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ten days, when only about two inches of the rectum could be forced down, and he has since then been able to go about his employment without the slightest inconvenience.

The profession are indebted to the late Dr. Houston, of Dublin, for the introduction of nitric acid in the treatment of vascular tumours of the rectum, many cases of its successful employment being given by him in the twenty-third volume of the *Dublin Journal of Medical Science.*

Since the above case was treated, I have had several of a similar nature, and the result has been the same. It would therefore be unpardonable in me to enlarge further on the subject, particularly as a similar treatment has been adopted very extensively by other surgeons, and is well known to the profession. It, however, struck me that if, instead of the great relaxation of the sphincter which so frequently follows its division, we could cause a constriction as great or nearly so as before the operation, we should be doing good service. Now this I think may be accomplished by a very simple method—employing the nitric acid before the relaxation takes place, or prior to any protrusion; and the plan I adopt, and which I have hitherto found very successful, is to apply the strong nitric acid around the margins of the sphincter ani which have been divided, and this I do on the fourth day after the operation; the pain of its application is quickly removed by smearing the parts over with oil, and it is only necessary to apply it twice.

Before concluding these remarks, I wish to state that I have found patients labouring under diseases of the rectum, particularly difficult to get under the influence of chloroform, and have found the process much facilitated by employing it locally as well as by inspiration, as I have found the parts excessively sensitive even when the patient has apparently been fully under its influence, and when pricking or pinching was unheeded. This, however, I think may be easily explained by the fact of the patient's sufferings having been for some time directed to the part, and to the nerves being in a highly sensitive condition.

Liverpool, 1855.

CONTRIBUTIONS TO THE PHILOSOPHY OF ZOOLOGY, WITH SPECIAL REFERENCE TO THE NATURAL HISTORY OF MAN.

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(*Continued from October No.*, 1855: *p.* 276.)

"A magnificent temple is a laudable monument of national taste and religion: and the enthusiast who entered the dome of St. Sophia might be tempted to suppose that it was the residence, or even the workmanship, of the Deity. Yet how dull is the artifice, how insignificant is the labour, if it be compared with the formation of the vilest insect that crawls upon the surface of the temple!"—Gibbon. *Decline and Fall.*

PART I.

Introduction.—The philosophy of zoology can be based only on anatomy. Men, it is true, of vast genius had attempted, and with some success, to formule the laws regulating or presiding over the formation of animal bodies—the laws, in fact, regulating animal forms—by a bold synthesis, independent of all analysis. Such were the attempts of Aristotle, and of Newton. Buffon, availing himself, no doubt, to a certain extent of the labours of Daubenton and others, but more especially influenced by the comprehensive views which a deep and constant meditation of Nature taught him to adopt, made an effort in the same direction, sufficiently powerful to attract the attention of the Sorbonne and the Vatican. But so long as the philosophy these great men taught or proposed was without a basis in anatomical research, so long was it entitled only to the name of "hypothesis," unsupported by proof, by an appeal to intuitive evidence, or by any analysis of the material composing the essence of animal forms. Their views, then, were, by all inquirers into truth, regarded—and this, in the nature of things, could not well be otherwise—merely in the light of ingenious hypotheses, grouping together phenomena of which the greater part were avowedly mysterious and inexplicable.

So long as the laws of zoology were confined to, and embraced within, the doctrine of final causes, all philosophic minds were of course sensible that the philosophy of natural history, including, of course, zoology, could have no existence; for these doctrines placed it of necessity within that ultimate appeal, the First Cause, where all science ceases. The principle, or rather the phenomena, of life, so mysterious in their nature, so difficult to investigate, led no doubt to this view—to this ultimate appeal. It was in vain that gifted men, as Fontana and others, mathematicians and geometricians, pointed out that final causes were not causes, but effects; the doctrine maintained its ground, and does so still. The successive philosophies of the day, as they were called—the theological, namely, and the metaphysical—gave the doctrine sufficient support to overrule the natural philosopher, and to remove the phenomena of life, at least, from his field of inquiry. The reason was this: the field of inquiry included MAN, whose obvious connexion with the zoological world could not be mistaken, could not be denied. But man's history had been made the subject of elaborate works by historical and theologico-historical writers; the animal and vegetable worlds had been described as subservient to him; whatever trenched on histories which, taken literally, are clearly and simply fabulous, gave alarm to powerful classes of men, deeply and intensely interested in obstructing all inquiry into truth, and Goethe, Oken, and Geoffroy St. Hilaire would have shared the fate of Galileo, but for the accidentally altered circumstances of the European world. The French revolution had occurred—that mightiest of all human events. The artificial bonds of society were loosened. Men for the first time ventured to think. The mass of mankind rose incredibly in intellectual calibre for a short space; it attempted to soar with science into the loftier, purer, and calmer atmosphere of the thinking world;

its natural grossness brought it rapidly to the earth, where it now lies, a prey to every imposture, the struggle serving only to rivet each chain more securely than before. In the struggle, science escaped, not unobserved by the natural enemies of truth, repudiating alike the deceiver and the deceived. But great as was the genius of Goethe, Oken, and Geoffroy, it would have proved unavailing to stem, even for an instant, the vast turbid current of folly and fable which passed even to later times for a history of this globe and its living inhabitants, but for the accidental appearance of one man, who unconsciously submitted to thinking men, not a hypothesis, not a theory, but a demonstration, irrefutable as those of Euclid—a demonstration of the fact, that all previous histories of the globe and its inhabitants were simply fables. That man was George Cuvier, an anatomist. Palissy, it is true, had attempted this demonstration long before, but Palissy was a potter, not an anatomist. Buffon threw out a bold conjecture, and was instantly silenced by the Church of Rome. Cuvier's demonstration could not be so disposed of; it admitted of no refutation. The most subtle Jesuit, ever ready with a refutation even of Newton, quailed before the organic remains, attesting the existence of a former world, of a vast, if not of an infinite, antiquity.

It is worthy of remark, that Goethe, Oken, Geoffroy, and Cuvier, however much they might differ on some points, agreed in this: that the basis of Philosophic Zoology was to be sought for in Anatomy. Goethe saw this at once, even when a mere student; so did Oken, Cuvier, and Geoffroy. Comparative anatomy was the starting-point of all, but from this their course was different, divergent; Goethe, by the transcendant force of his genius, was straightforward, cautious, and philosophical; Oken, theoretical, transcendental, and mythical: Geoffroy halted between the systems; Cuvier refusing the aid of embryology, preferred a perpetual recurrence to the miraculous interposition of supreme power—a frank confession that with him science and philosophy no longer guided his pen.

