feet, and presents four toes, the two inner toes of each foot. The external sexual organs are extremely defective. The abdominal cavity has been laid open to show the dilated condition of the colon.

229. A similar fœtus in which the fused posterior extremities terminate in a two-lobed stump. One lobe is turned back laterally ; it is considerably longer than the other.

*Presented by J. Stringfield, Esq.*

230. A similar fœtus in which the fused limbs ended in a single rounded stump. The limb has been dissected to show the arrangement of the muscles. The external vasti form a single muscle behind ; the sartorii are straight, and run down the outer sides of the stump. The two long adductors are close together in front. The tibia terminates in a long blunt cartilaginous point.



231. The viscera of the same. The lungs are very small, and both are of nearly equal size; each has but two lobes. The intestine terminates in an enormously dilated colon.
232. The external integument of the united limbs of the same foetus.
233. A similar foetus, with the skeleton of the stump and lower portion of the body exposed. This specimen shows the peculiar flexure of the spine well, the fusion of the bones of the limb, and their excessive rotation. There are two patellæ. *Presented by Dr. W. G. Sheppard, 1867.*

b. *Monopodia.*

234. A similar foetus, with the muscles of the lower half removed to show the skeleton. The pubes and ischia are fused. There is but one limb, as far as the skeleton is concerned. The tibia terminates in a point. *Presented by J. F. Steedman, 1864.*
235. The skin of the conical stump-like limb of the same. A small nipple-like prominence only represents the right limb. *Presented by J. F. Steedman, 1864.*
236. The thoracic viscera of the same, exhibiting situs mutatus, or transposition. *Presented by J. F. Steedman, 1864.*
237. A small Human foetus with monopodia, about the sixth month of gestation. A section has been made through the head and trunk as well as through the single stump, which represents the lower limb. The spine is contorted, the pelvis cannot be recognized. The limb terminates in a rounded stump, like that of an amputated limb. The patella is turned backward, and a small square piece of cartilage only represents the distal extremity of the limb.

✱

Subclass III. *Arrest of the whole axis.*

*Syn.* Amorphus, *Gurlt.*

Omphalosites, *Geoff.*

Monstres Paracéphaliens et Acéphaliens, *id.*

Anideus, *id.*

Acardia, *Först.*

Deficiency of the heart appears to be the most constant character of general arrest of development. The head is frequently absent; when present it is always rudimentary and malformed.



The tissues are all abnormal ; great hypertrophy of the connective tissue is frequent. The neural canal is seldom normal ; it is more frequently absent or open, or its cavity communicates with large cysts. Parts of the skeleton may be tolerably well formed ; sometimes there are four imperfect limbs, or there may be one or two more or less well-formed limbs only. The alimentary canal is always in a very imperfect condition from obvious arrest. They appear to be always twins to perfect fœtuses. Nos. 135 and 137, examples of encysted fœtuses, exhibit precisely similar conditions.

238. A Human male fœtus without any head or heart. The whole body is very œdematous, and has been much distorted by the manner in which it was originally suspended. Three extremities are better formed than the remainder of the body ; the left anterior extremity is, however, a mere shapeless mass. The spine has been exposed behind, and its laminæ removed on one side to show the cord. It has a single curve with its convexity backwards, and consists almost entirely of cartilage, but is otherwise normal.

239. The right half of an acephalous acardiac fœtus, which has been divided longitudinally in the median line. The vertebral column is truncated at either extremity, and consists of twenty-two segments, with a large spheroidal bony nucleus in each segment, except the first three.

The neural canal is closed in by laminæ ; it contains a cord, and its upper extremity is filled up and closed by a fibrous mass containing a small cyst. A proboscis ending in an ovate knob terminates the axis in front externally. The thoracic and abdominal cavities are not separated from each other. The upper and back part of the body-cavity is filled with a dense mass of connective tissue closely united to the spine, and probably representing the lungs, with an empty cavity in front bounded anteriorly by a small sternum, probably pericardial. The lower part contains one great median kidney, a pair of ureters, and a urinary bladder. The external sexual organs are too imperfect to denote the sex. There are apparently no internal generative organs. There is no liver. The intestine commences blindly in a sac in the cord and terminates in a rectum, which is impervious. The integument is much hypertrophied. The arm is very imperfect, and is terminated by a single nail. The posterior extremity is furnished with three toes, and is much more normal in form than the arm. The pelvis is apparently fairly developed.



240. The other half of the same. It exhibits similar characters, except that there is no arm on this side.

241. The right half of a Human amorphous microcephalous foetus with great hypertrophy of the connective tissue, so that the whole body has an elongated ovate form. There are no traces of limbs on this side, but a small tubercle represents the lower extremity on the other half (see No. 242). The anterior portion is separated from the rest by a slight constriction; it is covered with short soft brown hair. There was also a depression dividing that portion which represents the nates, and corresponding to the normal cleft between them. The spinal column has the usual flexures; but the spines are represented by a long continuous rod of cartilage, probably the remains of the unsegmented investing mass highly developed. Some of the laminae have been removed to show the spinal canal. There are numerous large cysts in the integument behind the spinal column.

This foetus was one of twins; the other was well formed.

The skull presents a very large occipital bone of considerable thickness; all the other parts of the cranium and face are so defective that they cannot be recognized. The tympanic cavities are marked by a blue glass rod; a black bristle below this marks the opening of the pharynx externally. Masses of cancellous bone above and below the opening probably represent the jaws. The thoracic cavity is filled with reticulated areolar tissue. The abdominal cavity is comparatively large. A small stomach is seen at its upper part: this communicates with the pharynx by a narrow pervious oesophagus. There is no pyloric orifice to the stomach, and no duodenum. A quarter of an inch of small intestine, blind at either extremity, lies below the stomach, but is in no way connected with it. The large intestine is blind above, makes a sigmoid curve, and terminates in a straight rectum, which opens externally by an anus. There is a considerable cavity in front of the intestine partially occupied by the kidneys (which are fused together into a single gland), the Wolffian body and its duct, and the urinary bladder. For a further description of these see the account of the other half of the same foetus, No. 242.

There is a long straight aorta in front of the spine, which terminates below in two umbilical arteries, and above by two carotids and subclavians. The right umbilical artery is marked by a blue glass rod; the right carotid is indicated by a bristle. Behind



the aorta several sympathetic ganglia are apparent ; and the pneumogastric nerve is seen in the neck lying upon the bodies of the vertebræ.

*Presented by John King, Esq., 1868.*

242. The other half of the same fœtus, showing the left Wolffian body and its relation to the kidneys, which are seen in section. This presents one of the most remarkable instances in the permanence and extraordinary growth of a temporary structure yet observed. A slice has been made through the hypertrophied integuments in the region of the inferior extremity, and the imperfect bones of the extremity are exposed. Three small openings, probably those of the mouth, orbit, and meatus auditorius, are indicated by bristles.

*Presented by John King, Esq., 1868.*

243. The right half of the head and neck of an amorphous fœtal Calf. The skull-cavity is excessively irregular and very small, consisting rather of several bony cysts than of the normal series of bones. The vertebræ of the neck constitute an enormous cancellous bony mass, traversed by a very much bent spinal canal and cord. The mouth forms a cavity that does not communicate with the œsophagus. There is an ill-shaped external ear. The external form is very irregular, from the great hypertrophy of the subcutaneous fat and connective tissue.

*Hunterian.*

244. The other half of the same.

*Hunterian.*

245. The skeleton of an amorphous fœtal Lamb from Trinidad. The fœtus consisted of an almost spherical mass about 10 inches in diameter, with a pair of fairly developed posterior extremities growing from it. It was covered with thick black wool. It possessed a considerable body-cavity, which contained a coil of intestine, No. 246.

The bones form two separate masses. The upper one consists of the ribs and vertebræ ; it was situated in the wall of the spherical mass. The lower one consists of the innominate bones and the inferior extremities.

The vertebræ are ankylosed by their laminae, and the spines form a single broad blade. The spinal canal is occluded, and there is considerable contortion of the whole column. The ribs are ankylosed together, and are exceedingly broad.



The innominate bones are united in front, but are widely separated behind; there is no trace of a sacrum. The femora are articulated with the pelvis by imperfect joints. The limbs are fairly developed, but the outer toes have been arrested in their growth.

*Presented by Dr. Huggins, 1866.*

246. The intestine of the same. It is blind at either extremity, and forms a large much convoluted mass.

*Presented by Dr. Huggins.*

Subclass IV. *Defective closure of the thoracic and abdominal cavities.*

This condition sometimes arises from simple arrest of development; the abdominal cavity, however, remains open more often as a result of some other malformation, especially curvature of the spine, the union of twins, or displacement of the abdominal viscera. A portion of the diaphragm is occasionally wanting.

a. *Fissure of the sternum (ectopia of the heart).*

Slight fissure of the sternum may exist without displacement of the heart; in the gravest forms there is complete ectopia of that organ.

247. The sternum of a Goose with deficiency of the median ossification. The carina is completely absent, its place being occupied by a fissure.

248. A foetal Pig with deficiency of the anterior thoracic and abdominal walls. The heart and peritoneal sac protrude from the cleft. The anterior membranous investment has been removed. *Hunterian.*

b. *Ectopia of the abdominal viscera.*

*Syn. Schistocomus, Gurlt.*

Cases of ectopia are most usually accompanied by other malformations; hence several are arranged in other parts of the Collection. See Nos. 262, 263, 283, 292.

249. A female Human foetus at about the seventh month, with the greater part of the intestine protruding above the umbilicus. The walls of the sac which contained this intestine have been removed.

*Presented by W. Harris, Esq.*



250. A female Human fœtus, probably at about the seventh month, with deficiency of the abdominal parietes. There is a large visceral tumour covered by transparent membranous walls. The tumour contains the liver and the greater part of the intestinal canal. There is also arrested development of the forearms. The hands are placed at right angles to the limb. There are but three fingers on the left and four on the right hand. The left leg is shortened. There is curvature of the spine and spina bifida in the lumbar region. *Hunterian.*

251. A portion of the trunk of a female Human fœtus, with displacement of the viscera and deficiency of the anterior abdominal wall. The liver and kidneys are disproportionately large. The abdominal parietes immediately above the umbilicus are very thick and loaded with fat, but over the liver they are thin and membranous.

*Presented by Dr. C. H. Bennett, 1868.*

*c. Deficiency of the diaphragm.*

252. The trunk of a full-time male fœtus with deficiency of the left half of the diaphragm. The anterior wall of the thorax and abdomen has been removed. The thoracic viscera have been pushed over to the right side by the intrusion of the abdominal viscera into the thorax.

253. A male Human fœtus with deficiency of the left side of the diaphragm and hernia of the intestines into the thorax, with consequent displacement of the thoracic viscera. The thoracic and abdominal cavities are laid open. The abdominal wall was deficient in front.

*Presented by T. Blizard, Esq.*

254. The thorax and viscera of a full-time Human fœtus exhibiting a similar condition.

255. A male Human fœtus at about the fourth month of gestation, with deficiency of the diaphragm and anterior abdominal wall, and considerable arrest of growth of the left lower extremity. The thoracic viscera are depressed on the left side, and there is lateral curvature of the spine. The case is described in the 'London Medical and Physical Journal,' vol. lii. p. 367.

