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ON

THE CAUSES OF DEATH

OF

MANY OF THE ANIMALS

AT THE

ZOOLOGICAL GARDENS, REGENT'S PARK,

FROM 1851 TO FEBRUARY 1860.

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[From the PROCEEDINGS OF THE ZOOLOGICAL SOCIETY OF LONDON,
February 28th and March 13th, 1860.]

LONDON:

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

P R E F A C E.

THE following pages are reprinted from the 'Proceedings of the Zoological Society of London' for the purpose of private circulation. The author has been obliged to condense as much as possible the information which he possesses; but he hopes hereafter to publish a more extended and practical treatise upon the diseases of the Lower Animals and of the Vegetable Kingdom as compared with those of Man; and he reiterates his belief that the diseases of the Human species will not be properly understood nor appropriately treated until the abnormal structural changes in the lowest forms of organization have been fully investigated.

21 Parliament Street, and
278 King's Parade, Chelsea,
April 24th, 1860.



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PART I.

Before I proceed to the immediate subject of my paper, a few preliminary remarks will be necessary.

In the earlier Numbers of our 'Proceedings' several accounts of the morbid parts of animals dissected are given by Professor Owen, Mr. Martin, the late Mr. Yarrell, and others; but I believe no attempt has been made in this or in any other country to investigate the diseases of foreign animals in confinement, in a comprehensive manner, so as to endeavour to draw practical and useful deductions from them. Such will be my object in the present communication. I have made rough sketches in oil-colours of many of the diseased parts I shall have to describe, so that they may be the better understood. In 1851 I obtained permission from the Council of the Zoological Society to examine all animals dying at the Gardens, for the purpose of physiological investigations; but in these researches I was especially anxious to ascertain the cause of death in all the animals I dissected, believing that the morbid condition of certain organs might throw some amount of light upon their functions. I mention this for the purpose of showing that, if I had examined these animals exclusively for the purpose of comparative anatomy, I should have been less careful about their abnormal conditions.

In most instances in the examination of the blood, and in the in-

vestigation of morbid structures, I have been aided by the use of the microscope. The large number of notes that I possess would enable me to make a very long communication; but, as my chief object in bringing this matter before the Society is to convey useful and practical information in plain and simple language, I shall reserve some of the more minute and scientific parts of the subject for the Pathological Society. In addition to these remarks, I may express my *belief that the nature of the diseases of man will not be thoroughly understood, nor appropriately treated, until the deviations from normal structure are fully investigated in plants and in the lowest grade of animals*: a doctrine, I believe, not promulgated before, and one that will be laughed at by many; but I have the greatest confidence that this mode of throwing light on the dark and uncertain nature of the art of medicine will hereafter be adopted.

For the purpose of pointing out what I believe to be the importance of this matter, I trust I may be pardoned for quoting a short extract from my work on the Spleen, written in 1852:—"Nearly all the great discoveries in physiology have been made by experiments upon living animals, in a state of health; but why should not their diseased conditions be turned to account? Why may not brute pathology hereafter clear up some of the doubts and difficulties of our art? The examination of one of the lower animals that has been kept in confinement is attended with these great advantages:—the exact nature of the food, and the deviations from the natural state of the animal, can be readily ascertained; and if the animal is small (a bird *e. g.*), the morbid parts are revealed at once, and the chain of causes is more apparent than in larger quadrupeds, the investigator always taking into account the peculiarities of structure."

I divide my subject into two parts, the first including that which forms the heading of this paper; the second will treat upon the best means of preserving the health of animals in confinement, and of preventing the disorders and diseases to which they are liable. The former division I shall consider this evening.

It will be well to remember that most of the animals in question were living in an artificial state, many of them exposed to a temperature much lower than that which was natural to them; their food, too, generally different from that which they were accustomed to obtain in their native haunts; and the situation of the Gardens, on a cold,

clayey soil, is another matter that should not be lost sight of. We must also, in estimating the nature of the diseases of quadrupeds, birds, and reptiles, consider the peculiarities of their anatomy. Thus that of the Mammals does not differ very materially, so far as regards diseased conditions, from that of man; many of them have a slower circulation, and the complexity of the stomach and the length of the alimentary canal, in the Ruminants especially, are important items in the account.

In birds the temperature is several degrees higher and the circulation much more rapid than in quadrupeds; whilst in reptiles the blood is cold, and the action of the heart generally slower than in the higher classes.