The discovery of the signification of the fossil remains (*ossemens fossiles*) led Cuvier to the conclusion, startling to the thinking mind the philosophic,—namely, that there had been three or four successive creations of the animal and vegetable worlds. As he grew older, and his intellect stronger, he himself felt the antagonism existing in such a view to sound philosophy, and he committed to paper a direct contradiction to those who had ascribed such an opinion to him. But still later he returned somewhat to his original views—the views of his early years. Goethe, Oken, Geoffroy, never changed; as at first, so at last: one creation was their motto; unity of organization; unity of type; unity of plan, was their theory. Not so expressed it is true, and variously modified by each, but still based on one great idea. Unity of plan, unity of design, observable, traceable, demonstrable, in all forms which live, which have lived, or which may hereafter come into being.

I commenced these inquiries in 1810, and since that moment have never lost sight of them. My first endeavour was to reduce the structure of the fore-foot of the horse to the corresponding parts in man; to compare and to discover the corresponding structures. I felt sure that they must have been formed on one plan; it was a deep conviction, arrived at by no reasoning—instinctive. As might be supposed, my success at the time was not great. The *rudimentary* fingers in the horse surprised me. Why rudimentary fingers? I said to myself. I fancied that all Nature's works were perfect. The theory of arrested development, at which Meckel and the German school caught so strongly, did not satisfy me, and never did, even when forced to teach it for want of a higher generalization. It is a doctrine I am now prepared to refute. The laws of deformation are as regular as the laws of formation. My next effort (1812) was to compare the organs of sight in man with the same in all other animals. Other structures followed, in all the natural families from man downwards. Satisfied, by a constant appeal to structure, that one great plan regulated all—that there could not be two or more plans—two or more creations—I had not yet seen any of the founders of the philosophy of zoology. This happened in 1821. Acquainted with what I had done for comparative anatomy, no introduction was required to those whom I most desired to see—Cuvier, Geoffroy, and De Blainville: Goethe and Oken were in Germany, and thus I never met the real founders of all philosophical anatomy. But my own dissections furnished me with data sufficient to prevent me coinciding with Geoffroy in his views of unity of organization; whilst deep instinct, which never errs, told me that of the four creations maintained by Cuvier, three at least must be superfluous; to the geometrician I leave the refutation of the one creation, intending not to meddle with that which seems beyond the reach of human thought. My object in this free inquiry is merely to ascertain, if possible, if there really be a philosophy in zoology—if its basis can be shown to rest on science—if zoological knowledge forms a part of science, or merely an amusing mode of contrasting the human with the non-human. As I view it, a history of zoology requires for its basis an inquiry into—

1. The laws of species and of natural families. Do species and natural families exist, or are these distinctions merely human contrivances resulting from imperfect observation? Is mankind composed of one great natural family, or of several? and if of one, how many species, as permanent varieties are called, enter into its composition? Are species and natural families permanent and eternal, or is it merely a question of time? What part do embryonic forms play in Nature's grand scheme? Do they merely shadow forth a unity of plan, or do they, rather, portray the endless varieties of forms which animal matter may in time and space assume? In this view, the embryo is the most perfect of forms, embracing within it *the possible* of the past, the present, and

the future. Individual adult forms simply show the development of that which can exist in unison with the existing order of things. The modern rhinoceros and elephant, tapir and sloth, are simply the developed forms of a natural family which once existed under other forms. They are not the mere hereditary descendants of the fossil world, as Geoffroy thought, but forms new in space and in time, but pre-existing in every embryo of their natural families. The embryo, then, is that which Nature perfects, that to which she looks for the continuation of *varied life* as it exists and has existed on the globe. The future is wrapt up in the same category. The embryo of any species of any natural family contains within it, during its phases of development, all the forms or species which that natural family can assume or has assumed in past time. In the embryo and the young individual of any species of the natural family of the Salmonidæ, for example, you will find the characteristics of the adult of all the species. The same, I believe, holds in man; so that, were all the existing species of any family to be accidentally destroyed, saving one, in the embryos and young of that one will be found the elements of all the species ready to reappear to repeople the waters and the earth, the forms they are to assume being dependent on, therefore determined by, the existing order of things. With another order will arise a new series of species, also foreseen and provided for in the existing world. There can be no such thing as arrested development, nor a gradual development of all forms towards perfection. Nature's works are perfect, first and last; and the hypothesis which supports the idea of a development tending to perfection is simply another expression of the doctrine of a final cause. The so-called "arrest of development" in the individual is a doctrine admitting of the easiest refutation. Development can only mean development, and nothing else. This may be either individually and specifically progressive, or zoologically retrogressive—*i. e.*, back towards other forms; but always development, notwithstanding—a retrogressive development. The laws of deformation are as constant and regular as the laws of formation, which we call perfect, as belonging to the existing world; this is all. But to enter on this inquiry, a preliminary investigation is necessary. Zoological forms either obey general laws or they do not; they have been formed on one great plan, or on several plans. If the latter be maintained, it ought to be shown in what the plans differ; if the former, the scheme or plan ought to be explained and its existence demonstrated, if possible. If no such plan exist, there exist no laws, which, indeed, in that case, are not required, the scientific basis on which zoology rests being removed, it would cease to be a science. Whether life was coeval with the globe or not, is a question not essential to the present inquiry. At its appearance it of necessity obeyed those laws which philosophy is called on to investigate. In their essence these laws can never alter: this is what science teaches. No fossil remains have ever been discovered contradictory of the theory that one great scheme or plan has at all times existed. In a strictly philosophical sense, there could be only one creation; but the real difficulty is to determine what were the zoological forms of that creation. Were they *species*—that is, *races*, or did the individuals represent natural families embracing many species? However this may be, one thing is certain: many races or species have ceased to be, whilst others, which were not then, now live. These are new species merely as regards man, for, in point of fact, distinct species exist not in Nature. They are not included in the great scheme which fills up all voids, all differences, all distinctions. The gap—absence of the link connecting one species, as we call them, with another—man assumes as a positive fact in Nature—an intentional part of her plan; but it is not so, as science will soon demonstrate. Some persons have troubled themselves with a refutation of the hypothesis of the convertibility of one species into another. It is wholly a labour of supererogation, for no strictly scientific man ever entertained such an hypothesis in the sense assumed by them.

My first step, then, is to establish the doctrine of one great plan or type for all animals; a unity of plan—that is, a type—a type "which exists everywhere, but is nowhere to be found." A material archetype is the invention of a mind sunk in materiality and in error. No such can exist, since a part can never represent a whole.

