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THOMAS WAKLEY, SURGEON,

M.P. DURING EIGHTEEN YEARS FOR THE METROPOLITAN BOROUGH OF FINSBURY,
AND CORONER FOR THE COUNTY OF MIDDLESEX.

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incision was made in a vertical direction, about an inch to the inside of the nipple, a very small portion of skin having been included. The morbid growth came away very easily, in consequence of the loose cellular tissue, which connected it with the skin and pectoral muscle on the one hand, and the inner border and posterior part of the mammary gland on the other; and in this situation the tissue was more condensed than elsewhere. No part of the gland was interfered with. The tumour weighed nine ounces, was irregularly lobed and lobulated on the surface, and was in colour similar to the grey matter of the brain, a loose envelope of areolar tissue covered its entire circumference. A section having been made through it, the surface became irregularly dotted over with milky points, and had all the appearance of a section of the parotid gland, though on a larger scale, and somewhat harder and darker. A microscopic examination showed the acinal elements of the gland tissue, and the presence of ducts in continuity from their first to the sixth grade of development. How the ducts ultimately terminated could not be made out; that they had nothing to do with the normal nipple was proved by no milk having exuded until a section of the tumour had been made. The patient has progressed favourably since the operation.

INTRODUCTION TO INQUIRIES INTO THE PHILOSOPHY OF ZOOLOGY.

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LECTURE ON ANATOMY, AND CORRESPONDING MEMBER OF THE ACADEMY OF MEDICINE OF FRANCE.

THE inquiries, of which the following pages are a summary, are the result of many years' investigations of questions which, as an anatomist and zoologist, have been constantly before me throughout the active period of my life. For the sake of method, I have subdivided the inquiries and summary into three sections: in the first, I consider the relation of species or race to genus or natural family; the second is chiefly occupied with the great question of unity of the organization, as proved by the skeleton, recent and extinct; the third has for its immediate object the application of the preceding inquiries to the natural history of the human family. The details on which these results are founded will appear from time to time.

Zoology is either a science or it is not. If it be a science, it ought to enable us to decide on some principles applicable to the zoological world. Is zoological investigation of so low a character as to be forced to leave to the philologist the settling the great question of the unity of mankind? Are there no anatomical differences sufficiently distinct to settle at once the question whether mankind be of one natural family, comprising several species, or of one species composed of several accidental varieties? Are there no external characters sufficiently well marked to settle the question, in case anatomy should fail to do so?

Zoology, if a science, should enable us to decide on the great questions of unity of the organization, and of a serial unity of all that lives; and if of all that now lives, by the anatomy of the fossil world the unity of the past and present ought to be proved or disproved. Ethnologists take advantage, as it were, of the differences of opinion existing on nearly all the great points of zoology, and seem to think that man does not come within the scope of those great physical laws obviously regulating life. In these inquiries I purpose bringing in review all these great questions.

The slow progress which the philosophy of zoology has made since the days of Aristotle, when compared with other sciences, must be ascribed, I think, to human prejudices. Geometricalians, mathematicians, and astronomers rose early above those prejudices, and set them at defiance. Zoologists could not, or dared not. Besides, zoological science had no real existence during the entire period of Rome's greatness and decline, and the forms of the Greek and Roman churches, which ruled the universal world of that period, prohibited all discussion. More than fourteen centuries were occupied in the quietly settling down of barbarous Europe into something of a civilized form; civil and religious liberty were terms without a meaning. In such a condition of society, it is easy to imagine the position of science.

Neither does it appear that true zoological science ever existed in Egypt or India. Transcendental theories there were, no doubt, in abundance, as the doctrine of metempsy-

chosis sufficiently proves; but as truth was not regarded, so there could be no science.

Reflecting on the causes of these circumstances, I have been often deeply struck with the simplicity of the means by which the truth was at last let in upon the human mind. The mass of human knowledge was immense; vast intellects had lived, and written; the more they wrote, the more perplexed everything became; the more mystical, the more obscure. This state of things came to a close almost in our own days.

The object of this inquiry into the philosophy of zoology is to ascertain the claim which zoology has, at the present moment, to be considered a science. The grand speculations of the Count de Buffon had no real basis in science—that is, they were unsupported by demonstration of any kind. The wild conjectures of Le Metherie and Lamarck were written in a style of romance, excluding them from the sober field of science. Nor was it until Cuvier appeared that zoology came to be studied philosophically and as a science. Goëthe, it is true, by his discovery of the unity of the organization, had, long prior to Cuvier, laid the basis of a superstructure which will in all probability prove enduring; but his labours in the field of the transcendental remained unknown; men's minds were not prepared to comprehend them; it was as if a Newton had appeared in the fourth or fifth century of the Christian era; even to Humboldt the illustrious Goëthe was incomprehensible; he had appeared before his age, a misfortune which has befallen many great men; and so, disgusted, he left that field, in which, had he persevered, he would no doubt have distanced all others.