The natural longevity of the lower animals is a point that should not escape observation. In the vast majority we have no means of knowing the age which they attain, and even among our British wild quadrupeds and birds we possess but little reliable information. As regards our domestic animals we are not much better informed, for but few of them are allowed to live the natural period of their existence. The probable *average* age of some of our British animals, judging from my own inquiries and investigations, is about as follows:—The horse 25 to 35 years, ass 30 to 40, ox 15 to 20, goat 15, sheep 15, pig 12 to 16, dog 14, fox 14, cat 16, hare 11, rabbit 11, the eagle and many of the accipitrine birds 30 to 60; the small passerine birds 12 to 16; ravens 30 to 50; goose 25 to 40. Many of the gallinaceous birds, as far as my information goes, are the shortest lived, some of them, the Cochin China cock for example, in some localities not living more than six or eight years. Among the reptiles, the tortoise is nearly the only one about the age of which we possess any positive information, and this animal is said to live a hundred years; and some of the Saurians (Alligators and Crocodiles) are probably very long lived. Another remark I may make *en passant*: the old adage “*Soon ripe, soon rotten,*” like many wise sayings, so called, is frequently inapplicable, for the raven and the goose in a few months attain their natural size; whilst many animals that are comparatively short-lived are much longer in coming to maturity. It must be borne in mind, too, that individuals among the lower animals, as among the human species, occasionally reach a great age. Thus Youatt mentions one instance of a horse that died at the age

of sixty-two. I know of an instance of a Suffolk cart-mare that bore a foal when forty-two years of age ; and I have recently dissected a cat that had reached the age of twenty.

I now come to the gist of my subject, viz. the cause of death of many of the animals during the period alluded to. For the sake of brevity and perspicuity, I will speak of the animals in classes according to the Cuvierian arrangement ; one advantage of this method will be the consideration of the differences in structure in connexion with the morbid changes.

The description of the secondary, or what may be called minor lesions, I shall make brief allusion to at the end of my paper, and confine myself at present to those diseases which, as far as I could judge, appeared to be the immediate cause of death.

I scarcely need say that in many instances it is difficult to ascertain the exact or immediate cause of death, so that a great number of deaths must come under the denomination of doubtful. Thus, fully to explain my meaning, an animal labouring under a chronic disease readily succumbs to any depressing cause, such as exposure to cold, change of diet, or food of an improper kind, slight external injury, &c., the vital forces being insufficient to resist a shock that an animal in a healthy condition would bear with impunity. I could give several examples of this during the late cold weather. An Armadillo (*Dasypus peba*), with a large and fatty liver, became suddenly torpid, and died in a short time. A Wagati Cat (*Felis viverina*) that had partly lost the use of the hind limbs appeared to die solely from the depressing influence of cold. A Civet Cat (*Viverra civetta*), in good condition and apparently in good health, died in a fit, the consequence probably of determination of blood to the brain from cold. I could mention several examples of birds that died from a similar cause, the presence of tubercles of the liver, spleen, and other parts, rendering the animals more susceptible to its influence. Animals, too, often died soon after a long voyage, the confinement, unnatural food, and other causes producing dérangement of the vital functions. A Dusky Duck (*Anas obscura*) that lately arrived from America had no discoverable disease in any part, but the small intestines contained thousands of entozoa (*Ligula*), and these, combined with the cause above alluded to, were sufficient to produce death. A monkey had been two years at liberty ; after a

few months' confinement in the monkey-house it died, and I could discover no sufficient cause of death. Another point must not escape observation, viz. the impossibility in most instances of examining the brain, as the specimens were many of them used for stuffing or for skeletons. I believe, however, that diseases both of the brain and heart are comparatively rare in the lower animals, although their occurrence is far from unfrequent,—the absence of mental exertion will to a great extent serve to explain this. Sudden and immediate death sometimes occurs, but it is very unfrequent.

