Curiosities of natural history / by Francis T. Buckland.

BUCKLAND'S

CURIOSITIES OF NATURAL HISTORY

MAN FOUND ONLY IN A FOSSIL STATE——REAPPEARANCE OF ICHTHYOSAURI.

A Lecture.—"You will at once perceive," continued PROFESSOR ICHTHYOSAURUS, "that the skull before us belonged to some of the lower order of animals; the teeth are very insignificant, the power of the jaws trifling, and altogether it seems wonderful how the creature could have procured food."

CURIOSITIES

OF

NATURAL HISTORY.

BY

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EIGHTH EDITION.

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In Memory of

THE FATHER,

TO WHOSE EXAMPLE AND INSTRUCTION

I OWE

THAT TASTE FOR NATURAL HISTORY

WHICH HAS FURNISHED ME WITH AGREEABLE OCCUPATION

DURING THE

LEISURE HOURS OF MY PROFESSION.

PREFACE TO THE FIFTH EDITION.

No less than four thousand five hundred copies of this work having been sold since its first publication, I am induced to issue another Edition.

As it is difficult to alter stereotyped plates, I have added, in the form of an Appendix, some notes and letters from correspondents relative to matters mentioned in my pages as first issued. I here beg to thank those who have kindly written to me for their permission to publish their observations. Several passages will be found from "The Naturalist" columns of "The Field" newspaper, which the Editor has kindly allowed me to reprint.

I have also made an Index to facilitate reference to whatever the reader may wish to look at a second time.

The longevity of this collection of notes on Natural History cannot but be gratifying to all concerned in its welfare; and my Publisher holds out hopes that it will for some time continue to occupy a place among the popular literature of the day

FRANCIS T. BUCKLAND.

Knightsbridge Barracks,
London, S.W.
Sept. 15, 1860.

PREFACE TO THE FOURTH EDITION.

The demand for this little book has induced me, at my Publisher's request, to issue a Fourth Edition. I myself should hardly have thought it worthy of the honour; the Public are the best judges. To them, to the Reviewers, who have so favourably noticed its contents, and to the many kind persons who have sent me communications on matters treated in its pages, I cannot be sufficiently grateful. And with best thanks,

Beg to subscribe myself,

Theirs most obliged,

THE AUTHOR.

Cavalry Barracks, Windsor;
December 1, 1858.

PREFACE TO THE FIRST EDITION.

THE Preface is generally the last portion of a book which is written, and on this account it ought to be read first. I would beg of those into whose hands this book should come, to reverse the usual order of things, and to read the Preface before they dip into the contents. They will then know why it was written.

For many years I had the great privilege of being much in the company of my lamented father, the Very Rev. William Buckland, D.D., &c., &c., Dean of Westminster. I never missed one course of his lectures during the time I was at Oxford, and he hardly ever went out on any geological or other expedition without taking me with him.

Always a diligent note-taker himself, he encouraged me in putting down every fact with which I was previously unacquainted, and in this way I accumulated much information, both from him and from other sources.

These notes during the last five years I have occasionally put together, and published in 'Bentley's Miscellany,' and in a rising little periodical, 'The St. James's Medley.' I have now collected, and have at the same time added very considerably to them.

I heard, not long ago, of a preparer of microscopic objects, who complained that 'he had exhausted the animal kingdom.' I am well aware that many books have been written on natural history, but still am of

opinion that the animal kingdom is not yet 'exhausted,' and with this belief, I have written the following pages.

In natural history, as well as in other researches, it is too much the practice to copy facts and observations from printed books, the great volume of Nature herself being left unopened. It has been my endeavour to search into this book, and to record facts which came under my own eyes. I have, nevertheless, not hesitated to use the eyes of other naturalists, at times and places when it was impossible to use my own. I have plainly marked as quotations all matter which belongs to other persons: should any one recognize any passage unacknowledged, he is requested to regard it as an oversight.

In the article on Rats will be observed several references to a paper which appeared on the same subject in the Quarterly Review, January 1857. I have thought it right to draw attention to these, that I might not be thought guilty of plagiarism. The article on Rats was published by me in Bentley's Miscellany, August 1852.

Without the knowledge of the structure and physiology of the lower members of the animal kingdom, it would be difficult rightly to understand many functions of the human economy; and much light has been thrown upon the art of healing by the study of the lower links of the chain of animal life.

I would wish it, therefore, to be understood, that the following pages have not been written to the neglect of purely professional subjects of investigation. It has been acknowledged by many of our greatest medical men, that Natural History is the handmaid to the study of medicine and surgery; and this is amply proved by the collection made by John Hunter, the immortal founder of the Museum of the Royal College of Surgeons. This great man points out to his followers the necessity of studying comparative as well as human

anatomy; for he has begun his series with the lowest form of animal life, ending with man himself.

My sincere thanks are due to the Council of the Royal College of Surgeons, London, for their kindness in allowing me to have drawings made of specimens contained in their noble Museum; a vast storehouse of facts, the treasures of which can only be appreciated by those who examine for themselves. To my friend Mr. Quekett, Curator of the Museum, I am under great obligations, not only for his kindness in giving me every facility of access to those specimens I wished to examine, but also for much information relative to the subjects under my investigation.

The drawings are by the anastatic process, but have not come out so clearly as I could have wished. The frontispiece, (photographed on wood from the original) Plate I., is a reduction of a drawing made many years ago for Dr. Buckland by the late lamented Sir Henry de la Beche. After my father's death, I found that a few copies only remained, and the plate could not be found. Unwilling, therefore, that it should be entirely lost, and at the same time having every reason to believe that it had never yet been published, I determined to endeavour to resuscitate it as worthy of the brilliant imagination of one of Dr. Buckland's most intimate friends. It was originally, drawn as a sort of quiz upon his geological lectures at Oxford, when he was treating upon Ichthyosauri, a race of extinct fish-like lizards. The subject of the drawing may be thus described—Times are supposed to be changed. Man is found only in a fossil state, in the same condition as the ichthyosauri are discovered at the present epoch; and instead of Professor Buckland giving a lecture upon the head of an ichthyosaurus, *Professor Ichthyosaurus* is delivering a lecture on the head of a fossil man. Around the Professor, whose jaws and teeth are monstrous as compared with those

in a human subject, is gathered a class of attentive listeners of the same race as himself, all anxious to learn the history of the creature to whom the curious and, in comparison to their own, diminutive skull belonged. Professor Ichthyosaurus is made thus to address his audience—'You will at once perceive that the skull before us belonged to some of the lower order of animals—the teeth are very insignificant, the power of the jaws trifling; and altogether it seems curious how the creature could have procured food.'

In the following pages no attempt is made at fine writing, and the matter is put down much in the order that it occurred to me.* I trust it may afford some amusement, perhaps instruction, to those who take an interest in the curiosities of Natural History.

F. T. BUCKLAND,

2nd Life Guards, Knightsbridge Barracks.

Nov. 30, 1857.
Athenæum Club, Pall Mall.

* The above statement is fully borne out by the 'Saturday Review,' who in mentioning the book says, 'Mr. B ckland's book reads like the contents of a note-book, thrown out pell-mell.' Its aim is rather, again to quote the same journal—'*amusement* and *profit*,' than literary excellence.

PREFACE TO THE SECOND EDITION.

In issuing a second edition of this collection of notes on Natural History, I have to express my grateful acknowledgments, both to the public and the press, for the favourable manner in which they have received and spoken of my endeavours to promote the observation of facts which we see in daily operation among the various members of the living animal world around us. It is by observation alone that we can arrive at truth; and great truths are ascertained only by a combination of numerous recorded facts.

Again, or for the second time, I make my bow; trusting to my readers to pardon all the imperfections, which still, after a careful revision, I fear, have escaped my notice.

F. T. BUCKLAND,

2nd Life Guards, Knightsbridge Barracks.

March 1, 1858.

Athenæum Club, Pall Mall.

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CURIOSITIES

OF

NATURAL HISTORY.

A HUNT IN A HORSE-POND.

PRAY what is there to be found in a horse-pond except mud, dead dogs and cats, and duck-weed? the reader may ask.—Pray what is to be found in that trumpery ball they call the earth? the 'Man in the Moon' may demand of his neighbour Saturn as they both come out for their evening stroll. The answer to such questions is, simply, '*Life;*' Life in all diversity of form, beautifully and wonderfully arranged, each individual deriving benefit from the well-being of the mass; the mass itself prospering in ratio with the individual.

To the inhabitants of the pond, the pond is the world; to the inhabitants of the world, the world, as compared to space, is but a pond; and when the adventurous lizard has made a voyage of discovery round his pond, he has as much right, comparatively speaking, to boast of his performance to his fellow-lizards, as Captain Cook

had, when he first sailed round the world, to write two thick volumes for the information of his fellow-men. Well, let us have a look at the pond-world; choose a dry place at the side, and fix our eyes steadily upon the dirty water: what shall we see? Nothing at first; but wait a minute or two; a little round black nob appears in the middle; gradually it rises higher and higher, till at last you can make out a frog's head, with his great eyes staring hard at you, like the eyes of the frog in the woodcut facing Æsop's fable of the frog and the bull; not a bit of his body do you see, he is much too cunning for that, he does not know who or what you are; you may be a heron, his mortal enemy, for aught he knows. You move your arm, he thinks it is the heron's bill coming; down he goes again, and you see him not; a few seconds, he regains courage and reappears, having probably communicated the intelligence to the other frogs; for many big heads and many big eyes appear, in all parts of the pond, looking like so many Hippopotami on a small scale. Soon a conversational 'Wurk, wurk, wurk,' begins; you don't understand it; luckily perhaps, as from the swelling in their throats it is evident that the colony is outraged by the intrusion, and the remarks passing are not complimentary to the intruder.

These frogs are all respectable, grown-up, well-to-do frogs, and they have in this pond duly deposited their spawn, and then, hard-hearted creatures! left it to its fate; it has, however, taken care of itself, and is now hatched, at least that part of it which has escaped the hands of the gipsies, who not unfrequently prescribe baths of this natural jelly for rheumatism.

In the shallow water close by, is a dark black spot,

that looks like a bit of old hat thrown away to rot.* Touch it with the end of a stick—the mass immediately becomes alive. Presto! thousands of little black long-tailed rascals seem immediately to start into life: these are embryo frogs, alias tadpoles, alias porwiggles, alias loggerheads, alias toe-biters. This last significant title has been given them by the amphibious boys of Clapham Common, whose toes they bite, when fishing about for fresh-water curiosities in the numerous ponds of that district. These little creatures are evidently selfish like other animals in the creation, for they are pushing, squeezing, and hustling each other, like people going to hear Jenny Lind. And pray what are they all so anxious to get at?—simply a dead kitten. And why should they not fight for good places? The dead kitten is to them what a turtle dinner is to the City folks; each duly appreciated by the rightful consumers.

But supposing there happens to be no dead kitten or decayed vegetable matter in their pond, what will the poor things get to eat? Why then they will do what the New Zealanders have done before them; they, the New Zealanders, ate up every specimen of the Dinornis they could find on their island, and then they set to work and ate up each other; so do the tadpoles. You ask a proof: last year, I went, with a tin quart-pot in my hand, toe-biter hunting, on Clapham Com-

* Some beavers were one day building their dam across a river, when an old hat came floating down the stream and lodged against their dam; the beavers collected round it and examined it; at last one of them applied his nose to it and exclaimed 'Alas! our grandfather.' This happened in the days when beavers were killed and their skins made into hats. The grandfather had returned to his colony in the form of a hat.

mon, and brought home exactly a quart of tadpoles; these I emptied into a tub in the beer-cellar; there they lived, being fed on meat several days, till one evening, on sending for a glass of the all-refreshing fluid, up comes John with half a smile on his face, and simpers out, 'If you please, sir, I have brought the beer, but I have upset the tadpoles.' On arriving at the scene of the disaster, there were the poor things high and dry on the floor. I restored them to their tub, but forgot to put back their meat. The next morning, I found some had not recovered their accident, and round the bodies of their departed brethren, were crowded the cannibal survivors, eating and pulling away, each for himself. After this, I left them much to themselves, and their numbers diminished considerably; the cook's opinion being, as usual, that that omnivorous creature, '*the cat*,' had a hand in it; bringing forward as an argument, which is not strictly zoological, as applied to tadpoles, that the 'cat is fond of fish.'

By the discovery of skeletons, murders are often brought to light; so it was in the case of Tadpole *v.* Cat; the skeletons of the murdered froglings I found in abundance at the bottom of their tub: and wonderful skeletons they were, the form of the little creatures being beautifully shown in a framework of delicate gristle, the various parts still united together, but separating on the slightest touch. I have sometimes seen capital skeletons of small animals in ponds, the flesh having been eaten away by tadpoles. In the United Service Museum are some very perfect skeletons of sea-birds made somewhat in the same way; they were brought home from the Arctic regions, and were made by the sea-lice: the birds were let down into

the sea to an immense depth, and left there twenty-four hours; these bones are as white as ivory.

Common shrimps are capital skeleton-makers: these little creatures are wonderful scavengers, and eat up the vegetable and animal refuse of the ocean. Behind the ancient fort at Tilbury, opposite Gravesend, is a considerable extent of flat ground, intersected by deep ditches. In these ditches I found swarms of shrimps feeding on the weed along the banks: though I could see them plain enough, I found it very difficult to catch them; for the moment my hand-net touched the surface of the water they vanished—shooting away like little meteors; and even when I did get them in the net they hopped out like gigantic fleas. I discovered a small sluice-gate, through which a shallow stream of water was running: looking over very quietly, I saw thousands of these little shrimps, all with their heads pointed up stream, feeding upon what they could find. Presently a crab, about three inches and a half long, appeared at the top of the water, then another, and then another: and these perpetually caught with their claws at passing portions of what they saw floating by; when they had got anything they sunk with it, probably to devour it. Till then I never quite understood the use of a crab's claws; though clumsy-looking things, the crab can wield them with great activity and neatness, and they seldom missed what they clutched at. The boys, taking advantage of this, drop into the stream a common bit of string, the crab seizes hold and goes to the bottom to examine his prize; but before he has time to ascertain that it is not edible, and to let go, the boy whips him up on to the land. Over the place where the shrimps were feeding, I observed masses of a white

looking substance floating: I got them up, and they turned out to be the shed skins of the shrimps; for shrimps shed their skins as well as lobsters. From examination, I should conclude that the shrimp emerges from his old skin at the junction of the tail with the body; he sheds even the skin of his antennæ or feelers, as well as of the peculiar saw-like weapon which projects between his eyes. When lobsters shed their outer skins, strange to say, they shed also the lining membrane of their stomachs. I could not find any of the lining membrane of the stomach among the shrimp skins. They were for the most part much broken up; but I picked out two or three good specimens which are now in the College of Surgeons.

My friend, Mr. Roberts of Worthing, has informed me that both lobsters and prawns have the most acute sense of smell. Nine miles out at sea, off Lyme Regis in Dorsetshire, is a ledge of chalk rocks abounding with these animals. If a basket be let down, the prawns directly crowd together around it: if it be daylight, and they can see the boat, they will not go in, but at night they go in in great numbers. Mr. Roberts says a lobster will smell a putrid object a hundred yards off. A crab is caught with fresh bait only. When at Weymouth, many years ago, with my father, I recollect his telling me a story of a large ship being wrecked off the Isle of Portland, and that many persons were drowned. Soon after the wreck, a great number of lobsters and prawns were caught, and none of the Weymouth folks would eat them, because they were supposed to have fed on the bodies of the drowned people, and this was very possibly the case. The lobsters were therefore sent off to London, for the benefit of those who did not

know their history. It is extraordinary how soon animals and birds find out the place where there is anything to eat (we may include our own species among the animals). The regiment to which I belong very frequently marches down to Wormwood Scrubs, for field-days. Upon arriving at the Scrubs, I have not seen a single rook; but the rooks very soon appear: they come to pick out what they can from the dung of the horses, and the bits of bread which drop out of the paper in which the men carry their refreshment. The rooks always go to the place where the regiment has dismounted, as there they find most to eat. These rooks come I believe from the trees in Holland Park—they certainly often arrive from that direction.

The habit of eating each other among the tadpoles may by some be considered horrible and unnatural; but when we consider the thousands that are hatched from the egg, its beneficial use in the economy of nature will at once be perceived. Were all the young tadpoles to become frogs, not only would mankind be cursed with a plague of Egypt, but the frogs themselves would suffer, inasmuch as there could not possibly be food for all, and starvation would be the consequence. Thus, by inquiry into the ways of an all-wise and munificent Creator, we may generally find that what at first sight seems cruel, is in reality merciful and kind.

Come again to the horse-pond a few weeks after the tadpole era, and you will find hundreds of lively little frogs, no longer black specks, but having lost their gills, and their tails, and their dead-kitten appetites, sent forth to fight their way in the world; or may-be, not in the world, but in the regions of the air above the

world, thence suddenly to descend, to the astonishment of rustics, and to the delight of those profound philosophers, newspaper naturalists.

I will not enter into the various changes assumed by the tadpole before it becomes a frog: this transformation has been ably described elsewhere. Those who wish to see with their own eyes what happens have only to go to the College of Surgeons, where they will find a series of models, of gigantic size compared to the originals, illustrating this point. These models were presented by Professor Echer of Freiburg.

It may not here be out of place to give the interpretation of frog showers, as now most generally received by competent judges. The actual fact, that considerable spaces of ground have been suddenly covered with numerous small frogs, where there were no frogs before, has been proved beyond a doubt. Some have called in the aid of waterspouts, whirlwinds, and similar causes, to account for their elevation into the regions of air, and some have even thought that they were formed in the clouds, from whence they were precipitated. It has generally been in August, and often after a season of drought, that these hordes of frogs have made their appearance; but, with Mrs. Siddons, we will exclaim, 'How gat they there?' Simply as follows:—the animals had been hatched, and quitted their tadpole state and their pond at the same time, days before they became visible to, or rather observed by, mortal eyes.* Finding it unpleasant in the hot, parched fields, and also running a great chance of being then and there dried up

* I am not sure that I am right in this theory. and feel half inclined to recant. See Appendix, pages 321 and 327.

by the heat of the sun, they wisely retreated to the coolest and dampest places they could find, namely, under clods and stones, where on account of their dusky colour, they escaped notice. Down comes the rain, out come the frogs, pleased with the chance. Forthwith appears an article in the county paper; the good folks flock to see the phenomenon. There are the frogs hopping about; the visitors remember the shower, and a 'simple countryman' swears the frogs fell in the shower, and he saw them fall: frogs, visitors, countrymen, editors, are all pleased, and nobody undeceives them, nor are they willing to be undeceived.

The skin of frogs readily absorbs water, and in hot weather they always retreat to places where they will find moisture, or at least a certain degree of dampness: if you want to catch a frog on a hot day, you must look under boards, clumps of grass, &c., and you will probably find him at home. After a continuance of hot weather, frogs are frequently found dead and quite dried up, particularly on or near dusty roads: they have probably come out of their damp hiding-places, and the moisture of their bodies having been evaporated before they had time to get back again, they have been dried up like mummies. When water is scarce, frogs collect together to keep each other moist. Water can become scarce from frost as well as from heat; and this was curiously exemplified by what once happened at Carlsruhe. The town, during a long frost, became deprived of the usual supply of water for many days. A great number of frogs, to shelter themselves from the frost, took refuge in the hydraulic engines by means of which the houses are supplied with water. The cold increasing, the frogs got up into the pipes, and in

many places became agglomerated into a mass so compact, that it was with the greatest difficulty they were cleared out, and a passage for the water made. There is a curious fact as regards the hybernation or winter sleep of frogs: of course in this state they cannot eat: most other animals, as the bear, marmot, &c., which hybernate, lay up in their bodies a supply of fat during the summer, which becomes absorbed in the winter. According to this rule, a frog ought to be very fat towards the close of summer, yet who ever saw a fat frog? Still a frog does lay up fat for winter consumption, not outside his body, but inside; for we find that the membrane which surrounds the intestines, the peritoneum, contains remarkable folds, and in these folds a fatty matter of a yellow colour is deposited, and this fat is, with reason, supposed to be stored up there for winter consumption. Dr. Townson, in his tracts on Natural History, London, 1799, records a series of observations which he made on frogs, and also on some toads: these were directed chiefly to the very absorbent power of the skin of these reptiles, and show that they take in and eject liquids through their skin alone, by a rapid process of absorption and evaporation; a frog absorbing sometimes in half-an-hour as much as *half* its own weight, and in a few hours *the whole* of its weight of water, and nearly as rapidly giving it off when placed in any position that is warm and removed from moisture. Dr. T. contends that as the frog tribe never drink water, this fluid must be supplied by means of absorption through the skin. Both frogs and toads have a large bladder-like sack, which is often found full of water; 'whatever this fluid may be,' (he says), 'it is as pure as distilled water, and equally tasteless.

This I assert as well of that of the toad, which I have often tasted, as that of frogs.' I myself, have frequently observed that when a frog is caught, by suddenly ejecting a quantity of water he will diminish his size nearly half. When you first catch him he looks very fat, but in five minutes he looks thin and half-starved; place him all night in a little water, shallow enough for him to sit comfortably in, and he will have recovered his plumpness by the morning.

The bag, or receptacle where this fluid is collected, looks like the organ generally called the bladder; but it is not the true bladder, for it is not in any way connected with the kidneys: it is formed out of a peculiar membrane (called the allantois), and serves two purposes;—first, it acts as a simple water reservoir; secondly, it assists in the process of respiration, for when injected with coloured size, the sides are found to be highly vascular, resembling somewhat the true lung structure.

The body of man himself contains a large proportion of water, and if he has no water he soon dies. A person can live longer without eating than he can without drinking. The bodies of men found dead in the deserts are dried up almost to nothing. The hot sand, wind, and sun, have caused every drop of water to evaporate from the flesh, and even from the bones. The bodies thus become very light in proportion to their size.

In the College of Surgeons is the dried body of a poor boy, that was found bricked up in a vault in a London church. This boy was about twelve years of age. He was found erect, with his clothes on, in a vault underneath St. Botolph's, Aldgate old church, in the year 1742; and is supposed to have been shut in at

the time of the plague in London, in 1665, as the vault had not been opened since that period till it was pulled down. This body weighs only eighteen pounds. Persons subject to great heat are obliged to drink much water to supply that taken away by evaporation. The Swansea copper furnace-man is exposed to great changes of temperature: a thermometer at his chest denotes 120°, one on his back, 60° or 70°. After two hours' exposure to the scorching blaze, he retires to the open air to cool himself, and to drink; his drink is generally water, two or three gallons in twelve hours; but then he perspires six hundred gallons in the year before his furnace. Yet, Dr. Williams reports that he is 'a merry fellow, who lives to a good old age, as hale, florid, and corpulent as his neighbours.' I am informed, that when steam-vessels are voyaging in the tropics, the heat of the engine-room, combined with the temperature of the air, is so overpowering, that the stokers and others have free access to an unlimited supply of iced water, in which oatmeal has been sprinkled; the drinkers say this oatmeal prevents so much water disturbing the stomach, and experience in these matters generally leads to right conclusions. If the men had not this water they would not be able to withstand the evaporation, and the heat would kill them. The human skin is in itself a great absorber of water, and sailors exposed in the open sea without fresh water, find their thirst relieved by applications to their bodies of cloths wet with salt water. Man has been aptly defined by a writer in the Quarterly Review as 'Forty-five pounds of carbon and nitrogen diffused through five and a half pailfuls of water.'

For the poor little frog a cruel fate is often in store

—no less than to be buried alive, in a two-legged, hat-wearing tomb. I have often seen boys allow frogs to jump down their throats (never to return), at a small charge of one halfpenny each frog. 'Fiat experimentum in corpore vili'—they received no hurt, or ill effects, therefore shall one of the race be honoured with a free passage down yet another throat. I follow Mrs. Glasse's advice, and first 'catch my frog,' then place him on the brink of the abyss; he hesitates, I don't half like it, one, two, three, he jumps—the deed is done. Am I any the better or the worse for it? not that I know of; others are of a different opinion. I am told that my 'croaking fits' date their origin from the moment poor frogee entered upon his fatal journey. Many frogs have I eaten since this date, not 'in statu naturali,' but cooked as a Frenchman only knows how to cook; and very good imitation of whitebait is a dish of *cooked* frogs—the comparison will not hold when the frogs have not seen the fire.