Thus it stood towards the close of the last century. Linné had formulated the zoological world, and Buffon had described it, but the philosophy of zoology remained where it was.

The first grand step to place zoology on a scientific basis was taken by Cuvier. He discovered the true signification of the fossil world. By this discovery delusions innumerable and of forty centuries' growth were at once laid prostrate. The instrument he employed was the descriptive anatomy of the adult individual "of all or of most species." He called it comparative anatomy, and so, in a certain sense, it was; but out of it arose the greatest discovery ever made in science, even admitting that modern research does not permit us to adopt the Cuvierian hypotheses. His great anatomical researches may be spoken of as of two kinds: first, as they refer to the living zoology; secondly, to the past and gone. In his inquiries into the structure of the first, he had the advantage of examining all the soft structures, whilst the writings of the naturalist and traveller, and not unfrequently the presence of a living specimen, enabled him to decide with much accuracy on the position the animal in question was entitled to hold in that scale of animal life which, commencing with man, descended to that all but invisible world, a knowledge of whose existence we owe to the microscope; or, in other words, as regards the living zoology, most of his researches were of an *ex post facto* character, the species having been previously determined by the external characters wholly and independent of dissection. No species, for example, can be in reality more distinct than the tiger and lion, the horse and ass, the dog and wolf, and it requires no science to prove this. Cuvier found to his surprise, no doubt, that his favourite instrument of research—anatomy—would not have enabled him to arrive at a fact which the merest glance at the living animal enabled him to decide on. He found to his surprise, no doubt, that anatomical differences in these and in many other species either did not exist or were so minute as not to warrant any special notice, or rather, could never have enabled any one to guess at the distinctness of the species alone. He went further than this, for he thought that no real differences exist. I have always thought otherwise. The differences are, it is true, small, and they seem unimportant; but if they are constant, that is enough. For once he gave to external characters an undue importance, in the instance of the dugong, which in this way he dislocated from its natural family.

With the extinct world it was different. Death and time, and the physical changes of the globe, had destroyed all structure, saving the osseous and certain other hard tissues, as the teeth; out of these Cuvier was called on to reconstruct that which no longer had an existence—that which had ceased to be—and that which most think can never be again. With a few exceptions, nothing was left to Cuvier but the hard parts—the skeleton and the teeth: whatever chiefly characterizes species, and even genus, had disappeared.

How he executed this great task all the world knows. It led him into the adoption of various hypotheses, which he defended with much pertinacity, from an idea that the views of his opponents were calculated to sap the foundation of his

own vast reputation. This was his error. He presumed his reputation to be based on his geological views instead of his anatomical. His contemporaries adopting this erroneous idea, have placed his statue in a saloon appropriated to mineralogical geology, properly so called! An error of a singular character, incomprehensible and unhappy! Posterity will put this right, and restore his statue to that museum which his industry formed and his genius planned; and without which the theories of Buffon, and of Goethe, Geoffroy, and De Blainville, and of Cuvier himself, are but idle dreams, in no way superior to those they displaced.

The first object aimed at by Cuvier was, to establish, anatomically, that the past zoologies were not single but several; secondly, that all extinct species and genera differed from the living, and each zoology from its predecessors, and the last extinct from the present living zoology. As an anatomist escaped with the real, he attempted, by the only instrument he deemed equal to the task—that is, anatomy, the demonstration of these views: he succeeded to his own satisfaction, and led the world with him. When I saw and conversed with this illustrious man, in 1821-22, and again in 1824-25, I had my doubts as to his being fully satisfied himself with his own theories, and this I found to be the opinion of others who were in almost daily converse with him; but be this as it may, the following hypotheses flowed directly from his researches:—

1st. That there had been several zoological creations, each specifically distinct from all that preceded.

2nd. That man himself formed a sort of epoch in the zoological world.