Quadrumana.—Of these I have inspected the bodies of sixty-seven, and I may remark here that I speak in this communication only of the animals dying at the Society's Gardens. Among them were two Ourangs (*Simia satyrus*) and four Chimpanzees (*S. troglodytes*); three of these apes died of *diarrhœa*, two of *pneumonia*, and one of diseased kidneys. They were between two and four years of age, and all were teething. There is, I think, but little chance of the young anthropoid apes living long in this country; if they could be obtained when nearer the adult period, there would be a much greater probability of keeping them for several years. I have neither time nor space to notice separately the diseases of the different animals; I shall therefore endeavour to classify the diseases as well as I am able, and comment briefly on the rarer forms of abnormal structure, especially when they occur in animals that have seldom or never before been dissected in this country. The supposed cause of death in the *Quadrumana* may be thus classified (I use the term supposed, because in this order, as in most of the others, I may often have been in error respecting the immediate cause of death): pneumonia 13, pleuritis and pericarditis 11, tubercles of the lungs 17, tubercles of the liver, spleen, and other parts 5, diarrhœa 4, atrophy 5; one of each of the following: tetanus (from diseased tail), epilepsy, fungus hæmatodes of the lungs, fatty liver, diseased kidneys, ruptured stomach, and aneurism of the aorta. In thirteen I could not discover any sufficient cause of death; but in these, as in most of the other specimens, from circumstances before alluded to, the brain was not examined.

The above deductions serve to correct a prevailing error, viz. that nearly all the *Quadrumana* in this country die from tubercles in the lungs. In five monkeys that I have recently examined no tubercles

were present in any instance. It is true that disease of the lungs is the most frequent morbid change, and that consolidation of the pulmonary tissue from inflammation is generally the forerunner of tubercular deposit; but a great number, as the list shows, die from other causes. As might be expected, the diseases of this order resemble more those of man than any of the succeeding. In one instance the transmission of the tubercular diathesis was very marked. A female *Rhesus* monkey that I examined died of extensive tubercular deposit in the lungs and in other organs; she had borne five young ones: two of these which I inspected also died of tubercles in the lungs, and probably the others shared the same fate.

As I shall have occasion to speak often of tubercle, I may as well at once point out the peculiarities of this deposit in the lower animals. Thus, large cavities, so common in the lungs of man, are but rarely met with in the brute, the extraneous matter having a more solid and cheese-like appearance. In birds the deposit is mostly hard and formed in concentric layers, differing materially from that which occurs in the human subject; it is often met with, too, on the surface of organs, in the shape of small nodules. This form of tubercle, I believe, is often of rapid formation, its structure being more albuminous than that of the other varieties. In reptiles it is generally softer and less circumscribed than in birds. Of all the chronic lesions to which foreign animals in confinement are exposed, this is by far the most frequent, although probably in their wild state it seldom occurs. I have examined the bodies of all the British quadrupeds and reptiles, and the greater number of the British birds, but, with two or three exceptions, they have been free from this disease. One of these exceptions was in a large number of Common Sparrows (*Fringilla passer*) that were found dead some years since in the Society's Gardens; in nearly all of these I found tubercles of the liver, spleen, or other organs,—a fact that does not speak much in favour of the locality of the Gardens.

The length of time that some animals will live with extensive tuberculous disease of the lungs and other parts is remarkable. In 1853 I had an opportunity of watching a Patas Monkey (*Cerco-pithecus ruber*); for some time the symptoms were a short, dry cough, loss of appetite, dull eye, great emaciation, and a pulse of 140 per minute. There was scarcely a sound portion of lung in this

animal, the whole being studded with tubercles in various stages of development. The wonder is that life could have been prolonged under such a vast accumulation of disease.

The presence of aneurism in a monkey has not, as far as I know, been before observed, and, although I have been especially careful to examine the larger arteries in most of the animals I have dissected, I have only in one instance—an old Capybara (*Hydrochaerus*)—met with ossified deposit,—an alteration so common in the human subject.

Chiroptera.—Three *Pteropi* (Fruit-eating Bats) are the only members of this order that I have inspected, and, with the exception of evidence of want of nutrition, no sufficient cause of death could be discovered.

Carnivora.—The animals of this order examined amount to more than one hundred, and their diseases differ in many respects from the preceding. Tubercles of the lungs are much less frequent, but their occurrence in the liver and spleen is not uncommon. Although it is said that “a cat has nine lives,” many of the *Felidæ* are readily killed by a slight amount of inflammation of the lungs. In several deaths I have found the first stage of *pneumonia* sufficient to produce the fatal result. Among the Carnivora, I have examined six lions (including two cubs), four tigers, two jaguars, and four leopards. One lion had a false aneurism of the lung; a lioness died in convulsive fits; I found a large quantity of hay in the stomach, but could discover no lesion of the brain or other organ to account for death. I may here mention that I have met with several cases of fatal obstruction of the bowels in carnivorous animals from this cause: large accumulations of hay and straw are matted together in the intestines, rendering them impervious. The most extraordinary example, however, that has come to my notice occurred in a common cat at Barclay’s Brewery, and in this instance, as the case is a very practical one, I think I may depart from the plan I had laid down of confining my notices to deaths in the Society’s collection. The cat in question had been for a long time confined in one of the corn-chambers, and was unable to procure grass; she gradually became emaciated and died nearly a skeleton; after death the stomach was found filled with a solid mass, formed of the twigs of birch-brooms. Mr. Braby, the intelligent veterinary surgeon of the establishment, gave me a half-section of this mass; it is now in the Museum of the College