A type being proved to exist, there arises next the question of varieties in zoological forms, embraced within the type. The application of these two inquiries includes all natural history as a science; if applicable to one they are applicable to all forms, man included. The law called "the arrest of development hypothesis" explains nothing, and involves increasing contradictions in terms. For many years I have preferred using the terms "persistence of embryonic forms," although this phrase also is open to manifest objections. The persistence of the webbing of the human fingers to the adult state has been described as "an arrest of development." I should have thought it rather "a retrogressive development" towards another form. Is the presence of a third and fourth head of the biceps muscle in man "an arrest of developmennt?" Is the presence of a supra-condyloid process in the humerus and the passage of the humeral artery and median nerve through the passage thus formed an arrested development? Is it even a persistence of embryonic forms? These doctrines are nearly the reverse of those I hold. In the embryo I see a perfect, not an imperfect being; its developments, transmutations, metamorphoses, follow certain laws; they equally tend to perfection of the individual species as a species, of the individual as an individual. But their developments must not be called imperfect, inferior, or arrested developments, merely because they happen to tend towards, and to produce, inferior forms of organization, as we esteem them. The brain of the human embryo, like all its other structures, no matter to what species it belongs, embraces every

possible form which man assumes, or has assumed, on the earth. The white races are not the more fully developed, and the negro the more imperfectly developed, species of one common natural family. The development of each is perfect in its way—equally so. The negro brain is not an imperfectly developed white brain, but a specifically formed brain, developed according to its own specific laws. When in the white races we find developments resembling the negro, and *vice versâ*, these are not arrested developments, but retrogressive, if you will, yet perfect in their kind. To instance a class of animals, supposed, erroneously, however, to be less complex in their organization than man, lower in the scale, less perfect—the class Fishes; and selecting amongst these, as, perhaps, most familiar to my readers, the natural family Salmonidæ,—if in this natural family, divisible into three sub-families, I find the young of any of the species of any of the sub-families strictly to resemble each other, and yet the grown *individual* of any of the species materially to differ from any other, it by no means follows that the one is a species less developed than another. In embryo—in the young—all are alike; each offers in itself the specific characters found in all. The embryo salmo, for example, is of no species; it is of all. Take from it one set of characters, it becomes the salmo; deduct another, you have the forelle; subtract a third, you have the trout. In every embryo, of every species, we have *the possible* of all forms appertaining to that natural family at least. The destruction, then, by geological or other phenomena, of all the species, saving one, of any natural family, would not necessarily extinguish that family, since, in the embryo of the remaining species, there exist the elements for the reappearance, perhaps, under modified forms, of all the extinct species. As of fishes, so of man: one natural family—one embryonic form, equal to the production of all species in accordance with the essential conditions of existence in time and space.

CHAPTER II.

Creative Nature adheres to a type which we do not know, cannot know, but which we are sure exists. This type is the only check we can well understand to an infinite variety of living beings. There are others, no doubt; the material conditions of the external world constituting the existing order of things present unquestionably potent checks to an infinite variety of forms, but as this has been esteemed by some as the great producing cause of forms, I dwell not on it here, unwilling to anticipate that which naturally belongs to a future section of the work.

This type embraces all living forms from the beginning. When Cuvier discovered the signification of the fossil remains, he was bound as an anatomist to view many of the extinct animals as belonging not merely to species, but even to genera totally distinct from those now existing. All this may be conceded without in any way interfering with the grand law of type, or unity of the organization as some have called it—an expression open to many objections. Cuvier thought his fossil species and genera so distinct from the now existing, as to imply a succession of new creations; for he did not believe in the conversion of any species into another by the agency of external circumstances, and of the embryonic manifestations; and of their coincidence with the history of living forms on the surface of the globe he took no account. The views were German, foreign, and, as he thought, pantheistic, and so he unwisely rejected them. I say unwisely, for the phenomena alluded to being at once material or physical, zoological and anatomical, they had a double claim on his attention. The fact, as I shall afterwards prove, of an individual of any natural family having, whilst young, the generic characters, was a fact which so profound a thinker was bound not to overlook. This mistaken view he afterwards pointedly denied. It still holds its ground in England, based on the misrepresentation of the doctrine of transmutation of species. But, in point of fact, there does not seem ever to have been any transmutation of species, the one into another—an ape into a man, a bat into an ape. Such views are entirely erroneous, and never were maintained by any Continental zoologist. The only transmutation which Nature knows is the development, in time and place, of natural families and species already provided for in the structure of the embryo—as thus: the existing elephants, which to Cuvier seemed to belong not merely to different species, but even genera from the extinct, and thus to *form a new creation*, are only new species and genera as observed by man; the natural family, as planned by Nature, includes in every embryo the elements of all these species which can only be developed when the necessary conditions of existence are present.

Centres of creation—a term much used by my esteemed friend and former student, Mr. E. Forbes, can have no meaning in a philosophic sense, other than marking the area where certains forms of life first found the geographical and geological conditions essential to their development, their well-being, and their persistence. The same applies to man. The Negro, the Saab, the Mongol are not the descendants of each other, nor of the white races, nor *vice versâ*: they are forms of development of species from individuals, each possessing within them the elementary forms of all the species of the natural family to which they belong. All that is required for their appearance on earth is the geographical, and above all, the geological conditions under which they can exist. When these are found, the region becomes what is called a centre of creation, from which the forms spread, under the limitations which Nature prescribes to herself.

In spreading from centres, man has both advantages and disadvantages over other animals, which, I shall endeavour to show in its due place; but, generally speaking the species of each great sub-family are much more limited in their area than might at first be supposed.

As with man, so with the elephant, so with the rhinoceros, horse, &c. What we call species have no real existence in Nature, she filling up the links and gaps, which in human systems constitute the specific and generic differences. The embryo of the young of any species of the Salmonidæ, for example, include in its internal struture, and external coloration and robe, the characteristics of all the species of all the genera which exists, or probably ever existed; so that it depends merely on circumstances clearly physical and external which species is to appear first, which last, in the zoological history of the world. The *possible* of every species is always present in the embryo of every species; the *real* is that which alone interests man. By *real*, I mean the developed adult individual then and there present to his thoughts. Embryonic forms, and the history of life on the globe, prove the possible to be quite as real as the specialized adult individual. What forms for example man has assumed, or may assume, is to existing man a matter of minor importance. He looks to what is. As in other animals, of all species, the human embryo includes within it the elements for the development of most, if not of all, the natural species now existing. It depends then, on time and place what specialized or fully developed form the embryo is to assume. Each species has its own development and its specialized individualism. The teleological argument, that the one is an improvement on the others, I leave to be handled by the metaphysician. I believe it to be essentially wrong, and involves or includes that very doctrine which these persons most dread admitting—namely, the transmutation of species. All species are perfect in their way, but it is the embryo alone which is perfect in every sense, and its development may be either *progressive* or *retrogressive*. I use these phrases as expressing merely human views; Nature admits of no such ideas. So far, to her all are alike. By progressive development, I mean that which tends towards the highest specialization of the individual; by retrogressive development is meant, the development of forms other than those of the species to which the individual belongs.