Happening to be in Germany, in 1846, I was desirous of getting some insight into the manners and customs of the inhabitants of the ponds, and after much observation, arrived at the same conclusion concerning them as the master of one of Her Majesty's ships did respecting the subjects of the Imaum of Muscat. Being compelled to record categorically a reply to the inquiry, 'What are the manners and customs of the inhabitants?' he wrote, 'Manners they have none, and their customs are very beastly.' This is much the case with the subjects of King Frog.

My knowledge of their vicinity was based upon auricular confession. Night after night, the most dreadful din of croaking bore testimony to the fact that they

were unburdening their consciences; and I determined to try if I could not unburden their bodies of their batrachian souls altogether. However, before I detail my proceedings, I have a word to say with reference to their croaking.

Horace bears expressive testimony to the disgust *he* felt at it, when, after a heavy supper to help him on his way to Brundusium, he exclaimed

——— 'Mali culices, ranæque palustres
Avertunt somnos.'*

So loud and continuous is their song, especially in the breeding season, that I find it recorded—in the former good old times of France, when nobles *were* nobles, and lived in their magnificent chateaux scattered throughout the country—that the peasants were employed during the whole night in beating the ponds within earshot of the chateaux, with boughs of trees, to prevent the slumbers of the lords and ladies being broken by their paludine neighbours. The frogs, can produce this noise under water as well as on land. Ovid alludes to this fact when he says,

'Quamvis sint sub aqua, sub aqua maledicere tentent,
Vox quoque jam rauca est, inflataque colla tumescunt.' †

In some places from their making this peculiar noise, they have been called 'Dutch nightingales.' In Scotland, too, they have a curious name, Paddock or Puddick; but there is poetical authority for it:—

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* 'The fenny frogs, with croaking hoarse and deep,
And gnats loud buzzing drive away our sleep.'—*Francis.*

† 'Although they are under the water, yet they try to curse under the water.
Their voice too is hoarse, and their inflated throats swell.

'The water-snake whom fish and paddocks feed,
With staring scales lies poisoned.'—*Dryden.*

Returning from the University of Giessen, I brought with me about a dozen green tree-frogs, which I had caught in the woods near the town. The Germans call them Laub Frosch, or leaf-frog; they are most difficult things to find, on account of their colour so much resembling the leaves on which they live. I have frequently heard one singing in a small bush, and, though I have searched carefully, have not been able to find him: the only way is to remain quite quiet till he again begins his song. After much ambush-work, at length I collected a dozen frogs and put them in a bottle. I started at night on my homeward journey by the diligence, and I put the bottle containing the frogs into the pocket inside the diligence. My fellow passengers were sleepy old smoke-dried Germans: very little conversation took place, and after the first mile, every one settled himself to sleep, and soon all were snoring. I suddenly awoke with a start, and found all the sleepers had been roused at the same moment. On their sleepy faces were depicted fear and anger. What had woke us all up so suddenly? The morning was just breaking, and my frogs, though in the dark pocket of the coach, had found it out; and, with one accord, all twelve of them had begun their morning song. As if at a given signal, they one and all of them began to croak as loud as ever they could. The noise their united concert made, seemed, in the closed compartment of the coach, quite deafening: well might the Germans look angry; they wanted to throw the frogs, bottle and all, out of the window, but I gave the bottle a good shaking, and made the frogs keep quiet. The Germans all went to sleep again, but I was obliged to

remain awake, to shake the frogs when they began to croak. It was lucky that I did so, for they tried to begin their concert again two or three times. These frogs came safely to Oxford; and the day after their arrival, a stupid housemaid took off the top of the bottle to see what was inside: one of the frogs croaked at that instant, and so frightened her, that she dared not put the cover on again. They all got loose in the garden, where I believe the ducks ate them, for I never heard or saw them again. These frogs cost six shillings each in Covent Garden Market; they are not difficult to keep alive, as they will eat black beetles, and these are to be procured at all seasons of the year.

In the green tree and edible frogs there are fissures at the corners of the mouth, for admitting the external protrusion of the bladder-like cheek-pouches which are inflated from the windpipe; and these are the instruments with which they produce their noise. These cheek-pouches they invariably protrude in their struggles to escape when held by the hind legs. Under these circumstances they are also capable of uttering a peculiar shrill cry of distress, differing completely from their ordinary croak.

The female frogs have not these voice sacs—in the males alone we find them. Their use may possibly be to enable one sex to be aware of the presence of the other.

In the bull-frog we find a very peculiar piece of mechanism, by means of which the animal is enabled to produce the well-known bellowing sound described by travellers; hence his name—bull-frog. Certain portions of the larynx (the arytenoid cartilages) are convex externally, and concave internally, so that when the entrance to the larynx is closed, they form a dome over

the windpipe, which Cuvier has compared to a kettle-drum.

In the centre of a dark pine forest near Giessen in Germany I found a shallow black-looking pond which was full of these noisy frogs. Anxious to catch some specimens, and obtaining a landing-net, I cautiously approached this pond, and then, without allowing my shadow to fall on the water, or making the slightest noise, I peeped through the dense brushwood at the side; yet the moment I showed myself, every individual who happened to be above water, jumped off his perch, and was out of sight in an instant. I tried every means to catch them, but in vain. At last I borrowed from some boys a long tube of wood with a small hole smoothly and equally bored through the centre, which they used to shoot small birds about the hedges. Armed with some arrows made of sharp needles tipped with cotton wool, I ensconced myself in a bush, and waited quietly for my prey. In a few moments, the frogs, one by one, began to poke their noses out of the water. I selected the finest, and by dint of a good shot, I succeeded in fixing an arrow in his head. In the course of the afternoon I bagged several of the patriarchs of the pond, some of them as large as the largest English toad. Upon being struck with the arrow, they nearly all protruded their sacculi from each side of the mouth, in the manner above narrated.

These frogs are not often used for the table in Germany, but in France they are considered a luxury, as any *bon vivant* ordering a dish of them at the 'Trois Frères' at Paris may, by the long price, speedily ascertain. Not wishing to try such an expensive experiment in gastronomy, I went to the large market in the Fau-

bourg St. Germain, and inquired for frogs. I was referred to a stately-looking dame at a fish-stall, who produced a box nearly full of them, huddling and crawling about, and occasionally croaking as though aware of the fate to which they were destined. The price fixed was two a-penny, and having ordered a dish to be prepared, the Dame de la Halle dived her hand in among them, and having secured her victim by the hind legs, she severed him in twain with a sharp knife, the legs, minus skin, still struggling, were placed on a dish ; and the head with the fore-legs affixed, retained life and motion, and performed such motions that the operation became painful to look at. These legs were afterwards cooked at the restaurateur's, being served up fried in bread crumbs, as larks are in England: and most excellent eating they were, tasting more like the delicate flesh of the rabbit, than anything else I can think of.

I afterwards tried a dish of the common English frog, but his flesh is not so white nor so tender as that of his French brother.

Should any person wish to have a dish of real French frogs, he can buy at Fortnum and Mason's, for half-a-guinea, a tin-caseful. They are beautifully preserved, and are ready for cooking. I have eaten them at the house of a lady, who kindly invited me to luncheon when she tried the experiment.

The old fishwife, of whom I bought the frogs, informed me that she had a man regularly in her employ to catch them. He went out every evening at dusk, to the ponds in the neighbourhood of Paris, with a lantern and a long stick, to the end of which was attached a piece of red cloth. The frogs were attracted by the light to the place where the fisherman stood. He then

lightly dropped his cloth on the surface of the water; the frogs imagining that some dainty morsel was placed before them, eagerly snapped at it, and their teeth becoming entangled, they became an easy prey, destined for to-morrow's market, and the tender mercies of the fish or rather frog woman.

I subsequently brought over several dozen of these frogs alive to England: some of them are still, I believe, living in the Ward's botanical cases of those to whom I presented them; the rest were turned out in a pond, where I fear they have been devoured by the gourmand English ducks, its rightful occupants.

The edible frog (*rana esculenta*) is brought from the country, in quantities of from thirty to forty thousand at a time to Vienna, and sold to great dealers, who have conservatories for them: these conservatories are large holes, four or five feet deep, dug in the ground, the mouth covered with a board, and in severe weather with straw. In these conservatories, even during a hard frost, the frogs never become quite torpid; they get together in heaps one upon another instinctively, and thereby prevent the evaporation of their humidity, for no water is ever put to them.

In Vienna, in 1793, there were only three dealers who supplied the market with frogs ready skinned and prepared for the cook.

Frogs feed principally upon beetles, which they find among the tufts of grass by the sides of the ponds. They do not, I think, grope about among the grass for their prey, but rather wait till the beetles run near them, and then they easily catch them by means of their projectile tongue. I have examined the stomachs of many frogs just caught, and have found both slugs, beetles,

and caterpillars. One year, when the wire-worm was proving very destructive to the turnips, I examined some frogs from a field swarming with it; the frogs were quite gorged with the worm, and must have done much good to the farmer. I mentioned the fact to him, and he issued an edict for the preservation of the frogs. In the cages where I have kept frogs, I have frequently found masses of the wing-cases and legs of the beetles and flies they have eaten. These wing-cases, being composed of a horny material called Chitine, are not digested. The same thing happens with bats. When going over Ely Cathedral, I observed, on an old beam, up in the tower, a shining glittering mass of something; it turned out to be a mass of the wing-cases of insects, mixed with the wings themselves. This beam was just underneath a hole which was full of bats, and what I found was the dung of the bats: so full was it of these wings and wing-cases, and also of the eyes of the insects, that when the sun shone on it, it appeared set with shining and iridescent points. Dr. Daubeny, some years ago, exhibited to the Ashmolean Society at Oxford, a similar mass of dung of bats, from a crevice in the tower of Holton church.

When Sir E. Home, Mr. Quekett informed me, visited the cave of Vavou, in the neighbourhood of New Caledonia, he found in a cave a quantity of very curious-looking material, which was ascertained to be bats' dung, presenting the same appearance as the specimen from Ely Cathedral. Its real nature was not ascertained for some time. I have sometimes found the wings of flies and scales of beetles in the dung of the common English swallow.

I have in my possession, a mass of the bones of frogs, mice, and again beetles' wings: which was found in a

moat of an old castle (the locality I forget). There was a considerable deposition of this peculiar mixture of bones, amounting to many inches in thickness. It was a puzzle for some time, how frogs, mice, and beetle bones came there all mixed together, but the two previous instances will give an explanation. Above the moat must have been an owl's nest and these birds always spit up the bones of what they eat. Owls live on mice, frogs, and beetles, and hence the deposition of their bones.

Virgil, a good observer of nature, when describing the approach of rain as predicted by animals, mentions the flight of cranes and swallows, the cow looking up to the sky, the pigs, &c., instances the frogs, especially, as being good barometers—

'Et veterem in limo ranæ cecinere querelam.' *
Georg. i. 378.

The green tree-frogs are used to this day in Germany as barometers; they are placed in tall bottles, with little wooden ladders. The steps of the ladder mark as it were the degrees; the frogs always go up towards the top in fine weather, and lower down at the approach of bad weather. I have often seen the Germans consult their frogs when starting on a pic-nic expedition. Leeches, too, make good barometers. I have two leeches in a long bottle, which generally will indicate what sort of weather is coming in the next twenty-four hours.

But let us return to our horse-pond: we have been sitting there some time, looking at, and thinking about, the frog family. The sun is very hot, and no horse has come to drink. Like a dandy from his club, decked in his best, the great water-newt, Sir Triton Cristatus (the

* And the frogs have sung their old song in the mud.

king of the pond in the absence of the ducks, who are his arch-devourers), rolls lazily forth from his hiding-place. Look at his beautiful coat, and his orange-coloured waistcoat—down the whole length of his back disports a magnificent crest,* for just now he is in prime condition. He is indeed a handsome beast, and by the way he parades himself up and down, in front of his favourite batch of weeds, he evidently knows it.

'O formosé "*Triton*" nimium nè crede colori.' †

We want you: how are we to get you? The question is often asked, 'What did your godfathers?' &c. My godfather, peace to his memory, gave me a silver cup, and a bit of advice. Sir Francis Chantrey was a fisherman, and a practical man. 'Never,' said he, 'go without a knife, a bit of string, and a sixpence.' We have followed his advice, and have all those three articles in our pocket. When we see the triton, our obedience to sponsorial authority is rewarded. We cut a stick with our knife, we tie a bit of string to the end of it; now for a hook—ah, here is a pin all ready, in the corner of our coat; this is soon crooked, and a worm affixed thereto; Triton sees it, he snaps eagerly, we have him, and for the first time in his life he is tied up in the corner of a pocket handkerchief. But where is Lady Triton? Not far off; she is recognized by her crestless and russet-coloured body, but she refuses the worm. She shall be caught, nevertheless, by means of our sixpence. This is quickly changed into fine brass wire

* I find that in captivity this crest becomes absorbed in a few days; the colours on the belly also lose their brilliancy.

† O, beautiful Triton, do not trust too much to your appearance.

at a neighbouring shop, the proprietor of which seems to sell everything, from a nail to a flitch of bacon, or a pair of old woman's pattens. In true hangman style, a noose of wire is made, and fastened to the stick—the captive couple meet again in the pocket-handkerchief. This lizard-fishing must be profitable sport to somebody, for on asking the price of some medium-sized specimens at Covent Garden, in a shop up the stairs, I found they were worth threepence each. Tadpoles also were saleable articles, and cost twopence a dozen, and the water-beetles, that have oars like a waterman (dytiscus), cost from twopence to sixpence each. Of 'weed,' they could 'make any quantity, a pennyworth, or sixpenny-worth,'—so something saleable is to be got even out of a horse-pond.

The newts are stupid things, and do not profit by experience. In a pond, in a brick-yard not far from Hanwell, I caught many beautiful specimens: the worm was fixed on to a good-sized fish-hook in this instance, and it was impossible for the lizard to get the hook into its mouth. I had a good day's sport, although I only *hooked* one; the others I caught by allowing them to bite at the worm; they went at it fiercely like bull-dogs, and held on tight like these animals. I gave my victim plenty of time, and when he had got a firm hold, quickly but cautiously pulled him out of the water. If the line became at all loose the triton escaped. I found that they were caught by their teeth sticking into the worm. One triton actually took the bait seven times, and was pulled out of the water thrice before I got him. This shows how very inactive their lacertine brains must be, and is another proof, were it wanted, that the intelligence of an animal depends upon the

development of its cerebral organ. I observed that these lizards, when taken hold of, invariably uttered a small shrill cry, something between a squeak and a croak: this cry I have heard frequently uttered by lizards in my vivarium; they generally utter it about sun-down. Frequently also they would turn sharp round and bite, or rather pinch the finger, their small teeth not being strong enough to break the skin. The females are either not so bold or so cunning (probably the former) as the males; they are much more difficult to catch, and much more wary in their movements. I saw one female have a fight with a gudgeon, who invariably returned to the same clump of weeds, as if looking for something; probably the female laid her eggs in this clump of weeds, and the fish wanted to eat them. The fish seemed afraid of the newt, and always made off when she came near; she charged him vigorously two or three times, and seemed to bite him.

The scene changes: the male and female newt have now resided a week in a private crystal palace of a globular shape. What we observed about them, imprimis, was that they lived like Mr. and Mrs. Sprat, and always quarrelled at dinner-time: a worm was given them, the gentleman did not wait for the lady, but seized the one end of the worm while she seized the other, each gulped their portion down as fast as Italians their maccaroni; but there must be an end to all things, and worms are included in the category. In due time the loving couple meet, nose to nose, each with having swallowed exactly half a worm. Husband looks daggers at wife, as much as to say, What business have you here? The compliment is returned, and they begin waltzing, twisting, twirling, and rolling over each other, round and

round their globe; neither will drop the worm, neither will cry 'peccavi;' somebody must give way, and that somebody is the poor worm, who 'comes a two in the middle,' and settles the conjugal difficulty.

One day I quietly let a worm fall exactly between two large newts that were resting at the bottom of my vivarium; they both turned at it at the same moment, and both made a bite. The worm gave a wriggle just at that moment, and, both newts missing him, caught hold of each other by the fore legs—newt A having the right leg of newt B in his mouth, and newt B the leg of newt A in the same position; they soon found out their mistake, and began writhing and tumbling about over and over, round and round the vivarium, as tightly fixed to each other as a couple of bull-dogs, knocking off the shells from the sides, and frightening the poor water-beetle out of his wits, and causing him to ply his oars vigorously. Both of the combatants at last seemed tired, and opening their mouths, set free the captured legs; they then retired to opposite ends of the tank, thoroughly exhausted. Could these two creatures when fighting have been seen under a powerful magnifier, they would have realised the strange pictures we see in Mr. Hawkins's book on 'The Sea Dragons.'

Secondly. I have observed that the lizards obey the command, 'Increase and multiply.' The young make their début in the form of an egg: the female will deposit them when in captivity. These eggs are not agglutinated together in a gelatinous lump as are the frogs' eggs, but are carefully deposited by the mother, one by one, each in a distinct spot from the other. Resting on a leaf or bit of weed, she folds it, by means of her two hinder feet, into the shape of a funnel, and therein

deposits a single egg, gluing, at the same time, the folded parts together, thus concealing and protecting the enclosed embryo. In due time the young lizard-tadpole comes forth from his egg, and much resembles, during the few first stages of development, his first-cousin, the frog-tadpole: both are furnished with tufted gills or branchiæ outside their body, which act the part of lungs; these disappear in time, and are replaced by true lungs inside their body. The eggs are deposited at the latter end of April, and during the months of May and June; but I know not how soon the tadpole assumes the form of a perfect adult lizard.

Thirdly. I have observed that the lizards frequently change their skins, as do snakes; and this much in the same manner. A few days before the skin is coming off, the lizard looks covered with a sort of slime, and appears stupid and sluggish. When he feels his coat is loose enough, he gets between two conveniently-placed portions of stick or weed, and, leaving the dead skin or slough, as it is sometimes called, behind him, comes forth more brilliant and lively than ever. These cast-off skins are sometimes most perfect, particularly when the lizard has not been disturbed during the operation: the only way to examine it is to take it most carefully out from the vessel in which it is found, on the top of a camel's-hair brush* (anything ruder, as a bit of stick, will tear it to bits), and place it in a wine-glass of clear water, then, with the lightest touch possible, brush the parts asunder, and, if you are lucky and have a light hand, you may get the whole skin expanded

* I once told a soldier servant to go and borrow me a camel's-hair brush; he came back and told me that — had not got a camel's 'hair-brush.'

quite perfect, looking like the ghost of its former owner. There is not a portion of the body that has not parted with its covering; the very toes and skin of the feet are seen hanging like an empty glove; and even the beautiful and yet hard and transparent covering of the eye remains faithfully fixed in its old companion, the skin. The lizards, why or wherefore I know not, are very fond of eating these cast-off skins. I have frequently seen them at work at it.

Crabs and lobsters, too, change their skins periodically, but how often is not certain. Mr. Quekett lately showed me a crab upon whose back an oyster had taken up its position, and there it was hard and fast. Now by examining the oyster it was evident that its age was about three years; it became, therefore, a self-evident conclusion that the crab had not cast his coat for three years, as an oyster, who has once taken up his position and fixed himself when quite young, can never make a change. Oysters, nevertheless, that have not fixed themselves, but remain loose at the bottom of the sea, have the power of locomotion; they open their shells to their fullest extent, and then suddenly contracting them, the expulsion of the water forwards gives a motion backwards. A fisherman at Guernsey told me that he had frequently seen oysters moving in this way. Passing through Billingsgate-market I saw, in a glass-case in a fishmonger's shop, a lobster, extended full length, of a green colour. I immediately inquired about it. It had been in the case some time, the man told me, and the colour had faded; but when it was alive, the green was of a much more brilliant hue. It came from the coast of Cornwall, and the fishmonger's theory was that when it had cast off its old coat and retired into a hole

in the rocks for its new coat to harden, this new coat became impregnated with copper, the chosen retreat being a hole in a rock containing copper. I do not quite agree with his theory, as I have seen the common fresh-water crayfish of a green colour, and they could not have got at any copper. The theory is, however, ingenious; there is no reason why a lobster should not have been green instead of dark blue, its natural colour when unboiled. The cause of a lobster turning bright red when boiled, is a mystery I never yet heard explained. Is it mechanical or is it chemical?

That lobsters have affection for their young is proved from the following facts communicated to my father by Mr. Peach, when writing to him on the subject of fishes' nests (see page 240). He states, 'This love of offspring is not confined only to the scaly tribe. I have been told by the fishermen of Goran Haven (Cornwall) that they repeatedly see the lobster surrounded by its young even until they are six inches in length: this I have had, not from a solitary observer, but from many, at different times, and quite unknown to each other. So large was one taken by a fisherman's boy, that it was put into the "store-pot," to be sold to the crab-merchant when he came round, but the wicker-work allowed it to escape. The old lobster has been seen lying with its head peeping from under a rock, with its large claws extended, and the young ones playing between them. When danger was near, the old one rattled its claws; the young ones sheltered themselves under the rock, and the old one followed.'

Every person who has eaten a lobster salad, must know what the so-called berries are like; they are the eggs of the lobster. The kangaroo, as is well known,

has a pouch in its abdomen, where it carries its newly-born young; and for this reason they are called marsupial (from μαρσυπος, a pouch): among creatures that live in the water, lobsters and crabs seem to be the representatives of marsupial tribes on land. If the tail of a lobster be stretched out straight, there will be seen on its lower surface a number of flat finger-like projections. In the male creature these are comparatively small and short; in the female, they are long and broad: and if it be the right time of year, clusters of eggs will be found adhering to these appendages, so that by simply examining the under surface of the tail, the fishmonger knows a male from a female lobster. This same arrangement prevails in the common fresh-water crawfish, and from a specimen in the College of Surgeons, it seems probable that even after the eggs are hatched, the young take shelter under the motherly tail; for No. 3783 is a crawfish, where several little mites of crawfish just come out of the egg, and not much bigger than the egg, are seen adhering firmly to the finger-like processes. When the mother closes her tail, her offspring will be snugly concealed out of harm's way beneath it. So that even in creatures so low in the scale of creation as lobsters and crawfish, we see that parental affection has been planted by the great Creator of their species, that the race may not become extinct.

Mr. Townsend, fishmonger, in Hungerford Market, tells me that, not unfrequently, lobsters are brought to Billingsgate with their two shells on, the old one in process of peeling off from the new one underneath. He promised to procure me the first specimen he saw, and a few days ago he sent to the College of Surgeons, two lobsters in the process of moulting. The shell of

the largest has split exactly down the centre of the head portion, so that a slight pull would tear the two parts completely away. The shell in fact comes off in two equal halves, just as does a regimental cuirass from the breast of a Life-guardsman, when loosened from the shoulder-straps and waist-strap. The old shell on the tail of the lobster is simply loose, and not split.

From what I observed in the Tilbury Fort shrimps, it is possible that the tail part is never split, but that the tail slips out of it, like a hand from a glove.

The second lobster is a very ragged-looking thing: he is casting his shell in a very slovenly manner; it is coming off here and there in patches and bits, which is I believe an exception to the rule. In the Vivarium House, at the Zoological Gardens, is the shell of a lobster cast in confinement—and it is pretty perfect. I find in the Magazine of Natural History for 1852, a most interesting account of this process of shell-casting in a spider-crab, from the pen of Mr. Gosse. I am not aware that there is any other account published of this most curious operation; and as Mr. Gosse watched it himself, I may be pardoned for introducing his own words: it occurred at Ilfracombe.