of Surgeons. I mention the case especially for the purpose of showing the importance of supplying carnivorous animals with grass. A most remarkable form of disease occurred in 1854 among some of the cats (lions, tigers, and jaguars), arising, I believe, from their having eaten glandered horseflesh. The animals had most of the symptoms of this fearful disease, which is so often transmitted to man; rabbits and cats that I inoculated from the nasal purulent matter of a jaguar died in a few days. A short time before this, as related to me by Mr. Bartlett, two gentlemen dissected at the Gardens a lion that was probably affected with the same disease: one died, and the other was nearly two years before he recovered from the effects of the poison. A remarkable instance of attachment occurred in the Cape hunting-dog (*Lycan pictus*), as I have stated in the 'Proceedings' for 1855; after the death of the dog, the bitch pined away, refused her food, and died in ten days. Many of the carnivorous animals were excessively fat, especially the bears. In a Persian lynx the quantity of fat in the pelvis and abdomen was very great, and I have seen similar accumulations in many of the *Felidæ*. Some writers on fatty degeneration in man have stated that the deposit of fat in wild animals is seldom or never met with; but this is an error; in many of our British wild animals it is very abundant. The body of the Barn-owl (*Strix flammea*) now on the table contains a large quantity of fat, a thick layer of which also existed under the skin; indeed I have never seen the same amount in a graminivorous bird. Lieutenant Burgess, some of whose papers are in our 'Proceedings,' informs me that many birds which he shot in India were exceedingly fat.

The chief diseases of the Carnivora may be arranged under two heads, viz. the inflammatory and the tuberculous, the latter (as I believe) being generally the effect of the former. One bear (*Ursus americanus*) died suddenly in a fit, and it is said that in these animals sudden death is not unfrequent. In one instance I found the lung of a tiger emphysematous, the ruptured air-cells forming elevations as large as walnuts.

Amphibia.—In three seals (*P. vitulina*) and in a walrus (*T. ros-marus*) the cause of death was not evident; the last-named animal had been fed by the Scotch captain who brought it to this country upon oatmeal!

Marsupialia.—The marsupial animals examined number about

thirty; many of them were very fat; tubercles of the liver are common in this division, and this organ is often soft and fatty. A tree-kangaroo (*Dendrolagus inustus*) had tubercles of the liver. The most remarkable death among these pouched animals was that of a great kangaroo (*Macropus major*), namely, from bleeding of the bowels; the blood appeared to ooze from a large extent of surface of the mucous lining of the alimentary canal. This membrane was very dark and ecchymosed. The cause of this was not apparent, as the animal was in excellent condition. In two Tasmanian Wolves (*Thylacini*) the deposit of fat was very abundant, and in one which died in hot weather, and the body of which was exhumed, the oily fat appeared to permeate almost every tissue.

Rodentia.—About thirty individuals of this order have been dissected, and tuberculous deposits in the liver and spleen were often present; several died from inflammation of the lungs. A Canadian porcupine (*Erethizon dorsatum*) died of distended stomach, having gorged itself with potatoes, after a sea-voyage. A beaver (*Castor fiber*) presented a large amount of tubercular disease of the liver and spleen, although in tolerable condition; whilst the body of the large squirrel (*Sciurus maximus*), in excellent condition, revealed no satisfactory cause of death. The two Capybaras afforded the most remarkable deviations from normal structure; one, as recorded in the 'Proceedings of the Pathological Society,' 1854, p. 347, had scirrhus of the kidney; the last that died had the liver so softened that the bile-ducts, arteries, and veins could be readily pulled from the substance of the liver; both suprarenal capsules, too, were enlarged and diseased,—a very rare occurrence in the lower animals.