It was natural for Cuvier, the discoverer of the application of descriptive anatomy to science, to exaggerate its importance in natural history. It led him on to the still more serious error of underrating the value of external characters. When the osteology and dentition of two species strongly resemble each other, he questioned their title to be called distinct. Thus the doctrine led to the confounding the dog with the wolf—jackal and fox. The various species of oxen were viewed as one; and but for its glaring absurdity, the ass and horse would have been viewed as belonging to one species. Anatomically, they strongly resemble each other; now look at the exterior! The same remark applies to man; but in him, besides a more strongly marked exterior, the anatomical differences in the races are much more strongly marked than between the horse, ass zebra, &c.

The great law of type, to which I return, must be investigated, then—1st, by the comparative anatomy of the adult individual; 2ndly, by the anatomy of the embryo. It was natural first to test it by the comparative anatomy of the adult individual. Whilst yet a student with Kielmayer, the great theory of unity of type burst on the mind of Goethe, and was instantly developed. The anatomical studies of a single winter and summer revealed to his vast mind the whole truth.

If we select any natural family of animals, we shall find that species are only distinct and manifest so long as we have not before us all the forms the family has assumed in time. This misled the great Cuvier. He fancied the fossil elephant, rhinoceros, horse, bear, tiger, hyena, &c., to belong to distinct and extinct species, and even genera; and so they do in a sense, but when all are brought together, and placed at once before the eye, his generic and specific *anatomical* distinctions break down, showing that the fossil and the recent form but one continuous uninterrupted living world, in as far as anatomical forms are concerned. And yet I will not deny that species do not exist, for, after all, our inability to discriminate them may arise from man's limited faculties. My esteemed friend, Dr. Andrew Smith, informs me that, some years ago, he placed before him the various known species of the natural family of the alcaudæ, and in presence of such an ordeal, all the pretended specific external characters of naturalists completely broke down. When, in 1817, I first dissected the serpents of Southern Africa, I fancied that as regards the dentition there existed a clear distinction between those with poison fangs and those without; and, in a practical sense, there is. But when I began to dissect the serpents of the globe, and not those of any particular region, I quickly found that the universal alone was true: that Nature admits or recognises no such gaps in her works as man chooses to discover. That certain species of serpents carry poison fangs alone on the upper maxillary bones is true; but as there are many which carry harmless teeth as well on the same bones, the fact becomes of little or no value scientifically or practically.

Human bones, in a strictly fossil condition, have not as yet been found, though some have been discovered in situations arguing, on modern geological views, a vast antiquity. This matter I may discuss hereafter. But what I chiefly insist on here is this, the human bones discovered in regions now temperate, resemble those races at present inhabiting the hottest regions of the earth; and it has been hastily inferred from a comparison of the cranium, that these fossils must have been the forefathers of the now existing coloured races; and *generically* they were no doubt, but not specifically, any more than the fossil carnivora were the *direct* special predecessors of the now existing tigers, panthers, and leopards. The Esquimaux cranium unmistakably belongs to the dark races of men; well, had the race been extinct, and these bones alone discovered in the Polar arch, it would have been inferred that they could not have lived there, but must have migrated from a hotter region, and

there perished. Now, nothing of this is true. Their centre of creation, using the expression as I have explained it, is the Arctic circle, within and near to which they live. That circle has undergone great changes no doubt, and man may have changed with them; but no species of man has ever yet been discovered with clearly marked pithecian forms, and the anatomy which finds strong resemblances between man and apes, is, to say the least of it, singularly coarse. The connecting links, or natural families between them, have not been found; they may not have existed as yet, though sure to come. As to human embryonic forms allied so closely to the lower specialities, I speak not of them here; instead of being composed of one great natural family not divisible into others, it is quite probable that in the human family there are sub-families in a fossil or recent state not yet discovered; all which species, the embryo of every species comprises within its structure, ready to be developed under favourable circumstances. But this is certain, these species cannot be produced under the existing order of things, nor are they direct descendants of each other.

Thus species would seem to be excluded from Nature's plan, but the idea remains in man's conception; and, after all, it may turn out that species is a distinct manifestation of the *real*, but ceases to be observed by man when the characteristics are so minute as to escape his powers of observation. But be it as it may, nothing in either view affects the great laws of unity of type—unity of organization—of all, the past, the present, and the future. "All the parts of an animal, taken together or separately, ought to be found in all animals." This was the doctrine formuled by Goethe, in 1780, from an instinctive conviction, sixty years before its admission into France—where it is not yet generally received—and ninety years before it had gained as adherents three or four scientific men in Britain; the mass rejected it as pure nonsense.

"Peut on déduire les os de crâna de ceux des vertèbres, et expliquer ainsi leur formes et leur fonctions." Here is the whole question formuled. In 1790 he arrives at the determination that the cranium is composed of six vertebræ:—

3 Posteriorly—	3 Anteriorly—
1. Occipital	1. Palatine Bones
2. Posterior Sphenoid	2. Superior Maxillary
3. Anterior Sphenoid	3. Inter Maxillary

These agree with the elaborate inquiry of Agassiz' collaborateur, Voght. Goethe mentions that the thought first struck him whilst looking at a portion of the backbone and cranium of a sheep in the Jews' Cemetery of Weimar. Happy and immortal thought suggested the emblems of death.

Whilst Goethe thus placed on a sure and unalterable foundation the basis of the transcendental in anatomy, as derived from the study of the adult and specialized individual form, he quickly saw that a study of the embryo was also essential to complete his views. Cuvier in the meantime, adhering to the comparative anatomy of the adult, made his grand discovery of the signification of the *ossemens fossiles*—a discovery entitling him to the thanks of all mankind. He fancied that he had also laid the basis of a new system of zoology; but this was a mistake. Linné and Buffon had left but little to be gleaned in that field. But, persisting in this route, and neglecting or misunderstanding the lights shed by embryology over the philosophy of zoology, he left to Geoffroy and other followers of the German school the pursuit of the transcendental, alone equal to explain the meaning of forms. As a natural consequence, he, as Hunter had done, wandered into that boundless region of detail, which Geoffroy early discovered to be without bounds as without result. But even in this remarkable discovery, (for it is one,) Geoffroy was long anticipated by Goethe, who characterized the attempt as "Un travail impossible, infini, que si par miracle il s'accomplira un jour, sera sans résultat comme sans limites." This early occurred to Geoffroy, to myself, to others. Cuvier's pupils did not see this; they were his pupils. Meckel followed in the same track, and his great work on Comparative Anatomy fell dead from the press.