'In the remotest corner of a tide pool, crouched a spider-crab, face outwards, as is the custom with crabs under such circumstances. On pulling it out, I was astonished and delighted to observe how completely the carapace and the limbs were covered with parasitical zoophytes, and also while in the act of securing the crab, I felt the body fall away from the carapace, which hung for an instant by the frontal part, and then gently detached itself, with a feeling to my fingers as if it had been torn away. On looking at the crab,

I saw the new carapace perfectly formed and coloured, with no marks of injury where the slough had parted from it.' Mr. Gosse took it home, and watched the process of sloughing. 'The posterior legs were freed first, the anterior pairs were about half out, and the animal pulled first at one, then at another, until they were quite drawn out as if from boots. The joints as they came out were a great deal larger than the cases from which they proceeded. It seemed to me that the parts, which had an almost jelly-like softness when extruded, were compressed as they were drawn through the narrow orifices by the fluids being forced back, these returning through their vessels, and distending the liberated portion of the limb as it was freed. The whole of the branchia were represented in the most beautiful order in the exuviæ. The coats of the stomach, with its minute teeth, were also there in the form of a membranous bag attached to the mouth by the lining of the œsophagus. The coats of the antennæ (the feelers) remained attached to the carapace (the upper shell), and the glassy cornea (the eye-cases) of the latter were not reversed. I did not see any of the struggling that is sometimes spoken of—it seemed a very easy and simple matter.'

Though I have never witnessed the casting of the shell in a crab, I have been fortunate enough to find two Dragonflies in the act of coming out of their larva state. Hunting about in the woods, at Weybridge, near London, I came upon a pond, round which were hovering hundreds of the largest species of dragonflies, or as the French call them, demoiselles; they were foraging about for food, and every now and then made a pounce down upon some unfortunate insect smaller

than themselves. Looking about among the rushes at the edge of the pond, I was much pleased to find in nearly every tuft, two or three cast skins of this insect. The first part of his existence the dragonfly passes in the water, in a very different shape to what it afterwards assumes. When it is time that the transformation should take place, the larva crawls out of the water, and on to a stick, bit of rush, or in fact anything that it can catch hold of. Now unless there existed some contrivance for holding firm the skin which is to be cast, it would hang about the body of the fly as it made its exit. Accordingly we find that at the ends of each of the legs of the larva are two curved and sharp-pointed hooks. When its instinct prompts, it places itself in such a position that the hooks shall have a firm hold, and keep the skin destined to be left in an immoveable position. The skin then splits at the back, and out comes the perfect fly. The larva-cases which I found were most abundant. There was an old post of rotten wood close to the margin of the pond, and this giving a firm hold, was literally covered with cast skins. On one bunch of rushes, I found a dragonfly just half way out; the head and one of the wings were quite free, but its tail was not as yet liberated. Most carefully did I catch it, wishing to preserve it in the act of transforming; I put it in my hat, but in a few minutes it came quite out of its old skin. A few yards further on from the place where I found the last specimen, I found another dry skin on a tuft of rushes; two of the rushes had been taken hold of by the legs of the opposite sides, and had been pressed together, so that their elasticity, in attempting to resume their natural positions, kept the legs quite tense, and the skin perfectly fixed.

A few inches below this cast skin, I found the dragon-fly which had just come out: it was resting upon a rush, and its wings were spread out to their fullest extent. The body of the creature was quite soft and moist, and it was evidently exposing itself to the sun, to allow its wings and body to harden before it took its flight. I brought home both the cast skin and the insect (which I killed by holding it over a chloroform bottle), and they are now in a cabinet in the Museum of the College of Surgeons. A few weeks afterwards I again visited this pond; hardly a dragonfly was to be seen, and the cast larva-cases had nearly disappeared.

But to return to the lizards. A magnifying glass will reveal, on the surface of the cast-off skin aforesaid, numerous pits and depressions, (remember the skin is inverted): these pits and depressions correspond to their relative elevations and furrows on the body of the lizard. These curious formations are little glands, set in the skin, which secrete a peculiar fluid, and which serve, I think, two purposes—first, to keep the body of the lizard moist when he goes out of the water, which he not unfrequently does, I mean on his own account; secondly, to afford his poor naked body some sort of protection. Who ever saw a dog hold a lizard long in his mouth? Certainly not. The captive exudes a peculiar acrid fluid from these glands, and the dog drops him instanter. This fluid is also partially poisonous to the human race. I remember once killing a lizard; and began to dissect him immediately afterwards: upon dividing the skin of the abdomen, there came forth a very peculiar and remarkably offensive odour. Though I cannot say it amounted to a stench, I confess I was obliged to give up my dissection; for I felt faint, and was obliged to lie

down for a few minutes. An hour afterwards, there was no trace of the odour; and I finished my work. I therefore advise naturalists never to dissect a newt till he has been defunct some little time. They are very difficult to kill by violence, but a little salt sprinkled on them soon causes them to die. The lizard tribe will remain alive a long time under circumstances that would be fatal to most other creatures. Mr. Quekett showed me a lizard called the 'horned frog of Texas,' in a little tin box in which holes had been perforated: this was the most hideous creature I ever saw, looking like a five-shilling piece, with a tail on one side, and two horns on the other. It had been sent in its box by post all the way from Carolina, in America. It had started on May 1st, and arrived at the College of Surgeons, London, May 17th, 1857. The box was not big enough for it to turn in, and it must have remained in the same position all this time: it looked very thin, and refused all food. Having frequently had occasion to feed snakes and tortoises when they would not eat, I proposed to Mr. Quekett to feed it; I accordingly, with some difficulty, opened its mouth with a bit of ivory, and having, as it were, gagged it open, I put in three big flies, and then took away the ivory, and the lizard swallowed the flies with apparent relish. This lizard, unlike the tritons, has not poison-secreting glands; nor are the Italian land-lizards armed with them, for the Italian cats delight to catch and eat them. Crocodiles have not glands in their skin which secrete acrid matter. Their skin is exceedingly hard and strong; so strong, indeed, as to be useful even in the shape of armour. In the British Museum there is a suit of armour—from ancient Egypt, I believe—made to fit a man, and composed entirely of

crocodile skin. The stuffed crocodiles in museums are of a dark, almost black colour; but I read that when alive, and in their native haunts, the skin is of a greenish hue. With reference to killing lizards by means of salt, I was lately told a wonderful story by a raw Lancashire man. It appears that once upon a time there lived a man whose appetite was enormous: he was always eating and yet could never get fat, he was the thinnest and most miserable of creatures to look at. He always declared that he had something alive in his stomach; and a kind friend learned in doctoring confirmed his opinion, and prescribed a most ingenious plan to dislodge the enemy, a big Triton, who had taken up his quarters in the man's stomach. He was ordered to eat nothing but salt food and to drink no water; and when he had continued this treatment as long as he could bear it, he was to go and lie down near a weir of the river, where the water was running over, 'with his mouth open.' The man did as he was told, and open-mouthed and expectant placed himself by the side of the weir. The lizard inside, tormented by the salt food, and parched for want of water, heard the sound of the running stream, and came scampering up the man's throat, and jumping out of his mouth ran down to the water to drink. The sudden appearance of the brute so terrified the weakened patient that he fainted away, still with his mouth open. In the meantime the lizard had drunk his full and was coming back to return down the man's throat into his stomach: he had nearly succeeded in so doing when the patient awoke, and seizing his enemy by the tail killed him on the spot. I consider this story to be one of the finest strings of impossibilities ever recorded.

It is possible that the power of secreting or exuding fluid possessed by lizards has given rise to the well-known story of the Salamander. The ancients, and some moderns, doubtless, believed, and do yet believe, that the Salamander is incombustible, and has the power (like Phillips's suicidal fire annihilator) of putting the fire out. Aristotle says, *it is reported* that the salamander, when it goes through the fire, extinguishes it. Elian says that it will live in flames, and attack fire like an enemy. From the above erroneous notions of the poor beast's power, the name of 'Salamander's wool' has been given to asbestos; and, why or wherefore I know not, but the alchemists tortured Salamanders in their attempts to change quicksilver into gold. I have never tried the experiment, nor do I intend to do so; but I conceive it likely that a lizard that has glands in his skin thrown into a fire, might escape death, and possibly be able to crawl away, defending himself from the heat by means of the exudation therefrom.

The alchemists have not been the only persecutors of the poor Tritons; modern philosophers have frequently tried experiments upon them, and have found out that, like lobsters and crabs, they can reproduce limbs or parts of limbs which have been amputated, whether by nature or accident.

A French philosopher, M. Bonnet, has amputated their tails, and arms, and legs, which have been reproduced with toes capable of motion; and in one case the same limb was reproduced four times; an eye, also, which he cut out, was reproduced in twelve months; and the results of many other similarly interesting, but cruel, experiments are on record. Would that the poor

limbless fellows from the Crimea had had this triton-like power, instead of being obliged to appeal to cork and wood—but clumsy substitutes at the best—for the useful members they have lost!

The tritons* of our glass-bowl are the representatives of the crocodiles and gavials, which formerly inhabited this 'right little, tight little island.' Query, was it an island in those days? Geologists, with good reason, think not; here, however, island or continent, gigantic lizards lived, died, and were buried. Should there be an unbeliever, let him go to the British Museum, and look at the bones of these gigantic British lizards in their coffins of hardened mud; let him read the white labels upon them, informing him where they were found; he will recognise many names of true English towns; some of them, perchance, nearer London than he had imagined.

I find in a Taunton newspaper that my late father, when addressing the Somerset Archæological Society, in 1849, made reference to the extinct lizard-like animals found fossil in England. He thus remarks:—'The lias to be found in the neighbourhood of Taunton was not only useful to the architect, but to the archæologist. It was the rock of which it might be said, as Virgil said of some of the pests of the farm,

"Quæ plurima terræ
Monstra gerunt."' †

The monsters of the lias stone were indeed most awful

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* Several of the tritons above-mentioned have been transferred from their glass-bowl to the fresh-water tanks of the Aquarium, in the Regent's Park Zoological Gardens. We advise the reader to inspect and admire them for himself.

† The monsters which the earth (or strata) bears in abundance.

monsters. My father valued one collection of them at the British Museum at 2000*l.*: they were so perfect that they could be dissected, as an anatomist would a dead dog; the skin, the scarf-skin, and even what they had eaten for their dinners, were discoverable. After referring to the Plesiosaurus, discovered by Mr. Conybeare, Dr. Buckland stated 'that on Tuesday last at Birmingham there was laid upon the table a thigh-bone larger than that of any elephant ever seen; it had no marrow, and was as solid as a gate-post—had perforations for the blood-vessels that intersected it to enter; and it had a fibrous structure which is not found in the whale, and also particular perforations which exist now only in the families of frogs, toads, and salamanders. It was the thigh-bone of a colossal salamander, and was found not thirty-three miles from that place.'

Again in a MS. note of one of my father's celebrated field lectures I find the following amusing description of the Megalosaurus (μεγας great, and σαυρος lizard), whose bones had been discovered in the neighbourhood of Oxford. 'During this period of monsters there floated in the neighbourhood of what is now the lake of Blenheim—huge lizards, their jaws like crocodiles, their bodies as big as elephants, their legs like gate posts and mile-stones, and their tails as long and as large as the steeple of Kidlington or Long Hanbro' (two neighbouring villages). Take off the steeple of either church, lay it in a horizontal position, and place legs to it, and you will have some notion of the animal's bulk. These stories look like fables, but I ask not your indulgence to believe them. There the monsters are, and I challenge your incredulity in the face of the specimens before your eyes;—disbelieve them if you can.'

Elsewhere my father remarks of this Megalosaurus: 'Although no skeleton has been found entire, so many perfect bones and teeth have been discovered in the same quarries, that we are nearly as well acquainted with the form and dimensions of the limbs as if they had been found together in a single block of stone.' Not only may the reader see and examine the actual bones of these gigantic lizards in the British Museum and other places, but he may, in these days of wonders, behold with his own eyes the bones as it were again clothed with flesh and muscle, and the monster Megalosaurus restored to life, hideous yet wonderful in its vastness.

Baron Cuvier estimated the Megalosaurus to have been about fifty feet in length, but Professor Owen, having more bones to examine and compare than the Baron had, has reduced its size to about thirty-five feet; but in his own words, 'the superior proportional height and capacity of trunk, as contrasted with the largest existing, the length even of thirty-five feet gives a most formidable character to this extinct "predatory" reptile.' Mark the word predatory. As there is never fire without smoke, so there is generally some sort of foundation for every story we hear. May not the idea of the dragons, curious stories of which are chronicled in various parts of England, owe their origin, in some way or other, to the veritable existence of these large lizards in former ages? To point out the train of ideas or circumstances which led to these ancient dragon stories is of course impossible, particularly as man was not coexistent with Megalosaurus and Co.—still there is a certain shadow or connexion between them.

In the garden of the Crystal Palace at Sydenham, stands the mighty giant Megalosaurus, formed and fashioned by the hands of the modern Pygmalion, Mr.

Waterhouse Hawkins, and not far from this Oxfordshire representative of giant lizards is the model of another huge creature, the Iguanodon, (Iguana, *ὀδούς*, tooth,) so called because the form of its teeth resembles those of a lizard called the Iguana. The Megalosaurus was a predatory reptile; the Iguanodon was herbivorous, and is found at Lewes in Sussex. Its bones were first discovered by the wife of Dr. Mantell, and the Doctor made out its history most satisfactorily. Strange it is that both my father and Dr. Mantell should be taken from us before the restorations of these and other monsters were erected. Neither of them lived long enough to see the results of their laborious investigations, amid the broken fragments of dirty bones dug out of the Oxfordshire and Sussex quarries, embodied, and the animals again, as it were, embued with life. The magnificent collection of Megalosaurus' bones in my father's museum at Oxford, and also that left behind him by Dr. Mantell, testify to their industry.

One of the most celebrated newts ever discovered was found about a century ago, in a miocene deposit, at Œningen, and was described by a philosopher of those days as a human skeleton, which he called 'Homo diluvii testis;' and a great fuss it then made in the learned world. Cuvier, however, came to the rescue, and decided that it was not the skeleton of a man, but of a gigantic salamander. This skeleton is still, I believe, in the Museum of Haarlem. Since this date, the Prince of Canino has examined it, and decided that it is closely allied to his genus, Sieboldtia, a gigantic water newt, three feet long, found by Siebolt (whence its name), in a lake within a volcanic crater in Japan.

A male and female specimen of this enormous water newt were brought alive from Japan, by their dis-

coverer, Sieboldt; but the female was eaten, during the voyage to Holland, by the male, which arrived safe and sound at Leyden, often changing its skin and feeding on small fishes, and snapping at the fingers of any man that attempted to catch it.*

Chameleons do not secrete any acrid poison, but they have, as it is well known, the power of changing their colour. I had a couple at Oxford, and tried several experiments, placing them on different-coloured cloths: the variety of colours they can assume is not very great. They unfortunately soon died, my servant having put the box in which they were kept in a very cold place. They are very passionate creatures. Mr. Madden writes, 'I trained two large chameleons to fight; I could at any time by knocking their tails against one another, insure a combat, during which their change of colour was most conspicuous. This change is only effected by paroxysms of rage, when the dark-green gall of the animal is transmitted into the blood, and is visible enough under its pellucid skin. One of them, which I kept for some months, deposited thirteen eggs in a corner of the room, each about the size of a large lavender-seed; the animal never sat on them.'

The reason here given to account for the change of colour is not very satisfactory. It has been said elsewhere to be caused by the injection of the blood vessels of the skin, but Mr. Quekett tells me that he has injected many chameleons, but has not found the blood vessels of

* I find, among Dr. Buckland's papers, a portion of the epiderm or scarf-skin of this very lizard. A MS. note states that he saw the animal alive at Leyden, October 20, 1835, and that it had lived there many years; it was one foot long when it arrived, but it grew to be three feet long. It had no nails on any of its toes.

the skin by any means numerous or capable of dilatation. The real cause of this phenomenon has yet, I believe, to be discovered, though there are many theories about it.

There are many insects and beetles which come out only at night. These are very interesting to the entomologist, who often finds it very difficult to catch the minuter kinds. Toads are therefore turned into beetle-traps, and made to catch these little night insects. A brigade of skirmishing toads is turned loose into the garden in the evening; the toads, unconscious why so much kindness is shown them, do their best to get a good meal, but in the morning their master comes and makes them eject all their night-work, which he does without hurting them; and in this way many curious and rare specimens of minute nocturnal insects have been obtained. I have heard of a capital way to catch night-moths, with little trouble; it was practised by a brave-hearted and gallant artillery officer, alas now no more! He lived in a charming country-house near St. George's hill at Weybridge: the woods thereabouts are full of curious insects, and he used to catch the moths by smearing the trunk of a tree with sugar and beer boiled together. A lantern was then placed near the trap; the moths attracted by it came flying round, and were caught by the sticky mixture. *

Toads are capital hands, too, at eating bees, when they can get no other insects. A gentleman in Oxfordshire

* "Mr. Buckland, we suspect, is not much in the habit of reading entomological publications [*this is quite true*]; if he were, he would frequently see opposite one and another name the mysterious announcement, 'At Sugar.' This means that the moth was taken by the very device here described,—a device as familiar to the insect-hunter as his collecting-box."

Review Literary Gazette, Jan. 2, 1858.

had a hive of bees in the cavity of a wall: a common toad which had taken up its residence in a hole close by was observed to walk forth and place himself at the mouth of the hive, and to catch the bees in their coming from and returning to the hive with much dexterity and activity. After witnessing the toad at work for some time and feeling convinced that, if his depredations, were suffered he would eventually destroy the whole hive, the owner of the bees killed the robber, and on inspecting his stomach, it was found full to repletion of dead bees.

Toads are generally reported to be poisonous, and this is perfectly true to a certain extent. Like the lizards, they have glands in their skin, which secrete a white highly-acid fluid, and just behind the head are seen two eminences like split beans: if these be pressed, this acid fluid will come out—only let the operator mind that it does not get into his eyes, for it generally comes out with a jet. There are also other glands dispersed thoughout the skin. A dog will never take a toad in his mouth, and the reason is that this glandular secretion burns his tongue and lips. It is also poisonous to the human subject. Mr. Blick, surgeon, of Islip, Oxfordshire, tells me that a man once made a wager, when half drunk in a village public-house, that he would bite a toad's head off; he did so, but in a few hours his lips, tongue, and throat began to swell in a most alarming way, and he was dangerously ill for some time. He had probably bitten right through the centre of the glands behind the head, and had got a dose of the poison. This toad's poison mixes readily in water. Under the microscope I find that it appears composed of numerous round cells. A small animal that I

inoculated with it was not in any way affected. When first this juice is squeezed out it is in external appearance very like the juice of the sow-thistle, which juice must also have some acrid properties, for it is often used to destroy warts by country people. Mr. G. Rainey, in the Microscopic Journal for 1855, has written a most interesting paper on the structure of the skin of the toad. He states that some French experimenters assert that the secretion from the toad's skin is fatal to animals; but that in his hands they have not proved so. That it should not be, what is commonly called venomous, he adduces the following most logical argument:—'There is one consideration which, as mere circumstantial evidence, may be mentioned in opposition to the views of the intensely-venomous power of the secretion in the toad, and that is, its general diffusion over a large part of the body, whilst in all those animals which are decidedly provided with a specific venom and not a mere irritant, the frightful apparatus which produces it is well known (see page 194) to occupy but a very confined locality.' When a toad is taken into the hand it feels somewhat hard, and its skin is not soft and slippery to the touch, as is the skin of the frog. Mr. Rainey tells us the reason of this is, that 'underneath the true skin is a layer of earthy material that will effervesce with acids.' Tortoises have a covering, not of skin but of bone, and Mr. Rainey very justly considers this earthy deposit in the toad's skin to be analogous to the scaly covering of the chelonean (χελυς, a tortoise) reptiles. As regards the use of the skin follicles in the toad, Mr. Rainey gives the following solution:—'These follicles have something to do with the absorption and retention of fluid which in this class of reptiles is taken

into the system by the skin. Frogs have no cutaneous organs to retain fluid, so that this reptile requires more frequently than the toad a fresh application of moisture to its surface. If a frog be exposed to the absorbing power of dry mould, as the toad frequently is, the fluid would pass through the skin into the dry earth. The contents of the follicles of the toad mixing with the dust and other extraneous substances, constantly in contact with its skin, especially as the secretion is of a glutinous material, and has a tendency to coagulate when wetted, may possibly form a coating on its external surface, and thus tend to diminish evaporation; and in this way it may assist in retaining the fluid absorbed into the body, and in preventing its desiccation, and thus furnish another means of adapting this animal to the physical and physiological states and conditions under which it is ordained to live and perform its part in the accomplishment of that one universal and wise purpose, for which this much-despised reptile, in conjunction with all other living beings, was destined and created.'

But do not let my verdict of *poisonous* cause the destruction of toads by my readers; they are most useful reptiles, and devour thousands of small insects, that would otherwise eat up the vegetation. Gardeners well know this when they turn them into the hot-houses. As proof, I subjoin this testimony from a gardener: 'In the autumn of last year a pit wherein I grew melons was so much infested with ants, as to threaten the destruction of the whole crop, which they did first by perforating the skin, and afterwards eating their way into the fruit; and after making several unsuccessful experiments to destroy them, it occurred to me that I had seen the toad feed on them. I accordingly put half-a-dozen toads into

the pit, and in the course of a few days hardly a single ant was to be seen.' There is just now a plague of ants in many of the London houses, which defy extermination. I strongly recommend those who are troubled with these plagues to try whether a toad or two won't help them.

In the year 1825 my father tried a series of experiments, relative to the old story of toads being found in stones, blocks of stone, &c. As these experiments were made with much care, and the detailed account is rarely to be met with in print, I may be pardoned for here introducing my father's own words, for the benefit of observers of the present day. He writes:—

'In the month of November, 1825, I commenced the following experiments with a view to explain the frequent discoveries of toads enclosed within blocks of stone and wood, in cavities that are said to have no communication with the external air.

'In one large block of coarse oolitic limestone (the Oxford oolite from the quarries of Heddington), twelve circular cells were prepared, each about one foot deep and five inches in diameter, and having a groove or shoulder at its upper margin fitted to receive a circular plate of glass, and a circular slate to protect the glass: the margin of this double cover was closed round and rendered impenetrable to air and water by a luting of soft clay. Twelve smaller cells, each six inches deep and five inches in diameter, were made in another block of compact siliceous sandstone, viz. the Pennant Grit of the coal formation near Bristol; these cells also were covered with similar plates of glass and slate cemented at the edge by clay. The object of the glass covers was to allow the animals to be inspected, without

disturbing the clay so as to admit external air or insects into the cell. The limestone is so porous that it is easily permeable by water, and probably also by air; the sandstone is very compact.

'On the 26th of November, 1825, one live toad was placed in each of the above-mentioned twenty-four cells, and the double cover of glass and slate placed over each of them and cemented down by the luting of clay: the weight of each toad in grains was ascertained and noted by Dr. Daubeny and Mr. Dillwyn at the time of their being placed in the cells; that of the smallest was 115 grains, and of the largest 1185 grains. The large and small animals were distributed in equal proportion between the limestone and the sandstone cells.

'These blocks of stone were buried together in my garden beneath three feet of earth, and remained unopened until the 10th of December, 1826, on which day they were examined. Every toad in the smaller cells of the compact sandstone was dead, and the bodies of most of them so much decayed, that they must have been dead some months. The greater number of those in the larger cells of porous limestone were alive. No. 1, whose weight when immured was 924 grains, now weighed only 698 grains. No. 5, whose weight when immured was 1185 grains, now weighed 1265 grains. The glass cover over this cell was slightly cracked, so that minute insects might have entered: none however were discovered in this cell; but in another cell whose glass was broken, and the animal within it dead, there was a large assemblage of minute insects; and a similar assemblage also on the outside of the glass of a third cell. In the cell No. 9, a toad, which when put in weighed 988 grains, had increased to 1116 grains, and

the glass cover over it was entire; but as the luting of the cell within which this toad had increased in weight was not particularly examined, it is probable there was some aperture in it by which small insects found admission. No. 11 had decreased from 936 grains to 652 grains.