Edentata.—The examination of the misnamed toothless animals has been very limited, three armadillos and one large ant-eater (*Myrmecophaga jubata*) forming the whole. The armadillos appeared to die from derangement of the assimilative organs; in one the liver was soft and fatty, but in none of the above was there any active disease.

Pachydermata.—Although the animals in this section are but few in number, the morbid appearances were of especial interest. In the female Asiatic elephant which I examined the condition of the blood was very remarkable; it was generally tough, and could readily be pulled out of the vessels; one portion from the posterior *cava* and iliac veins measured 4 feet in length. The animal, apparently in good health, was frightened during a thunder-storm, had profuse

watery diarrhœa, and died the next day. As these animals are not often inspected, I may mention that I examined the viscera of another Asiatic elephant that died in Yorkshire from inflammation of the lungs after exposure to severe cold. Of three tapirs (*T. americanus*), two died of peritonitis; in one this was occasioned by a small oblong smooth perforation of the stomach from simple ulceration, as exhibited in the drawing; in the second the cause of the peritonitis appeared to be doubtful; the third had brain symptoms from diseased kidneys. The death of two peccaries (*Dicotyles torquatus*) was occasioned by inflamed lungs. An Indian sow (*Sus indicus*) died of abscess of the brain. A zebra, when apparently in good health and in excellent condition, broke its neck by striking its head against the palings of the paddock. It will scarcely be believed that the colon and cæcum of this animal weighed 224 lbs.; the liver, as shown in the drawing, was covered with large cysts (*Echinococci*); one of them contained 8 oz. of yellowish fluid; probably the fluid contents of all the cysts amounted to about three pints; but, notwithstanding the presence of these *Entozoa*, the animal appeared to be in perfect health.

In the female African wart-hog (*Phacochoerus*) that recently died at the Gardens, the animal had suffered from peritonitis and perforation of the intestine.

Ruminantia.—The inspections of the members of this order have been far more numerous than those of the preceding, including some of the rarer species of deer and antelopes; their diseases too are of a more varied nature; the presence of *Echinococci* in the liver, lungs, and other viscera, is very frequent. My space will not allow of my alluding so fully to some of the morbid conditions which I have found in the ruminants as I could wish. Of two giraffes which I inspected, one had diseased liver, and the paunch was enormously distended with food; it probably weighed more than a hundred weight, and this distension was most likely the cause of death; the liver and spleen both contained acephalocysts the size of a hen's egg, and the buccal glands were filled with chalky concretions about the size of peas; this was an old female that had borne six young ones. The second was a younger animal, and appeared to die of inflammation of the lungs. The alimentary canal of the old giraffe measured 254 feet in length, that of the other 209 feet. I mention this, because, as these measurements differ materially from those of many who have

examined other specimens of this animal, future inquirers must determine their accuracy. In three reindeer (*Cervus tarandus*), all in good condition, the deaths appeared to arise from enormous distension of the paunch, similar to that which sometimes occurs in sheep after eating coleworts or other succulent food; the lichen was probably not sufficiently dried. In one of these animals the heat of the contents of the paunch was so great that I could scarcely bear my hand upon it.

In a Harte Beeste (*Antelope caama*) I found false aneurism of the spleen. In a Sambur deer (*Cervus hippelaphus*), in excellent condition, nearly the whole of the lining membrane of the small intestines was covered with flakes of lymph; an appearance which I never witnessed in any other animal. This deer had been lying upon the cold ground, and probably the inflammation was thus occasioned.

Many of the deer and antelopes died from inflammation of the lungs, especially those of immature age. Tubercles of the lungs are also very common among them. In the old male leucoryx (*Antelope leucoryx*) the lungs were studded with tubercles. A leucoryx a year old, got by the above, had not only tubercles in the lungs, but the whole length of the exterior of the intestinal tube was covered with small, hard, semitransparent tubercles,—a disease in the human subject called tubercular peritonitis. This is another instance which shows the hereditary nature of tubercle in the lower animals.

In a Bubaline antelope (*Antelope bubalis*), which died of extensive tubercular disease of the lungs, I found a Bezoar in the paunch,—a concretion that, some years ago in the East, would have realized some thousands of pounds.

In an Addax (*Antelope addax*), besides an extensive deposit of tubercles in the lungs, there was a large accumulation of bony matter around the air-cells, as shown in the preparation.