*Presented by J. C. Yeatman, Esq.*



## Class VI. MALFORMATIONS OF THE AXIS FROM DISEASE.

Subclass I. *Curvature of the axis.*

The causes producing congenital curvature of the axis are unknown; it may nevertheless be looked upon as the effect of disease, and may occur at any time during foetal life from the earliest period. Except that the resulting malformations are more grave, it differs in no way from ordinary lateral curvature.

a. *Simple curvature.*

256. A Perch with congenital curvature of the spine.

*Hunterian.*

257. A similar specimen, with the integuments and muscles of the left side dissected off.

*Hunterian.*

258. A Trout with congenital curvature of the spine.

*Presented by Sir A. Carlisle.*

259. The embryo of a Goose about the fourth day of incubation, with curvature of the axis.

*Hunterian.*

260. The skeleton of the trunk of a hybrid Duck, bred in St. James's Park, with a very remarkable antero-posterior flexure of the sacral region, giving rise to considerable shortening of the trunk.

*Presented by H. J. B. Hancock, Esq., 1868.*

261. A foetal Calf removed from one of the lateral halves of a divided uterus, No. 450, with considerable curvature of the spine.

*Hunterian.*

b. *With ectopia of the viscera.*

*Syn. Monstres Célosomiens, Geoff.*

262. A Human female full-time foetus with curvature of the spine and considerable contortion of the inferior extremities. The anterior thoracic and abdominal wall has been removed, with the viscera; it forms the next preparation. The abdominal cavity is so small that all the viscera protruded into a large sac situated in front of the abdomen.

263. The anterior thoracic and abdominal wall of the same, showing the opening through which the viscera protruded.

The anterior wall of the hernial sac has been removed. The



posterior aspect of the abdominal wall has a transverse ridge below the neck of the exomphalos; this corresponds to the pubic symphysis; below the ridge the external abdominal wall looks backward and presents a mucous surface of a triangular form. This surface may be looked upon as a kind of cloaca. The intestine opens at the apex of the triangle, where it is marked by a green glass rod; it has probably been cut at this point, as it entered the umbilical cord to form an umbilical hernia, a condition commonly seen in such malformations when the bowel ends in a blind extremity in the cord. The ureters open by two minute openings marked by bristles at the base of the triangle. The vagina is situated in the centre of the space; it is marked by a purple rod: a papilla, with a blind foramen between it and the vagina, is seen above the latter and between it and the ureters; its nature is uncertain, but it probably represents the blind rectum; it is marked by a pale blue glass rod. The liver and intestine are voluminous. The kidneys have coalesced in the median line, and open externally by a single ureter, the other ureter ends in an impervious cord. A purple rod is passed under both ureters. There is a body on the left side which is not paired on the right, it appears to be a suprarenal capsule. The uterus is very large, and its cornua are widely separated. The diaphragm is imperfect, and the heart is much drawn down by the displacement of the abdominal viscera.

264. The bones of a foetal Calf with strong backward curvature of the spine, and doubling back of the ribs. The pelvic bones are closely approximated, and several of the ribs are fused together. There has evidently been complete ectopia of the viscera. No anterior extremities existed. This condition is nearly identical with, except in the absence of the anterior extremities, that described by Gurlt under the term *Schistozomus reflexus*. *Hunterian.*

Subclass II. *Dropsy of the axial canal of the cerebro-spinal system.*

Dropsy of the axial canal of the brain and spinal cord is by far the most frequent disease of intra-uterine life. When confined to the cord, it gives rise to the condition known as spina bifida; the neural arches are open behind, although they are usually well developed. In extreme forms a lamina and spinous process is formed on each side of the vertebral column and lies parallel to the transverse process, the canal being completely



opened out by the pressure of the tumour. The tumour consists of the membrana reuniens superior, skin, connective tissue, and the substance of the cord spread out into a cyst, and almost converted into fibrous tissue by hypertrophy of its connective elements. Sometimes the tumour becomes pedunculated by pressure, which the perfect laminæ above and below exert upon it during its rapid increase. It is common in the lumbo-sacral region, but extremely rare in the back and neck, except when accompanied by internal hydrocephalus and considerable malformation of the skull. In the latter case the occipital bone exhibits considerable deficiency. When dropsy occurs at a later period of development, it gives rise to the formation of an enormous cyst on the occiput or vertex, *epicephalocoele*; and when it occurs towards the close of intra-uterine life it produces distention of the skull and great enlargement of its neural arch, *hydrocephalus*.

a. *Spina bifida*.

265. A portion of the lumbar and sacral region of a new-born Child affected with spina bifida. The surface of the tumour is ulcerated. *From Sir A. Cooper's Museum.*
266. A vertical section of the lower part of the back and sacrum of a new-born Child with spina bifida. In this specimen the chorda equina is incorporated with the walls of the tumour. *From Sir A. Cooper's Museum.*
267. A similar specimen with the spinal canal opened from behind. *Hunterian.*
268. A vertical section of the lumbar and sacral region of a Child affected with spina bifida. The lower extremity of the cord is incorporated with the walls of the tumour, from which the lumbar nerves appear to arise. This preparation and the last, No. 267, were taken from children born of the same parents. *Hunterian.*
269. A sacral spina bifida opened from behind; the sacral nerves have been cut through at their junction with the wall of the cyst.
270. The lumbar vertebræ and sacrum of a new-born Child with spina bifida, showing the defective condition of the neural arches. *Hunterian.*
271. A dried preparation, consisting of the bones and ligaments



of the lower portions of the vertebral column of a Child with spina bifida. There is a thin membranous cyst corresponding to the intervertebral ligaments and membrane. The neck of the cyst is very narrow ; but this appearance is much increased by the mode of preparation.

*Presented by Dr. Thurnam, 1871.*

272. A vertical section of a large lumbar spina bifida from a Child. The tumour is divided by a vertical septum, which is perforated by a large oval opening. The integument has been removed, but the tumour is covered by subcutaneous fat.

*Presented by R. Partridge, Esq., 1869.*

273. A sacral spina bifida from a Child. The tumour is covered with thickened integument; it has been opened at the side. Its cavity is seen to be divided into loculi by imperfect septa.

274. The six lower dorsals, the lumbar and sacral vertebræ of a new-born Child with spina bifida. The laminæ of the four lower dorsal, lumbar, and sacral vertebræ have been widely separated by dropsy of the cord. The laminæ are well formed and are abnormal only in having been opened out by the tumour. This specimen indicates very clearly that spina bifida does not arise from arrest of development, but from pressure from within.

*Presented by F. Kiernan, Esq., 1871.*

275. A section of the sacrum of an Adult with spina bifida.

*Presented by Sir W. Blizard.*

276. A portion of the head and neck of a Child which died three days after birth from the effects of a ligature applied to a cervical spina bifida. The peduncle of the tumour is marked by a bristle ; it passes between the laminæ of the sixth and seventh cervical vertebræ, the spines of these bones being deficient. The laminæ of the perfect vertebræ have unfortunately been removed to show the cord.

*Presented by A. White, Esq., 1827.*

277. The skeleton of a Human hydrocephalic foetus with a spina bifida involving the dorsal, lumbar, and sacral regions. In this specimen the bodies of the vertebræ are also deficient, so that the spine is completely cleft as high as the cervical region.



b. *Occipital deficiency.*

278. The skull and vertebral column, with a portion of the ribs and the pelvis, of a hydrocephalic male fœtus, with distortion of the vertebral column, defective development of the occipital bone, and defective closure of the vertebral canal behind.

The laminae of the cervical and first six dorsal vertebrae are widely separated behind; those of the right side are defective. There are apparently but five cervical vertebrae, and their laminae are fused together. The head was pressed back so that the edges of the enormously dilated foramen magnum rest on the edges of the laminae of the dorsal and cervical vertebrae, to which they were attached by ligament. The supraoccipital cartilage bones are very small. There are, however, two scale-like bones representing the upper part of the supraoccipital bounding the foramen magnum above. The frontals and parietals are very large. There is spina bifida in the lumbar and sacral region. The pedicles and laminae are well developed, but they are spread out on either side, so that the spinal canal is open behind. There was talipes of both feet.

*Presented by J. Hutchinson, Esq., 1870.*

279. An occipital bone with similar deficiency from a Human fœtus.

c. *Epicephalocèle.*

*Syn. Monstres Exencéphaliens, Geoff.*

280. A Human female fœtus with a large cyst-like tumour in the occipital region. The frontal bones are much depressed. The cyst has been opened behind; the posterior part of the cerebrum protrudes into it.
281. The head of a Human fœtus with a large epicephalocèle on the vertex. *Hunterian.*

Subclass III. *Anencephalus.*

*Syn. Monstres Pseudencéphaliens et Acéphaliens, Geoff.*

In anencephalus the roof of the skull is absent or consists of the membrane-bones pushed forward upon the forehead, where they form a narrow band or crest; the cartilaginous supraoccipital is always absent, and the whole base of the skull is widely exposed. The neural arches of the cervical vertebrae are more or less open,



they are rarely closed. The brain is usually absent; it is sometimes represented by a cyst filled with fluid which protrudes from the occipital region. The condition arises, probably, sometimes at least, from ulceration of the vertex in the embryo. (See No. 282.)

282. A Human male foetus at six weeks, with the brain exposed in the occipital region; a large circular ulcer occupies the occiput. When recent the edges of the ulcer were vascular and eroded. The spinal cord and vertebral laminae are deficient in the cervical and upper dorsal region.

*Presented by B. T. Lowne, Esq., 1871.*

283. A Human anencephalous foetus about 2 inches long, with entire deficiency of the brain and spinal cord. The bodies of the vertebrae are exposed behind as far as the sacrum. There is curvature of the spine and ectopia of the viscera.

*Presented by F. Kiernan, Esq., 1871.*

284. A vertical section of the head of a Human female anencephalous foetus. The roof of the skull and the laminae of the cervical vertebrae are entirely wanting. The brain-membranes, containing some brain-substance and a large clot, form a tumour which projects behind the head.

*Presented by W. Copeland, Esq.*

285. A vertical section of the head of a Human female anencephalous foetus, injected. The roof of the skull is wanting; the laminae of the first three cervical vertebrae are open. There is no trace of brain, but the base of the skull is covered by a thin vascular membrane.

*Hunterian.*

286. The other half of the same.

*Hunterian.*

287. The abdomen of the same opened in front, with the principal viscera removed, to show the much lobulated kidneys, a condition of arrested development.

*Hunterian.*

288. A preparation similar to No. 285.

*Presented by Sir W. Blizard.*

289. The skull and vertebral column of a Human anencephalous foetus. The frontals, parietals, and the upper part of the squama occipitalis are very narrow from before backwards, and these bones are much depressed, so that they lie upon the anterior part of the base of the skull. The supraoccipital is absent, so that the opening is an



immensely enlarged posterior fontanelle. The exoccipitals are very large and perforated by a considerable foramen. The spinal canal is open, the laminae and spines being spread out on either side; several are ankylosed together, as are also the three upper ribs of the right side. The bodies of the cervical vertebræ exhibit two lateral centres of ossification, a condition very constantly met with in conjunction with other forms of abnormal development.