'When they were first examined in December, 1826, not only were all the small toads dead, but the larger ones appeared much emaciated, with the two exceptions above mentioned: we have already stated that these probably owed their increased weight to the insects which had found access to the cells and become their food.

'The death of every individual of every size in the smaller cells of compact sandstone, appears to have resulted from a deficiency in the supply of air, in consequence of the smallness of the cells, and the impermeable nature of the stone; the larger volume of air originally enclosed in the cells of the limestone, and the porous nature of this stone itself (permeable as it is slowly by water and probably also by air), seem to have favoured the duration of life to the animals enclosed in them without food.

'It should be noticed that there is a defect in these experiments, arising from the treatment of the twenty-four toads before they were enclosed in the blocks of stone. They were shut up and buried on the 26th of November, but the greater number of them had been caught more than two months before that time, and had been imprisoned all together in a cucumber-frame placed on common garden earth, where the supply of food to so many individuals was probably scanty, and their confinement unnatural, so that they were in an unhealthy

and somewhat meagre state at the time of their imprisonment. We can therefore scarcely argue with certainty from the death of all these individuals within two years, as to the duration of life which might have been maintained had they retired spontaneously, and fallen into the torpor of their natural hybernization in good bodily condition.

'The results of our experiments amount to this: all the toads both large and small inclosed in sandstone, and the small toads in the limestone also, were dead at the end of thirteen months. Before the expiration of the second year, all the large ones also were dead: these were examined several times during the second year through the glass covers of the cells, but without removing them to admit air; they appeared always awake, with their eyes open, and never in a state of torpor their meagreness increasing at each interval in which they were examined, until at length they were found dead; those two also which had gained an accession of weight at the end of the first year, and were then carefully closed up again, were emaciated and dead before the expiration of the second year.

'At the same time that these toads were enclosed in stone, four other toads of middling size were enclosed in three holes, cut for this purpose on the north side of the trunk of an apple-tree; two being placed in the largest cell, and each of the others in a single cell. The cells were nearly circular, about five inches deep, and three inches in diameter; they were carefully closed up with a plug of wood so as to exclude access of insects, and apparently were air-tight: when examined at the end of a year, every one of the toads was dead, and their bodies were decayed.

'From the fatal result of the experiments made in the small cells cut in the apple-tree, and the block of compact sandstone, it seems to follow that toads cannot live a year excluded totally from atmospheric air; and from the experiments in the larger cells within the block of oolitic limestone, it seems also probable that they cannot survive two years entirely excluded from food; we may therefore conclude that there is a want of sufficiently minute and accurate observation in those so frequently recorded cases, where toads are said to be found alive within blocks of stone and wood, in cavities that had no communication whatever with the external air. The fact of my two toads having increased in weight at the end of a year, notwithstanding the care that was taken to enclose them perfectly by a luting of clay, shows how very small an aperture will admit minute insects sufficient to maintain life. In the cell No. 5, where the glass was slightly cracked, the communication though small was obvious, but in the cell No. 9, where the glass cover remained entire, and where it appears certain, from the increased weight of the enclosed animal, that insects must have found admission, we have an example of these minute animals finding their way into a cell, to which great care had been taken to prevent any possibility of access.

'Admitting, then, that toads are occasionally found in cavities of wood and stone, with which there is no communication sufficiently large to allow the ingress and egress of the animal enclosed in them, we may, I think, find a solution of such phenomena in the habits of these reptiles, and of the insects which form their food. The first effort of the young toad, as soon as it has left its tadpole state and emerged from the water, is to seek

shelter in holes and crevices of rocks and trees. An individual, which, when young, may have thus entered a cavity by some very narrow aperture, would find abundance of food by catching insects, which like itself seek shelter within such cavities, and may soon have increased so much in bulk as to render it impossible to get out again through the narrow aperture at which it entered. A small hole of this kind is very likely to be overlooked by common workmen, who are the only people whose operations on stone and wood disclose cavities in the interior of such substances. In the case of toads, snakes, and lizards, that occasionally issue from stones that are broken in a quarry, or in sinking wells, and sometimes even from strata of coal at the bottom of a coal-mine, the evidence is never perfect to show that the reptiles were entirely enclosed in a solid rock ; no examination is ever made until the reptile is first discovered by the breaking of the mass in which it was contained, and then it is too late to ascertain, without carefully replacing every fragment (and in no case that I have seen reported has this ever been done), whether or not there was any hole or crevice by which the animal may have entered the cavity from which it was extracted. Without previous examination it is almost impossible to prove that there was no such communication. In the case of rocks near the surface of the earth, and in stone quarries, reptiles find ready admission to holes and fissures. We have a notorious example of this kind in the lizard found in a chalk-pit, and brought alive to the late Dr. Clark. In the case also of wells and coal-pits, a reptile that had fallen down the well or shaft, and survived its fall, would seek its natural retreat in the first hole or crevice it could find, and the miner dislodging

it from this cavity, to which his previous attention had not been called, might in ignorance conclude that the animal was coeval with the stone from which he had extracted it.

'It remains only to consider the case (of which I know not any authenticated example) of toads that have been said to be found in cavities within blocks of limestone, to which, on careful examination, no access whatever could be discovered, and where the animal was absolutely and entirely closed up with stone. Should any such case ever have existed, it is probable that the communication between this cavity and the external surface had been closed up by stalactitic incrustation, after the animal had become too large to make its escape. A similar explanation may be offered of the much more probable case of a live toad being entirely surrounded with solid wood. In each case, the animal would have continued to increase in bulk so long as the smallest aperture remained by which air and insects could find admission; it would probably become torpid as soon as this aperture was entirely closed by the accumulation of stalactite or the growth of wood. But it still remains to be ascertained how long this state of torpor may continue under total exclusion from food and from external air: and although the experiments above recorded show that life did not extend two years, in the case of any one of the individuals which formed the subjects of them, yet, for reasons which have been specified, they are not decisive to show that a state of torpor, or suspended animation, may not be endured for a much longer time by toads that are healthy and well fed up to the moment when they are finally cut off from food, and from all direct access of atmospheric air.

The common experiment of burying a toad in a flower-pot covered with a tile, is of no value unless the cover be carefully luted to the pot, and the hole at the bottom of the pot also closed, so as to exclude all possible access of air, earthworms, and insects. I have heard of two or three experiments of this kind, in which these precautions have not been taken, and in which at the end of a year the toads have been found alive and well.

'Besides the toads enclosed in stone and wood, four others were placed each in a small basin of plaster of Paris, four inches deep and five inches in diameter, having a cover of the same material carefully luted round with clay; these were buried at the same time and in the same place with the blocks of stone, and on being examined at the same time with them in December, 1826, two of the toads were dead, the other two alive, but much emaciated. We can only collect, from this experiment, that a thin plate of plaster of Paris is permeable to air in a sufficient degree to maintain the life of a toad for thirteen months.

'In the 19th vol. No. 1, p. 167, of Silliman's American Journal of Science and Arts, David Thomas, Esq., has published some observations on frogs and toads in stone and solid earth, enumerating several authentic and well-attested cases. These, however, amount to no more than a repetition of the facts so often stated and admitted to be true, viz. that torpid reptiles occur in cavities of stone, and at the depth of many feet in soil and earth; but they state not anything to disprove the possibility of a small aperture, by which these cavities may have had communication with the external surface, and insects have been admitted.

'The attention of the discoverer is always directed

more to the toad than to the minutiæ of the state of the cavity in which it was contained.'

But frogs are found sometimes in a true fossil state: some good specimens have been discovered in the so-called 'papier kohl' (a species of semi-fossil wood that splits up into thin sheets like paper), near the town of Bonn, on the Rhine. They were associated with remains of roach, dace, and a curious kind of carp. Possibly in former days there might have been in the antediluvian forest (now turned into coal) just such another pond as that I found in the pine-wood near Giessen, where I killed my frogs with the blowing-tube. As in former times there existed gigantic lizards, so also there were gigantic frogs, or creatures very frog-like in their conformation. Specimens of these creatures have been modelled by Mr. Waterhouse Hawkins, and may be seen at Sydenham. This beast has been christened the Labyrinthodon, because, when a thin slice is made of its tooth, the structures are seen blending one with the other in an in-and-out fashion like a labyrinth. I lately saw in a sugar-plum shop a stick of what the boys call sweetstuff, composed of various coloured sugars intermixed; strange to say, they had assumed exactly the pattern we find in the tooth of the Labyrinthodon. Long before they found the bones of our friend they found his footsteps; like hounds who have to hunt along the footsteps of the fox a long time before they catch their fox. These footsteps were like the impression of a man's hand, so they called it the Chirotherium, or beast with a hand. There are some fine specimens of these footsteps in my father's geological museum at Oxford; and many years ago I well recollect making frogs walk over soft plaster of Paris to show the similarity of

their foot tracts with those of their great-great, &c. grandfather.

As a sample of the 'toad-in-a-hole' stories which we see every now and then in newspapers, I insert the following newspaper scrap, which I find among some MS. notes of my father's, relative to toads:—'A few days ago, as two colliers were working coal in a pit in the neighbourhood of Bathgate, Linlithgowshire, they were astonished, on breaking a large piece of coal, to see a living frog skip nimbly from it. The niche in which it had lived was perfectly smooth, and of the exact shape of the frog. The hind legs of the animal are at least twice as long as those of an ordinary frog, the fore legs almost gone. It is of a beautiful bronze colour. It leaped briskly about the moment that it was liberated from its dark abode. How many generations it may have been shut up from light and air it is impossible to say; certain it is that although diminutive in form, and with great brilliancy of eye, *it is a very antediluvian-looking customer. It inspires us with a kind of fear to be brought into contact with a living being that has, in all probability, breathed the same air as Noah, or disported in the same limpid stream in which Adam bathed his sturdy limbs.*'

Examine this story by means of the key afforded by my father's experiments, and its absurdity becomes apparent.

RATS.

Aridum et ore ferens acinum, semesaque lardi
Frusta dedit, cupiens variâ fastidia cœnâ
Vincere tangentis malè singula dente superbo:
Cùm pater ipse domus paleâ porrectus in hornâ
Esset ador loliumque, dapis meliora relinquens.*
Horace, Sat. II. vi. 85.

In the above lines Horace amusingly describes the grave hospitality shown by the *Mus rusticus* towards his old friend the *Mus urbanus*, the feast being held, we are given to understand, in 'paupere cavo,'† situated on a rugged mountain-side. During the entertainment the conversation turned upon the vanity of mundane affairs, and the certainty of death to all, whether bipeds or quadrupeds: the moral appearing with the dessert—that it behoves rats, as well as men, to be jolly, under whatever circumstances they may happen to be placed. On taking leave, the city beau returned the compliment of the invitation, and his country friend trotted off with him to enjoy, as well as he might, the contrast to his own humble apartments,

* He goes, and freely fetches
Whole ears of hoarded oats and vetches;
Dry grapes and raisins cross her chaps;
And dainty bacon, but in scraps:
If delicacies could invite
My squeamish lady's appetite.
The matron of the house, reclined
On downy chaff, discreetly dined
On wheat and darnel from a manger,
And left the dainties for the stranger.—*Francis.*

† Miserable burrow.

In locuplete domo—rubro ubi cocco
Tincta super lectos canderet vestis eburnos. *

Whether other such murine feasts have taken place since, or whether the London *mures* are given to the same hospitality towards their brethren as their predecessors of Italy exercised, I know not; but I do know, and we all know, that there are many representatives of this noble and ancient family in London, whose habits and modes of living (though we don't often read notices of their *soirées* and entertainments in the columns of the 'Morning Post') are exceedingly interesting, and point out to us, that if we only look we may find something to admire and reflect upon in the humblest works of the munificent Creator.

But to our subject:—

There are two kinds of rats known in Great Britain—the black rat and the brown rat. The black rat, or, as it is sometimes called, the old English rat, does not seem to be an aboriginal occupier of the British soil. The earliest mention of it is by Genner, in his 'Historia Animalium,' published at Zurich about the year 1587. It is probable that it was introduced into this country from France, the Welsh name for it being to this day, as I have it from a gentleman of Welsh extraction, 'Llygoden Frengig'—'the French mouse;' and I am, moreover, given to understand, on good authority, that it still abounds in the barns and granaries scattered throughout Normandy.† We all

* When harass'd with a length of road,
They came beneath a grand abode;
Where ivory couches, overspread
With Tyrian carpets, glowing, fed
The dazzled eye.—*Francis.*

† Quoted by the Quarterly Review.

know the common brown rat when we see it: the black rat is a different-looking animal; he is much slighter in make, his upper jaw projects further over the lower jaw than it does in the brown rat, his ears are much larger, and his tail very much longer than in his first cousin, and lastly his colour is a jet black, with numerous long hairs projecting out from the lower fur-like coat. He is a very timid creature, and rarely shows fight; he is, in fact, not very powerful, but his want of strength is made up by his excessive activity. I have examined several, and found their bodies a mass of muscle without a particle of fat.

By the side of the rat now so common in England, the aboriginal rat has no chance; he might get away from him, being more active, but in a pitched battle the brown, through his weight and superior power, must be victorious. Rats, as will be seen hereafter, are very fond of fighting, and are addicted to cannibal habits. In the rat tribe, as well as among ourselves, the maxim that 'the weakest goes to the wall' holds good, and the consequence is that the black rat has become very scarce indeed, and the brown rat reigns predominant in his stead. Stuffed specimens, even, are very rare in museums, and the example they have in the British Museum is by no means a good one. I hope to be able to present them with a better. There is a case on record to prove that the Norway rat is the principal agent in the extirpation of the black rat. Some years ago a London rat-catcher shut up together in a cage the result of his day's work, consisting of several dozen rats, of both species, and put them away carefully for the night, their intended fate being to afford sport to his employer's dogs the next morning. What was his astonishment, when he came to fetch them, to find none

but brown rats remaining! these cannibals having cruelly devoured all their sable brethren.

The black rat is reported by phrenologists to have the cerebral organs differently developed to those of the brown rat (and this fact was insisted upon by Spurzheim in support of his theories).* The black rat delights not in low haunts, such as cellars, pigsties, nor does he burrow and run into holes, etc., but lives chiefly in the ceilings and wainscoats of houses, and under the ridge-tiles, and behind the rafters of out-houses. Advantage may be taken of this habit; for the surest way to catch him is to place snares of thin wire, fixed open, on the beams or rafters which he is in the habit of traversing. Into these he will thrust his head, and struggling to escape, will throw himself off the beam, and thereby become strangled in the wire by his own weight.

The author of a curious book—'The Vermin Catcher, 1768,'—confirms this fact. He writes: 'I was once exercising my employment at a gentleman's house, and when the night came that I appointed to catch, I set all my traps going as usual, and in the lower part of the house in the cellars I caught the Norway rats, but in the upper part of the house I took nothing but the black rats; I then put them together into the great cage to keep them alive till the morning, that the gentleman might see them, when the Norway rats killed the

* "It is certain, and must be conceded, that animals which live on mountains, or which are fond of high regions, have one part of their brain more developed than the species of the same genus which live in flat and low countries. This difference is very sensible in roes, hares, rats, &c. One species of rats lives in canals, cellars and the lower parts of houses; another in corn-lofts and garrets, and the difference in their cerebral organization is very distinguishable"—*Spurzheim's Phrenology*, p. 142. 1825.

black rats immediately and devoured them in my presence.'

It is a general notion that there are many black rats still remaining in the vast city of sewers underneath the houses and streets of London, but the author of 'London Labour and London Poor' tells us otherwise.* 'One man, who had worked twelve years in the sewers before flushing was general, told me he had never seen but *two* black (or old English) rats.' His evidence, however, goes to prove that they are not quite extinct. He says: 'In my inquiries as to the sale of rats (as part of the live animals dealt in by a class in the metropolis), I ascertained, that in the older granaries, where there were series of floors, there were black as well as brown rats; "Great black fellows," said one man, who managed a Bermondsey granary, "as would frighten a lady into *asterisks* to see of a sudden."'

There are two exhibitions of happy families in London; one stands at Charing Cross and about the streets, the other remains permanently at Waterloo Bridge. They both claim to be the original 'happy family,' but I think the man at the bridge has the greatest claims to originality. He is the successor to the man who first started the idea, thirty-six years ago—Austin by name; the present owner has exhibited eight years, and always in the same place. Both of these men told me that black rats were very scarce things indeed; one of them had to give half a crown for a single one. He afterwards got another, but finding they would not breed in captivity, he turned them out under the floor of his room, to give them a better chance of breeding: the result of the experiment he has promised to let me know.

* All the sewer-labourers I have spoken to, confirm this.

I have been informed that a gentleman who was in the habit of crossing London Bridge early in the morning some years ago, frequently saw whole colonies of black rats out on the mud banks by the river side at low-water; lately, however, they have all disappeared, killed, most probably, by the increasing numbers of the Norway rats from the large granaries and store-houses that have sprung up near the bridge.

An intelligent rat-catcher informs me that the present head-quarters of the old English black rat is the Isle of Dogs; that they abound there in the numerous ditches, and come out to feed upon what is left by the tide. In his opinion these black rats are not aboriginal in England, but that they came over originally from Jersey in ships. They thrive, he tells me, in marshy places, particularly where the water is brackish, and there are many such places in Jersey. I have not yet had an opportunity of verifying his assertion. My friend Mr. Coulson, of Clifton, Bristol, most kindly sent me up five beautiful young black rats from Bristol; they were in a large iron cage, and when excited moved about the cage more like birds than rats. I never yet saw other creatures with four legs so active as they: their tails are remarkably long, and they use them as levers to spring by when about to jump. Opening the cage to examine them, one escaped, running under my hand. It took myself, three other persons, and two dogs three quarters of an hour hunting in my room to catch him again—so active was the little brute. We were obliged finally to kill him to get him at all: one of my friends present very appropriately called him 'black lightning.'

The other species of rat, now so universally known

and generally esteemed a pest by all, is commonly supposed to have come from Norway, and is, therefore, called (but wrongly) the Norway rat. This is a strange mistake, for it would imply that this animal was aboriginal in that country; whereas, in fact, at the time when the name was first applied to it, it was not even known to exist there. How this mistake arose I know not, except from the fact that there exists in Norway a little animal, not unlike a rat, called a lemming, described in a treatise entirely devoted to it by the celebrated Danish historian and antiquary, Wormius, about the seventeenth century. This may be the origin of the name; but, however, it made its appearance in Paris about the middle of the eighteenth century, and in England not many years earlier. It is now agreed by most naturalists that it is a native of India and Persia; that it spread onwards into European Russia, and was thence transferred by merchant-ships to England and elsewhere.

This species of rat having nearly exterminated the black rat, has multiplied in the course of years to a fearful extent, and has taken sole possession of every haunt and lurking-place where he can be warm and dry, and at the same time find food in abundance.

What has happened in England has happened elsewhere, viz. the Norway rat has destroyed the aboriginal rat of the country. A gentleman whose family had property in Jamaica, informs me that several rats were imported to that island to keep down the plantation rats. This was not a wise plan, for no sooner had the Norway rats arrived in their new quarters than they multiplied so exceedingly that they became a greater pest than the original rat.

Again, as regards New Zealand, we read in the 'Field' newspaper, in answer to a question as to whether any good sporting can be had there, an answer from a gentleman who signs himself Kaiapoi: 'With the exception of a small species of rat, now nearly extinct, having been all but exterminated by the importation of the common Norway rat, there is not a single indigenous animal in the country; the rats have become a serious nuisance.'

Again, another answer to the same question: 'In reply, I may state that New Zealand is about the worst country for a sportsman in the world. Nearly a century ago, Captain Cook left pigs and rats upon the island, and these have become a serious nuisance in many parts.' I lately saw an advertisement of a man who was 'willing to buy any number of live cats for exportation.' Doubtless these cats are destined for New Zealand; we shall have the story of Whittington and his cat over again. It is by no means a bad speculation.

But according to a Canterbury paper the tables are now turned here in England against even the Norway rat. We read: 'Among the numerous articles for sale in our market on Saturday last was a number of live rats from Australia. When asked what inducement there was to introduce vermin into one's house, we were told such was the antipathy of English rats to those from Australia, that it required only the introduction of some two or three of the Australian breed to extirpate any number of English rats. We were further told that they realized a high price, in consequence, from those who had faith in their frightening propensities.' I have heard rumours of the existence of another species of British rat, that has become nearly

extinct. Mr. Blick, of Islip, informs me, that some years ago he well recollects seeing in Leicestershire and Northamptonshire a small species of black water-rat, shaped like a mole, with a long body and short legs and a short thick head; but this rat is now very rare. The fishermen report that the common water-rat has killed them. It is reported that they are still to be found in Barton brook, near Woodstock in Oxfordshire; but I have never yet seen one.

It is a curious, but nevertheless well-ascertained fact, that wherever there is a good habitat for a rat, it is quite certain that there a rat will be. The immediate occupier may be slain, but in a few days the favourite spot will be found out, and taken possession of by another rat, who will in his turn meet the same fate as his predecessor, and will be succeeded by another deluded victim, who is doomed, as the doctors would say, 'to be taken as before.'

The rat is a most strict observer of the law 'Be fruitful and multiply;' for Madame la Ratte is generally in an interesting condition thrice a-year, and on these occasions she does not look forward to nursing one helpless little individual, but thirteen or fifteen small unfortunates. I have had practical demonstration of the aptness of this family for propagating its species. In cleaning out the cage containing a little happy family of five rats, of variegated colours—all of which were perfectly tame, and live in peace and harmony—I felt something among the hay, warm and soft; on taking it carefully out, it proved to be a little tiny rat, hairless and eyeless, but nevertheless endowed, like a biped baby, with the full and audible use of its infant lungs. On hearing its cries, the mother—a beautiful snow-white

rat, upon whose head maternal cares were pressing at the early age of eight weeks—rushed forward, and seizing her screaming infant between her teeth, hastily ran off with it. Upon further examination, ten other young innocents were found carefully packed up in the corner of a cigar-box, which had been placed in the cage for the use of the colony in general, but which had been kindly vacated by the other considerate rats in favour of the lady who was literally in the straw. The owner is happy to announce that the mother and her little family are all doing well. Such, indeed, is the amazing fecundity of this animal, that they would soon overrun the whole country, and render all our attempts to destroy them fruitless, had they no enemies to lessen their numbers. But this baneful increase is happily counteracted, not only by numerous foes among other animals, but by their destroying and eating each other. The same insatiable appetite that impels them to indiscriminate carnage, also incites the strongest to devour the weakest, even of their own kind; and a large male rat is as much dreaded by its own species, as the most formidable enemy.

I once had three rats brought to me in a cage; in removing one it got hurt. I fed them, and put them into a stable. The next morning there were only two rats in the cage, the injured rat having been set upon and slain by his fellow-prisoners. They had not only slain him, but had actually begun to eat him, choosing the head to begin upon. Wishing to see the result, I left him, and in the course of the day, although well supplied with bread and milk, these cannibals had nearly devoured their friend. I have preserved the bones as proof of the fact. I afterwards ascertained that it was

one only of these rats that was murderously inclined, for he killed and ate every rat put in to him. In the course of about a month, this brute killed five rats that were put into his cage. He always began at the neck, just behind the ear. A gentleman at Clapham, to whom I gave some rats, had bred a number in a squirrel's cage, which was hung up in a garden. One morning, not long ago, he looked at the rat in it—a white female with young. Instead of the white rat, he found a great brown male of the common kind coiled up in the nest. The white one was gone, and the young ones all killed and partly devoured. This brown rat must have climbed up a perpendicular smooth iron bar to get at the cage. Out of the hole in the cage, where the intruder got in, the white mother might have got out if she liked, but she preferred staying at home and looking after her young ones.

The Yankees, I am told, take advantage of the cannibal propensities in the rats. A clever Yankee being much troubled with rats, and being determined to get rid of them, tried every possible plan, but without success. At last he got a lot of rats and shut them in a cage; they devoured one another till only a single one was left. He then turned this one loose, who, excited with the blood of his fellow-rats, and having become a genuine cannibal, killed and ate all the wild rats he could find on the premises. A good Yankee story.