In the old female elk (*Cervus alces*), which died last year, portions of the lungs were inflamed and in the first stage of consolidation; the blood too, as I have found in many animals, was dark, thick, and treacle-like. The alimentary canal of this animal measured 129 feet.

Although I have endeavoured to compress the notes before me as much as possible, I find the subject has extended to a greater length than I expected; I must therefore defer the remaining portion of my paper until our next meeting.

PART II.

In addition to the remarks I made in my last communication on the diseases of the Mammalia, I may mention that biliary concretions in the gall-bladder have not been met with, although they are not uncommon in stall-fed oxen and in sheep fed upon much saccharine matter. Derangements and alterations in the colour and consistence of the bile, as shown by the specimens exhibited, are very common: this fluid was often found thick and treacle-like, and in one instance in an old *Leucoryx* (*Antelope leucoryx*) the gall-bladder was much enlarged, and contained 4 oz. by measure of dark-coloured bile. Calculi in the urinary bladder I have not met with, although this viscus has generally been examined. Eye-diseases are not uncommon,—cataract is often present. Of diseases of the ear I believe nothing is known in the lower animals; but it is probable that many cases of deafness and of disorganization of the auditory apparatus would be found, if the subject were inquired into.

Blood-diseases in mammals, birds, and reptiles, form one of the most interesting and instructive part of the inquiry; but my space will not allow me to enter fully into this matter. The blood is often found thick and treacle-like, the colour mottled, some of it often of a pinky hue; large concretions of fibrine often form in the cavity of the heart, and sometimes, I believe, are the means of prolonging life, by accommodating the size of the cavity to the diminished power of the circulating organ.

Since our last meeting, the death of the Red River hog (*Potamochoerus penicillatus*) has afforded another example of the difficulty of arriving at a correct inference respecting the cause of death. The stomach of this animal was filled with a mass of short, tough straw, which probably the organ was unable to get rid of; the blood*, however, presented the mottled, pinky appearance before described;

* Dr. Halford, who took the heart home for investigation, confirmed this statement respecting the appearance of the blood; he found also some amount of inflammation of the lining membrane of the heart.

under the microscope many of the corpuscles were irregular in shape, and some apparently disintegrated.

BIRDS.

Of these I have dissected many hundreds, but I need not enter minutely into the nature of their diseases. Affections of the liver and of the alimentary canal are the most common, and those of a tubercular character greatly preponderate. Tubercle in birds, I believe, is often very rapidly deposited, especially one form of it, viz. the nodular or albuminous. The liver, spleen, and intestinal tube often contain large masses of tubercular deposit, as shown in the specimens and drawings. This deposit in the lungs of birds is comparatively rare. In some of the *Raptors* I have found large tumours in the chest closely adherent to the ribs, and of a hard, fibro-tuberculous character. The viscera of some Wading birds (*Grallæ*), especially the Storks and Cranes, have offered the most remarkable deviations from normal structure in the shape of tuberculous and inflammatory products. In some instances I have been led to attribute the cause of death to the presence of a quantity of tough grass in the gizzard, which so interfered with the grinding process of the organ as to prevent a proper supply of chyle; hence the diseased state of blood and other derangements that followed. Nails, buttons, pieces of wood, and other extraneous bodies in the gizzard, are very common, but I have not been able to discover any ill effects from them. In a Great Black-backed Gull (*Larus marinus*) that had been some time in the Gardens, a large fish-hook (by which probably the bird had been captured) was imbedded in the proventriculus.

Diseases of the kidneys are very common in birds, the weight of these organs in proportion to the body being greater than in any other class of animals,—*a fact, I believe, never stated before*; but it serves to explain, in some degree, the prevalence of morbid changes in these viscera. The renal organs in birds in confinement are often enlarged, softened, fatty, and granular; in some cases tubercular: but one of the most remarkable changes in connexion with the kidneys of birds is obstruction of the ureters, and occasionally a blocking up of the *cloaca* with *urate of ammonia* in a hardened state.

This I have often met with, and I believe, combined with diseased blood, it is a frequent cause of death. Pericarditis (inflammation of the heart-bag) I have observed more frequently in this class than in any other; frequently complete adhesion of the pericardium to the heart from old or recent inflammation is found crippling the action of the circulating organ. The internal cavities of the heart, too, often bear evidence of inflammation and its consequences.

Dropsy of the pericardium and of the thoracic air-cells, I have several times seen; and the legs and feet of the long-legged birds, such as the Cranes, Storks, and Herons, are often œdematous.