To establish such hypotheses, necessitating the repeated interference of miraculous or, at least, of unknown powers and influences; it was absolutely necessary to prove specific differences, and by means of anatomical characters. The instrument of research broke down in Cuvier's own hand, and this he admitted, though with great reluctance. I shall allude very briefly to a few of the natural families whose anatomical differences did not present specific characters sufficiently distinct. Amongst the carnivora stand the lion and tiger, species as distinct as it is possible to imagine; but neither the anatomy of the skeleton nor the dentition show this, the differences being, in fact, so trifling that Cuvier failed to observe them, or, observing them, did not think them worth noting. Other species of the carnivora differ still less from each other; the specific distinctions of leopards, panthers, jaguars, and wild and domestic cats, depend, or nearly so, on external distinctions; and as these were destroyed in the fossil and extinct, it became evident that, as regards the carnivora at least, the extinct and living species could not be compared with each other. The fossil zoology was gone for ever, and with it all hopes of its restoration, and more especially of the determination of its identity with, or its distinctness from, the present living zoological world. The large fossil carnivora might have been lions or tigers, panthers, jaguars, leopards, &c., or, what is more probable, and what, indeed, is my own opinion, were animals specifically distinct from any of these, and which, were they now alive, could at once be determined to be a distinct species, by their external robe, proportions, and habita. The fossil horse may have resembled the quagga, the zebra, the domestic horse, the dzoital, or—and, again, this is my opinion, even an animal wholly and specifically distinct from all these.

The same remarks apply equally to other natural families—bears, dogs, pigs, oxen, rhinoceros, &c.; the elephant itself may almost be included. Here, then, arose the first *petitio principii* in the scheme of Cuvier. You were asked to believe in the specific and generic difference of animals which differed not, or very little, anatomically; and the *petitio* would have been rejected at once but for the circumstances already alluded to; namely, that—first, amongst the living zoology there are numerous distinct species, which differ but little, if at all, anatomically from each other; secondly, anatomy revealed the existence of many animals whose forms had ceased to be represented in the living zoology. Here, then, was proof that many species, and even genera, had actually become extinct, leaving altogether out of view the other objection which Cuvier saw well might be raised to his anatomical demonstration—namely, that the now existing elephant, lion, tiger, rhinoceros, ox, pig, horse, &c., are simply the descendants, by direct continuity or generation of the extinct. The probable effects of domesticity were not overlooked by Cuvier, and he applied the argument to the fullest extent, rivalling the imaginative Goethe himself. But Goethe asked for domesticity extending through millions of years. This dangerous request Cuvier avoided. And now, after years of deep thought on these great questions, I adhere to the ideas of Cuvier—namely, that the fossil remains belonged

to animals perfectly distinct from the existing zoology. Anatomical differences exist. That they are exceedingly minute, I admit; nevertheless, they seem to me constant. The nasal bones of the ass differ constantly from those of the horse; so do those of the lion and tiger. The distinction extends to the whole physiognomical character of the crania in these four species and in all others. But so it is in man, chiefly in these very bones, and in the physiognomy of the skeleton of the face. For it is not in the comparative length or size merely of the nasal or maxillary bones that the cranium of the Bosjeman and the Australian differ from the other races of men, although these differences are no doubt as constant and real as are the anatomical differences of any two species; they differ in every respect, and especially do they display a physiognomical distinction, which the experienced eye detects at once. When fossil man shall be discovered, he also will be proved to have belonged to a species distinct from any that now live. By the generic law I am about to establish, his affiliation with the existing races may and will be proved, but by the fact of his extinction, but still more by those slight anatomical differences which, though seemingly unimportant, are not really so. His relation to the present or living world will be the same as that of the extinct solidungula and cassowaries to the living—generically identical, specifically distinct. For who, by examining merely the skeleton of the Hottentot, could have reconstructed, had the race been extinct, that singular specimen of humanity? I go further: were the Jew extinct, no zoologist that ever lived could have re-discovered in the cranium and skeleton those unaltered and unalterable features of a race the most remarkable perhaps on the globe.

It is no discredit to anatomy that it cannot effect everything: it cannot restore species. Specific characters are in the main external; the anatomy of the interior leads to higher considerations than the mere determination of species. To this fact I shall afterwards return. The cranium of the white ox of Caledon differs specifically from that of all other oxen I have examined.

To the author of the “Ossenmens Fossiles” we also owe the theory of fixity of species. This at first sight might appear an extraordinary contradiction to his other views; but on reflection we shall find it is not so, for, as a preliminary step, it was absolutely necessary for him to prove the extinct zoologies to be specifically distinct from the present, and that they were not convertible into each other by any known physical law. Hence the law of fixity of species was forced upon him. After the most deliberate reflection, I adhere to the same view—namely, the inconvertibility of species into each other by any physical laws now in operation. The influence of domesticity I consider but small. By it a few artificial breeds may be maintained artificially, and by a constant struggle with Nature's laws. It owes, in fact, its seeming importance to the vast extent of man's dominion over the globe. Hybrid races, properly speaking, have no existence.