I was witness to the following circumstance: A dog had been killing some rats for a match, and one wounded rat was left alive in the rat-pit. Twenty other rats were then placed in for another dog. These fresh comers found out the wounded one, and instantly,

though there were many people looking on, set upon him and killed him then and there. One of the rats seemed to take the part of the wounded one, but a gigantic rat left the wounded one he was murdering and attacked the would-be rescuer and killed him also. This seems a wise provision, though, at first sight, a cruel one. If a wounded rat got into a hole, he would linger there perhaps many days in a dying state. His fellow-rats, however, soon find him out and put him out of his misery. At the same time it is a salutary check upon their increase, for a colony of rats has thus in itself the elements of self-destruction. Were all to live, there would not be sufficient food for their existence; some must die, and those are killed who are disabled from foraging for themselves. In this way, too, one poisoned rat often kills more; his neighbours eat his body, and with it the poison. But it appears that the rats have found out what poison is, for a gentleman with whom I was conversing on the subject informed me, that he knew a case where poison having been placed down for rats, a pair of old ones drove their young away from it, and filled up the holes where it was placed, so that they should not get at it.

Rats are remarkably subject to tumours in the skin. Examining about half a sackful of dead rats one day, I found that more than half had these tumours. I have in my possession a dried body of a rat with a little round hole in its back, where one of these places had burst. This had probably caused the death of the animal, and he had gone away to die in solitude, as is the habit with most animals. Not long ago, I examined the body of a man which was exhibited at Hungerford Market. The hand-bill of the exhibition stated that it was a

fossil man; no fossil was it, but simply a body quite dried up, just as was the rat's. This body was found buried in the guano, but in which island I cannot recollect. His name was Christopher Toledo, for one of the staves of an oil-barrel was found on his body, with the name and the date, 1670, cut out rudely, probably with a sailor's knife. To the head a long black pigtail was attached. Sailors in former days wore pigtails, and I see that in the castings affixed to the Nelson column, Charing Cross, the sailor who is carrying Lord Nelson has a pigtail. This poor man, whose body I examined, had met with cruel treatment; he had probably been tortured and then murdered. The right collar-bone had been broken; and that he had lived some time after the accident, or more probably the blow, was evident from the fact that his right arm was much larger than the left—the result of swelling. Had he died immediately, the arm could not have had time to swell. I thought the teeth projected in a remarkable way. I examined them more closely, and ascertained that the upper lip had been cut off quite to the bone. The owner of the skeleton was not aware of this till I pointed it out to him. He fully agreed with my observation. What a story could poor murdered Christopher Toledo tell us, could his body have the power of articulation!

In Oxford-street there was, about four years ago, another exhibition of 'a semi-fossilated man from the guano island of Ichaboe.' To see this I paid one penny. It cost me a shilling to see Christopher Toledo. This man was a Chinese; his Tartar features, small feet, and peculiar hair told us this. The proprietor considered his mummy much more valuable than the

specimens from Egypt; for he writes in his exhibition bill—'The length of time it has been covered with guano is undecided, but it cannot be rated at less than from two to three thousand years; how much more, it is impossible to state, but the probability is that it far exceeds in antiquity, as it does in interest, those gum and bitumen preserved bodies imported to us from Egypt.'

I have a notice of yet a third human fossil. It is a handbill of an exhibition, preserved by my father. 'Now exhibiting, an antediluvian child, found in a *supercritacy* soil at Dielgen, near Brussels, Belgium. There does not perhaps exist in the world a discovery so rare and so wonderful in the matter of geological science. Until now there never was found but the bones of animals to have turned into a fossil state. Cuvier, the most celebrated of his age, has denied the existence of human fossil remains, and others pretend, that previous to the deluge the human race had no existence. The proprietors of this fossil being obliged to return to Paris, &c. &c. *Admission* £1 *each.*'

On the above bill I find the following in my father's MS.: 'I saw the above, with Mr. Pentland and Sir Francis Chantrey, 12th June, 1840. It is nothing but concretion of chert in the Brussels sand, something like the head and trunk of a child without legs.

'W. Buckland.'

But enough of human fossils.

Mr. Gibbons, a most intelligent and civil rat-catcher, residing in the Broadway, Westminster, informs me that the rat will breed every seven weeks, and that the female will begin to have young as early as fourteen weeks old. He has one now in his possession of this

age, who has eight young ones, and likely soon to have another family. The rat in question is a cross between the old British black rat and a white rat, which he turned out in a place where he knew the black rat still existed. In a few weeks he caught a young one, of a piebald colour—viz. a beautiful jet black and a pure white, plainly denoting its parentage. By cross-breeding with the offspring of this rat, he has obtained some remarkable and very curious piebald varieties, which are perfectly tame, and bear handling. One of them is now sitting on the writer's table washing and cleaning himself with his little white paws. Mr. Gibbons informs me, that in a litter of rats the boars predominate in number over the sows. In a litter of eight, there were only two females, in a litter of eleven only three. He supposes this very justly to be a provision of Nature to keep down the breed.

Mr. Shaw, of rat-catching notoriety, informs us, in a little book on the rat, that 'his little dog Tiny, under six pounds weight, has destroyed two thousand five hundred and twenty-five rats, which, had they been permitted to live, would, at the end of three years, have produced one thousand six hundred and thirty-three millions one hundred and ninety thousand two hundred living rats!'

During summer the rat resides chiefly in holes on the banks of rivers, ponds, and ditches; but on the approach of winter they visit the farm-houses, and enter the corn-ricks and barns, where they devour much of the corn, and damage more than they consume. They are very fond of pig-sties, running about among the pigs, picking up the leavings of the oatmeal out of the troughs, and even nestling down near to the warm body

of the fat unwieldy porkers, whose obese sides make not bad pillows for his impudence—the rat.

On one occasion, when a boy, I recollect secretly borrowing an old-fashioned flint gun from the bird-keeper of the farm to which I had been invited. I ensconced myself behind the door of the pig-sty, determined to make a victim of one of the many rats that were accustomed to disport themselves among the straw that formed the bed of the farmer's pet bacon-pigs. In a few minutes out came an old patriarchal-looking rat, who, having taken a careful survey, quietly began to feed. After a long aim, bang went the gun—I fell backwards, knocked down by the recoil of the rusty old piece of artillery. I did not remain prone long, for I was soon roused by the most unearthly squeaks, and a dreadful noise as of an infuriated animal madly rushing round and round the sty. Ye gods! what had I done? I had not surely, like the tailor in the old song of the 'Carrion Crow,'

> 'Shot and missed my mark,
> And shot the old sow right bang through the heart.'

But I had nearly performed a similar sportsman-like feat. There was poor piggy, the blood flowing in streamlets from several small punctures in that part of his body destined, at no very distant period, to become ham, in vain attempting, by dismal cries and by energetic waggings of his curly tail, to appease the pain of the charge of small shot which had so unceremoniously awaked him from his porcine dreams of oatmeal and boiled potatoes. But where was the rat? he had disappeared, unhurt; the buttocks of the unfortunate pig,

the rightful owner of the premises, had received the charge of shot intended to destroy the daring intruder.

To appease piggy's wrath, I gave him a bucket-full of food from the hog-tub: and, while he was thus consoling his inward self, wiped off the blood from the wounded parts, and said nothing about it to anybody: no doubt, before this time, some frugal housewife has been puzzled and astonished at the unwonted appearance of a charge of small shot in the centre of the breakfast ham, which she procured from Squire Morland, of Sheepstead, Berks.

The frequenters of the Zoological Gardens in Regent's Park, may, if the room be quite quiet, and the sun warm, observe numerous rats in the den of the rhinoceros. I have frequently watched them playing about, and running backwards and forwards over his thick armour-like hide, as he lies basking in the pleasant sunshine. He evidently thinks them quite beneath his notice, for he makes no efforts to drive them away, beyond occasionally flapping his great ear when they tickle him in any tender part. They come to the rhinoceros' house for the same purpose that they go to the pig-sty, viz., to get what they can from the leavings of their superiors. The keeper informs me that he not unfrequently finds dead rats crushed quite flat in the straw under the place where the rhinoceros has been sleeping. The poor rat has but a small chance of escape when the huge carcase of the great beast comes plump down upon him, and settles itself there for a good long sleep. Rats, too, are also found killed in the same manner in the straw bed of the elephant. These rats probably come out of the straw thatch which covers the building where the rhinoceros and elephant live;

they are common also in the deer-house, where they come for the oats, of which they are particularly fond. If any person wishes to keep rats alive a long time in a cage, let him give them plenty of oats and plenty of water, for the absence of water will kill them in a very few hours. A fine full-grown rat was brought to me; it appeared in perfect health and vigour, and when I went near it, it ran about the cage uttering its peculiar cry of alarm, and fixing itself in an attitude of defence up in one corner of the cage. I introduced a spoonful of water to it, and in a moment it seemed to forget its ferocity, for it came up hesitatingly at first, and tasted the water; gaining courage, it soon took hold of the spoon with its fore-paws to steady it, and greedily drank up all the water. I gave it two or three spoonfuls more, and then some wet bread; the next day it had again some wet bread, but not any water. On looking at it the next morning I found my poor rat in the agonies of death. I took it out of its cage and poured some brandy down its throat, at the same time putting its hind feet in hot water, but in vain, it died in my hand. I could find no internal cause for its death; but on consulting a rat-catcher he informed me that it died for want of water without a doubt. I must therefore confess that I unwittingly was the cause of its dying, and for the future I shall know better how to act towards captive rats. One great reason why they are so abundant at the Zoological Gardens is that they have free access to water from the banks of the Regent's canal, as well as plenty of food, which they purloin from the animals. In the deserts of Africa there are numerous colonies of rats and mice of different kinds; now how do these little beasts live during the droughts without water? The

all-wise and ever kind Creator has provided for their wants. An African traveller, Campbell, writes—'I was surprised how so many mice could have lived without water till I observed them rolling berries from succulent plants into their holes. On examining one of the largest of these berries I found it contained about three teaspoonsful of water. This is a provision God has made to supply the wants of these little animals.' Man, too (the poor Bushman), is supplied with water from a similar source, for he finds growing in arid and dry places natural water reservoirs in the shape of 'melons, which being roasted yield good water.'

As a curious instance of the way in which animals always find out the place best adapted for their habitation, I may adduce the fact that at the Zoological Gardens, although the rats swarm not ten yards away from the parrot-house, yet they never come *into* this building. Here mice take their place. How is this? The rats have probably found out that it is no use going there, they would get nothing for their trouble, for they could not get through the bars of the birds' cages to get at the seed; the little mice, on the contrary, who, as all well know, are great seed-eaters, with ease run in and out between the wide bars of the parrots' cages, and help themselves both to seed and water. They have found out that, although the great cockatoo has such an enormous and formidable-looking bill, it won't hurt them, and that Mr. Cockatoo is not a carnivorous bird. When, therefore, these gaudy denizens of the tropics have finished their day's screaming and 'pretty pollying,' out pop the little mice, taking tithe of all the seed-boxes they can get at. Having finished their meal they retire behind the hot water pipes which run round the room,

and with full stomachs lie lazily in their warm and comfortable quarters alongside the pipes till they are hungry again. No wonder, therefore, they obey the law 'increase and multiply.'

Rats, when hard pressed for food, are not particular as to what they eat. In extremities they will attack and devour human flesh. An instance, corroborating this fact, came to my personal knowledge and inspection about Christmas-time, 1851. The body of an unfortunate pauper, whose frame was emaciated to the last degree by famine and want, was brought to one of the theatres of anatomy in London for dissection. When the corpse was placed on the table, it was found that the whole of the lips and parts of the ears were wanting; in the place of the eyeballs were empty sockets; the parts also covering the palmar surface of the fingers were gone, only the bones and nails being left. Besides this, marks of teeth were visible on various other parts of the body. How came all this mutilation? What had caused this fearful disfigurement? Upon inquiry, it was ascertained that this poor victim of starvation had been taken in from the streets, friendless and unknown, into a workhouse—there he had died, and had been carried to the dead-house previous to removal to the dissecting-room. The rats (for, living in a workhouse, we may suppose that they, too, did not get too much to eat) had found out the corpse, and in the space of one night had committed all this havoc, devouring the most tender parts of the body; at least, I suppose they had found the parts that were missing were the most dainty morsels, for the marks of their sharp teeth showed that they had had a taste of nearly every other part of the body. After this event, means

were taken to prevent the ingress of the rats into the dead-house ; and a similar case has not since occurred.

A gentleman who has seen much of the world informs me that when coming from India he was very much annoyed by the cockroaches : they actually at night, when he was asleep, came and devoured the little rims of white skin at the roots of the finger-nails. I have also heard that they will eat the hair of the sleeper, which, I think, is very likely, particularly if there be any oil on the hair. Sailors are inclined to be merciful to the cockroaches, because they wage war with and devour the bugs. Bearing these facts in mind, when looking at the elephant in the Zoological Gardens, I observed that just at the roots of all his nails were white marks, as if the skin had been rasped away by a file : the elephant, we observed, perpetually picked at these places with the finger-like extremity of his trunk. It occurred to me that it was not at all unlikely that the rats had been gnawing at these parts when the monster was asleep; I am by no means certain of the fact, but think it not at all unlikely, knowing the habits of rats. That rats will gnaw the skin of dogs' feet is evident from the following extract from Dr. Kane's most interesting work.

Last week I sent down Rhina, the most intelligent dog of our whole pack, to bivouac in their citadel, forward. I thought she might at least be able to defend herself against them, for she had distinguished herself in the bear hunt. She slept very well for a couple of hours on a bed she had chosen for herself on the top of some iron spikes. But the rats could not or would not forego the horny skin about her paws ; and they gnawed her feet and nails so ferociously that we drew her up yelping and vanquished.'

A hungry rat will sometimes attack and kill an infant; a case occurred in 1853, at Bristol. 'The mother was woke by the cries of her child, and she found that the poor little thing had been bitten by a rat under the right eye, and it was bleeding profusely.' It ultimately died of hæmorrhage, the rat's sharp tooth having probably cut across an artery or a vein.

Rats will sometimes attack living men, though in this case fear, and not hunger, is their motive. Mr. Mayhew writes as follows:—'About that time a troop of rats flew at the feet of another of my informants (one of the men who work in the London sewers), and would have no doubt maimed him seriously, "but my boots," said he, "stopped the devils." "The sewers generally swarm with rats," said another man: "I runs away from 'em, I don't like 'em. They in general gets away from us; but in case we comes to a stunt end where there is a wall and no place for 'em to get away, and we goes to touch 'em, they fly at us. They're some of 'em as big as good-sized kittens. One of our men caught hold of one the other day by the tail, and he found it trying to release itself, and the tail slipping through his fingers; so he put up his left hand to stop it, and the rat caught hold of his finger, and the man's got an arm now as big as his thigh."'

Rats are very fond of warmth, and will remain coiled up for hours in any snug retreat where they can find this very necessary element of their existence. The following anecdote well illustrates this point:—My late father, when Fellow of Corpus College, Oxford, many years ago, on arriving at his rooms late one night, found that a rat was running about among the books and geological specimens, behind the sofa, under the

fender, and poking his nose into every hiding-place he could find. Being studiously inclined, and wishing to set to work at his books, he pursued him, armed with the poker in one hand, and a large dictionary, big enough to crush any rat, in the other, but in vain; Mr. Rat was not to be caught, particularly when such 'Arma Scholastica' were used.

No sooner had the studies recommenced, than the rat resumed his gambols, squeaking and rushing about the room like a mad creature. The battle was renewed and continued at intervals, to the destruction of all studies, till quite a late hour at night, when the pursuer, angry and wearied, retired to his adjoining bedroom: though he listened attentively, he heard no more of the enemy, and soon fell asleep. In the morning, he was astonished to find something warm lying on his chest; carefully lifting up the bed-clothes he discovered his tormentor of the preceding night quietly and snugly ensconced in a fold in the blanket, and taking advantage of the bodily warmth of his two-legged adversary. These two lay looking daggers at each other for some minutes, the one unwilling to leave his warm berth, the other afraid to put his hand out from under the protection of the coverlid, particularly as the stranger's aspect was anything but friendly, his little sharp teeth and fierce little black eyes seeming to say, 'Paws off from me, if you please!'

At length, remembering the maxim that 'discretion is the better part of valour'— the truth of which, I imagine, rats understand as well as most creatures—he made a sudden jump off the bed, scuttled away into the next room, and was never seen or heard of afterwards.

In my college rooms at Christchurch, a bachelor rat

had taken up his quarters, but where these quarters were I never could find; he used to appear on the floor when all was quiet and disappear again on the slightest noise. I never could catch him, but he was a terrible nuisance, for he made a great noise running about during the night. The scout used to put out the breakfast before the chapel hour, and when I returned I frequently found marks of the rat's paws and teeth on the butter-pat. What became of him in the long vacation I could not tell; on my return to the rooms he soon re-appeared. At last I found his retreat: it was under a heap of papers on a side table, and he had made his nest in an old college cap. He had lined it with pieces gnawed off the carpet, and had made a fine store of provisions in the shape of bits of bread, cake, cheese, and everything edible he could find about. The collection was so various that I made a catalogue at the time.

The love of warmth brings many rats out of the sewers to take their siestas in the large hair warehouses in Lambeth. They only come in the day, and decamp at night, probably in quest of food. They have made runs up on to the floors where the hair is placed to dry, and, finding a nice soft bit, roll themselves up quite into a ball; the outside of which is horse-hair, the nucleus a live rat. The boys connected with the establishment have found this out, and go feeling among the hair with their hands. The moment they come on a lump harder than the rest, they pounce upon it without fear, for the rat cannot bite through his thick self-made great-coat: they then rush off to a tub of water and shake poor Mr. Rat out of his hairy (not downy) bed into the merciless element, when he is soon drowned.

Let us here pause for a moment, and see whether,

with all his bad qualities, we cannot find some good trait joined, and something to admire in the construction of his body, as adapted to his very peculiar mode of life.

The rat is one of the most despised and tormented of created animals; he has many enemies and very few friends; wherever he appears his life is in danger from men, dogs, cats, owls, &c., who will have no mercy on him. These perpetual persecutions oblige him to be wary in his movements, and call for a large amount of cunning and sagacity on his part, which give his little sharp face a peculiarly knowing and wide-awake appearance, which the most superficial observer must have noticed. Though, poor creature, he is hated and killed by man, his sworn foe, yet he is to that same ungrateful race a most useful servant, in the humble capacity of scavenger; for wherever man settles his habitation, even in the most remote parts of the earth, there, as if by magic, appear our friends the rats. There were thousands of rats in the camp before Sevastopol; and a rat-hunt in the trenches was not an uncommon occurrence. Again, they swarm at the camp at Aldershot: the sentries see them at night going to the nearest water to drink. The rat quietly takes possession of the out-houses, drains, &c., and occupies himself by devouring the refuse and filth thrown away from the dwelling of his master (under whose floor, as well as roof, he lives). This refuse, if left to decay, would engender fever, malaria, and all kinds of horrors, to the destruction of the children of the family, were it not for the unremitting exertions of the rats to get rid of it, in a way no doubt agreeable to themselves, namely, by eating it. Let us take an example. The sewers adjoining a

connected series of slaughter-houses, as Newgate-market, Whitechapel, Clare-market, &c., are often nearly choked up with offal and the foul refuse of animal matter, swept into them by the careless butchers. It may be imagined what fearful maladies would arise from this putrid mass if it were allowed to stay there neglected. How is this evil result prevented? Why, by the poor, persecuted rats, who live there in swarms, and devour every morsel of concentrated cholera as it comes down to them, profiting, thereby, themselves and the inhabitants of the houses who reside above their haunts.

The late Professor Coleman remarked that a rat was the only animal who would thrive, and always have a clean coat, living, at the same time, in the most filthy and stinking places. And he was right; for a rat will live in air that would be fatal to any other animal. Hence, too, we see why the rat is always cleaning himself. Never does a rat finish a bit of food, or is touched by human hand, but that he cleans himself immediately afterwards.

Passing lately through Newgate-market, I inquired concerning the rats, and was told by several butchers that but few rats are now seen there. A war of extermination was waged against them not very long ago, and all were killed that could be killed. The holes were covered with iron, and the rats obliged to remain in their drains. Again, the rats are deprived of most of their perquisites, even when they do get out, by the officers of the Sanitary Commission, who take good care that the offal shall be removed very frequently. Talking to a man who kills horses in the neighbourhood of Regent's Park, I learnt that formerly they used to congregate in great numbers in the place where he used to stack the horses' bones; and that when the bones have

been removed, between eighteen and twenty dozen rats have been slain in a morning—this, after the bones had been allowed to remain many months undisturbed. Now, however, in these degenerate times, he is obliged by the Commissioners to remove the bones of every three horses; and a rat is but seldom seen. When in Paris, I paid a visit to the horse-slaughtering place at Montfaucon; there I saw from fifteen to twenty horses, tied up in a row, all to be killed that day. I was told that sometimes they slay double that number. The horse being killed, and the skin taken off, the carcass is cut up with hatchets, and thrown into a huge metal tub, big enough to contain the bodies of several horses; when it is full, the top is fixed on, and steam turned into it. After a time the lid is again taken off, and it is found that the steam has quite separated all the flesh from the bones, which are beautifully white. The bones, are then picked out, and placed in stacks; the flesh is thrown out by shovels, and spread out widely on floors, to which the air has free access. It soon becomes quite hard and dry, and is then sent off in sacks to the chemist, who, operating on it, soon converts it into Prussiate of Potash, and this, again, into Prussian blue. The bones are ground up in a mill for manure; so that, in a comparatively short space of time, the horse, having worn out his energies in the service of man, and being of no further use, is converted, one half into Prussian blue, the other into loaves of bread, through the medium of the wheat which absorbs his powdered skeleton. Thus the Frenchman practically carries out the threat of the ogre, who, when he smelt the Englishman, pronounced the following anathema against him—

'Fe fa fum;
I smell the blood of an Englishman;
Be he alive or be he dead,
I'll grind his bones to make my bread.'

In the place where these bones are stacked were plenty of rats. It is walled round; and in the inside of the wall are several holes left. When the bones are taken out, the rats, finding themselves becoming exposed, endeavour to conceal themselves in the holes. These holes are only just deep enough to contain half their bodies; and their tails are left exposed, capital handles for the men to catch them by. They are placed, when caught, in cages, and carried off. But what becomes of them? We have heard that their skins are used to make gloves. I have inquired in many glove-shops in London for gloves of this description; and friends in Paris have also made the same inquiries, but without success. Either they are not used for this purpose, or, what is more probable, the glove-dealers won't own to rat-skins in their gloves. By way of testing the fact, I have tanned several rat-skins; and the result of my experiment is that, in a prepared state, the skins are very thin and very fragile; still, however, they might be made into gloves of a very delicate description.

The thumbs of gloves are generally of a different kind of leather to that of the rest of the glove. Rat-skins would do well for the thumb part of the glove.

Small delicate hairs are often seen still adhering to gloves—I am keeping a sharp look-out for these, to examine them with a microscope. The structure of a rat's hair is very peculiar, and is unaltered by being immersed in tanning; so that, if I could find the hair of

a rat still remaining on the skin which forms the glove, I could verify the fact of rat-skins being used by the French furriers. Plate II. Fig. 2, gives the appearance of a rat's hair under the microscope.

Not very long ago, a portion of hard, dry skin was found underneath the bossed head of a huge iron nail, that was fixed into the door of the Chapter-house at Westminster. Upon this skin were found several hairs. Mr. Quekett, curator of the museum of the College of Surgeons, recognised this hair to be human, and asserted that it belonged to a fair-haired person. In former times, the Danes used to come up the mouths of the English rivers to pillage the churches. When they were caught, they were skinned, and their skins nailed to the door of the church they attacked. In the course of time, all the exposed portion would peel off; that covered by the nail would remain protected, and thus bear testimony to the cruelty of our ancestors.