*Mr. Langstaff's Museum.*

290. A male Human anencephalous foetus.

*Presented by John Abbey, Esq., 1826.*

291. A male Human anencephalous foetus with the placenta adherent to the membranes of the brain.

*Presented by T. M. Donohoo, Esq., 1862.*

292. A female Human anencephalous foetus with ectopia of the viscera. The sac containing the protruded intestine has been laid open; a large portion of the placenta is seen adhering to the sac.

These two preparations are interesting, as they show an extremely frequent complication of these conditions. On *à priori* grounds it would appear extremely likely that the placenta would become adherent to an open membranous surface like the peritoneum, arachnoid, or pia mater, or to the edge of an ulcerating surface like that exhibited by No. 282. It is not a little remarkable that so many have considered such adhesion as the cause of the malformation, as it is far more probably an effect, or an accidental complication extremely prone to occur.

*Hunterian.*

## SERIES III.

### ABNORMAL CONDITIONS OF THE LIMBS.

#### I. IN INVERTEBRATES.

293. A small Crab in which the upper nail of the left claw exhibits the form of an entire claw, without, however, any joint at its base.

*Purchased.*



## II. IN VERTEBRATES.

## Class I. VARIATION.

## A. In the number of Digits.

The number of digits is frequently in excess of the normal number, *polydactylism*: more rarely fewer are developed; such specimens have been arranged under the fourth and fifth Classes.

a. *Polydactylus*.

*Syn.* *Perissodactylus*, *Megalomelus perissodactylus*, *Gurlt*.

Several distinct conditions have been arranged under this head\*. It has, however, been thought wiser to attempt no division until a much larger collection of specimens can be obtained. Some of these conditions are admitted varieties; such are the accessory toes of the St. Bernard dog and Dorking fowl: others are probably the effect of fission or dichotomy, either of a single digit, or of several, or even of the entire limb. Sometimes the accessory digits resemble adventitious buds, and the supernumerary parts not unfrequently simulate to those of the opposite limb.

294. The foot of a Fowl with the inner toe bearing an accessory digit of three phalanges, nearly resembling the second toe of the other foot, on its inner side. The middle toe has also a minute supernumerary nail growing from its last phalanx on the same side.

The existence of a supernumerary toe on the inner side of the foot is characteristic of the Dorking breed, and is transmitted very truly.

*Hunterian.*

295. The skeleton of the other foot of the same bird.

*Hunterian.*

296. The left manus of a Pig, with a small accessory inner toe behind the normal one.

This toe is probably a supernumerary digit added to the normal second digit, and not a thumb, a view amply confirmed by the succeeding preparations.

*Hunterian.*

297. The left manus of a Pig with considerable enlargement of

\* See Introduction.



the second metacarpal bone, which bears a large accessory toe inside its normal digit. The accessory toe simulates the inner digits of the right manus. It cannot be identified with any normal digit.

*Presented by Mr. E. Horniblow, 1872.*

298. The skeleton of the right manus of a Pig, which is almost completely double. The accessory parts apparently belong to the left side of the body.

The condition of this manus, as well as the succeeding, is apparently identical with that of a human hand described by Jardine Murray (*Med.-Chir. Trans.* vol. xlv. p. 29), a photograph of which is preserved in the Museum of the Middlesex Hospital.

*Hunterian.*

299. A similar specimen.

*Hunterian.*

300. Part of the skeleton of the left manus of a Calf with a supernumerary toe on its inner side. The epiphysis of the third metacarpal bone is very broad and is partially divided into two portions, and its shaft is correspondingly broad below.

301. The manus of a small Horse, with an accessory hoof and imperfect digit growing from the inner side of the distal extremity of the middle metacarpal bone. The splint-bones are normal, and there is no evidence to show that the hoof and digit represent the second. As in the above and some of the following cases, it has apparently the characters of a digit from the other manus. The epiphysis of the metacarpal bone is also partly doubled.

This foot is described in the Osteological Catalogue as No. 3206.

*Purchased.*

302. The left second and third metatarsal bones of a Horse, with excessive development of the second, which ends below in a trochlear extremity for articulation with a digit\*.
303. The right and left third metacarpal bones of the same Horse, with a supernumerary second metacarpal of large size, having an inferior trochlear surface for a digit attached to each. An internal splint-bone, however, existed as usual, a fact which can readily be made out from the

\* A similar case of development of a splint-bone in the manus is figured and described by Wood-Mason in the *Proc. Asiat. Soc. Bengal*, 1871, p. 24.



articular surfaces and general form of the bone, although it has been unfortunately lost.

304. The skeleton of the right manus of a Horse, with an additional largely developed digit intercalated between the inner splint-bone and middle toe. The second row of carpal bones is fortunately preserved, and exhibits an additional bone, probably an os magnum. A great deal of irregularly ossified tissue surrounds both digits. The horse was shod on both toes. *Presented by Lawson Tait, Esq., 1872.*

305. The skeleton of the right manus and pes of a half-grown Cat. The manus possesses seven digits; there are also two trapezoid bones in the carpus, and the proximal extremity of the metacarpal bone of an eighth digit is apparent. The pes has five digits.

In the manus the digits are arranged in the following order, beginning from the inner side of the hand:—A preternaturally slender thumb and a second digit (index), having its ungual and median phalanges like those of a left digit, are articulated with the trapezium and inner trapezoid respectively; a second thumb, consisting of three phalanges, is attached to the outer side of the index by ligament: a second index with normal *right* characters follows; its metacarpal bone does not reach the second trapezoid but ends in a point above and is joined by ankylosis to the head of a third metacarpal bone so intimately that it appears at first sight to be a portion of that bone; no other portion of an accessory third digit exists; the remaining digits are the normal third, fourth, and fifth. It appears as if the inner side of this manus has been doubled, the accessory toes being reversed and afterwards fused in obliquely behind and inside the normal digits.

In the pes the second digit is supplemented by an additional reversed second digit. The middle cuneiform is also double. The inner cuneiform exists, but the normal rudiment of a hallux is absent.

*Presented by B. T. Lowne, Esq.*

306. The left manus and pes of the same animal, exhibiting the same malformation, dissected to show the muscles.

In the manus a distinct extensor muscle, proprius pollicis, goes to the accessory or inner thumb, and a second similar muscle goes to the phalanges of the accessory index. It has probably been detached from its proper thumb, which is extremely minute and has become united with the finger which bears it. There is a flexor brevis pollicis (?) to the same finger.



The pes has an additional extensor with a single tendon for the supernumerary toe. There is also an additional flexor profundus and a large abducens. It also receives a slip from the superficial flexor.

The cat from which these specimens were taken was one of a litter of five. All had five or six digits on the pes and six or seven on the manus, with one exception, where the hand was normal. The female parent was also the mother of the probable male parent; both had six or seven digits on the pes and manus respectively. The same peculiarity has been noticed in others of the breed. The mother is since said to have produced a perfectly normal litter. These animals were born at Kingswood, near Bath.

*Presented by B. T. Lowne, Esq., 1872.*

307. The pelvis and posterior extremities of a small Monkey with doubling (dichotomy) of the whole inner side of the left limb.

The obturator foramen is double and there are two ischial protuberances. The femur is abnormally thick and has a double trochanter major. There are two tibiæ; the outer one, being very thin, resembles a fibula closely, but an examination of the tarsus at once reveals its true nature. All the bones of the tarsus except the os calcis and astragalus are double. The astragalus is very broad, and exhibits unmistakable marks of partial doubling; it articulates with two scaphoids, and each of these has its three cuneiforms. An additional cuboid is seen between the two sets of cuneiform bones. All the toes are doubled, except the thumb, and occur in the following order, from within outwards,—1st, 2nd, 3rd, 4th, 5th, 2nd, 3rd, 4th, 5th. The median thumb is evidently crowded out, as its cuneiform bone exists. The inner set of cuneiform bones are very much crowded together. All the toes are unmistakably left digits, none are reversed.

*Hunterian.*

308. The right hand of a new-born Infant, with a supernumerary fifth finger springing from the fifth metacarpal bone. The specimen has been dissected to show the arrangement of the tendons. The accessory finger receives the tendon of the extensor minimi digiti, a slip from it going to the normal digit. The accessory finger also receives a slip from the adductor. The infant from which this, together with the two following preparations, was made exhibited several other malformations. See No. 155.

*Presented by R. Partridge, Esq., 1864.*

309. The left hand of the same Infant, dissected. It presents



a very rudimentary accessory fifth finger, attached by ligament only to the metacarpal bone. It has neither tendons nor muscles.

*Presented by R. Partridge, Esq., 1864.*

310. The right foot of the same Infant, with a supernumerary outer toe. The specimen is dissected. The fifth and supernumerary toes are equal in size; both are articulated with a very broad metatarsal bone. The fourth tendon of the flexor longus digitorum splits into two equal parts; one portion is inserted into the accessory toe. The additional toe also receives a distinct slip from the tendon of the peronæus tertius. The other foot was normal.

*Presented by R. Partridge, Esq., 1864.*

311. The bones of a Human thumb with dichotomy of the terminal phalanges. The accessory and normal bones are symmetrically developed, apparently right and left.

*Presented by Dr. Thurnam, 1872.*

312. The skeleton of the left foot of an adult Human female, with a supernumerary fourth toe, resembling that of the right foot, between the outer and fourth digits. The additional toe has a distinct but imperfect metatarsal bone, which is attached to the outer side of the fourth, and wedged between it and the fifth metatarsal bone. There is a cup-shaped cavity at the base of the fifth metatarsal bone, which lodges the base of the accessory bone.

*Presented by Erasmus Wilson, Esq., 1869.*

313. A portion of a Human foot which had six toes. The great toe has been removed. The three outer toes are enclosed in a common integument to their extremities.

*Hunterian.*

## Class II. DUPLICITY.

Arranged in Class I. (see page 71).

## Class III. EXCESS OF GROWTH (HYPERTROPHY).

314. Wax models of two Human hands and a foot, with the index and middle fingers of the hands and the corresponding toes excessively hypertrophied.



## Class IV. ARREST OF GROWTH.

Although arrest of growth and arrest of development affecting the limbs very frequently occur together, and one is either the result or cause of the other, yet there are certain forms of arrest of growth giving rise to great shortening of the limbs, *brachymelia*, which are not accompanied by any obvious arrest of development. In brachymelia the bones are usually exceedingly well ossified, but there is frequently deformity from irregular contraction of the muscles, as well as great hypertrophy of the subcutaneous tissue. Arrested growth is sometimes confined to the digits, and is more frequent in the forearm and leg than in the arm and thigh. When the whole of the lower limbs is affected, the pelvic girdle is also usually of small size. Arrest of the forearm or leg gives rise to considerable modification in the arrangements of the muscles; the flexors and extensors of the digits in these cases usually arise from the shaft of the humerus or femur.

## A. In the Digits.

315. The left hind foot of a Pig in which the third digit is shortened by arrest of growth. It is worthy of remark that in the *Solidungula* this is the only functional digit.

*Hunterian.*

316. The other hind foot of the same animal with more considerable defect of the corresponding toe. *Hunterian.*

317. The left hand of a Human infant at birth with considerable shortening of the fingers. The ungual phalanges and the nails are much smaller than is normal. The thumb is short and thick, but its terminal phalanx is not abnormally defective. The mother had a similar malformation.