Hydatids (*Echinococci*) of the liver and other viscera are of frequent occurrence, and sometimes are of large size. Thus in the Crowned Pigeon (*Goura coronata*) one of these cysts in the liver contained more than 3 oz. of serous fluid. Some of them were occasionally filled with concrete biliary matter after the death of the *hydatids*. A good specimen of this was lately seen in the old Honduras Turkey (*Meleagris ocellata*) which died at the Gardens. Diseases of the feet, as in caged birds, are of frequent occurrence, especially among the perchers. The toes get stiff and contracted, the nails are sometimes lost, and occasionally the feet are affected with a kind of dry gangrene. Excesses from the abnormal production of cuticle are likewise very common.

Entozoa and *Epizoa* are very numerous, in diseased animals especially: but, as I intend to bring this matter before the Society in a separate paper, I need only mention it here. *Pediculi* in birds are often very abundant—these parasites, like some in human shape, appearing to flourish best where corruption is most rife; but in the viscera of birds I have often found a lower form of life, existing I believe long before death, viz. the presence of *fungi*. I have not only met with the sporules of mould in the tubercular lungs (as others have described before me), but I have seen them also upon deposits of lymph in the abdomen.

REPTILES.

In the *Chelonians* it is often difficult to ascertain the cause of death, many of them apparently being a long time dying, and frequently death not being detected until some days after dissolution; so that I

have not been able to arrive at any satisfactory evidence as to the morbid changes. In a few instances I have seen small tubercles of the liver.

Saurians.—The same remark respecting the morbid changes will apply to *Loricata* ; in these, however, I have found more satisfactory evidence of disease, the tubercular being the most frequent lesion. As I stated some time since at the Society, in ten Alligators and Crocodiles that I examined, the stomachs of all contained stones and pieces of wood, and in two others since inspected I have found the same substances.

In some of the Lizards I have seen the intestines obstructed with hard feculent matter. In a large Iguana the intestinal tube was blocked up with grape-stones. The death of one of the Lizards (*Uromastix spinipes*) arose partly from bleeding from the lungs. The reptile in question, the lungs and liver of which were studded with tubercles, was put into a warm bath—rather a strange mode of treatment for a cold-blooded animal—and hæmorrhage was the result. Let me make one observation about the temperature of the Reptile-house. None of the reptiles here are cold-blooded, their bodies being of a like temperature with that of the surrounding atmosphere ; and the same remark will apply to those living in hot climates. The time some reptiles will go without food, and without any apparent diminution of bulk, is also a circumstance worthy of note. I dissected a Python (*Python molurus*) that had not fed for ten months ; and even more extraordinary examples than this could be adduced. To return to the diseases of the Lizards, I may add, that the tubercular are the most common.

Ophidians.—In this division one of the most remarkable and peculiar diseases is found. It will be remembered that a few years since a great mortality occurred among the serpents ; nearly all of them died, and I had an opportunity of examining a great many of them. The disease, which I believe is highly contagious, consists of ulceration of the lining membrane of the mouth, and the deposit of masses of semitubercular matter in different parts of the intestinal tube, but chiefly in the rectum, blocking up the canal, and producing obstruction. With this form of disease there is also a peculiar condition of the blood. Some of the reptiles dying of this affection were very fat, especially the Puff Adders (*Crotho arietans*).

Tubercles in the liver, lungs, and other parts in the Ophidians, are very frequently met with. In the Boa which some years ago was said to have swallowed a blanket, it will be seen by the drawings now exhibited that the lungs and liver were thickly studded with small miliary tubercles; but the immediate cause of death was inflammation of the pericardium (heart-bag): upon this, and hanging from it, were large flakes of lymph partly organized.

Batrachians.—I have had but few opportunities of examining specimens of this order soon after death, and therefore cannot speak of their diseases.

I may make one observation respecting the reparative power in the reptiles. In many of them it is very rapid. In a Boa that had its tail accidentally jammed off, the part was very quickly repaired; and I have seen many instances of the same kind in reptiles; and, if the accounts are to be believed, the large Salamander (*Sieboldia maxima*) just obtained by the Society will reproduce its extremities—bone, muscle, integument, and other parts.

In bringing this imperfect sketch to a conclusion, I may observe that my time and space have been too limited to do justice to the subject; but I trust that the information conveyed will not prove altogether unprofitable.