In the College of Surgeons may be seen three specimens of human skin, presented by Mr. Albert Way, viz.—'Portion of human skin, said to be that of a Dane, from the door of a church at Hadstock, Essex;' a second specimen is from Copford, in Essex; and a third from 'The North door of Worcester Cathedral.'

Again: a murder was, by means of a few hairs brought home to a cruel woman, who had cut the throat of her little daughter. These hairs were found on the blade of a knife and sent to an eminent microscopist for examination. They came back labelled, 'Hairs of a squirrel.' Now, this fact convicted the woman, as it was the link wanting in the chain of evidence. The poor child, when murdered, had on a boa made of

squirrels' hair, and some of the hair had adhered to the knife when the murder was committed.

Should the idea of utilizing rat-skins come into operation, my friend Mr. Coulson suggests opening a trade with the Chinese for the skins of the rats which they eat. This would be a new feature in the fur trade. Even in England rats' skins have been sometimes used for the purpose of clothing; but this, as will appear from the following paragraph extracted from an old newspaper, was more for ornament than use:—

'An ingenious individual of Liskeard, Cornwall, has for some time past been exhibiting himself in a dress composed from top to toe of rat-skins, which he has been collecting for three years and a half. The dress was made entirely by himself: it consists of hat, neckerchief, coat, waistcoat, trousers, tippet, gaiters, and shoes. The number of rats required to complete the suit was 670; and the individual, when thus dressed, appears exactly like one of the Esquimaux described in the travels of Parry and Ross. The tippet, or boa, is composed of the pieces of skin immediately round the tails of the rats, and is a very curious part of the dress, containing about 600 tails—and those none of the shortest.'

Again: 'A lady in town (Glasgow) has just now a pair of shoes, of exquisite workmanship, the upper parts being made of the skins of rats. The leather is exceedingly smooth, and as soft as the finest kid, and appears stout and firm. It took six skins to make the pair of shoes, as the back of the skin is the only part stout enough for use.'

An eminent skin-merchant in the City informed me, that several years ago a batch of several thousand rat-

skins were imported from France, but they did not answer for manufacturing purposes, as they were too small, and too fine in texture. None are now imported that he knows of.

An old book on natural history thus describes the rat's personal appearance:—'The eyes are large and black; the tail is covered with minute scales, mixed with a few short hairs; and the general figure is disgusting.' Now this very tail, ugly as it may appear, is mentioned by the great Cuvier as one of the first things that struck his mind, as demonstrating the bounty of the Creator towards the humblest of his creatures, in adapting their bodily formation to the peculiar mode of life which He intended them to enjoy. We all admire the wonderful construction and admirable working together of the numerous muscles of the human hand and forearm, yet, says Cuvier, 'there are more muscles in a rat's tail than there are in that part of the human economy we admire so much, the hand.'

The tail is indeed a most useful appendage to the rat: it is composed of a chain of small bones, with a multitude of muscles above mentioned to move them. 'Many minute scales and short hairs cover it, and thus constructed it becomes prehensile, as the tails of many monkeys and lemurs; in fact, a sort of hand to the rat, by means of which he is enabled to crawl along the tops of railings, and along narrow ledges of walls, balancing himself by it, or entwining it round the projecting portions of the difficult passages along which his course lies. By means of it, too, he is enabled to spring up heights otherwise inaccessible, using it on these occasions (like the kangaroo), as a lever, or rather as a projectile spring. When, moreover, according to a

story, which requires confirmation, the delicious oil or sweet wine lies beneath his reach in the long-necked bottle, his ever-useful tail serves him in good turn; he dips it into the coveted fluid, and then enjoys the reward of his sagacity, and says to himself, as he licks it up, 'What's a rat without a tail?'

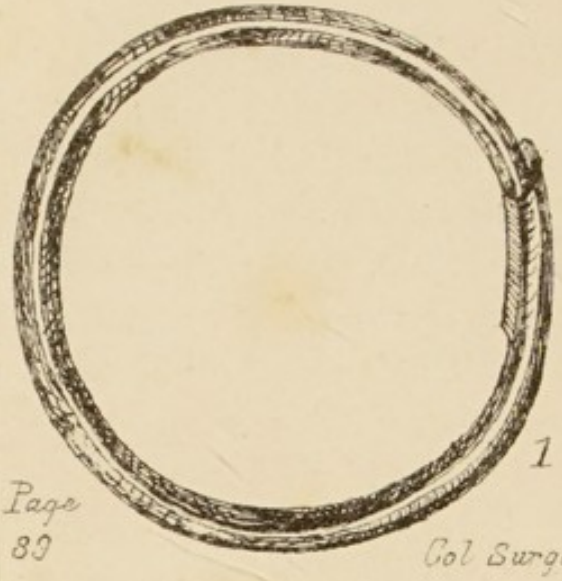
He can climb up trees also, for many years ago a gentleman who had rooms at Christ-church, Oxford, looking on to a garden belonging to Oriel College opposite, observed the rats climb up the currant-bushes and eat the fruit, while the boughs were bending, and almost breaking with their weight. The loss of the fruit was put down to biped thieves; nobody ever thought of the rats.

We all know that rats can burrow well. Mr. Bishop, the celebrated gun-maker of Bond-street, tells me that he recollects that at Ealing, near London, there were, once upon a time, some gooseberry-trees, planted in a row. These trees suddenly died, and they died in a regular order, one after the other. Nobody could tell the reason, till one day a tree was dug up, and its roots were found 'stript off as if with a scissors.' They found, also, a hole under the trees, and at the end of the hole an enormous rat. 'This rat,' says Bishop, 'had begun at the first tree, gone on to the second, and so on till it had eaten the roots of all the trees, and killed them.' I tell the tale as it was told to me.

The rat is admirably armed and equipped for the peculiar mode of life which he is ordained to lead. He has formidable weapons in the shape of four small, long, and very sharp teeth, two of which are fixed in the upper and two in the under jaw. These are formed in the shape of a wedge, and by the following wonderful

provision of Nature, have always a fine sharp cutting edge. On examining them carefully, we find that the inner part is of a soft, ivory-like composition, which may be easily worn away, whereas the outside is composed of a glass-like enamel, which is excessively hard. The next time the reader has a boiled rabbit for dinner, let him perform a simple experiment and convince himself of this peculiar structure common to the rat, rabbit, and, in fact, to all rodent animals. Let him extract from the rabbit's jaw one of the teeth, and with his penknife let him ascertain the comparative hardness of the two component parts of the tooth: he will find that he will be able easily to cut away the internal softer portion, but that the external hard, glass-like enamel of the tooth will be so hard that it will not only resist the knife, but will readily cut and scratch the human nail. He will also, if the rabbit be not boiled too much, observe that the lower end of the tooth is quite hollow and contains a jelly-like substance. This substance is the pulp of the tooth, which, by the addition of earthy matter, and gradually growing onwards, ultimately becomes hard, true tooth-material. On showing a rat's tooth, taken out of its socket, to a friend who has been through the worst part of the Crimean campaign, he looked at it attentively and said, 'Ah, if a Zouave had that he would soon fasten it on to a bit of stick, and turn it to some useful purpose.' The upper teeth work exactly into the under, so that the centres of the opposed teeth meet exactly in the act of gnawing; the soft part is thus being perpetually worn away, while the hard part keeps a sharp, chisel-like edge; at the same time the teeth grow up from the bottom, so that as they wear away a fresh supply is ready. The consequence

Plate, 2.



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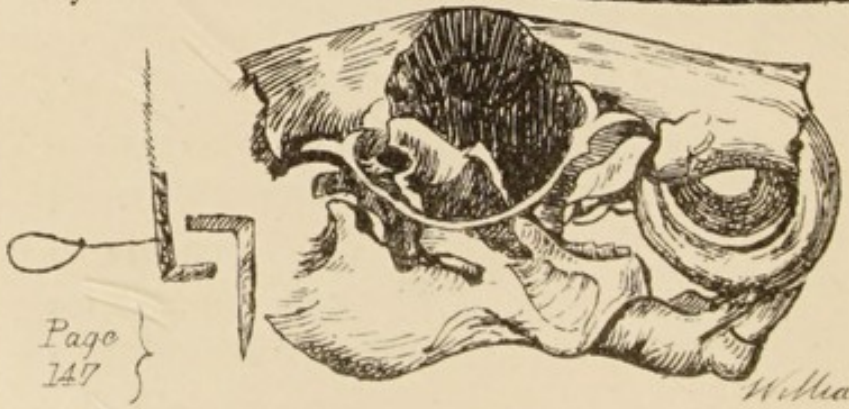

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of this arrangement is, that if one of the teeth be removed, either by accident or on purpose, the opposed tooth will continue to grow upwards; and as there is nothing to grind it away, will project from the mouth and be turned upon itself; or if it be an under tooth it will even run into the skull above. There is a preparation in the museum of the Royal College of Surgeons which well illustrates this fact. It is an incisor tooth of a rat, which, from the cause above mentioned, has increased its growth upwards to such a degree, that it has formed a complete circle and a segment of another. The diameter of it is about large enough to admit a good-sized thumb. It is accompanied by the following memorandum, addressed by a Spanish priest to Sir J. Banks, who presented it to the museum:—'I send you an extraordinary tooth of a rat. Believe me it was found in the Nazareth garden (to which order I belong). I was present when the animal was killed, and took the tooth. I know not its virtues, nor have the natives discovered them.'* See Plate II. Fig. 1.

In the same cabinet as the above specimens, there are others, illustrating the same point, both in rats and rabbits; as, for example, No. 2232, of which I give a drawing, Plate II. Fig. 5. In this case the under teeth are seen in their places, but shorter than they are naturally: probably the under teeth of this rat had been knocked off by an accident, and the upper teeth being unopposed, grew in the form of a ring, before the others had time to attain their natural size, and so keep the upper teeth in check by wearing them down. The beaver, too, being a rodent, or gnawing animal, is

* Quoted by the Quarterly Review.

subject to the same dental accident; and we find in No. 2203 a very remarkable case in point. Here the tooth in the right half of the lower jaw, from want of opposition to its corresponding tooth, has proceeded to grow until it has again penetrated the mouth, near the spot where it is joined to the upper jaw, thus completing a circle. It is not improbable that the right half of this poor beaver's jaw became dislocated from its socket by an accident some considerable time before its death; for otherwise there would not have been time for the tooth to have grown to such an extent: the beaver meanwhile continued able to eat with the left half of the lower jaw, which was not dislocated. The portion of the lower jaw which forms the actual joint confirms this supposition, for it is quite rough, and exhibits signs of inflammation having taken place; whereas it ought in a natural state to be of a glass-like smoothness. The molar teeth, too, in the dislocated side have grown beyond their usual size. These beaver's teeth are formidable weapons, and there is a bit of wood close by the last-mentioned specimen, beautifully grooved by their sharp cutting teeth.

Beavers have not long been extinct in England. I have a fine specimen of a beaver's jaw, not fossil, dug up in the fens of Lincolnshire, and I have heard on good authority that beavers were killed in Wales in the time of Oliver Cromwell. Still I imagine they were never very common, for I have never yet seen a beaver's bone or tooth among ancient British or Saxon remains. These former inhabitants of Great Britain used much bone in their household implements, and had beavers been common, we should probably find some bone or other converted to some useful domestic purpose.

There is a curious but little known fact, which well illustrates the ravages which the rats can inflict on a hard substance with their little sharp teeth. Many of the elephants' tusks imported into London for the use of the various workers in ivory are observed to have their surfaces grooved into small furrows of unequal depths, as though cut out by a very sharp-edged instru ment. Surely no man would have taken the trouble to do this, for what would be the profit of his labour? The rats, however, have found out there is something worth working for, or else, clever fellows, they would not have used their chisel-like teeth with such effect. They have discovered which tusks contain the most gelatine or animal glue—a sweet and delicious morsel for their dainty palates; and, having gnawed away as much as suited their purpose, have left the rest for the ivory-cutter; he, for his part, is neither unable nor unwilling to profit by the fact marked out by the rats' teeth; for ivory which contains gelatine is particularly valuable for many purposes.

Being anxious to get further evidence on this point, I called upon Mr. Robert Thomas Fauntleroy, of the great ivory firm in Tooley Street, near the London Bridge Station. He most politely and kindly took me into his warehouse, where, arranged on shelves, and placed on the floor, I saw more elephants' tusks than I ever saw together before in my life, representing altogether a vast amount of capital. In these rooms were tusks of elephants from all parts of the world where elephants exist—from India, Ceylon, North Africa, the Cape, Siam, &c.; each having their *peculiar characteristics*, which I cannot now go into, as this is not a special treatise on ivory. In the room devoted to the tusks

from India a delicious odour pervaded the whole place; this proceeded from the Indian spices and other foreign aromatic substances, which had been packed with the tusks. In the room set apart for African ivory, I scanned the rows of tusks, and to my delight found many —nay, very many—gnawed by rats; guessing roughly, about one tusk in twenty was rat-gnawed. Now from experience I can swear to the mark of a rat's tooth, whether the material gnawed be hard or soft, and if ever I saw the marks of rats' teeth, it was upon these tusks. The rats had touched only just the tip of the tooth, and in one instance they had gnawed the tip quite away, leaving a blunt stump; this must have been a particularly savoury tusk. In one tusk only could I find marks at the upper end, and these but very slight: the rat had been making an experiment to see whether it was good; he had found out that there was but little gelatine up there, and therefore had not prosecuted his researches. It is a curious fact, as narrated to me by Mr. Jaques, the ivory-turner of Hatton Garden, that the rats gnaw the African ivory, more especially that which is called green ivory, on account of its amber-tinted, transparent colour; Indian ivory they will not, and do not touch; there is not enough gelatine in it to make it worth their while to be at the trouble of gnawing. Even of the African ivory they touch only the tip and lower extremity, and why? because it is the purest, and densest, and softest part of the tusk.

When this article on rats first appeared in Bentley's Miscellany, I stated that the ivory-turner chooses the rat-gnawn ivory to make his billiard-balls; and this statement was copied by the Quarterly Review; but I have since ascertained that I was mistaken in the fact.

I consulted Mr. Jaques upon the subject, and he tells me that billiard-balls are made only of East Indian ivory, *that which the rats never touch*; and not of African ivory, which they always do touch. The African ivory contains more moisture and gelatine than the other kind; and this occasions the ivory to shrink in drying, and consequently the ball, when turned, to get out of the round; it is, however, very valuable to make other articles, *not* billiard-balls. Mr. Jaques tells me that the trade have always given the alligators the credit of gnawing the ivory; which is simply impossible, for when and where could they have the opportunity of getting at the tusks? And even if they had been gnawing—or rather champing at it, for an alligator is not a rodent, or gnawing animal—the marks on the ivory would have been very different to those made by the rats. Mr. Jaques confirms the fact, that where the gnawing has taken place, the ivory has been 'very transparent, and of the finest quality.'

In my father's museum at Oxford is a specimen of a rat-gnawn tusk, of which a drawing is given (Plate II. Fig 4.). From the shape, it will be readily seen that it is the lower end of the tusk; the grooves in it are very deep, and very well marked. I find that, with a tooth taken from the skull of a rat, I can easily make grooves in this bit of ivory similar to those made by the rats when alive—only, of course, my grooves are not so clean cut as those made by the live rats.

The ivory-turner values his 'tips' or 'points' more than any part of the tusk. The 'hollow' part of the tusk is cut either into sections to make napkin rings, or into strips to make paper cutters. The tip is used for the more delicate turnings, and particularly for fine carvings, as brooches, umbrella and parasol handles, and

ivory chessmen. It is, it appears, very difficult indeed to turn a billiard-ball perfectly true. It may be as true a circle as the lathe can make it, and yet not be a good ball when put to the test. The test is this: the ball is rolled gently along a billiard-table, till it stops of its own accord. If at that moment it falls either to one side or the other, it is useless to the player; if, on the contrary, it remains motionless on the same line on which it was originally projected, it is allowed to pass muster. The density of the ivory in different parts of the tusk occasions this difference to the ball, and often gives great annoyance to the ivory-turner, who, after all his trouble in turning, finds his ball untrue from causes beyond his reach. One would have thought that a billiard-ball would have lasted for ever, but it appears they very soon wear out; many thousands are exported to Paris and the large continental cities, and also to New York, in which places the billiard-tables are going day and night: the consumption of billiard-balls from this cause is astonishing.

The rats are useful in an indirect way to the purchaser of ivory from another cause. Not only is the fact of the rat's judgment in choosing good ivory, by making a meal of it, acknowledged and acted upon by the turner who wishes to get a good bit of ivory; but the mark of his teeth will show to the eye what the substance of the ivory, otherwise concealed under the external crust of the tusk, is like—whether good, bad, or indifferent. Many a turner will give the merchant a higher sum for a tusk, if previous to the bargain he will saw off the tip, that he may see more of the quality of the ivory, whether the tusk is sound throughout. Now if the rat has been gnawing, the turner does not make this request, because in the grooves eaten by the

rat, he can see plainly what the substance under the external coat is. Inside the elephant's tusks very frequently bullets, both of lead and iron, are found: those who wish to know how they got there, will find all they want in the Proceedings of the Society of Arts, for December 17, 1856, in a paper read by Professor Owen, F.R.S., in which he most clearly describes the growth of the elephant's tusks, and the result of the introduction of a foreign body into that tusk. I have seen two or three good specimens of bullets in solid ivory, in a shop window in St. Paul's Churchyard: these balls are of lead or iron, and I understand that in this shop a tusk was once cut which contained a bullet of gold. In Mr. Fauntleroy's warehouse I saw an entire skull of an elephant, which was exhibited in the Exhibition of 1851.* A special order was sent to the West Coast of Africa for this skull, African skulls being rare in Europe. This poor brute had been in the wars, for I detected a lead ball flattened and sticking into the bone just above the eye. Upon examining the head more minutely, I found at the top of the skull a hole large enough to admit a finger: it was a shot hole, for the edges of the bone round were pressed inwards, and there were marks round it where the periosteum of the bone had been inflamed. The fracture had, however, partially healed up. In my opinion the bullet found had entered the head by this hole, and traversed the cellular substance of the skull till it had been arrested on the opposite side by the great masticatory muscle; and having there spent its force,

* Since sent by Mr. Fauntleroy to the South Kensington Museum, where it can be seen forming the nucleus of a fine collection of ivory, both manufactured and in the natural state.

it remained, and remains to this day firmly fixed in the wall of the skull. I also observed a great quantity of the teeth of the sea-cow, or walrus. Each tooth has a hole bored in it by the Esquimaux, who having passed a bit of seal-skin, or gut, through it, transport it from place to place. In one instance the tooth has split under the operation, showing the structure beautifully. The Hippopotamus is commercially called sea-horse, while the walrus is called sea-cow: these two varieties of ivory are much used in the manufacture of artificial human teeth. Some of the elephants' tusks also were bored, but for a different purpose. On account of their weight they are difficult to get off to the ships: they are therefore often bored in the hollow part, and slung on to empty casks, and thus conveyed safely to the ship in the offing, through the surf, which dashes on the shore. Many of the tusks are covered with minute cracks, and Mr. Fauntleroy informed me that these cracks were generally found in North African ivory. This ivory is conveyed on the backs of camels over the desert; the camels are unladen every night, and the tusks are placed on the ground: the dew moistens them, and the next morning they are placed, without being wiped, on the camel's back again. The burning sun of the desert falls full upon them all the next day's march, and this alternation of heat and moisture causes the tusks to crack: good specimens of this cracked ivory can be seen fastened to the wall outside Mr. Holtzapfell's shop at Charing Cross. Strange to say, these tusks have more cracks inside than appear externally, evidencing the superior hardness of the 'bark,' as the outer coat of the tusk is called.

Apropos to elephants, my friend Mr. Neil, the engineer, told me a capital story of one. A menagerie came once

upon a time to Lavington, near Devizes, and at nightfall they turned the elephant out into a grass field to eat his fill. The beast found out that there were turnips not far off, so he got through the fence and made terrible havoc among them. In the early morning, a labourer comes, and finds the elephant pulling up the turnips with his trunk, and devouring them. He rushes off to his master, and says, 'Master, master, do come, there is an awful beast in the turnip-field, a walking backwards and a picking up turnips with his curly tail!' The man had never seen an elephant before, and mistook his trunk for his tail.

Mr. Fauntleroy tells me that even in his warehouse, the rats will find out and gnaw the so-called ivory-nut, or vegetable ivory, sometimes nearly consuming the entire nut. Now this fact of rats gnawing ivory is not only an important diagnostic mark in the choosing of a tusk, but we ourselves follow the rats' example, and for the same reason. In the manufacturing districts many *tons* of ivory are sawn up to make handles of knives and forks.* From this operation a great quantity of dust of ivory is the consequence. This dust is sold at the rate of sixpence a pound, and when properly boiled, and otherwise treated, makes the finest, purest, and most nutritious animal jelly that we know of. I lately

* According to Mr. P. L. Simmonds, the total imports of ivory in the past three years have shown a gradual decline: the imports from India and the East, according to a parliamentary paper, averaged, the last seven years, about 3341 cwt., estimated, in 1855, at 68,874*l*. When we come to consider that each elephant has but two tusks, and how many must be killed to make up the above weight, it will be easily seen how it is that elephants are gradually getting rare, and the hunters obliged to go further inland for them.

recommended this ivory jelly to a patient, who required some form of food highly nutritious, but yet not bulky, and my prescription answered admirably. The ivory-dust can be procured at most of the large ivory-turners in London. Years ago ivory jelly used to be a fashionable remedy, and much sought after, and it only now requires to be known to be appreciated.*

Rats have a remarkable instinct for finding out where there is anything good for food; and it has been often a subject of wonder how they manage to get on board ships laden with sugar and other attractive cargoes. This mystery has, however, been cleared up, for they have been seen to come off shore to the ship by means of the rope by which she is moored to the quay, although at some distance from the shore. By the same means they will leave the ship when she comes into port, if they find their quarters filling or filled with water; hence the saying, that 'rats always leave a sinking ship,' is perfectly true. If, however, the ship be water-tight, they will continue breeding to an enormous extent. M. de St Pierre informs us, that on the return of the 'Valiant' man-of-war from the Havannah, in the year 1766, its rats had increased to such a degree that they destroyed a hundred weight of biscuit daily. The ship was at length smoked between decks, in order to suffocate them; and six hampers were for some time filled every day with the rats that had thus been killed.

Rats are not selfish animals: having found out

* *Receipt to make Ivory-dust jelly.*—In a brown stewing-pan with a cover, put 1lb. of ivory-dust, and three quarts of water; let it gently simmer for twelve hours, or until it is reduced to one quart; then put it away to cool, and take the clear jelly off. Add wine and sugar *ad libitum*.

where the feast is stored, they will kindly communicate the intelligence to their friends and neighbours. The following anecdote will confirm this fact. A certain worthy old lady, named Mrs. Oke, who resided at Axminster several years ago, made a cask of sweet wine, for which she was celebrated, and carefully placed it on a shelf in the cellar. The second night after this event she was frightened almost to death by a strange unaccountable noise in the said cellar. The household was called up, and a search made, but nothing was found to clear up the mystery. The next night, as soon as the lights were extinguished and the house quiet, this dreadful noise was heard again. This time it was most alarming; a sound of squeaking, crying, knocking, pattering feet; then a dull scratching sound, with many other such ghostly noises, which continued throughout the live-long night. The old lady lay in bed with the candle alight, pale and sleepless with fright, anon muttering her prayers, anon determined to fire off the rusty old blunderbuss that hung over the chimney-piece. At last the morning broke, and the cock began to crow. 'Now,' thought she, 'the ghosts must disappear.' To her infinite relief the noise really did cease, and the poor frightened dame adjusted her nightcap and fell asleep. Great preparations had she made for the next night; farm servants armed with pitchforks slept in the house; the maids took the family dinner-bell and the tinder-box into their room; the big dog was tied to the hall-table. Then the dame retired to her room, not to sleep, but to sit up in the arm-chair by the fire, keeping a drowsy guard over the neighbour's loaded horse-pistols, of which she was almost as much afraid as she was of the ghost in the cellar.