*Presented by R. Partridge, Esq., 1868.*

## B. In the Limbs.

*Syn. Nanomelus, Gurlt.*

*Phocomèle, Geoff.*

318. A foetal bitch Puppy with extreme shortening of all four extremities and arrest of growth in the posterior portion of the trunk. *Hunterian.*



319. A Human female foetus with shortening of all four extremities. There is a considerable abnormal deposit of subcutaneous fat. The child was still-born at the eighth month of pregnancy.

*Presented by William Lyon, Esq., 1825.*

320. A female Human foetus with arrest of growth in the pelvic girdle and all four extremities. The left inferior extremity has been dissected. The muscles of the toes and the gastrocnemius arise from the femur immediately below the insertion of the psoas and gluteus maximus. A constriction may be seen around the right thumb, which is obviously in the first stage of so-called intra-uterine amputation.

*Presented by Sir S. Hammick.*

321. The skeleton of a full-time hydrocephalic foetus, with extreme shortening of the limbs. All the bones are well ossified except the sternum; its cartilaginous condition is an indication of arrested development. The shrivelling of the cartilaginous epiphyses has much increased the deformity of this preparation.

*Presented by R. Liston, Esq.*

322. The skeleton of a similar foetus with the great arteries injected and preserved. The urinary bladder is also attached to the pelvis.

## Class V. ARREST OF DEVELOPMENT.

Arrest of development is occasionally uncomplicated, as in *aschistodactylus*, or webbing of the digits. It is more commonly accompanied by atrophy, which is sometimes so complete that no trace of the part remains. So-called intra-uterine amputations apparently always arise from atrophy. Sometimes a single bone is undeveloped, probably from early arrest and atrophy.

### A. Of the Digits.

#### a. *Aschistodactylus*, Gurlt.

*Syn. Syndactylus, Geoff.*

323. The skeleton of the manus of a Pig, with the second phalanges of the functional digits adherent, and their third



phalanges fused into a single bone. This condition probably arises from imperfect differentiation of the digits and persistence of the primitive connecting web in which they are formed. *Presented by Sir W. Blizard.*

324. The other manus of the same animal; the functional digits are included in a single hoof.

*Presented by Sir W. Blizard.*

325. A precisely similar specimen.

*Presented by Sir E. Home, Bart.*

326. A similar specimen in which the digits are included in a single narrow pointed hoof. *Hunterian,*

b. *Perodactylus.*

*Syn. Ectrodactylie, Geoff.*

This condition exhibits arrest accompanied by atrophy.

327. The hands of a full-time Human foetus. The right is prepared as a skeleton. The thumb of the left hand is represented by an imperfect terminal joint only; this adheres to the hand by a narrow pedicle of integument. In the right hand the thumb is entirely wanting, and the fifth digit is adherent to the metacarpal bone of the fourth. The union is ligamentous, and the base of the fifth metacarpal bone has been entirely absorbed. The process of atrophy seen in progress in these digits is precisely similar to that which affects supernumerary digits. In these the phenomenon is observed far more commonly than in the normal parts.

*Presented by R. Partridge, Esq.*

B. Of the Limbs.

a. *Ischnomelia.*

Where the limb is preternaturally slender, some of the bones are frequently absent; the digits are often arrested at an early stage of development. There is usually arrest of other parts accompanying this condition. A patagium very rarely remains in arrested conditions of the limbs. See No. 329\*.

\* See also Gurlt, *Path. Anat. der Haus-Säugethiere*, ii. p. 118, and Theil ii. tab. iv. fig. 5.



328. A foetal Pig, in which the development of the posterior limbs and pelvic girdle has been considerably arrested. The femora are deficient from atrophy, so that the limbs are only attached to the trunk by skin and ligamentous tissue. The abdomen has been opened below to show the extremely diminutive condition of the pelvis and pelvic viscera. The hind legs terminate in blunt points, and each has a very imperfect hoof. *Hunterian.*
329. A foetal Puppy, in which the development of all four limbs has been arrested. The specimen has been much altered by having been dried previously to being placed in spirit, but is of extreme interest, as it exhibits a very rare condition, a patagium extending from the flank to the elbow on either side. *Mus. Brit.*
330. The skeleton of a Human foetus, at about the sixth month of gestation, with the radii and thumbs wanting. The head is slightly hydrocephalic. All the bones are abnormally slender, especially the clavicles, which are considerably bent. The ossification of the sternum is very irregular and imperfect, as is also that of the pubic symphysis. *Presented by Erasmus Wilson, Esq., 1869.*
331. The skeleton of a Human seven-months' foetus, with total deficiency of the right arm. The scapula and clavicle are, however, present. The left arm is represented by a cartilaginous humerus, a slender ulnar, and a single digit, which consists of a metacarpal bone and three phalanges united by cartilage and ligament. *Presented by Sir W. Blizard, 1811.*
332. A Human male foetus, 7 inches in length, about the fifth month of gestation, with the left arm arrested and atrophied. The arm consists entirely of soft tissues, and has a three-lobed extremity; one of the lobes terminates in a slender thread-like process. The remains of the limb are attached to the glenoid cavity by connective tissue. The great pectoral muscle ends in the connective tissue of the limb. A portion of the integument has been removed to show the conditions described above. *Mus. Brookes.*



b. *Peromelia*, Gurlt.*Syn.* *Perochirus* and *Achirus*, *Gurlt.**Hémimèle* and *Ectromèle*, *Geoff.*

When the development of a limb, or a portion of a limb, is arrested and the arrested portion undergoes atrophy a stump is frequently left like that of an amputated limb. The process is apparently the same as that which is seen in a less complete stage in No. 309, 327, and 328. The remains of the atrophied limb are usually apparent as a papilla upon the stump, showing that the ordinary view, that such conditions arise from intra-uterine amputation, is fallacious. Those who suppose the amputation to arise from ligature by the umbilical cord seem to forget that the cord is a growing structure, and that it is so frequently wound around the neck and body that amputations, not only of the limbs but of the head, would be frequent, and slighter effects of such constriction would occur in numerous cases. No definite line can be drawn between the conditions classed under the terms *ischnomelia*, *peromelia*, and *amelia*. Transitional conditions are of frequent occurrence.

333. A Human female foetus, about the fifth month of gestation.

The left leg is deficient from the knee. It presents the appearance of the stump of an amputation. There is also defective development of the face and left anterior extremity. The left hand at first sight appears to have but three digits, but on closer inspection two of these are seen to be double. The manner in which these fingers are flexed and adhere together throws considerable light upon the condition exhibited by Nos. 352 and 353.

334. The right leg of a foetus, of which the other three extremities exhibit the condition known as intra-uterine amputation (see Nos. 335, 336, 337). Only a single toe is developed. The tibia is represented by a large mass of cartilage, and a small cartilaginous nodule represents the bones of the foot. The leg is much shortened and bent. A section has been made to show the cartilages.

Arrest of differentiation of the same kind, affecting only a portion of a segment in the limb, would give rise to fusion of the upper part of the bones in the forearm or leg, either above or below. A very interesting specimen of fusion of the upper part of the radius



and ulnar of both arms in an adult is preserved in the museum of St. Thomas's Hospital.

335. The right arm of the same fœtus. The limb terminates just below the elbow in a stump like that of an amputation.

The arm has been divided vertically to show the condition of the internal parts. The humerus is perfect and articulates with a piece of cartilage, which represents the upper extremity of the ulna. The direction of this rudimentary olecranon is such that the forearm, if developed, would be flexed at right angles to the arm. The triceps and brachialis anticus are both seen in section. The skin is stretched tightly over this olecranal cartilage, but it forms a tubercle at its anterior extremity, an exceedingly rudimentary representative of the forearm and hand.

336. The left arm of the same fœtus, in which the upper arm ends in a conical stump at the junction of the middle and lower thirds of the humerus. A longitudinal section has been made through it, to show the rounded termination of the humerus and its relation to the integument. A minute cutaneous knot represents the more anterior parts of the limb.

337. The left inferior extremity of the same fœtus. All the parts below the condyles of the femur are represented by a minute tubercle only on the outer side of a rounded stump; and this is formed by the skin, which is stretched tightly over the inferior articular extremity of the femur. The limb has been divided vertically.

338. A Human full-time fœtus, with the inferior extremities represented by button-shaped processes, and the position of the superior extremities indicated by minute depressions only. The left inferior extremity has been dissected; it is seen to consist of ligamentous tissue, into which numerous irregular muscles arising from the pelvis are inserted. The testes are abdominal, and there is an excessive development of subcutaneous fat.

*Presented by C. J. White, Esq., 1870.*

*c. Micromelia.*

This term has been applied to minute undeveloped limbs. Examples are exceedingly rare.



339. A portion of the left hip of a Wild Boar, with a small process representing the left posterior extremity. The following particulars are extracted from Hunter's Manuscript 'Cases and Dissections,' vol. iii. p. 70:—The animal had no kidney on the side, the left testicle had not descended, its epididymis, vas deferens, and vesiculum, as well as the gubernaculum, were entirely absent. The gland itself was rudimentary. The right testicle was normal and situated in the scrotum. *Hunterian.*

d. *Amelia.*

Where the limbs are totally deficient. In such cases it is impossible to determine whether the condition arises from primitive deficiency of the limb, or from subsequent arrest followed by atrophy.

340. A Frog with entire deficiency of the right anterior extremity. A portion of the integument has been removed to show the complete absence of all traces of a limb.

*Hunterian.*

341. A Chick, with total deficiency of the right inferior extremity. The inner toe of the left foot is double.

*Hunterian.*

342. A foetal bitch Puppy, with total deficiency of the anterior extremities. There is slight arrest of development of the face.

*Mus. Brit.*

## Class VI. MALFORMATIONS FROM DISEASE.

### A. Distortion from irregular muscular contraction.

The malformations included in this division are probably due to some form of cerebro-spinal irritation or defect. They frequently accompany other abnormal conditions.

#### a. *Talipes.*

Talipes varus, valgus, calcaneus, calcaneo-varus and -valgus occur as congenital conditions. The question of their origin from irregular muscular contraction is still an open one; but the arguments in favour of this view are exceedingly strong. The



subject is discussed at length in Mr. W. Adams's Jacksonian Prize Essay on Club-foot, chapter xii. p. 195.

343. The right leg and foot of a Human infant at birth, with talipes varus, dissected to show the muscles.

*Presented by W. Adams, Esq., 1864.*

344. A similar preparation.

*Presented by W. Adams, Esq., 1864.*

345. A similar preparation.

*Presented by W. Adams, Esq., 1864.*

- 345 a. Two Human foetal left astragali. The upper specimen is deformed, and was taken from the foot of a new-born infant with talipes varus. The other specimen is normal.

*Presented by W. Adams, Esq., 1864.*

- 345 b. The tendo Achillis, tibialis posticus, flexor longus, and tibialis anticus tendons of a Child, a year old, that had been operated on successfully for club-foot at six weeks.

The line of junction between the old and new tendon could only be traced with difficulty, especially in the tibialis anticus and posticus tendons. In the former there seemed to be about half an inch, and in the latter three eighths of an inch of new tendon. In the tendo Achillis rather more than half an inch of new tendon could be recognized. The flexor longus does not appear to have been divided.