In Cuvier's hands, Comparative Anatomy assumed a new and more philosophic form; with him it meant the descriptive anatomy of the adult of all species. He discovered the value of this new element of science, and by its means explained the meaning of the fossil remains—a discovery which has no equal. By its means he became the founder of true geology and palæontology, explaining the past by the present. But he declined explaining the present by the past; this was reserved for Goethe, Oken, Geoffroy, and others. With Cuvier closed an æra—the æra of comparative anatomy as he viewed it. It had performed its mission, and therefore cannot be resuscitated, at least for the same purposes. Another element of science threw it into the shade—embryology. It is true that Goethe, with an inspiration almost divine, had shown that, in the comparative anatomy of adult forms, the secrets of embryology and palæontology were wrapped up; and discovered, in fact, the transcendental. But it required a more exact embryology than was known to him to give the new doctrine a basis, and this soon followed.

The æra of Cuvier, then, was closed—wound up by a higher generalization. But the influence of his grand discoveries will and must continue for ages. The thanks of mankind are for ever due to him who, next to Galileo, has the most contributed to extend the sphere of human mental vision. He belonged eminently to the positive age, the age of facts; by them he stood, reckless of consequences, at least for a time. He gave to man a new and true History of the Globe.

CHAPTER III.

ALTHOUGH the skeleton be not present in all animals, philosophic anatomists have agreed on selecting it as the system most favourable for the

establishment of their views. When present, certain segments of it enclose the nervous system; others, the respiratory, digestive, and generative. Its connexion, however, with the functions of locomotion cannot be overlooked, and these are not confined to the limbs.

The doctrine of first cause, first distinctly formuled by Socrates, afterwards by Philo-Judæus, and pushed to its utmost extent, by Paley, or at least by the Dutch writer whom he is said to have pirated, had so firmly taken possession of all minds, that the adoption of any more philosophic view seemed, at least in England, impossible. In Germany it was otherwise. Anatomists very early began to reject this view; to curb its pretensions, and to assert that the skeleton of animals was constructed on higher principles than a mere arrangement of levers and pulleys. At an early period of the discussion which arose between the German and French schools, the former adopted the theory of type. Geoffroy fell insensibly into the same view, but with this difference: his view was wholly material; he looked for the small bones of the ear in the fish, where no tympanic cavity exists, and he imagined he found them in the opercular bones, enlarged, spread out, and called on to perform other functions. Animated by the highest philosophic spirit, he was still disposed to restrict Nature in the choice and number of materials at her command. He could not be brought to believe that any germs were ever lost or disappeared; the early fusion of primitive germs was a doctrine he scarcely admitted. His idea of the unity of organization was too mechanical; yet he rose to the doctrine of type at last, and first formuled a typical vertebra, distinctly and clearly as a generalization of the highest order, and as Nature's grand type in the formation of the skeleton.

The views of Goethe, Autenrieth, Oken, and Spix, admitted a type, but nothing more. They did not require the detection of every element of every great system of organs as being constantly present; they perceived in the embryonic metamorphoses ample verge, without such material applications, for disappearance of forms, without any violation of the type; nor did they expect to find in any animal, a fragment and part only of creation the type of the whole. They seemed to see—at least this was the view I adopted in 1827—that as a part can never be perfect nor equal to a whole, so, by Nature's type, is meant the scheme or plan of creation—not any created thing.

Thus far and thus early did the German school push their philosophic views. In this chapter I mean briefly to re-examine the doctrine with reference to the skeleton.

As early as 1822, Geoffroy himself placed on paper his conception of a typical vertebra, for with all others he accepted of a vertebra as being the type of the skeleton. Goethe's doctrine of cranial vertebræ was all but established, notwithstaning the opposition of Cuvier. Geoffroy admitted a typical vertebra, which was not to be found in any one animal, but might be constructed out of many. To the nuclei or germs of the typical vertebra he gave names which of course never came into use. But already Spix had gone much farther, and in his idea of a typical vertebra he included the skeleton. In this view I concur—that is, every part of the skeleton must belong to or be the development of the vertebra.

The signification of the various bones of the skeleton is the object aimed at, and their determination in all classes of animals which have a vertebrate skeleton. Of these bones a vertebra clearly furnishes the type. The first object, then, must be to determine the component parts of a vertebra.

Although the vertebræ repeat each other, it is presumable that each has its own individual character. The usual method of speaking of them is applicable only to the descriptive anatomy of the individuals composing a species, as man, the horse, &c., but wholly inapplicable for the purposes of comparative anatomy. The number of elementary nuclei or germs entering into the composition of Nature's typical vertebra is of necessity quite unknown, and must forever remain so. What we see we may describe.

It is probable that certain cranial vertebræ maintain a constant relation with the ganglions of the nervous system they support on the dorsal aspect of the column; but no such relation seems to exist with respect to the subsequent ones composing the column, each class of vertebræ, perhaps even many single vertebræ, forming a distinct group in themselves, capable of multiplication to any extent. What I mean is this: the seventh cervical vertebra in birds is not the analogue or homologue of the seventh cervical vertebra in man. In man, the group of which the seventh cervical vertebra forms one is multiplied into two or three in the sloth, and into a still greater number in birds.

Of the osseous frameworks which form, in the vertebrate kingdom, the skeleton, that of man claims especial notice, partly because is the skeleton of the most remarkable of Nature's productions, and partly because the professors of the arts of medicine and surgery occupy themselves with it alone, to the exclusion, indeed, of all others. But to the scientific zoologist, anatomist, and physiologist, the human skeleton is of no more importance than any other: from it alone its true nature and signification could never have been discovered; the signification and meaning of its various parts were liable, not only to be overlooked, but even wholly misunderstood. In a word, unaided by comparative anatomy and embryology, the præsternal bones, the supra-condyloid process, and many other structures must have for ever remained a mystery even to thinking men:—not but what all these were included in the grand generalization of Newton, but men overlooked the passage: in advance of his time, he was unintelligible to men of his day, in theory, at least. Bnt Goethe, Autenrieth, and Oken appeared, and formuled, in a mode intelligible to the bulk of men, the transcendent generalizations of Newton. Goethe first discovered the law of unity of organization, applied it to material forms, and pronounced the words "cranial verte-

bræ :" he was so much in advance of his day, that even Humboldt could not comprehend his meaning, nor what he aimed at.