Sure enough her warlike preparations had succeeded; the ghost was certainly frightened; not a noise, not a sound, except the heavy snoring of the bumpkins, and the rattling of the dog's chain in the hall could be heard. She had gained a complete victory; the ghost was never heard again on the premises; and the whole affair was soon forgotten. Some weeks afterwards some friends dropped in to take a cup of tea, and talk over the last piece of gossip. Among other things the wine was mentioned, and the maid sent to get some from the cellar. She soon returned, and gasping for breath, rushed into the room exclaiming,—'*'Tis* all gone, ma'am;' and sure enough it was all gone. 'The ghost has taken it,'—not a drop was left, only the empty cask remained, the side was half eaten away, and marks of sharp teeth were visible round the rugged margins of the newly-made bung-hole.

This discovery fully accounted for the noise the ghost had made, which caused so much alarm. The aboriginal rats in the dame's cellar had found out the wine, and communicated the joyful news to all the other rats in the parish; they had assembled there to enjoy the fun, and get very tipsy (which, judging from the noise they made, they certainly did) on this treasured cask of wine. Being quite a family party they had finished it in two nights, and having got all they could, like wise rats, they returned to their respective homes, perfectly unconscious that their merry-making had nearly been the death of the rightful owner and 'founder of the feast.' They had first gnawed out the cork, and got as much out as they could: they soon found that the more they drank the lower the wine became. Perseverance is the motto of the rat, so they set to work and ate away the

wood to the level of the wine again. This they continued till they had emptied the cask: they must then have got into it and licked up the last drains, for another and less agreeable smell was substituted for that of wine. I may add, that this cask, with the side gone and the marks of the rats' teeth, is still in my possession.

Rats, like men, being kindly disposed, often give information of good things to others, which, alas! may prove in the end to be the destruction both of the informers and the informed. I give a case in point.

A country gentleman was much annoyed by a colony of rats which had settled in his cellars, and, though he caught several of them in traps, yet he never could succeed in getting rid of them entirely. At last, knowing well the habits of the animal, he determined on destroying the whole colony at one grand *coup*. He therefore procured a large box, and, having half filled it with meal, sat himself down in the cellar by the side of it, concealing his person under some sacks, and leaving only a spy-hole for his eyes. The rats soon poked their noses out to reconnoitre, timidly at first, but soon they came out and began to eat the meal sprinkled about, cautiously, however, keeping one eye upon the mysterious bundle in the corner.

The next night he repeated the same plan of action. The rats this time were bold enough to get into the box by means of little ladders placed for them. The first, of them was rewarded by a plentiful feast of meal, and was soon joined by many hungry companions.

On the fourth night, however, it was determined to put an end to their proceedings. By this time the rats had lost all fear, and had spread the news far and wide of their good fortune, so that there was a large

assembly of them in the box, greedily devouring the remains of the meal, unsuspicious of the fate that awaited them at the hands of the apparently innocent bundle, of which they had now no dread.

Mistaken creatures! up rose the executioner, and down went the lid. The rats became prisoners under a padlock, with strong oak boards between them and liberty. The next morning the box and its living contents were lifted into the yard, and, at a signal, launched into a horsepond. It swayed to and fro, and while kept under water with poles by two men, the numerous bubbles of air escaping from the chinks of the box told plainly of the death-struggles of the little quadrupeds within.

At length all was quiet. The colony of rats, which had possessed the cellar for so many generations, was no more. Their holes were filled up with mortar mixed with glass, until a new generation should arise to meet the same fate in some future meal-box.

There is another curious instance of rats losing their lives in quest of food, which has been kindly communicated to me by a friend. When the atmospheric pump was in use at the terminus of the Croydon Railway, hundreds of rats lost their lives daily. The unscientific creatures used in the night to get into the large iron tube, by exhausting the air from which the railway carriages were put in motion, their object being to lick off the grease from the leather valve, which the engineers of the line were so anxious to keep air-tight. As soon as the air-pump was put to work for the first morning train, there was no resisting, and out they were sucked dead corpses!*

* Quoted by the Quarterly Review.

This atmospheric railway on one occasion certainly committed a theft. As a train was passing a railway station a lady happened to have a white pocket handkerchief in her hand: the draught of the train snatched it away, and it fell under the passing carriages; in an instant it was sucked up and drawn into the pipe, the train passed on, and the handkerchief was never seen again.

The rat, though naturally a savage creature, is, by dint of kindness, capable of being tamed and made obedient to the will of man. Some of the Japanese tame rats and teach them to perform many entertaining tricks; and thus instructed exhibit them as a show for the diversion of the populace.

We read in the Naturalists' Cabinet, 1806, that 'a gentleman travelling through Mecklenburg about forty years ago, was witness to a very singular circumstance in the post-house at New Hargard. After dinner, the landlord placed on the floor a large dish of soup, and gave a loud whistle. Immediately there came into the room a mastiff, a fine Angora cat, an old raven, and a remarkably large rat, with a bell about its neck. They all four went to the dish, and without disturbing each other, fed together, after which the dog, cat, and rat lay before the fire, while the raven hopped about the room. The landlord, after accounting for the familiarity which existed among these animals, informed his guest that the rat was the most useful of the four, for the noise he made had completely freed the house from the other rats and mice with which it had previously been infested.

But capacity for becoming tame and accustomed to the presence of man, is not confined to the 'foreigneer' rats; I myself have had many tame ones.

When carrying on my observations on rats, I bought a pair of piebalds, and put them in a Ward's case, which formed a capital cage for them. In the course of a few weeks my colony increased to an enormous extent: I had specimens of almost every kind of rat—the pure white albino rat with pink eyes, the common brown rat, the true black rat, and the snake or ship-rat. I had to pay several shillings for my black rat, but he was a fine beast. By taking trouble I obtained some very remarkable crosses; I had one litter half albino half black—the white the colour of snow, the black the colour of coal. Their physiognomy, too, was very peculiar, and a rat from this lot might readily have been taken for a new species: they were really very pretty creatures. I could never obtain a cross between a black and a brown rat, except through the medium of a hybrid in whom the blood of the black breed existed. Of the cross between the brown and white rat I had many live specimens, so many, indeed, that periodically I took a bag full to the Zoological Gardens, for the benefit of the snakes. All my rats knew me well. The moment I came to the room they swarmed round the door of the cage, and I was obliged to keep them back while I put in their food, as a huntsman does to his hounds. At feeding-time there was not a single rat in the cage that I could not take up and handle with impunity; they never offered to bite me. If, however, a stranger tried to touch them, they were all up on their hind legs in a fighting attitude in a moment. The snake or ship-rats, however, I acknowledge beat me. I got two from the docks, and unwisely turned them in with the others. In a few moments a most tremendous fight began—snake-rats *versus* the company. I put them into another cage by themselves, after having

had the greatest difficulty in catching them; and this, first, because the moment I got hold of their tails the skin came off in my hand, and, secondly, they were so tremendously active that having caught them I could hardly hold them. When you wish to catch an ordinary rat, seize his tail, and lift him from the ground: at this instant he will try to turn up and bite, and a most severe bite he will give if you don't keep perpetually twisting him round and round—he then can't turn upwards; then having caught him in the right hand by the tail, swing him under the left arm. The rat will immediately endeavour to get away, and so doing fix himself on your waistcoat; bring your arm to your side, and you have him a prisoner: then if you wish further to examine him put the fore-finger of the right hand behind his right shoulder and the thumb in front of the left, he is secure and can't possibly bite; don't squeeze too much or he will die, for a rat is a tender beast, and does not require much killing. The snake-rats, however, managed to twist round; one made his teeth meet in my hand, so I let him go. A day or two afterwards I found the remains of his body eaten by the common, or, as I then called them, the wild rats, who used to come nightly to the tame rats' cage to see what they could pick up. This, I think, was the only time I was ever bitten by a rat, but I should nevertheless advise a novice to be careful what he is about in his first attempts.

Rat-catchers will frequently tell you that, to prevent the rats biting them, they put some preparation disagreeable to the rats upon their hands; but this is not the truth. It is done by knowing the habits of the animal. I subjoin the experience of an old rat-catcher on this subject:—

'Rats may be taken out of the cage very easily; for, if you don't hurt them, they will not bite you; for, by standing together in the trap, they are cowed, and have not the least notion of biting, unless you should happen to squeeze them too hard as you catch them one by one with your hand. There is a wide difference in the temper and disposition of these animals; for some are so savage and untamed, that they will set up their backs, looking very fiercely, and crying out if you do but look at them: but when you meet with one of this kind, shake him well in the cage, together with the rest, and observe when he has put his head among the others, and take him out by his tail, and he will not bite you; but observe, when you have first catched them, do not go to handle them directly, for then they are so mad and furious that they will bite anything.'

I have frequently had rats brought to me in iron cages. On arrival they have shown themselves exceedingly fierce, biting at everything and uttering their peculiar cry of alarm when I went near them. In the course of a few hours they become pretty tame, even eating bread and milk out of a spoon introduced between the bars. In a day or two they take no notice of me whatever, except to beg for food with their noses through the bars when I go near; and here, be it observed, a rat invariably washes himself all over after eating, no matter what. The operation is performed just as a cat does it, viz., by licking the paws. They are naturally exceedingly clean animals: I never yet saw a parasite of any kind on one. When a rat eats, he, by means of his sharp front teeth, gnaws away a mouthful, which he deposits in a sort of pouch formed between his grinding teeth and his cheeks; then he ceases gnawing and masticates his food, by

moving his jaws incessantly and without pausing. They move ten times faster than the jaws of a rabbit. When a rat drinks, he laps up the fluid like a dog, and does not suck it up like sheep. A rat generally tastes his food with his tongue previous to eating it. It is curious to see a rat asleep. I never saw it but once, and that in a case where the animal was ill. It is as difficult to catch a rat asleep as it is a weasel. The rat coils himself into a ball, and places his nose down between his hind legs: his tail is curled up round the outside of his body: he then looks like a mass of hair. No part of his body projects but his two delicate ears, which are beautifully adapted for catching the least sound, and which seem to be placed there as sentries; and pretty sharp sentries they are. It is certainly not the case, as has been stated elsewhere, 'that the garbage on which rats live poisons their teeth and renders the wounds they make deadly.' A rat, though living in and among garbage, is always clean in its person, and his teeth are always beautifully clean; the yellow-looking substance on the front part of the tooth is its natural colour, and not the result of the accumulation of tartar.

When house-surgeon at St. George's Hospital I had to attend several cases of rat-bites. The result of my experience is that a person with a good constitution will easily recover without any severe symptoms from the bite, which is a pure, punctured, clean-cut wound; but a person who has not healing power in him *might* suffer severely. If a drayman who is full of beer, or a highly fed and pampered gentleman's servant—representatives of the two most 'unhealing' classes I know—were bitten by a rat it would go hard with them, and they might lose their lives. I would, myself, much rather be bitten ten

times by a rat than once by a man or a horse. I have seen severe consequences from the former accident; and, but lately, a slave-owner in America hit his slave in the mouth, and the teeth made a severe wound, which ultimately proved fatal. A horse's bite is a terrible thing: a poor little 'tiger' groom was brought to the hospital; the great cab horse, of which he had charge, pushed him down, and then took him up between his teeth and shook him as a cat does a mouse. The poor boy had two great black marks on his back where the horse's teeth had been, just as though he had been pinched in a door. A friend of mine, who has charge of a regiment in India, writes to me that he has to attend to very many severe wounds caused by the bites of camels, who not only have front teeth like a horse, but also enormous tusks in the upper jaw, sharp and pointed like a dog's. I have also been called upon to treat two or three horse-bites which occurred in the regiment to which I belong.

Although my rats were very prolific, not above one litter in three ever grew to be decent-sized animals. If the mother was disturbed in any way, even by moving her cage, she would set to work and kill and eat every one of them. I have also seen the mother move her little hairless and blind young from one corner of the cage to another in her teeth. How she manages not to hurt them with her sharp teeth I know not; she carries them with the greatest care and delicacy. One day a poor mother had moved her young about into several parts of the cage, but could not fix on one point. I saw what was wanting, she could not obtain cover for them. I put my hand into the cage full of tow and cotton wool; she came instantly and took it out of my hand and covered up her young. But, notwithstanding all

this care, and although evidently most anxious for their welfare, this kind mother, obeying, I suppose, some wise law of nature, devoured during the following night every one of the little ones of which she had been so careful the preceding day.

Talking of tame rats, I knew a worthy whipmaker who worked hard at his trade to support a large family. He had prepared a number of strips of leather, by well oiling and greasing them. He carefully laid them by in a box, but, strange to say, they disappeared one by one; nobody knew anything about them, nobody had touched them.

However, one day, as he was sitting at work in his shop, a large black rat, of the original British species, slyly poked his head up out of a hole in the corner of the room, and deliberately took a survey of the whole place. Seeing all quiet, out he came, and ran straight to the box wherein were kept the favourite leather strips. In he dived, and quickly reappeared, carrying in his mouth the most dainty morsel he could find. Off he ran to his hole, and quickly vanished. Having thus found out the thief, the saddler determined to catch him. He accordingly propped up a sieve with a stick, and put a bait underneath; in a few minutes out came the rat again, smelling the inviting toasted cheese, and forthwith attacked it. The moment he began nibbling at the bait, down came the sieve, and he became a prisoner. 'Now,' thought he, 'my life depends upon my behaviour when this horrid sieve is lifted up by that two-legged wretch with the apron on, who so kindly cuts the greasy thongs for me every day: he has a good-natured looking face, and I don't think he wants to kill me. I know what I will do.'

The whipmaker at length lifted up the sieve, being armed with a stick ready to kill Mr. Rat when he rushed out. What was his astonishment to see that the rat remained perfectly quiet, and, after a few moments, walk quietly up on his arm, and look up in his face, as much as to say, 'I am a poor innocent rat, and if your wife *will* lock up all the good things in the cupboard, why I must eat your nicely-prepared thongs; rats must live as well as whipmakers.' The man then said, 'Tom, I was going to kill you, but now I won't; let us be friends. I'll put you some bread and butter every day if you will not take my thongs and wax, and leave the shopman's breakfast alone; and—but I am afraid you will come out once too often; there are lots of dogs and cats about who won't be so kind to you as I am; you may go now.'

He then put him down, and Mr. Rat leisurely retreated to his hole. For a long time afterwards he found his breakfast regularly placed for him at the mouth of his hole, in return for which he, as in duty bound, became quite tame, running about the shop, and inquisitively turning over everything on the bench at which his protector was at work. He would even accompany him into the stables when he went to feed the pony, and pick up the corn as it fell from the manger, keeping, however, a respectable distance from the pony's legs. His chief delight was to bask in the warm window sill, stretching his full length to the mid-day sun. This unfortunate though luxurious habit proved his destruction, for one very hot day, as he lay at his ease taking his siesta, the dog belonging to the bird-shop opposite espied him afar off, and instantly dashed at him through the window. The poor rat, who was asleep at the time, awoke, alas! too late to save his

life. The cruel dog caught him, and took him into the road, where a few sharp squeezes and shakings soon finished him. The fatal deed being done, the murderous dog left his bleeding victim in the dusty road, and, with ears and tail erect, walked away as though proud of his performance. The dog's master, knowing the history of the rat, had him stuffed, and his impaled skin, with a silver chain round the neck, forms to this day a handsome addition to the shop-front of the bird-shop in Brompton.

Another still more remarkable instance of a tame rat has come to my knowledge.

Some time ago the driver of a Bow and Stratford omnibus was moving some trusses of hay in his hay-loft, when, snugly coiled up in a corner, he found a little miserable-looking rat, whose mamma, having carefully tucked him up in bed, had gone out on a foraging expedition to find something for her darling's supper. The little fellow being of a remarkably piebald colour, excited the pity of the omnibus man, who took him up, and brought him home to his family. The little children soon took to their new pet, and named him Ikey, after their eldest brother, whose name was Isaac. The little creature soon grew up, and reciprocated the kindness he had received, by excessive tameness towards every member of the family. He was therefore allowed to roam about the house at perfect liberty. His favourite seat was inside the fender, or on the clean white hearth, but, strange to say, he would never get on it unless it was perfectly clean. On one occasion, when the goodwife was cleaning the hearth, she gave Master Rat a push; up he jumped on the hob, and finding it an agreeable resting-place, there he stayed. As the fire grew

brighter and brighter, so the hob became warmer and warmer, till at last it became unpleasantly hot; but he would not move from his perch till the hair on his legs and body became quite singed with the heat.

His master had perfect control over him, and made, for his special benefit, a little whip, with which he taught him to sit upon his hind legs in a begging posture, jump through a whalebone hoop, drag a small cart to which he was harnessed, carry sticks, money, &c. in his mouth, and perform many other amusing tricks.

The rat perfectly understood the meaning of the whip, for whenever it was produced, and his master's countenance betrayed coming wrath, in fear and trembling he would scamper up the sides of the room or up the curtains, and perch himself on the cornice; waiting there, till a kind word from his master brought him down again, hopping about, and squeaking with delight. In these gambols of mirth he would run so fast round after his tail, that it was almost impossible to distinguish what the whirling object was. At night he would exhibit another cat-like habit, for he would stretch himself out at full length before the fire on the rug, seeming to enjoy this luxurious way of warming himself. This love of warmth made him sometimes a troublesome creature, for when he found the fire going out and the room becoming cold, he would creep up into his master's bed, and try to insert his little body under the clothes. He was never allowed to remain here long, but was made to decamp as soon as his presence was discovered. He then took up his refuge in the folds of his master's clothes which were placed on a chair, and of these he was allowed to retain quiet possession till the morning. The master became so fond of his rat that he taught

him at the word of command, 'Come along, Ikey,' to jump into his greatcoat pocket in the morning, when he went out to his daily occupation of driving the 'bus.

He did not, however, carry him all day in his pocket, but put him in the boot of his 'bus to act as guard to his dinner. But why did not the rat eat up his master's dinner? because, as said the man, 'I always gives him his bellyful when I has my own breakfast before starting.' The dinner was never touched, except when it happened to consist of plum-pudding. This Ikey could not resist; his greediness overcame his sense of right, and he invariably devoured the plums, leaving the less dainty parts of the repast for his master. The rat acted as a famous guard to the provisions, for whenever any of the idle fellows who are always seen lounging about the public-houses where the omnibuses bait, attempted to commit a theft, and run off with the bundle out of the boot, Ikey would fly out at them from under the straw, and effectually put to flight the robbers.

At night he was taken home in his master's pocket, and partook of the family supper; but if any strangers happened to be present, he was taken with a shy fit, and, in spite of his hunger, secreted himself till they had gone.

His teeth, after a time, became bad and worn out, and the children finding this out, delighted to give him a sort of hard cake made of treacle, called, in infant parlance, jumbles, or brandy-snacks. Of these Ikey, in his younger days, was very fond; but now, on the contrary, they gave him much trouble to masticate, and his perseverance and rage when attacking the said brandy-snacks caused the young folks many a hearty laugh.

This rat is, I believe, still alive and enjoys good health, though, the weight of age pressing on his hoary head, he requires many little attentions from his kind and tender-hearted protectors.*

An amusing incident took place not long ago in the Vauxhall Bridge Road, which a bystander afterwards described to me. A rat-catcher, carrying a cage with six rats in it, entered a public house: he unwisely left his cage on the form outside. The folding-doors of the tavern had no sooner closed, than a band of young urchins who had been following at a respectful distance came up and espied the cage, and the rats within. 'Let's have a lark,' says the greatest rogue of the party. 'Look here, here are some rats in a cage, where is the man what belongs to the rats?' 'He is in the public-house,' exclaimed his comrades, 'I seed him go in.' 'Let's let 'em out, and see if they will run,' continued the first speaker. 'I'll tell the man, I'll tell your mother if you do,' exclaimed a timid, white-haired lad. 'I will though,' said the other, 'here goes.' He accordingly opened the door of the cage, and out they all bolted in an instant. 'Master, master, your rats are gone!' exclaimed the whole party assembled. Out came the old rat-catcher with the half-emptied porter pot in his hand, exclaiming, 'Where, where?' 'There, there, up the street, master, run.' The old man dashed down the pot, and away he went up the road as hard as he could go. The rats in the mean time made best use of their liberty, and were scampering up the middle of the dusty road, jumping and squeaking, with their long tails well stretched out behind them, running in a

* Quoted by the Quarterly Review.

straight line, one behind the other like horses in a well-contested race. They did not seem inclined to listen to the oaths and injunctions of the old man in pursuit, but continued their course direct to a heap of bricks and rubbish close by. Here the old man pulled up, arriving some minutes after the rats, and then, dashing down his cap, exclaimed, 'It's no use running after 'em : if they go at that rate they will get home before me ; however, I dare say I shall meet with my frends another day, let 'em go and enjoy themselves while they can!' With these words he ran back again in pursuit of the young miscreants, the cause of all his misfortune ; they too, like the rats, had quicker legs than the old man, and again he was unsuccessful in his pursuit. Like a wise man, therefore, he picked up his empty cage and retired again to the tap-room, to console himself for the loss of his rats, to abuse the whole race of boys in general, and the boys in the Vauxhall-road in particular.

There is a curious fact connected with the habits of the rat, which warrants a closer observation on the part of those who have the opportunity—it is the emigration of rats. It appears that rats, like many birds, fish, &c., are influenced to change their abode by want of food ; by necessity of change of temperature ; by want of a place for incubation, where they may obtain food for their young ; and, lastly, by their fear of man.

'A Spanish merchant some years ago had forestalled the market of Barcelona filberts on speculation. He filled his warehouse with sacks of them, and refused to sell to the retail dealers, except at such a price as they could not afford to give. Thinking, however, that they would be obliged to submit to his demand, rather than not procure them for sale, he persisted in exacting

his original price, and thus lost nearly all his treasure; for he was informed, by an early-rising friend, that he had seen, just before sunrise, an army of rats quitting the warehouse. He immediately went to examine his sacks, and found them gnawed in various places, and emptied of above half their contents, and empty shells of filberts strewed over the floor.'

Pennant relates a story of a burglarious troop of rats, which nearly frightened a young lady out of her wits, by mistaking her chimney for one leading to a cheese-room. She was suddenly wakened by a tremendous clatter in her bed-chamber, and on looking up saw a terrific troop of rats running about in wild disorder. She had presence of mind enough to throw her candle-stick at them (*timor arma ministrat**), and to her great joy she found that they speedily departed by the way which they had entered her apartment, leaving only a cloud of soot over the room.

Forty years ago, the house of a surgeon in Swansea was greatly infested with rats, and he completely got rid of them by burning off all the hair from one which he had caught alive, and then allowing it to return to its hole. It was said that he never afterwards saw a rat on his premises, except the burnt sufferer, which on the following day returned, and was caught in the same trap from which he had been but just set at liberty. I suppose that in their 'Advertiser,' the description of a ghost, and a notice of haunted premises, was given, which caused the whole colony so unanimously to decamp.

The above story reminds me of a curious nondescript

* Fear finds arms.

animal from the torrid zone, which was exhibited some years ago at Yarmouth. A gentleman who, unfortunately for the showman, happened to be a naturalist, paid his penny, and went in to see it. It turned out, though the owner positively denied the fact, to be a large bear, with his hair closely shaven away, except in sundry places, which added much to the grotesque appearance of his nude person.