*Presented by W. Adams, Esq., 1864.*

346. The right leg and foot of an adult Human subject, with extreme talipes varus, injected and dissected to show the muscles, vessels, and nerves. The contracted condition of the plantar fascia is well seen.

347. The right leg and foot of a Human adult with congenital talipes varus, dissected.

*Presented by R. Partridge, Esq., 1866.*

348. The left leg and foot of the same subject, dissected, to show the bones and ligaments.

*Presented by R. Partridge, Esq., 1866.*

349. The right leg and foot of a Woman, aged 30, with talipes varus, dissected and dried.

This specimen is minutely described in Mr. W. Adams's Prize Essay, p. 163. It is of extreme interest, because there is no doubt about its having been congenital in its origin.

The oblique position of the os calcis, the vertical deviation of the



astragalus, the lateral position of the navicular bone in respect to the astragalus, the displacement inwards and backwards of the cuboid bone, and the angle of flexion of the anterior portion of the foot from the transverse tarsal joint are well exhibited.

*Presented by W. Adams, Esq., 1864.*

*b. Congenital distortions of bones by curvature.*

350. The skeleton of the hind leg of a Rabbit, in which the femur is much shortened and curved. During life the animal was unable to use the limb; it was turned up over its back.

*Presented by B. T. Lowne, Esq., 1871.*

351. The bones of the arms of a Human subject, with extreme contortion of the radius and ulna in both limbs. The carpal extremity of the right ulna is dislocated.

*c. Congenital dislocation.*

352. The phalanges of a distorted Human hand, dislocated and adherent to each other, probably by abnormal muscular contractions at an early period. The specimen is imperfect.

*Hunterian.*

353. Two of the metacarpal bones and some of the phalanges of a similar distorted hand. The specimen is imperfect.

*Hunterian.*

## SERIES IV.

### ABNORMAL CONDITIONS OF THE SKIN AND ITS APPENDAGES.

The specimens classed under this Series are probably all due to variation or congenital diseases. As there are but few of them, and nothing is known of their nature, they have not been further subdivided.

354. A Fowl which is almost entirely without feathers. It came from the egg in this condition and lived seven months.

*Purchased.*

355. A full-grown Mouse without hair on its skin from birth. The vibrissæ and scales on the tail are normal, and the



integument is considerably wrinkled as if from hypertrophy\*.

*Presented by W. Clift, Esq., 1820.*

356. A similar hairless Rat, killed with a similar Rat in a barn near Colchester, Feb. 1, 1872.

*Presented by Dr. Bree, 1872.*

357. The feet of a Golden Poland Cock, five years old, with two spurs, one of very large size, on each foot.

*Presented by T. B. Curling, Esq., 1872.*

358. A large horn which grew from the groin of a Ram.

*Hunterian.*

359. The core of the same.

*Hunterian.*

360. The head of a Cow with a very large horn-like appendage growing from the forehead immediately between the eyes.

*Hunterian.*

361. A portion of the core of the same hollowed into numerous cysts.

*Hunterian.*

362. Another portion of the same.

*Hunterian.*

363. Another portion of the same.

*Hunterian.*

## SERIES V.

### ABNORMAL CONDITIONS OF THE OSSEOUS AND MUSCULAR SYSTEMS.

This Class is intended to include all variations from the ordinary type in the disposition and arrangement of muscles and of individual bones.

#### A. Of the Sternum and Ribs.

364. The sternum and rib-cartilages of a Human adult, in which the cartilages of the eighth ribs are united directly with the sternum, and those of the first and second, on the left side, are fused together.

*Hunterian.*

365. The cleft sternal extremity of a Human rib.

366. Two of the left lower ribs of a Human subject, with dichotomy of their anterior extremities, probably from the same subject as No. 367.

\* A similar condition is described by J. S. Gaskoin as a zoological variety, Zool. Soc. Proc. 1856, p. 38.



367. The first and second right ribs, probably from the same subject, united by bone throughout the greater part of their length.

368. Two specimens of united ribs from a Human subject, one from the right and the other from the left side.

*Presented by F. Kiernan, Esq., 1872.*

369. Two similar specimens from a Sheep.

## SERIES VI.

### ABNORMAL CONDITIONS OF THE SENSORY ORGANS.

#### A. Of the Eye.

370. The head of a large Carp, with entire deficiency of the eye on the left side. *Hunterian.*

371. A Chick at about the tenth day of incubation, in which the left eye has suffered arrest at a very early period. The right eye is abnormally large, and the upper beak deviates to the left, so that it crosses the lower one.

*Presented by B. T. Lowne, Esq., 1872.*

372. A Chick about the beginning of the third week, similarly malformed.

373. The right eye of a Sheep, with a dark brown tumour from which a lock of wool has grown on the outer edge of the cornea.

*Presented by J. C. Chaylor, Esq., 1870.*

## SERIES VII.

### ABNORMAL CONDITIONS OF THE HEART AND VESSELS.

#### Class I. VARIATION.

##### a. *Abnormal arrangement of the vessels.*

374. The thorax of a Human foetus laid open in front, with the arteries injected. The two carotids are given off from a common trunk in the situation of the innominate artery. The left subclavian arises separately, and the right springs



from the posterior part of the arch of the aorta, and passes behind the œsophagus to its destination.

*From the Museum of Sir A. Cooper, Bart.*

375. A portion of the arch of a Human aorta. The vertebral arteries are given off between the innominate and left carotid arteries. The right vertebral is considerably larger than the left.

b. *Situs Mutatus.*

376. A large Human heart with all its parts reversed; there was also reversion of all the viscera. The systemic auricle and ventricle are enormously enlarged and hypertrophied. The coronary sinus is largely dilated and receives two large veins. There is no evidence that the hypertrophy and dilatation are due to the malformation. These changes are the results of disease. The spleen in this case was divided into nine separate glands (see No. 390). The specimen is described and figured in the Path. Soc. Trans. vol. xx. p. 93, pl. v.

*Presented by Dr. Hickman, 1871.*

c. *In the number of arterial valves.*

Sometimes two or four valves exist at the mouth of the aorta or pulmonary artery. With our present knowledge it is perhaps best to consider these deviations as variations. There is no evidence of dichotomy in cases of supernumerary valves. The condition is not very rare.

d. *Division of the cavity of a ventricle by an adventitious septum.*

This condition is perhaps a very near approach to excess of development. In the following preparation, however, it is apparently due to a variation in the development and position of the columnæ carnæ.

377. An adult Human heart with a strong muscular septum dividing the apex of the right ventricle into two cavities. The septum terminates in a concave margin between the pulmonary artery and the tricuspid valve; it apparently consists of united columnæ carnæ. It is perforated by numerous small openings, between the muscular bundles of which it is composed.

*Hunterian.*



## Class V. ARREST OF DEVELOPMENT\*.

a. *Arrested closure of the ductus arteriosus.*

378. The heart of a male Infant, which died with symptoms of cyanosis five days after birth. The ductus arteriosus is quite patent. The foramen ovale remains as a slight opening. The heart is abnormally large and weighed  $1\frac{1}{4}$  oz. *Presented by Dr. Thurnam.*

b. *Of the foramen ovale.*

379. The heart of a Child three years old, with a large valvular opening in the fossa ovalis. A quill is passed through the opening. *Presented by Sir W. Blizard, 1811.*
380. The heart of an Adult with a valvular opening in the fossa ovalis. A glass rod has been passed through the opening. *Presented by Sir W. Blizard, 1811.*
381. A similar preparation. *Presented by Sir W. Blizard.*
382. The auricular septum of an adult Human heart, with a similar opening in the fossa ovalis. *Hunterian.*
383. The auricular septum of an Adult of sixty years of age, with a double valvular opening in the fossa ovalis. *Hunterian.*

c. *Of the ventricular septum.*

384. The heart of a lad of thirteen, with both ventricles laid open. The septum is deficient above, so that a semilunar opening exists between them. *Mus. Heaviside.*
385. An adult Human heart, with a similar semilunar opening in the upper part of the ventricular septum, protected by a pouch-like valve of endocardium. The upper edge of this valve is strengthened by a thickened margin, above which there is a semilunar opening between the ventricles. The pouch projects considerably into the right ventricle; it is perforated by several small openings. The outer flap of the tricuspid valve is converted into a similar pouch, which probably covered the septal pouch during the ventricular systole, and partially closed the abnormal opening. *Purchased.*

\* The other Classes do not occur in this Series.



386. A small Human heart, with a semilunar opening at the upper part of the ventricular septum. The pulmonary artery has not half its normal calibre. The left auricle and the left auricular ventricular opening are much contracted. The mitral valves are very imperfect. The right auricle is enormously dilated, its walls being entirely membranous in places.

The condition of the pulmonary artery and the dilated right auricle point to an imperfect condition of the lungs, with corresponding venous congestion. Unfortunately no history has been preserved.

387. A Human foetal heart, with the position of its great vessels reversed (*situs mutatus*). There is no trace of a ventricular septum. There is but one auriculo-ventricular opening, with five valves around its margin. There is one large auricle with a small pouch on its right side; this pouch has an auricular appendix, and obviously represents the systemic auricle. The larger *left* auricle is pulmonary; but it also receives the superior and inferior cava.

d. *Of an artery (stenosis).*

Is usually accompanied by other abnormal conditions. See No. 386, where there is partial stenosis of the pulmonary artery.

e. *Premature closure of the ductus arteriosus or foramen ovale.*

This sometimes occurs. It may either be looked upon, like stenosis of the arteries, as a form of arrest, or it may result from disease or from some other malformation.

f. *Of a valve.*

Occasionally one of the flaps of the arterial or auriculo-ventricular valve is arrested and remains rudimentary. This condition is usually accompanied by disease of the valves, warty growths on the endocardium, or even pericarditis. It is probably the result of congenital disease.

388. A portion of the heart of a Boy ten years of age with two of the aortic valve-flaps united into a single flap. The



valves are thickened. There are several wart-like fibrinous growths on the endocardium, and the remains of numerous old pericardial adhesions are apparent.

*Hunterian.*

*g. Deficiency of the pericardium.*

Is a very rare form of malformation, which would probably find a place in this Class.

## SERIES VIII.

### ABNORMAL CONDITIONS OF BLOOD-GLANDS.

#### A. Of the Spleen.

The Human spleen normally exhibits a tendency to become lobulated; occasionally the lobules are separated and form accessory spleens, and in some cases numerous small separate glands occur in the place of a single spleen; division of the spleen is probably a mere variety.

389. A Human spleen with a small detached lobule on its under surface. *Hunterian.*

390. Seven, out of nine, small spleens from the same subject as the malformed heart, No. 376. The case exhibited complete transposition of the viscera; it is described in the Path. Soc. Trans. vol. xx. p. 93.

*Presented by Dr. Hickman.*

## SERIES IX.

### ABNORMAL CONDITIONS OF THE DIGESTIVE ORGANS.

#### A. Of the Teeth.

391. Three specimens of Human incisor teeth adherent in pairs. The lower specimens are the upper and lower milk



median incisors; the upper specimen apparently consists of the two median upper incisors intimately united. They are probably all from the same subject.