Has the grand era of Cuvier passed away, leaving all the great zoological questions near as they existed in the time of Buffon. He lived long enough to hear his doctrine of fixity of species denied in *toto* by Geoffroy. Those fossil remains he had so laboured to prove the remains of an ancient extinct zoology, asserted to be the immediate predecessors and forefathers of the existing races of animals; the present zoology to be directly descended by generation from the past; the very existence of species all but questioned; whilst the theory of successive creations, on which he so much reposed, rapidly shaken, if not entirely overthrown, by the theory of a serial unity and one creation, proposed and all but proved by another descriptive anatomist, of an eminence second only to himself, my illustrious friend De Blainville.

It was whilst reflecting on these conflicting views that it seemed to me that the time had come to test the practical merits of transcendental anatomy. Zoologists had left unexplained every great question, even to the extinction of some races, and the appearance of others, seemingly new, on the globe. Why, I said to myself, should some species, perhaps even natural families, become extinct, whilst others new to man appear on the earth? If there be a serial unity, and one creation, there can be no new species, strictly speaking, for such may simply be the extinct, altered in form by the then existing circumstances. This was Geoffroy's view. But, convinced of its inaccuracy, I sought another explanation in the idea ascribed to De Blainville, that he imagined all species to have been created at once, I do not believe he ever entertained. The four or five successive creations of Cuvier were probably no place in science, I naturally looked for a physical law on which to base the affiliation of existing species with the extinct,

and this law, I felt, could only be discovered in the transcendental.

My first observations were made on animals low in the scale of the vertebrata—on fishes, in fact. I selected, as I shall presently more fully explain, the natural family of the Salmonidae, as the one to which I had given most attention. In the young of the true salmon, I found the specific characters of all the sub-families of the genus present; that is, red spots, dark spots of several kinds, silvery scales, proportions, and a dentition identical. The young fish before me was, in fact, a generic animal, including within it the specific characters of all the species composing the natural family. To connect this generic animal with any species, you have but to imagine the disappearance of certain characters then and there present. Nothing requires to be added. Take, for example, the dentition—the dentition of the *vomer*, to which M. Valenciennes attaches so much importance, and in which he has endeavoured to discover the true distinguishing characters of the three sub-families into which that distinguished naturalist subdivides the Salmonidae. Look at these vomerine teeth in the young of any of the species—that is, as I view it, in the *generic animal*, and in the adult of all the species, that is, in the animal *specialized*—and we shall find that the *generic animal* possesses a dentition embracing all the characters by which the fully-developed individuals are afterwards to be recognised. But it is the young alone which comprises all, combined with the anterior group of teeth (teeth of the chevron) a double row on the body of the *vomer*, which row, becoming in due time single, characterizes, according to M. Valenciennes, the adult of the sub-family Forelle, or, disappearing altogether, marks the true salmon when adult, the common trout growing up with the dentition of the generic animal. The primitive type, then, is not lost, as M. Valenciennes seems to have supposed, but retained in one species at least of the natural family. As with the dentition, so with the coloration and proportions; and thus the law of generation being *generic*, and not *specific*, marks the extent of the natural family, its unity in time and space, the fixity of its species, the destruction of some and the appearance of others being but the history, not of successive creations, but of one development, extending through millions of years, countless as the stars of the firmament.

Look now at the colt a few months old as it gambols through the fields, and say, does it resemble the domestic animal from which it is sprung, in colour, proportions, movements, attitudes? Not in the least. Its colour is a rich, deep fawn, to be found only amongst the *wilde*; in its proportions it resembles the quagga or zebra, and as it canters along, its rocking-horse motion and short frisking tail recall to the mind scenes only to be seen in Southern Africa, on the plains of the Koonap, or the slopes of the Winterbergen, where roams the wild horse, to which this young of a domestic horse bears the strongest resemblance. The obvious inference is, that even in animals so high in the scale of mammals as the solidungula, the young is a *generic animal*, including in it the colour, proportions, movements, and habits of the genus or natural family, of all its species wherever placed, and representing, more especially in this instance, a wild species of that family, never domesticated nor subdued by man. Even here, where we should expect *specific* and other influences to have told strongly on the product—that is, the young, we find the *generic* law to be in full force, and that the young of the domestic horse resembles a species peculiar to another region of the earth. The natural family, then, of the solidungula embraces in the young of each species all the forms which it, the genus, can or has assumed on the earth. The quagga and the zebra may become extinct; but their forms remain in the generic young of whatever species still lives. The fossil horse belonged, no doubt, to the same family; as the exterior is lost, the precise species cannot now be determined. That he belonged to any species now living I do not believe; but he was of the family, and may appear again. Thus the successive appearance of new forms or species is no new creation, but merely the development of forms already existing in every natural family. The extinction of species which has gone on through millions of years has led some to the belief that Nature hastens onwards to the extinction of life on the globe. It is possible; but I lean to the opposite opinion, believing that living nature will have no end. That which has been may be again, the potentiality existing in every species of every natural family; and to this creed point the infinite affiliations of germs, not confined to natural families, but extending to all that lives. These are speculations on which I do not enter. Primordial forms are visible in all genera; the germs themselves must be eternal.