A vertebra may be viewed as the type of the skeleton, which supports and gives attachment to the muscular masses of locomotion. It serves many other purposes besides this one, to which I shall afterwards allude.

As a part can never represent a whole, so no vertebra of any animal whatever can be the type of the primitive or typical vertebra in Nature's grand plan of creation. We can never, or may never, know, therefore, all the elements which Nature can develop in a vertebra; we merely guess at what may be by examining what is. In man, a vertebra seems composed, in the embryo, (for to that we must go,) of so many elements, which may or may not remain distinct, and be developed in adult man, but in other animals, for to Nature the animal world is the production of one idea, not many. As all Nature's works have not been examined, the original primitive elements of a vertebra are unknown.

The vertebræ piled on each other form the vertebral column, and may be thus named: cranial, cervical, dorsal, lumbar, sacral, coccygeal. They are repetitions of the one type, and there is probably a limit to the number found in each region in all the vertebrate kingdom, but this number has not been determined. Nearly every word in the nomenclature of these bones employed by medical men is faulty or vicious. They are called vertebræ, and yet they do not turn; false and true, as if such words had any meaning; the cranial bones have been for thousands of years viewed quite apart from the vertebræ, as if they were something mysterious; the sacral vertebræ are spoken of as one bone; the coccygeal as one, two, three, or four, in man.

As we do not know the number of the primitive elements of the vertebræ, we can only guess at the type. But one thing is obvious: each vertebra is furnished with a body, unless we make of the first an exception. Perhaps, after all, it is the pedicle from which the processes start, that is the essential element of a vertebra; the completing of the arch backwards, to enclose the nervous centres, and forwards, to enclose the respiratory and digestive organs, being not at all essential to the idea of the type. The functions of the bodies of the vertebræ are therefore probably mainly mechanical—that is, they are not so intimately connected with the philosophy of the skeleton, as might at first appear. It is in the pedicle that we look for the germs out of which are to be formed the extensive osseous appendages which, proceeding backwards, partially enclose the cerebro-spinal axis, and, forwards, the viscera.

The pedicles are presumed to contain certain systems of nuclei, which, though they probably exist in all vertebræ and in all animals, are only developed when required. I name the first group, laminar; the second, costal. Certain of the latter group become ribs. The processes springing from these pedicles do not, in any animal, represent all the germs which exist. Several disappear by *primordial fusion* at so early a period as to escape observation; hence when we find spines are superadded to the laminar processes or elements, it does not follow that these are new parts superadded, but simply germs developed which in many animal disappear at once, and in others are carried to their highest development. This remark applies to the anterior or costal germs of the pedicle, which, passing forward, partially enclose the lungs and heart.

A question arises here which has not yet been fully solved: is it the type of the vertebrata to have the vertebræ repeated in front, or along the abdominal aspect of the trunk? or, in other words, are there two columns, a vertebral and sternebral? If this were proved to be the type of the vertebrata, then the appendages of each column would also require to be determined, and how much of the skeleton they include. To this column the sternebral may belong as centres and processes—1, the hyoid bones, the body, and arches; 2, the sternum, properly so called, and the costal cartilages, the bones of the shoulder and upper extremities; 3, the symphysis of the pubis, the ossa innominata, the lower extremities.

In this view the sternebræ represent a repetition of the vertebræ; to the latter belong the appendages or elements connected with the movements of the trunk; to the former those in union with the movements of the limbs. There would then be two skeletons, a dorsal and a ventral; neither the nervous centres nor the visceræ; least of all the blood-vessels require osseous arches for their protection.

The vertebræ and sternebræ repeat each other; they are different forms of one type; but each bone also differs from every other. They are analogous, but, of course, not identical in any sense. That they are not the same is obvious to all who are of sane mind. To prove the corresponding or *analogous* bones in animals is attended with some difficulty. When we say of the bone of the arm of the horse that it corresponds to the humerus in man, our meaning must be readily understood, whether we call it analogous or homologous, so long as we do not say they are identical. But this is not so easily done with respect to the bones of the trunk and head. Each vertebra represents a segment, and one of a genus. The seventh cervical vertebra of man does not correspond to the seventh cervical vertebra in birds. Nature adheres to the type, and can repeat it indefinitely.

The human physiologist, not particularly choice in his theories, invents uses for parts, and speaks of them in language leading one to suppose that they had been formed for that special purpose. In this style Sir Charles Bell talked of the ribs and of many other parts; he spoke of the ribs as if they had been made solely for the use of the lungs and for respirations, forgetting that fishes, which yet do not breathe, are much better supplied with ribs than any mammal.

The bronchial arches of fishes probably belong to the system of the Sternæbre; nevertheless, their superior segments may belong to the Vertebræ. According to the principles laid down, the nearest

approach to the type of the skeleton or skeletons will be found in the fish which retains so many embryonic structures.

The jaws seem to be appendages of the cranial vertebræ. The signification of the hyoid apparatus still requires a more rigorous inquiry. Of the anterior column, if they really belong to it, these branchial bones seem the fundamental and essential or starting point. They are first found perfect in the adult fish; the remaining parts of the column, that is, sternum and pubic portions, being but partially developed, or wholly suppressed. Were the anterior or ventral column divided into three groups of vertebræ—cervical, thoracic, and abdominal—the cervical would represent the fully developed segment, seeing the part it plays in the adult fish and in the embryo of all mammals. Its size in the cetacea, compared with the greatly diminished thoracic portion or sternum, and to all but deficient pelvic portion of the same column, supports this view.

The deposition of osseous matter, independent of all pathological circumstances, is found to occupy in the vertebrate two distinct positions. These may be termed—first, central; second, peripheric. The first has a certain reference to the nervous centres, the importance of which has probably been overrated; its relation to the muscular system, or that of motion, is obvious and direct. The second refers to the periphery, and invests the nervous terminations or papillæ—an appropriate name enough for it is dermo-skeleton, were it not that this term has unhappily been applied to the portion having a reference to the external integument, properly speaking, and not to the peripheric terminations of the nerves of sense.

The central skeleton may be subdivided, as regards its nature, into that having cartilage for its basis, and that originating in the fibrous tissue. The first embraces what the human anatomist usually calls the skeleton; the second includes the osteoids, wherever found, and of whatever form.