*Presented by J. Swan, Esq., 1838.*

392. A Human second molar tooth with an inverted tooth wedged in between its fangs. (The inverted tooth is probably the wisdom-tooth, which has been developed on the ascending ramus of the mandible, and which has grown downwards, displacing the fangs of the second molar with its crown and becoming impacted between them.)
399. The double tusk of an Elephant.

#### B. Of the Alimentary Canal.

#### Class V. ARREST OF DEVELOPMENT\*.

##### a. *Of the pharynx and œsophagus.*

The pharynx may terminate in a blind pouch, which is either entirely separated from the œsophagus or connected with it by a fibrous or muscular cord only; in such cases the œsophagus often opens into the trachea, near its bifurcation.

394. The tongue, pharynx, trachea, and œsophagus of a Human foetus, with a small portion of the diaphragm and stomach. The œsophagus opens into the trachea just above its bifurcation; it is not connected with the pharynx. The trachea has been opened in front, and a green glass rod has been inserted into the œsophagus.
395. A similar preparation from a new-born Child, in which the lungs and stomach are also preserved. The œsophagus is united with the pharynx by a muscular band.

*Presented by Dr. Ayres.*

396. A similar preparation from a Human foetus; the lungs are abnormal in form, and have not been inflated with air.

##### b. *Atresia of the rectum.*

*Syn. Atreto cormus, Gurlt.*

One of the most frequent malformations which come under

\* The other Classes have not occurred in this Series.



the notice of the surgeon is atresia ani, or arrest of development of the lower extremity of the rectum.

397. A portion of the rectum of a Child born with an imperforate anus. It has been considerably distended by the meconium. *Presented by Sir W. Blizard.*

398. A similar preparation. *Presented by Sir W. Blizard.*

399. The rectum of a female Child nearly two months old born with an imperforate anus, for which no operation was performed; it is much distended, and its muscular coats are hypertrophied. The following note is extracted from Hunter's Manuscript 'Cases and Dissections:—“Upon examination of the body the large intestines were found very much enlarged and distended, particularly towards the rectum. The jejunum and ileum were slightly inflamed; the viscera in other respects appeared natural. The colon and rectum contained fluid fæces.”

*Hunterian.*

400. The rectum of a Child with imperforate anus; the last inch of the bowel is represented by a fibrous cord only; it is much distended above, and its coats are thickened.

401. The rectum of a female Child which was born with imperforate anus, in which the operation was performed; death took place a few hours after. *Hunterian.*

402. The rectum of a female Child born with an imperforate anus. The operation was performed more than a month before death. *Presented by A. C. Hutchison, Esq., 1828.*

403. The rectum of a male Child upon whom the operation for imperforate anus was performed with some success. In this instance the trochar had to be introduced three inches before it reached the intestine. The child survived more than ten months. The parts around the artificial opening are much contracted by the action of the spirit in which it is preserved, so that its length is reduced to little more than an inch. The child suffered much from constipation, sometimes for three weeks at a time, and also from a small fistulous opening between the intestine and the urethra; the urine first became tinged with fæces at the end of three months. The intestine above the structure is greatly dilated and hypertrophied.

*Presented by A. C. Hutchison, Esq., 1823.*



404. A portion of the rectum of a female Child with a complete septum nearly four inches from the anus. This preparation had been dried before it was put into spirit.

*Presented by T. B. Curling, Esq., 1871.*

405. The imperforate rectum of a foetal Pig. *Hunterian.*

406. A vertical section of the pelvis of a male foetal Pig, showing the viscera *in situ*. The rectum terminates in a blind pouch; there is no anus. *Hunterian.*

407. A similar preparation from a female foetal Pig, in which the vagina is also imperforate, and the uterus is largely dilated with fluid. *Hunterian.*

## SERIES X.

### ABNORMAL CONDITIONS OF THE URINARY AND GENERATIVE ORGANS.

#### Class II. DUPLICITY\*.

##### Subclass I. *Dichotomy.*

Dichotomy affecting the kidney to a greater or less extent occurs comparatively frequently. In the slightest forms the gland only exhibits indications of doubling, which extend in the more marked forms to the pelvis and then to the ureter. Sometimes there are two pelves and ureters. The most marked condition of dichotomy exhibits two distinct ureters opening separately into the bladder; the kidney has then the appearance of two kidneys fused together. The opposite sides of the body are commonly affected symmetrically, and sometimes the double kidneys of opposite sides extend across the mesial line, and are fused together by their lower edges.

##### a. *Of the kidney and ureter.*

408. A small injected, double Human kidney with a double pelvis and ureter; the ureter becomes single about three inches from the gland. *Presented by Sir W. Blizard.*

\* No specimens of the first, third, and fourth Classes have occurred in this Series.



409. The fellow kidney to the last. The ureters are united closer to the gland than in the preceding preparation.

*Presented by Sir W. Blizard.*

410. A double Human kidney and a portion of the urinary bladder. There are four ureters, two to each kidney. The left kidney has not been preserved.

411. A section of a very large Human kidney. The pelvis and ureter are double ; they are injected. *Hunterian.*

412. A section of a similar kidney. *Hunterian.*

413. The lower part of a Human urinary bladder with four perfectly distinct ureters. The orifices of the ureters and seminal ducts are marked by bristles. *Mus. Heaviside.*

414. A similar preparation from the same subject as Nos. 411 and 412. *Hunterian.*

415. A similar preparation, in which only one lateral half of the bladder has been preserved. *Hunterian.*

416. A pair of kidneys from a Human adult, with partial doubling of both glands and of their pelves. The glands are united by their lower margins. A portion of the aorta is preserved, and a second set of renal arteries are seen about  $2\frac{1}{2}$  inches below the normal vessels.

417. The kidneys of an adult Human subject with partial doubling of both glands, including their pelves. The lower edges of the glands have coalesced across the mesial line.

418. The lower half of the trunk of a Human foetus with large partially double kidneys united by their lower edges across the mesial line. There is an additional renal artery on the right side only.

*Presented by Sir W. Blizard.*

## Class V. ARREST OF DEVELOPMENT.

### A. Of the Kidney.

419. The kidneys of an encephalous full-time (?) foetus slightly arrested in their development. The lobuli are somewhat more distinct than in the normal kidneys of a seven months' foetus.



## B. Of the anterior Abdominal wall and Bladder.

Where there is arrested closure of the abdominal parietes below the umbilicus, and the deficient space is occupied by the urinary bladder. When closure is almost complete, *epispadias* results: in the more severe forms of this malformation the anterior wall of the bladder is absent, and the posterior portion of that viscus forms a part of the abdominal wall, and projects as a soft rounded tumour, upon the surface of which the ureters open. The symphysis pubis is either deficient or ligamentous, and the penis usually consists of little more than a glans.

a. *Epispadias*.

420. The bladder and generative organs of a Man, aged 22' with extreme epispadias; the bladder is of small size, and opens by an infundibuliform passage above the root of the penis. The penis is shorter than is normal; it consists of a pair of cavernous bodies surmounted by a rudimentary glans; its upper surface is grooved and covered with mucous membrane. The symphysis pubis is imperfect and ligamentous.

*Presented by R. Partridge, Esq., 1865.*

b. *Ectopia vesicæ*.

421. The lower part of the trunk of a Human foetus at about the sixth month of gestation, with complete ectopia of the bladder, so that its posterior wall forms a soft rounded tumour, extending from the umbilicus to the root of the penis, which is rudimentary. The ureters open immediately above the root of the penis; their orifices are marked by bristles. The mother was a negress, aged 16 years. The foetus was one of twin birth and was still-born.

*Presented by Dr. R. Sweeting, 1869.*

422. The lower part of the trunk of a small Human foetus with complete ectopia of the bladder. The penis is represented by a slight rounded eminence, apparently the glans, with a fold of skin beneath it united to it by a well-marked frenum. There is a slight vertical line immediately above the glans, on each side of which are the openings of the prostatic and seminal ducts. The ureters are marked by bristles. The scrotum is well formed;



but the testes have not descended. One kidney is preserved; it is much lobulated from arrest of development.

*Presented by L. J. Beale, Esq., 1829.*

423. The lower part of the trunk of a Human foetus at about the sixth month of gestation, with complete ectopia of the bladder. The penis is similar to that of the last preparation. The kidneys and ureters are preserved; they are much atrophied. The orifices of the latter are marked by bristles.

424. A Human female pelvis from an adult, aged 39 years. The pubic bones are separated from each other to the extent of five inches, and the interval is occupied by a ligamentous band. The woman from which this pelvis was taken was the subject of complete ectopia of the bladder (see next preparation). The pelvis has evidently been much modified by the manner in which the weight of the body is thrown upon the sacrum, the pubic bones being reduced by atrophy and their symphysis widely separated.

*Presented by C. Mayo, Esq.*

425. A plaster cast of the bladder and external generative organs of the same individual.

This cast is in the cast-room.

*Presented by C. Mayo, Esq.*

### C. Of the Urino-generative Tract.

The conditions commonly known as hermaphroditism are chiefly dependent on various forms of arrested development of the urino-generative tract. Those which affect the male are classified in the following pages under the terms *hypospadias* and *androgyny*, and those which affect the female under the term *gynandry*.

Hypospadias is the slightest form of arrest in the urino-generative tract in the male, but no definite line can be drawn anywhere between the slightest degree of hypospadias and the most highly abnormal form of androgyny; a series of perfectly transitional malformations exist between these extremes. Simple hypospadias consists in the defective closure of the anterior part of the urethral canal below, so that the urethra opens at a distance from the extremity of the penis, although it is continued as an open groove to its normal termination. In those animals



in which the penis is contained in a sheath the abdominal integument is united to the penis along the edges of this groove, and the usual retractor muscles are absent. In the most marked forms the scrotum is completely divided into two lateral organs, which in the human subject exactly simulate the labia of the female. The urethra opens at the base of the penis between the lateral halves of the scrotum.

In Androgyny the penis is very rudimentary or absent, and the scrotum is cleft. The urethra and sexual orifice are distinct in the human subject; but in animals this is not usually the case. The sinus pocularis, or male homologue of the uterus, is largely developed and generally has two more or less developed cornua. The vasa deferentia are commonly impervious throughout a considerable portion of their length. The testes are abdominal or lie in the inguinal canal; they are usually much atrophied, and probably never exhibit their normal structure. The subjects of this malformation so closely resemble the female externally that it is impossible to determine the sex without dissection. Many forms of gynandrous females resemble normal males far more closely than even slightly androgynous males do.

In most animals the penis is present, but permanently retracted in lateral sigmoid curves, and remains very diminutive; it is usually entirely concealed in a fold of integument, and strongly resembles a clitoris. In Bulls, where the bulb of the urethra is normally a capacious pouch, it forms the termination of the urino-generative tract, and closely resembles the vagina of the female. Such animals are called "Free Martins" when, as is usually the case, they are twins with perfect males; they frequently have well-developed teats and much larger mammary glands than are normal in the male. The urethral bulb terminates in a solid sexual cord of enormous dimensions; this cord is always surmounted by a pair of cornua; sometimes it is perforated by the Müllerian ducts, which run through its entire length and terminate blindly in the cornua. It will be remembered that the Müllerian ducts normally disappear in the male at an early period, but that they persist in the female and form the uterus and Fallopian tubes. This structure is therefore the homologue of the female uterus largely developed.