If we inquire into the law of generic forms lower in the scale, as in fishes, to which I have just alluded, we find still

stronger confirmation of the point I now seek to determine. The natural family of the Salmonidae, as the one with which I am best acquainted, was that fixed on for the inquiry. Look at the young salmon when but a few inches in length, and you will find that in its dentition, colouring, and proportions, it is not a *specific* animal, but a *generic*—i. e., it possesses (and is therefore perfect) all the natural history characteristics of the three sub-families into which the Salmonidae have been divided. At first, for example, its dentition is the type of the common trout; as it grows it assumes the character which we find to prevail in some of the Forelle or sea trout. Lastly, it assumes the true salmon dentition; but that which especially merits attention is, that the original type of the generic being is of a character so ample as to embrace all possible forms which the dentition can assume in any species of that natural family. Nothing is wanting; nothing new appears; nothing has to be supplied; all is foreseen; all provided for. To institute a species, all that is required is to omit or cause to disappear, or cease to grow, some parts of the organ or apparatus already existing in the generic being. In every natural family there is a species which bears, to the generic animal, that is, to the young, a stronger resemblance than any other. In the Salmonidae it is the common trout of fresh-water rivers, but there may be others. In the solipede it seems to be the quagga of Southern Africa.

Does this question apply to the human family? I think it does. The existing species of men seem to me to belong strictly to one great natural family. The species are separated from each other by anatomical and natural history characters as wide as those marking species in any natural family; their structural affiliations are of two kinds; one, general—that is, connected to the entire animal kingdom; the other, more limited—that is, bearing a relation to the class of animals nearest to it. But I cannot discover any direct affiliation with the highest quadrupeds, nor vice versa. The inference is, that a class or natural family between man and animals is wanting, or they never have appeared. Anthropomorphous apes there are none, nor pithecan men; but as there unquestionably exists a *serial unity* of all that lives, or has lived, or may hereafter, so no such gap can be as that alluded to. This serial unity implies one origin of all things, which, for want of a more suitable term, we call a Creation. But to investigate the period of this origination there remain many important inquiries still to be entered on, such, for example, as the relation or affiliations of natural families.

Thus I endeavour to dispose of the theories of Cuvier and of his illustrious colleagues Geoffroy and De Blainville:—first, the fixity of species is a fact, proved by human history, chiefly by the monumental and artistic—it includes man; but, secondly, other species once existed which are now extinct, the living zoology taking their place. This implies no real generic extinction, nor a new creation, the past, and the present, and the future, no doubt, being included in the *generic young*. Whilst any member of a natural family exists, new species will always appear, that is, new to man when adult and specialized; even the old may reappear by the revolution of time. Thirdly, in one sense, there is probably no such thing as species, Nature's intention being to fill up all gaps; but as these gaps exist, and always have existed, they serve to show us species and generic distinctions. Science does not yet enable us to show clearly the relation of one natural family to another. Affiliating races probably exist, uniting the past, the present, and the future into one grand scheme; but these affiliating races have not yet been discovered. Between them and the highest order of the quadrupeds there obviously exist several distinct gaps which science has not as yet been able to fill up. Some species, perhaps, or even genera, have been lost, or never yet appeared; for the laws which regulate the extinction of one species and the appearance of another not having as yet been traced, all is conjecture. The extinction of the one and the appearance of the other, from one and the same generic animal, probably depends on the existing order of things. One thing is certain, the development of new species has no relation to any kind of successive perfectability.

When Geoffroy asserted that the present zoology descends directly by generation from the past, he in one sense was right; but as he knew not the true relation of species to genus, his hypothesis was directly at fault if he meant that the fossil and recent species were identical. Now this was his meaning, and this is what De Blainville affirms of the fossil ox, lion, or tiger, bear, and horse. My own inquiries, based on a minute examination of each species on natural history considerations, and on the application of the transcendental—i. e., the application of the law proving descent to be *generic* as well as *specific*, are all opposed to these views.