The peripheral skeleton is developed in the structure protecting the extremity of the nerves; in the skin, eyes, ears; properly speaking, there are no such things as a neuro-skeleton and splanchno-skeleton. The chief teleological purpose of what is usually called the skeleton is its adaptation to motion; its connexion with the nervous centres and with the viscera may be viewed as accidental, or at least not essential. There is no natural distinction between the pretended neuro-and splanchno-skeletons; they start from a common centre; they are parts of one system. The nervous centres are formed independent of the osseous system; so are the viscera. I do not object to the harshness of these terms, but to the erroneous views they imply. Even the teleological uses, always mechanical, of the phaneric or dermic skeleton, essentially connected with the nervous papillæ, are unknown. An enamel appears in the group, thus associating the structure with dentine and the strictly phaneric group.

British anatomists and zoologists resisted admitting the law of unity of the organization as long as they possibly could. Newton, the immortal Newton, had long ago formuled the law to a certain extent; unity, as a type, the only view admissible. Of this they were ignorant. Geoffroy attempted to submit the law to a rigorous anatomical demonstration, and he failed of course. Oken following Goethe, returning to the faith of Newton, recalled physiologists to the law of type, abstract, metaphysical, true. Dumeril's first attempt in the Academy failed; men's minds, even those of Academicians, were not prepared to call a bone of the cranium a vertebra; a thinking vertebra was a phrase which startled the Academy, and Humboldt himself smiled at the absurdity of calling the lower jaw and cranial bones and hyoid bones, by any other names than the accidental, unphilosophical, unmeaning language of the surgeon. Speculations of a more abstract character than these have emanated from the German school. Oken and Carus, his follower, have endeavoured to support such views by an appeal to the microscope and to the doctrine of a primitive nucleated cell. There may be much that is true in their views, and unquestionably much that is ingenious; but the present state of science does not admit of their adoption. All honour be to Oken, who persisted during life in his praiseworthy attempts to advance the cause of truth.*

Conclusion.—The unity of type, in as far as regards the skeleton, extends to all that ever lived. Cuvier's discoveries prove this. Between the past and the present there is a profound resemblance, and the discoveries of Cuvier go no further than the proving that forms we call specific have lived which do not now exist, and this may be admitted even of some natural families, but they do not prove the necessity for new creations. The mammoth is of the same natural family as the living elephant; so also is the rhinoceros, extinct and recent. But neither the species, nor, perhaps, even natural families, though parts of one grand scheme, required to be contemporaneous, since each individual of each natural family contains within it the forms of all the species of that natural family at least. M. Flourens thinks that the whole question turns on this: "si les depouilles des animaux actuels se trouvent ou non parmi les depouilles des animaux fossiles." For my part, I do not think that it is of the least moment whether they are or not, so long as a *serial* unity can be proved to exist. Now, this has been done by De Blainville. He has placed at the head of each group that animal which most resembles the preceding one, and terminates it by the one which most resembles that which follows; and although the series be far from complete, enough has been done to show that it exists.

The theory of the contemporariety of specific forms is at variance with all the facts of modern geology, and with the discoveries of Cuvier. It may be true, notwithstanding; nevertheless, I do not believe in it, for it is a doctrine rendered unnecessary by the generic perfectibility of the embryo.

De Blainville thought that no cataclasm has occurred since life appeared on the globe. I leave

* Geoffroy and the French school thought the simple-minded and enthusiastic Oken rather wrong in the head.

the reply to geologists. He also thought the animal species fixed, defined, and definable for science; so thought Cuvier; it was the pivot on which he moved. The monumental records of Egypt were summoned to his aid, and on these he pointed out the giraffe, the leopard, the antelope, the ibis, and the crocodile, depicted at least 5600 years ago, *seemingly* identical with those now inhabiting the same Nilotic land. He forgot man, who stands exactly in the same category. But be this as it may, it were desirable to show, even yet, that after 5600 years all are *strictly* identical. "The present, then, *cannot* be descended from the past by direct hereditary descent," and of any other mode of descent he admits not, in so far as I am aware. He denied the influence of external circumstances, and stood by the fixity of species. Geoffroy, on the other hand, held that species was ever varying, always under the influence of the external world, Lamarck went further, if possible; but "his work came not from observation, it was an idea." De Blainville seems to have thought that all species that ever lived were created at once. I endeavour to offer a solution of some of these difficulties from observation. The present world comes from the past, but the existing species have not the hereditary specific likeness of the past, they have only generic likenesses; they are of the same family, yet specifically different; they are embryonic forms, developed under circumstances favourable to them, adverse to their predecessors. Centres of creation can mean only those regions of the earth to and from which any species of animal or plant may be traced. They might be more appropriately called centres of diffusion, for the frequent use of this term creation leads to many errors. Africa, for example, is a vast centre in this sense, having but little communication with the rest of the world, and the Gallipagos form a small centre, seemingly insulated from the existing order of things. The diffusion of the organic remains of certain natural families might lead one to suppose that in former states of the earth the diffusion from a common centre of the then existing species was much wider than at present; but this is probably a delusion, based on the idea that by the anatomical organic remains we can decide on what is distinct in species, and what is not. Try the experiment upon any living natural family—the horse, for example—the antelope—the rhinoceros—the salmon—man—and the delusion will be at once manifest.

Species is the product of external circumstances, acting through millions of years. When produced they continue until extinguished by external circumstances; and as this requires vast cycles of time, they seem external to man, and but for the discovery of the true character of the fossil remains, by Cuvier, the enormous delusion would have been perpetuated—namely, that the existing species were identical with the extinct. Thus Cuvier closed the career of the greatest delusion that ever afflicted human intellect.

As species become extinct they are replaced by others from embryonic forms existing in all the species of every natural family; generic forms, common to them with the extinct. In this sense they are new—new to man, new to existing Nature. They are not new creations. Thus man is entitled to hold that species exists in Nature, since it is part of her plan that they be developed in time, and persist for a time; but as Nature knows not time, neither does she acknowledge species. Species and time are of human invention; they measure the capacity of his mind; forgetful of the difference, he fancies they must play the all-important part in the physical laws that regulate the universe.

The question of generic characters (natural family) is more difficult; still more is the succession of the great classes of animals on the globe. Modern geologists connect their appearance with certain great geological changes the surface of the globe has clearly undergone. They coincide mysteriously with the metamorphoses of the embryo from its earliest stages; the discoveries of De Blainville, intercalating the embyro with the extinct; the extinct with the living, and, further, supplying the *serial* link connecting natural families with each other, seem to support these views.

Appendix.—The doctrines and views of my most esteemed friend, Etienne Geoffroy (St. Hiliare) having been both grossly pilfered and much misrepresented in this country, I have thought it right to give, in the form of an appendix to this chapter, a few extracts from one of his latest works.