The whole structure of the generative organs of these "Free Martins" is such that, even after dissection, Hunter believed them to be Cows with testes instead of ovaries †. This is not the case; but cysts (cysts of Morgagni) frequently occur in the peritoneal fold which embraces the upper extremity of the cornua of the hypertrophied Müllerian ducts, and the epididymis is sometimes separated from the extremely atrophied testis, giving rise to this appearance. The occurrence of these imperfect twin males has given rise to the belief that all female cattle born as twins with males are imperfect: this, however, is not so, as a perfect female is sometimes produced with a male at a birth. There is not, however, any evidence of the existence of androgynous Bulls which are not "Free Martins;" but attention has probably not been paid to this subject.

Gynandry includes those cases in which the female organs appear like those of the male; it frequently occurs in the human female, and the extent of the malformation is considerably less than in Androgyny. The vagina almost always remains as a narrow canal; but the uterus is commonly well developed. The clitoris attains a very large size and strongly resembles the male penis. In infants it is impossible to distinguish between a hypospadiac male in which the malformation is extreme and a gynandrous female without examining the internal organs. Atresia of the anus sometimes accompanies this malformation, and occasionally the rectum opens into the urino-genital sac, giving rise to a cloaca.

\* *In the Human subject* ‡.

a. *Hypospadias*.

426. A lateral section of a pelvis of a Human male six months' foetus with extreme hypospadias. The urethra opens at the root of the penis; it is marked by a bristle. The scrotum is deeply cleft; the left testis is seen in the in-

† See 'The Works of John Hunter,' by J. F. Palmer, vol. iv. p. 34; and Hunter's 'Animal Economy.'

‡ In this Series the malformations of the Human subject have been placed first because they are more readily comprehended by the student, and throw much light on similar conditions in animals.



guinal canal; the right gland is entirely within the internal abdominal ring, and lies in the right iliac fossa.

b. *Androgyny.*

*Syn.* Pseudo-hermaphroditus, *Gurlt.*

Androgynus, *Gurlt.*

Hermaphrodismes masculins, *Geoff.*

Hermaphrodismes neutres, *Geoff.*

427. The lower portion of the trunk of a male child in which the external generative organs so closely resemble those of a female that the child was called "Ellen." The scrotum is very large, completely divided into two halves, so that it forms two labium-like folds of skin; these are thickened by hypertrophied connective and adipose tissue. The penis is absent; but a fold of skin strongly resembling the nymphæ and clitoris exists in its place: it is probably the prepuce. The urethra and sinus pocularis open by distinct orifices between the lobes of the scrotum. A blue glass rod marks the orifice of the sinus. The urethra is laid open laterally, as is also the lower part of the sinus. The upper part of the sinus is surrounded by prostatic tissue, and it terminates in a pair of cornua, to which the vasa deferentia are attached; these are probably impervious. The testes are abdominal. The bladder and one kidney have been preserved.

*Presented by R. Partridge, Esq., 1865.*

c. *Gynandry.*

*Syn.* Hermaphrodismes feminines, *Geoff.*

428. The external and internal generative organs of a Human female fœtus. The clitoris is greatly enlarged, and the opening of the vagina is reduced to the diameter of the urethra for more than an inch from its outlet; beyond the neck of the bladder it dilates to its normal size. The uterus and ovaries are normal. The posterior wall of the vagina has been laid open, and a bristle marks the orifice externally.

429. The generative organs of a Human female infant. The clitoris is very large; a fold of skin above it represents



the prepuce. The labia are close together below the urethra-like external generative opening: they resemble a scrotum. Externally this fœtus could not have been distinguished from a hypospadiac male. The inch and a half of the genital tract common to the vagina and urethra is very narrow. Above the neck of the bladder the vagina is normal; it has been laid open to show the os and cervix uteri. The Fallopian tubes and ovaries are normal. The left round ligament has been preserved; it ends in the cellular tissue of the labium.

430. The external organs of generation of a Human female infant. The vaginal opening is contracted as in the last two preparations. There is a very large clitoris almost embraced by the labia and nymphæ, the latter forming a prepuce above the clitoris.

There appears to have been an imperforate anus accompanying the malformation, for which an operation has been performed; this is not, however, recorded.

*Hunterian.*

**\*\* In Animals.**

**a. Hypospadias.**

431. The generative organs of a male Sheep with extreme hypospadias. The urethra opens immediately in front of the anus; but a groove passes forward from this point to the extremity of the penis. The glans penis is small, but is situated in the normal position. The retractor muscles of the penis are absent, and the abdominal integument is united with the edges of the groove on the under side of the penis, as far forward as the glans. The scrotum is cleft into two distinct sacs; these are filled with hypertrophied connective tissue. The testes are abdominal. The vesiculæ seminales and vasa deferentia open into the urethra.

*Hunterian.*

432. A similar preparation. The upper part of the bladder, vasa deferentia, and all the parts beyond have been removed.

*Hunterian.*

433. A longitudinal section of the extremity of the penis of a similar Sheep.

*Hunterian.*



434. The generative organs of a Dog with extreme hypospadias. The scrotum is bifurcated. There is a large hood-like pouch in front of the imperforate penis, and a median furrow in front of the urethra. The urethra opens close to the anus. The testes are contained in the scrotum.

*Hunterian.*

b. *Androgyny.*

435. The generative organs of a small androgynous Dog. The testes are abdominal and atrophied. The vasa deferentia are impervious and like fine threads. The penis is imperforate and very rudimentary. The urinary and sexual outlets are immediately in front of the anus; they are close together, but distinct. The vasa deferentia are united into a single cord, nearly two inches behind the external orifice\*.

*Presented by Sir E. Home, Bart., 1802.*

436. The generative organs of an androgynous Sheep. The penis is imperforate and of small size; it is retracted in lateral sigmoid curves, so that its extremity lies in front of the urethral outlet. The retractor muscles are well developed; the glans is covered by a hood-like sheath. The extremity of the urethra is marked by a blue glass rod. There are four well-marked teats, each with a single gland-duct. The testes are abdominal.

*Hunterian.*

437. The generative organs of a young androgynous Bull. The penis is permanently retracted, so that its extremity lies in a sac-like pouch in front of the anus.

*Hunterian.*

438. The testes of the same animal, imbedded in a mass of subcutaneous fat above four well-formed abdominal teats.

*Hunterian.*

439. A section of the pelvis of an androgynous Calf, showing the generative organs.

There is a narrow urino-genital pouch, about 4 inches in length; it is marked by a blue rod. The urethra, marked by a purple rod, opens into this sinus near its outlet. The upper (anterior) extremity of the sinus ends in two cornua, into which the vasa deferentia open. Two small cysts, probably the remains of the

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\* Described in Phil. Trans. vol. lxxxix. p. 157, tab. iv. figs. 1 & 2.



upper part of the Müllerian ducts, lie near the extremity of the cornua. The left cornu and part of the corresponding vas has been accidentally destroyed. The right testis is seen under the pubic arch: a section has been made through it to show its structure. The left testis is elongated and atrophied considerably. The vas deferens of the right side is impervious throughout a great portion of its length. A clitoris-like fold at the orifice of the sinus encloses a very diminutive folded penis in a small cyst-like cavity.

*Hunterian.*

440. A section of the pelvis of a Sheep, from the West Indies, in which the generative organs closely resemble those in the last preparation, except that the testes are both much elongated and the uterus masculinus (or upper part of the genital pouch) is perforated by two tubes, Müllerian ducts. There are no cysts of Morgagni, or at least they are not apparent\*.

*Hunterian.*

441. The generative organs of a very young Calf, described as a "Palmer's Free Martin." They exhibit a highly androgynous condition. The large urethral bulb is laid open from above to show the orifices of the urethra and sexual ducts.

Just within the orifice of the bulb which forms the external opening, and closely resembling the vagina of the female, a slight depression is seen, and immediately beneath this, in the anterior wall of the bulb, is an exceedingly diminutive penis; it is retracted permanently in sigmoid curves. The neck of the bladder opens into the sinus of the bulb near its upper extremity, and just above it are the openings of the vasa deferentia; the bulb is prolonged slightly above these, and ends in a thick solid cord, the sexual cord of the embryo. This terminates above in two solid cornua, an inch and a half in length; a pair of rudimentary testes are suspended in a peritoneal fold at their extremities. The epididymis is much larger than the gland, and this has given rise to the opinion that both ovaries and testes exist: sections have been made through these parts. The microscope shows that the testes consist of dense fibrous tissue with cells; their character is not that of an ovary, but closely resembles the testes usually found in these cases. The vasa deferentia are incorporated with the sexual cord above, but are well formed below, as are also the vesiculæ seminales†.

*Hunterian.*

\* See Hunter's 'Animal Economy,' p. 60. † Museum Drawings.



442. The generative organs of an androgynous Bull. The animal was described as "Mr. Arbuthnot's Free Martin" \*.

This preparation is essentially similar to the preceding, except that it is much larger, and the genital cord is perforated by Müller's ducts; these have been laid open through their entire length; they are seen to terminate blindly near the extremity of the cornua. The vesiculæ seminales are normal, and the vasa deferentia are developed; they pass up in front of the genital cord for a short distance, and then lie as convoluted tubes along its outer borders, to the extremity of the cornua; they terminate in the epididymis. The testes lie close to the extremity of the cornua; they are very small in proportion to the epididymis, and hence they might easily be mistaken for ovaries. The openings of Cowper's ducts and of the vasa deferentia are marked with purple, and the urethra with a green glass rod.

*Hunterian.*

443. A similar but much larger preparation, from "Mr. Wright's Free Martin," which was five years old †.

In this preparation a portion of the bladder has been removed and the spermatic arteries injected. The orifice of the bladder is marked by a blue glass rod; the openings of the vasa deferentia and Cowper's glands are marked with green rods. The sexual cord in this preparation is quite solid. The testes are situated at the extremity of its cornua; one is seen in section. Hunter said of them:—"I call these bodies testicles, first, because they are twenty times the size of the ovaries of the cow, and nearly the size of the testicles of the bull, or rather those of the 'ridgil,' the bull in which testicles never come down; secondly, the spermatic arteries are similar to those of the bull, especially of the 'ridgil'; thirdly, the cremaster muscle passed up from the rings of the abdominal muscles as it does in the 'ridgil.' Although I call these bodies testes, for the reasons given, yet when cut into they had nothing of the structure of the testicle, not being similar to any thing in nature; they had more the appearance of disease." On microscopic examination they are found to abound in fibrous tissue enclosing cells, with here and there what appear to be seminal tubes.

\* Hunter's 'Animal Economy,' 1st edit. p. 57, pl. i., 2nd edit. p. 71, pl. ix.; and Museum Drawings. The descriptions of plates ix. and x. in the second edition of the 'Animal Economy' are transposed and wrongly numbered.

† Hunter's 'Animal Economy,' 1st edit. p. 59, pl. ii., 2nd edit. pp. 64 & 71, pls. viii. & x.; and Museum Drawings.



Hunter adds: "The animal had four teats, but the glandular part of the udder was small."

*Hunterian.*

444. A similar but much smaller preparation, described as "Mr. Wells's Free Martin"\*.

The vesiculæ and their ducts, as well as the terminal portion of the vasa deferentia, are normal. Cowper's glands are present, and there is a rudimentary penis retracted in sigmoid curves. The sexual cord is solid, as are likewise its cornua. There is only a trace of an epididymis on the left side; but the cornua of the sexual cord ends in a large thick-walled cyst: the vas deferens on this side is deficient in several places. On the right side there is no trace of a vas or epididymis, and a small oval body, more like an ovary than a testis, exists in the place of the testis; it consists of tissue, however, which, on microscopic examination, appears identical with that of which the imperfect testes of these malformations usually consist; there is no reason to regard it as otherwise than an imperfect testicle. There is much fat in the neighbourhood of these rudimentary sexual bodies. The animal from which this preparation was taken was a "Free Martin." The following history is given by Hunter in his 'Animal Œconomy':—"It was between three and four years old, and had never been observed to show any signs of desire for the male, although it went constantly with one. It looked more like a heifer than Free Martins usually do. The teats and udder were small, compared to those of a heifer."

*Hunterian.*

*c. Gynandry.*

445. A section of the pelvis of a Puppy, with a cloaca common to the rectum and urino-generative pouch. The sex is uncertain; but the appearance of the glands is more like that of ovaries than of testes.

There is a large sinus with two cornua beyond the opening of the bladder, but no trace of vas deferens, vesiculæ, or penis. There is no uterus, properly so called, and no vagina. The microscopic structure of the genital glands is more like that of an ovary than of an abnormal androgynous testis. In their immature state and extremely fibrous condition, however, it would be impossible to assert with any degree of certainty that the animal was either a modified male or female.

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\* 'Animal Œconomy,' 2nd edit. p. 64, pl. xi.



d. *Hermaphrodisism.*

*Syn.* Hermaphrodisme bisexuel, *Geoff.*

Although there is no evidence that true hermaphrodisism is an arrest of development, it has been thought advisable, in the absence of all knowledge as to its nature, to place it in the same series as those remarkable conditions known as Androgyny and Gynandry, with which it appears to have some connexion.

True hermaphrodisism is not uncommon as a malformation amongst unisexual Invertebrates. Sometimes one side of the body is male and the other female; this is the usual form amongst insects. Another form of true hermaphrodisism has been frequently observed amongst fish, in which a portion of one or both ovaries is differentiated into a testis. The following preparations are of this kind:—

446. The ovaries and external generative aperture of a Codfish injected. A large piece of convoluted testicle is intimately connected with the wall of the right ovisac, in the middle of its outer margin. It is uncertain whether the seminal ducts in this case open into the ovisac; but in a precisely similar case described by Dr. J. A. Smith\* there were five distinct ducts perforating the ovisac and opening into the cavity of the ovarium.

*Presented by W. Lynn, Esq., 1825.*

447. A similar preparation, in which the posterior end of the left ovary is united with a convoluted mass of testicle almost equalling the ovary in size.

*Presented by Sir A. Carlisle, 1821.*

448. A similar preparation, but not injected, in which a portion of convoluted testicle is attached to the anterior end of the left ovary. The testis is about half as large as the ovary. The right ovisac has been opened to show the tufts of ova.

*Presented by Sir E. Home, Bart., 1802.*

449. The ovaries of a Fish, probably a small Cod, with a very small convoluted mass of testes attached to the anterior extremity of the right ovary.

*Mus. Brit.*

\* Journal of Anatomy and Physiology, 1870, p. 256.



## D. Of the Uterus.

a. *Double uterus.*

The Müllerian ducts in some animals (the Didelphia) remain distinct, in others partially distinct, forming the uterine cornua; or they unite to form the cavity of the uterus, their distinct ends forming the tubes, as in Man. Sometimes in the latter the union either fails partially or entirely, giving rise to a corniculate or double uterus. The vagina is also divided by a septum in extreme cases.

450. The uterus of a Cow, in which there is a partial septum below the cornua. The body of the uterus contains a single cavity, from which the deformed immature foetus No. 261 was taken. There are two cervices and a double os. *Hunterian.*

451. The vagina and internal generative organs of a Human adult female. The vagina is completely divided by a strong muscular septum. The uterus is double, and each lateral half is quite separate from the other; they have been bent over laterally in making the preparation. There is a single tube and ovary to each uterus. The cavity of the vagina and uteri are laid open.

*Presented by T. Wormald, Esq.*

452. The orifice of the vagina of a Human adult female; it is divided by a strong muscular septum, commencing immediately above the urethra. The right nympha forms a free process posteriorly, as if it had been dissected from its attachment.

453. A double Human uterus and vagina. One of the lateral uteri contains a full-time foetus; the other cavity is considerably developed, measuring 4 inches in diameter. The vagina is completely divided by a septum. The bladder, the right side of the vagina, and both uterine cavities are laid open. There is but a single Fallopian tube to each uterus. *Hunterian.*

§ Sometimes one lateral half of the uterus is undeveloped, *uterus unicornis*; sometimes the os or the vagina is occluded. It is uncertain whether such malformations should properly be included in the present Class.



b. *Atresia of the os.*

454. A section of a Human adult female pelvis, with the internal generative organs *in situ*. The uterus is very much enlarged; it is prolapsed, and lies in the curve of the sacrum. The os was occluded, and an operation was performed, but the patient died. The uterus contained a quantity of offensive fluid. The right ovary is diseased and contains large cysts filling the right iliac fossa. There are traces of blood-clot in the peritoneal cavity.

*Presented by T. Wormald, Esq.*

## SERIES XI.

## ABNORMAL CONDITIONS OF THE OVIDUCT AND OVA OF BIRDS.

## A. Of the Oviduct.

455. The sacrum of a young Fowl with the right oviduct persistent. It forms a large thin-walled cyst, which was distended with air. The left oviduct was normal; it has been removed, but its orifice is indicated by a bristle.

*Presented by W. B. Tegetmeier, Esq.*

456. The oviduct and ovary of a small Hen, which during life laid eggs about the size of a Pigeon's, consisting exclusively of albumen, covered by a very perfect shell. One of the eggs is seen in the abdominal opening of the oviduct. The oviduct is so small that it could not grasp and transmit the yolks. The ovary is loaded with well-developed ova. When the abdomen was opened the peritoneal cavity was found to be full of the yellow fluid contents of the yolks, which had escaped. The egg which is now in the open extremity of the oviduct was found in the abdominal cavity; another was situated in the cloaca.

As the egg found in the abdominal cavity had undergone no change, it appears probable that it passed back into the abdominal cavity when the Fowl was killed; it was therefore replaced in the extremity of the oviduct, to show how it must have passed into



the peritoneal cavity. It appears that as each yelk was matured it fell into the abdomen, and was ultimately absorbed, whilst the oviduct poured out albumen and formed a shell, as it would if the yelk had passed into its tube. The Hen, when killed, was apparently perfectly healthy. Specimens of the eggs are preserved in No. 467.

*Purchased, 1871.*

## B. Of the Ova.

### a. *Twin Eggs.*

In these two yelks or two perfect Chicks are enclosed in a single shell. Double-yelked eggs seldom produce two Chicks. Twin Chicks are probably produced from single-yelked eggs. For further remarks on these conditions see page xix.

457. The egg of a domestic Fowl with two yelks. The shell is well formed, and the egg is larger than the normal size. A portion has been cut away to show the interior.

*Hunterian.*

458. A similar specimen.

*Hunterian.*

459. The egg of a domestic Fowl containing one Chick. A twin Chick escaped from the egg; both birds were then alive. The one now in the egg, however, died immediately.

*Presented by W. D. Oliver, Esq.*

460. The egg of a Fowl containing two distinct and perfect Chicks. The alantois and yelk appear to have been single.

### b. *Of the coverings of the yelk.*

Inflammation of the oviduct gives rise to deficiency of the calcareous covering of the egg, and to a fibrinous condition of the albumen. In some cases, from causes at present unknown, the shell-membrane is the seat of calcareous deposit.

461. The shells of three eggs, in which the shell-membrane is the seat of calcareous deposit.

462. The shell of a Hen's egg, in which the small pole of the albumen was prolonged into a short spiral and covered with shell. It is probable that this specimen is due to disease in a minor degree, similar to that which produced the following abnormal eggs.

*Presented by Dr. F. R. Fairbank.*



463. A Hen's egg, invested in a strong fibrous shell-membrane, but without any shell. The albumen is drawn out into a long twisted process at one pole of the egg. A section has been made through the albumen to show its fibrinous condition. *Presented by Sir A. Carlisle, 1818.*
464. A similar specimen, in which both poles of the egg are prolonged. *Presented by W. Clift, Esq., 1811.*
465. Two Hen's eggs without shells, but with a thick shell-membrane, exhibiting small spots of calcareous deposit on the surface, united by a narrow pedicle. *Hunterian.*
466. A similar specimen.  
*Presented by W. B. Tegetmeier, Esq., 1867.*

c. *Pseudo-Eggs, or Eggs without yolks.*

467. Pseudo-eggs laid by the Hen the oviduct and ovaries of which are preserved in preparation No. 456. The eggs consist of normal albumen enclosed in a small but well-formed shell.
468. A small, elongated, curved, pseudo-egg from a Fowl, probably deformed by abnormal contractions of the oviduct.  
*Presented by W. S. Pocklington, Esq., 1860.*
469. The shell of a similar pseudo-egg.
470. The imperfectly calcified egg-shell of a similar egg.
471. Two small pseudo-eggs, formed of concentric masses of fibrinous albumen and united by a long pedicle; they are without shells. Sections have been made through them to show their structure.
472. The egg of a Bantam Hen, with two small masses of albumen, which have descended upon it in succession, covered with shell, and united by calcific deposit to its upper extremity.

d. *Included Eggs or Pseudo-Eggs.*

Sometimes a small egg, or pseudo-egg, remains in the oviduct, or, according to Mr. Tegetmeier, is carried back from the shell-secreting into the albumen-secreting portion of the oviduct, and becomes invested with a second layer of albumen and a second shell; or it is met by and invested in a second ovum; in this



way one egg becomes included in another. Very frequently the included egg is cracked or broken; in such cases impaction is probably the cause of the phenomenon.

473. The shell of a normal Hen's egg, enclosed in a larger very thin shell. The inner shell is cracked, and appears to have been cracked within the oviduct. The space between the outer and inner shells probably contained albumen only, poured out under the irritation of the cracked and impacted egg.

474. A similar specimen.

475. A smaller egg-shell included within a larger one; both shells are perfect. An opening has been made in the outer one. *Presented by Dr. Birch, 1857.*

476. The shell of a Goose's egg, containing that of a second egg; both shells were perfect: the outer shell has been fractured. *Presented by Dr. Leach.*

477. A small well-formed pseudo-egg, which was found within another egg. *Hunterian.*

e. *Fibrinous masses from the Oviduct.*

When an egg is broken or otherwise impacted in the oviduct, it may become surrounded by fibrinous layers, and these often form a mass of very large size.

478. An immense fibrinous mass, containing a broken egg, from the oviduct of a Hen. A section has been made to show the composition of the tumour.

*Presented by W. B. Tegetmeier, Esq., 1871.*

479. A section of a similar fibrinous mass, containing a broken egg. *Presented by W. B. Tegetmeier, Esq., 1871.*