Extracts from Geoffroy's Work, "Etudes Progressive." 1835.—C'est enfin marcher à la conviction qu'il est pour la composition et l'assiette de toutes choses dans l'univers, un système de modifications incessantes, sous l'ordonnée desquelles se sont successivement débattues et définitivement établiés les deux zoologies, l'ancienne et l'actuelle. Ainsi sont lu les raisons de ces formes spéciales qui différencient les animaux et les plantes des divers âges de la terre, et surtout l'explication de ce fait, rendue de plus en plus evidente, savoir—que chaque sorte de formes spéciales et diverses sort de l'emploi d'un même fonds de matériaux, comme aussi d'un assujétissement fixe à des lois pour leur arrangement respectivement similaires. Je me flatte d'arriver de cette manière à la démonstration que les deux zoologies se suivent sans lacune ni interruption, comme engendrées l'une de l'autre, et à la suite de modifications survenues sous l'action de temps; elles auraient subi chacune l'influence des changements que chaque sorte de milieux ambiants aurait d'abord subis d'âge en âge—changements qui se trouvent constituées le mouvement général de l'univers. La donc apparaissiat obscurement, sans doute, des éléments régrettables pour leur defaut de clarté, leur digne et leur insuffisance; mais toute fois d'une acquisition désirable et bien profitable, puisqu'ils tendent à verser quelques lueurs dans l'indéfinement longue et profonde nuit où se trouvent plongées pour nous les faite de la jeunesse de la terre," &c. &c.—p. 9

In a note he adds that he presented to the Academy in 1834 several memoirs to prove "que le principle de l'unité typeal de l'organization contient des éléments de révélateurs, et de domination, d'après lesquels c'est un de leurs faits conséquens

que les séries animales et végétales dépendent par voie continue de génération, d'espèces des réspectivement conformées, lesquelles placées sous l'empire des circonstances et milieux ambiants des âges antediluviennes, habitaient alors la terre, et qui par suite de la modification survenue dans ces causes, se sont modifiés avec et comme celles-ci, et puis éteintes, pour toutes ensemble définitivement disparaitre."

That these were no random ideas thrown out, as the Germans often do, can be proved by a reference to all his works: they had been deeply thought of. To a clear and simple announcement of them to the Academy of Sciences there were the following objections:—Cuvier and his pupils were alive, and it was presumed that they had definitively settled the question respecting the fixity of species—the unalterability of species; so that the present races of animals could not be, under any circumstances, the modifications of the ancient fossil races.—p. 105.

Now the theory of development, as it is called, can have a reference only to one of two views;—

"En me livrant à l'espoir d'établir que les séries animales et végétales de l'état actuel déscendent par voie continue de génération d'éspèces réspectivement conformes des âges antediluviennes, et que la transmutation de leurs formes tient à des changements survenues dans les milieux ambiants," &c.—p. 104.

Cuvier's great proposition against the continuity of the races was the *historic proposition*. Bacon had already recommended experiments to try the metamorphoses of organs, to see if we could not thereby diversify and multiply species. Pascal also had announced the pre-existence of an animal matter—the blastoderm of modern writers.

Geoffroy, in his great Memoir, 1831, announced the continual change of species in the following terms:—

"Création successive et progressive."—p. 102.

"Enchaînement suivre et nécessaire, de roulement méthodique.... Progrès continus.... Embrassee aussi bien dans l'avenir que dans le passé. ... Subséquence des faits nécessaires développement continu." Unity and variety:—"Elle ne parait du moins vraiment et heureusement explicative des révolutions du globe, du développement des deux diverses zoologies, l'engendrement l'une par l'autre. Et je vais; plus loin, qu'il soit décidement démontré que les races actuelles sont le produit de la même création continuellement successive et progressive, et qu'elles sont réellement déscendues par une filiation non interrompues des anciennes races aujourd'hui perdues.... Changements qui constituent seul le mouvement général de l'univers.... Réealisant un développement continu, successif dans ses phases, et progressif dans les temps."—119.

Indeed, Buchez had stated, in a more popular way, the whole doctrine (see p. 120), viz., that in embryogeny we have the successive epochs of the animals of the earth shadowed forth. At page 138 he declares that vitalism must be explained by general laws.

(To be continued.)

Medical Societies.

PATHOLOGICAL SOCIETY OF LONDON.

Mr. Arnott, President.

Mr. Henry Thompson exhibited a specimen of

STRICTURE OF THE URETHRA,

with the following history:—T. R——, aged seventy-eight, came under his care, two years ago, with narrow stricture. In a few visits, catheters 1, 2, and 3 passed, but no larger. As his symptoms were then greatly relieved, nothing more was done on account of his age and infirmities. In April of this year, he was again under the care of Mr. Thompson, in St. Marylebone Infirmary, with distended bladder, swelling in the perinæum, and erysipelas of the anus. The bladder was freely relieved by a No. 2 catheter, and an abscess in the perinæum opened. For a time, he rallied, and promised to recover, but ultimately exhibited symptoms of exhaustion, and died on the 28th of April. On post-mortem examination, there was found a very narrow, unyielding stricture of the urethra, one inch anterior to the junction of this bulb with the membranous portion, and immediately behind is a bulging-like recess; the prostatic portion is unnaturally dilated, and the prostate gland about twice the usual size. The bladder was very much thickened, the kidneys nearly normal, and an abscess involving the spongy portion of the urethra appeared in the perinæum.

Mr. Henry Thompson next exhibited a drawing of a case of

EXTROVERSION OF THE BLADDER,

in a child two years of age, under his care. The child is small for his age, but very intelligent. The father, mother, brothers, and sisters are all exempt from any deformity. The bladder is extroverted, the upper border corresponding with the umbilicus, the lower with a short penis, cleft longitudinally, and exhibiting the urethra as a trough in the median line. Below is a large scrotal projection, containing intestine and two testicles. A portion of the bowel may be reduced, but the greater part, as well as the testicles, cannot be removed from their position in the sac. The orifices of the ureters are very small, the left being more distinct than the other.

Mr. Henry Thompson also exhibited

AN ENLARGED TESTICLE,

which he had removed that morning from a patient in the St. Marylebone Infirmary, aged twenty-five years. Seven months previous he had been sitting across the corner of an iron bedstead, and on stooping received a blow on the right testicle. After the cessation of pain, he felt nothing for two or three weeks, when it became tender and began to swell. Since that time it gradually increased in size, until it became as large as a small cocoa-nut. The patient complained of severe "dragging pains" in the loins and thighs. On examination, the tumour was found irregular, ovoid, and of