Speaking of ghosts, I have heard that some years ago there was a lone house standing by itself near a plantation, not far from Guildford. This house nobody would ever take because it was haunted, and strange noises heard in it every night after dark; several tenants tried it but were frightened away by the noises. At last, one individual more courageous than the rest resolved to unravel the mystery. He accordingly armed himself cap-a-pie, and having put out the light remained sentry in one of the rooms. Shortly he heard on the stairs pit, pat; a full stop, then pit, pat; a full stop again. The noise was repeated several times, as though some creature, ghost or no ghost, was coming up stairs. At last the thing, whatever it was, came close to the door of the room where the sentry was placed and listening; his heart, too, chimed in with the tune pit, pat, rather faster than it was wont to do. He flung open the door —hurry skurry, bang; something went down stairs with a tremendous jump, and all over the bottom of the house the greatest confusion, as of thousands of demons rushing in all directions, was heard. This was enough for one night. The next night our crafty sentry established himself on the first landing with a heap of straw and a box of lucifer-matches; soon all was quiet. Up the stairs again came the pit pat, pit pat. When the noise was

close to his ambush he scraped his match and set fire to his straw, which blazed up like a bonfire in an instant; and what did he see? only a rabbit, who stood on his hind legs, as much astonished as was the sentry. Both man and beast having mutually inspected each other, the biped hurled a sword at the quadruped, who disappeared down stairs quicker than he came up. The noise made was only the rabbit's fore and hind legs hitting the boards as he hopped from one stair to the other. The rabbits had got into the house from the neighbouring plantation, and had fairly frightened away, by their nocturnal wanderings, the rightful owners thereof. The more courageous sentry was rewarded for his vigil, for he held his tongue as to the cause of the ghost. He got the house at a reduced rent, and several capital rabbit pies made of the ghosts' bodies into the bargain.

That rats will emigrate we well know from experience. My father, when Canon of Christchurch, Oxford, was usually in residence during the long vacation; when the young men went away, their rooms, in consequence, became bare of food for the rats, and they all migrated to my father's house in Tom quadrangle; many scores of them I myself have caught in traps at that particular time of the year. When term commenced again, the rats went away only to reappear at the next vacation. The same thing happens at Westminster: the Canons' houses there have numerous rats in them when the Westminster boys are gone home for their holidays.

On the bleak and bare downs, near Isley, in Berkshire, not very far from the Didcot station of the Great Western Railway, are situated lone barns, in which the corn gathered from the neighbouring fields is

stacked. Rats have been frequently met in colonies by shepherds at early morning, marching in long lines direct from one barn to another. They have been watched and seen to go direct across country in a straight line. They generally leave one barn for another, when the wheat has been threshed out and their food thus taken from them. But the curious point is how they know where to go; how do they find out where there is a barn containing food for them? do they send out scouts, or does their instinct guide them? I believe it is the same marvellous instinct that guides the hungry rats, as that which guides the swallow in her long and wearisome journey to warmer climates, or impels the shoals of herrings and sprats to visit our shores. A medical gentleman, who lived in the neighbourhood of these downs, tells me that on one occasion preparations were made to ferret and destroy all the rats in a barn near Weston. The next morning the company came—ferrets, dogs, big sticks, and all—but not a rat could be found. In vain the ferrets poked in and out of the holes; in vain the dogs routed under the straw; in vain the men brandished their sticks; the rats were all gone, not one solitary individual remained. We can but conclude that, from former experience, some of the patriarchs among the rats, observing the preparations made, had advised a general change of quarters, and their advice had been taken by the whole colony. Curiously enough, my friend afterwards ascertained from a labourer that he had met a regiment of rats very early in the morning of the day the hunt was to have taken place in the Weston barn, marching along Chilton bottom towards another barn situated some distance away. Some years ago a gentleman driving in a gig, about three

o'clock one fine summer's morning, met, upon Kingston Bridge, a colony of rats on the march. He pulled up, and the rats filed off to the right and left, taking not the least notice of either him or the gig.

Though not considered a delicacy by English palates, the rat, nevertheless, used to afford a dainty dish to the negro slaves of Jamaica. The slave-masters did not often ruin themselves by long butchers' bills for meat for their living property; so that the poor wretches were obliged to set their brains to work to procure animal food for their craving appetites. They caught and afterwards cooked the rats in the following way, as described by the Rev. B. Vernon, in his 'Early Recollections of Jamaica.'

He writes as follows: 'But to return to Inkle (a native of Congo, in Africa, who was employed as a watchman over a coco piece, or yam-ground). His larder did not afford many delicacies, and when the continuance of a storm detained me beyond the usual hour of an early dinner, I have enjoyed a black coco, or part of a roasted yam, at his expense, and to his apparent gratification; which latter was not diminished, perhaps, by the certainty of having such favours returned in kind; for I blush not to avow, that I carried to him many a salt shad or herring to season his vegetable diet.

'The most pressing case of hunger never carried me so far beyond the prejudices of civilised life as to induce me to partake of roasted rat, in which he delighted. His method of catching and of cooking this vermin deserves notice. It were, perhaps, more easy for me to make, than to describe, his simple but efficient trap. It consisted of a small conical basket, to which was fastened in the wicker work outside (running from the apex to

the open mouth), a tough and elastic lance-wood stick, three or four feet long, with a strong twine, manufactured by himself from the bark of a tree, attached to the further and smaller end. In order to set the trap, the stick was bent into a bow; a running noose being formed at the end of the twine, and passed through an aperture left in the edge of the basket for the purpose. This noose was carefully spread out round the inner edge, and concealed under the rim. Below the noose a separate piece of twine was fixed, drawn through the basket twice, so as to cross at right angles, and firmly secured on the outside. In order to reach the bait, which was deposited at the apex, the rat must gnaw through these cross strings. As soon as they gave way, the elasticity of the bow suddenly and tightly drew the noose, and the rat was strangled. These traps were laid upon the ground, and seldom failed to secure the prize, which was prepared for the table in the following primitive manner. After carefully cleaning the inside and cutting off the tail, the body was impaled on a long wooden skewer, and turned briskly round over a fierce fire, until the hair was completely burnt; it was then scraped with a sharp piece of wood, until free from fur, and of a rich, toasty, brown colour; and finally, the end of the skewer was stuck into the ground, inclining towards the fire, where it remained sometimes for hours, with an occasional change of position, until it became quite dry and crisp, and thus ready for the evening meal. When I expressed surprise that he could eat such food, Inkle would reply with a merry grin, "Ki? nyoung, massa, ratta sweet, hearee? If nyoung massa nyam ratta one time, no more him nyam ratta ebery day, hearee?"—The French are right who say, "Ce n'est que

le premier pas qui coute ;" but that " premier pas " in rat-eating I could never take.

' Poor Inkle's ingenuity in procuring, and afterwards preparing, his repast, fully illustrates the truth of the saying,

" Ingeni inventor venter." ' *

The natives in India who cut grass for the officers' horses are very fond of rats when they can get them: they singe and eat them as did Inkle.

In that marvellous country, China, where every inch of ground is cultivated, and every bit of refuse of all sorts and kinds, even to the hair collected and sold by the barbers who shave the pate of John Chinaman, is collected for manure in order to grow food for the millions of starving wretches, almost everything that can be cooked is eaten up—to rats, and dogs, and mollusks. I have seen a dried rat bought in the market of a Chinese town. It has been split down the centre, powdered with some white substance, and pressed under some heavy weight, as is evident from its shape, its appearance being very much like that of the common English haddock. These John Chinaman buys, soaks in water, and then dresses ' more suo '—boils, roasts, or fries. In reference to the subject of using human hair for manure, as I was being operated on by a celebrated London barber he informed me, that he was obliged to burn the cuttings of the hair to get rid of the mess out of his shop; but when he was an apprentice at a town in Huntingdonshire, he was allowed the sweepings of the shop as a perquisite, and that he sold it at sixpence per bushel to a neighbouring farmer. The farmer

* The empty stomach the mother of invention.

told him that the places where he nad placed the hair did not require manure for three years afterwards. He was not aware that barbers ever sold hair-cuttings in London for manure: he did not think it would pay, because it required the cuttings of so many people to get a bushel. In the country the customers came in with long locks, which were cropped off pretty close, but in London the customers do not have much hair cut off at a time.

In a penny exhibition at a fair, I went in to see some 'sea lions'—two beautiful little seals—and some 'India-rubber dogs.' The seals were in very good condition and obedient to the word of command. At the word of command, 'Lay on your back, Jemmy,' Jemmy turned himself gracefully into the position ordered, and looked up at his master with a look of affectionate obedience. Jack's (the other seal) turn came next. 'Roast the pig, Jack,' was the word of command; immediately Jack rolled himself round and round in the water, staying always in the same place in his tub, so fast that it was quite impossible to make out his form. The performance being concluded each received a bit of fish. I am now sorry that I did not buy a seal that was once offered to me in the neighbourhood of the docks for ten shillings. The poor seal was in a tub, and looked moribund; his head too, strange to say, was covered with a very peculiar species of tick, such as I never saw before nor since. Thinking the seal would not live long enough to get as far as Westminster, I did not buy him. I afterwards heard that a Jew bought him for five shillings, cured him, and sold him at a considerable profit.

But the 'India-rubber dogs:' these were three dogs looking like a cross between an Italian greyhound—

which by-the-by has been aptly defined by a Frenchman as 'un chien sans un profession'*—and a terrier; hair they had none; they looked like scalded black pigs, for their skin was as black as a hat, firm yet exceedingly elastic to the touch, giving one the idea of India-rubber—hence the showman's name for them. This man informed us that his dogs were brought from China, and that they were of the kind eaten by the Chinese. Were I compelled to eat a dog, I would certainly choose this kind in preference to a rough, hairy, dissipated-looking English terrier.

In another show I inspected a 'Californian cock.' It was a fine specimen of the English cock, upon which John Hunter's famous experiment had been repeated—the spur had been cut off the leg and implanted in the comb; strange though it may seem, yet it is true, that the spur will actually take root and grow in its new place. Let the sceptic go and inspect for himself at the Royal College of Surgeons, London, two or three heads so treated. In the 'Californian cock,' this operation had been performed, and a very successful one it had been; for the spur had not only taken root, but had actually grown; taking the form of a corkscrew, and representing two turns and a half of the screw.

Hearing that I was interested in rats, Mr. Rupert Jones kindly sent me an extract from a French newspaper, of which the following is a translation. It appears from it that there can be lawsuits about rats, as well as about other matters, and also that the Zouaves perform the Hunterian experiment of transplanting one part of an animal's body on to another. The story runs thus:

* A dog without a profession.

Pliny, Buffon, and Lacepede have made us acquainted with the races of animals which inhabit the two hemispheres, but none of these savants, any more than the naturalists their successors, have made mention of the 'trumpet-rat,' and a search for it among the antediluvian animals discovered by science will be equally unsuccessful. The 'trumpet-rat' is modern; its existence dates from the time the Zouaves were in Africa. The action at law brought by M. Triguel against Girome, a retired Zouave (ancient Zouave), makes us believe that this is the animal in question.

The *Plaintiff*. 'Gentlemen, this individual has cheated me out of a hundred francs (4*l*.), and has, at the same time, wilfully abused my confidence. He knows that I am much interested in geology, antiquities, natural sciences. I have collections of fossils, of medals, of shells, of rare animals, of curious plants. One day he called upon me, and said, 'Sir, I have a kind of animal which has never been mentioned by any naturalist.' 'What is it, Sir?' 'It is "the trumpet-rat."' 'What do you call the trumpet-rat?' 'Sir, as the name indicates, it is a rat which has a trumpet?' 'Where is it?' 'On his nose like a rhinoceros.' 'And you have it alive?' 'Alive and well; if you wish to see it, you have only to come to my house.' 'Directly; come along.'

'I was very anxious to see this strange animal. We arrive at his house, and he shows me in a cage an enormous rat, very lively and in good condition, and which really had on its nose a sort of slender excrescence about two centimetres long (two-thirds of an inch), covered with hair like the body of the animal, with vertebræ in it, and, a most extraordinary thing, larger at the summit than at the base, the contrary to what it

ought to be in the usual course of things. I ask to examine this phenomenon; he puts it in my hand, and holds its paws and head that I might examine at my ease this extraordinary trumpet. I ask him if it were not a dupe, and a mystification, and to convince myself I take a pin and force it into the trumpet. The animal cried out, winced, and a drop of blood came from the prick. The experiment was conclusive—it was really a trumpet forming a part of the rat.

'I wonder. I ask this man if he would sell his rat. He answers in the affirmative. I ask his price. Fifty francs. I pay it without any bargaining, and I bring the animal home. I invite my friends and servants to see it, the cry of admiration was universal—I was enchanted.

'Some one says to me, 'You ought to procure a female (this was a male). I had thought of that, but having seen but one rat at the house of the person who sold it to me, I concluded that he had no more. I determined, therefore, to go directly to see, and I ask him if it were possible to get a female. 'Nothing easier,' he answered me; 'I have written to Africa, and they have sent me many trumpet-rats, of which I have two females.' With these words, he brings out a cage full of rats like that which he had sold me. He chooses me a female, for which I pay him fifty francs (2*l*.). I carry it off more enchanted than ever. Some months afterwards the female has young: I look at them, they had not trumpets. I say to myself, 'Without doubt they will sprout hereafter like the elephants' tusks.' I wait one month, two months, six months; every day I look at the nose of my rats, but the trumpet never appeared.

'In a house where I go frequently I make the acquaintance of an officer who had served a long time in

Africa. 'Tell me,' I says to him one day—'you have been in Africa—do you know the trumpet-rats?' 'Perfectly,' he answers me. 'Ah! then you can inform me.' I then tell him my story. Then this gentleman began to laugh, as though his sides would split. I say to myself, 'Certainly then I have been duped.' When he was calm I beg him to explain the motive of his hilarity. Then he tells me what follows: The trumpet-rat, he tells me, is not a supernatural thing, it is an invention due to the leisure moments of the Zouaves. This is how they make them: you take two rats; you tie their paws firmly on a board, the nose of one close to the end of the tail of the other; with a pen-knife or a lancet you make an incision into the nose of the rat which is hindermost, and you graft the tail of the first into the nose; you tie firmly the muzzle to the tail, and you leave the two rats in this position for forty-eight hours. At the end of the time the union has taken place, and the two parts are grown together; then you cut off the tail of the rat which is in front to the required length, and let him go, but still keep the other tied to the board but with his head loose, and you give him something to eat. At the end of a month or more the wound is perfectly healed, and the eyes of the most curious scrutators would not see a trace of the grafting. This is what these Zouaves do; the rats have no trumpet, you have been deceived,' (les rats n'ont pas de trompe; vous avez été trompé).

'On the part of the defendant, it was urged that he had certainly made up the rats as has been stated, but he affirms that he had not sold them to the plaintiff as rats 'born' with a trumpet.

The *President*. 'Is this true, M. Triguel?'

M. Triguel. 'You understand, Sir, after the experiment which I made with the prick of the pin, which bled and made the animal cry, I ought to believe that the trumpet was natural.'

The *President.* 'Then the defendant told you that it was a particular kind of rat?'

The *Plaintiff.* 'Yes, without doubt.'

The *Defendant.* 'In fact—it is a particular kind of rat.'

Verdict for the Zouave—the trumpet-rat maker.' (*Gaz. des Trib.*)

To my mind this story seems almost impossible; not that the tail of one rat would not grow on to the nose of another, for I believe it would, were the operation properly performed; but I confess that if I were told to tie a rat down in such a manner that he could not move for eight and forty hours, I should express my inability so to do.

Rat-eating is not confined to China alone. Mr. Blackwell, of Bristol, informs me, that when a French schooner was windbound at Hale in Cornwall, not very long ago, the sailors cleared the country round of rats and snails; they pouched and scalded the rats, and then hung them up by dozens, looking beautifully white, on the yard-arms to dry.

Poor Dr. Kane was seriously troubled with rats in his North Pole expedition, but afterwards they served him a good turn. He writes: 'We have been terribly annoyed by rats; some days ago we made a brave effort to smoke them out with the vilest imaginable compound of vapours—brimstone, burnt leather, and arsenic; and we spent a cold night on deck in consequence, and to give the experiment fair play, but they recovered the

fumigation. We now determined to dose them with carbonic acid gas: Dr. Hayes burnt a quantity of charcoal, and we shut down the hatches, after pasting up every fissure that communicated aft. They nearly set the ship on fire during this operation; but, however, the next day, upon inspecting the scene of our operations, we found twenty-eight well-fed rats of all varieties of age.' Afterwards, when the crew were starving, the rats came in as an article of food, and Dr. Kane himself says:—

'Another article of diet less inviting at first, but which I found more innocuous [than bears' liver], was the rat. We had failed to exterminate the animal by our varied and perilous efforts of the year before, and a well-justified fear forbade our renewing the crusade. It was marvellous, in a region apparently so unfavourable to reproduction, what a perfect warren we soon had on board. Their impudence and address increased with their numbers; it became impossible to stow anything below decks. Furs, woollens, shoes, specimens of natural history, everything we disliked to lose, however little valuable to them, was gnawed into and destroyed. They harboured among the men's bedding in the forecastle, and showed such boldness and dexterity in dodging missiles that they were tolerated at last as inevitable nuisances. Before the winter ended I avenged our griefs, by decimating them for my private table. If I was asked what, after darkness, and cold, and scurvy, are the three besetting curses of our Arctic sojourn, I should say rats, rats, rats.

'Before I pass from these intrepid and pertinacious visitors, let me add that, on the whole, I am personally much their debtor. Through the long winter night, Hans used to beguile his lonely hours of watch by

shooting them with the bow and arrow. The repugnance of my associates to share with me the table luxury of "such small deer" gave me the frequent advantage of a fresh-meat soup, which contributed no doubt to my comparative immunity from scurvy.' Again he writes: 'Our diet will be only a stock of meat biscuit, to which I shall add for myself a few rats chopped up, and frozen into tallow balls.'

When that gallant sailor Rear-Admiral Beaufort was making a cruise in H.M.S. 'Woolwich,' his ship was swarmed with rats. He has kindly informed me that the boys amused themselves by catching them with cane spears, armed with needle points, and they killed scores at a hunt. Determined to get over the silly prejudice against such animals, as they fed on his peas and flour, he ordered those that were killed to be brought to his steward for selection, and he reports that the old grizly ones were very strong, but that spatchcocked and broiled, with plenty of salt and pepper, the head quarters were really not bad; but prejudice was stronger even than rats, and no one, either young or old, could get down a mouthful without a long face. One morning the admiral was awoke by the cold nose of a rat licking his lips. The rat was chased, and wedged itself so firmly between the timbers that the ship's carpenter had actually to cut away a considerable portion of one of the timbers to get at him; he then got hold of him, but the rat wisely slipt his tail, and again escaped; but at last the armourer's long-handled pincers brought him out.

When Captain Inglefield went to the North Pole in the ship 'Phœnix,' in the year 1853, my sister gave him three white pet rats which were quite tame. These three rats went to the North Pole in a cage specially provided for

them, and became quite favourites on board. One of them died of an abscess in the back, the second was given away to one of the officers belonging to a ship that was at Melville Island, and the third came back to England sound and well, and when I last heard of it, it was still alive.

A charming young lady was kind enough to give me the particulars of her pet dove, who is a great Arctic voyager. This tender bird has been twice to the North Pole, and spent the summers of 1853-54 there on board Captain Inglefield's ship the 'Phœnix.' She then remained with Captain Inglefield in the 'Sidon,' in the Black Sea. Not only is this dove a great traveller, but she is a fighting dove as well, for she was present at the bombardment of Sebastopol, and her cage was knocked to pieces by a shot. Her only other adventure was making herself ill by eating some strange berries, but she recovered after the administration of an emetic. This bird has picked up wisdom in her travels, and now considers herself a veteran bird, and entitled to take liberties. When a stranger comes into the room, she flies, as often as she can get out of her cage, on to his head, or on to the nearest corner of the table or floor; then she stands at his feet, and commences the funniest succession of jerks and bows, cooing loudly and hoarsely all the time. A few weeks after she came home from the North Pole, an officer of the ship happening to call upon her mistress, she manifested the utmost impatience to get out of the cage even when she only heard his voice, but the moment she saw him she flew direct into the breast of his coat, where she had been accustomed to nestle in the homeward voyage. She was scarcely ever in her cage on board ship, as she was

too tame to fly away. Captain Inglefield took a large quantity of wheat and canary-seed and gravel with him on each voyage, as the dove's provision.

Rats are terrible plagues on board ships. There is an improvement upon the old plan of killing them by means of smoke. A rat is not so easily killed by stinking vapours, as remarked above. The new plan, as I have been told, is to take the infected ship alongside a steamer, and having stuffed up every crack, and door, and window, to introduce a leather hose; steam is then forced down the hose into the ship; the rats can't stand this; they get parboiled, and the cockroaches with them; the ship is thus thoroughly freed from all its live stock. I have it on the authority of Captain Shipton, R.N., that in the American war, it was no uncommon thing to get hold of a lot of coasting vessels, and in order to get rid of the trouble of them, after taking the crews out, the captors set fire to them, and then hundreds of rats were seen scudding up the rigging, not knowing which death was least disagreeable—drowning or burning.

A friend who has travelled much, tells me than when off the Cape of Good Hope a heavy sea struck the ship he was in, and lifting up the long boat from her lashings, knocked her against the bulwarks, and made a great hole in her side. This long boat was the receptacle for all sorts of lumber, and had been taken possession of by a colony of rats. At the moment of concussion, the rats retired into the innermost crevices of the lumber. As the boat was now of no further use, it was determined that she should be thrown overboard; tackle was therefore fitted, and she was hoisted up, and dropped plump into the raging sea. The scene of con-

fusion amongst the rats, who discovered too late their fate to be committed to the deep, was indescribable. The carpenter had bored a hole in the bottom of the boat, as sailors do not like that anything they throw overboard should be picked up; and as the boat began to fill, the rats came nearer and nearer to the surface of the sea, till at last they were entirely deserted by their faithless boat, and obliged to swim about, as best they might; but this did not last long, a heavy sea was on, and a great wave came thundering along; the half-drowned rats were borne to the top of it, and then were lost in the watery valley the other side.

There is a third kind of rat, which is very generally distributed throughout England, whose personal appearance is well known to most anglers; it is the 'water-rat,' or, as it is sometimes called, the 'water-vole.' This little animal may be considered as the representative of the beaver (many years extinct) in the British isles. He is entirely aquatic in his habits, and is never seen except by the water-side. Upon examining his anatomy we shall find that he, too, is constructed with reference to the mode of life he is destined to follow. His neck is very short, his head rounded and convex above, to enable him to swim fast through the water. His fur is almost waterproof, being composed of two sets of hairs, some long and projecting, others short and thickly set, together forming a close silky pile, which effectually resists the entrance of the water, and serves its owner in the place of a very warm, waterproof great-coat. I have often seen the water-rat swimming under water, and have frequently observed that he appears to be surrounded by a case of air, in fact, looks like a large air-bubble swimming along. This effect is pro-

duced, I imagine, by means of the first set of hairs above mentioned. The air which he takes down with him on plunging in, would naturally escape were it not that it is delayed by adhering to these long *quasi* reservoirs, and thus renders the whole body more buoyant than it otherwise would be. The tail in the house-rat, as we have above mentioned, serves as an organ of balancing and prehension; in the water-rat it is so modified as to become a sort of rudder and paddle; it is much rounder and more taper, being slightly compressed towards the tip, to afford as much resistance as possible to the water; acting, in fact, like the broad end of the oar, as used by fishermen in propelling their boat from its stern end.

In the house-rat the ears are long and projecting, so placed as to catch the smallest sound. What would be the use of such ears to the water-rat? they would only be in his way; accordingly we find the following beautiful modification and adaptation of means to ends. The external ears are short, and rounded, and *entirely concealed in the fur*, overlapped, moreover, externally with extremely soft hairs. The hair of the rat under the microscope is a most beautiful object; it looks like a number of small kidney-beans placed side by side in a row inside a tube. As though these hairs were not sufficient protection against the entrance of the water, the meatus, or aperture of the ear, is capable of being closed up entirely by a thin angular operculum. This admirably-designed curtain the rat is enabled, when he plunges below the water, entirely to draw across the passage of the ear, and completely exclude the element in which he swims. The water-rat never comes near the abode of men, water-mills excepted; he prefers living

by the sides of canals and ponds, and in the water-meadows, forming a secure retreat for himself in the banks in case of need. The holes and tortuous burrows he excavates are, beyond description, complicated. Frequently a large portion of the bank by the side of the river Itchen, in Hampshire, has given way under my feet, completely undermined by the rats. In this way much damage is done to the dams and banks, on whose security and firmness much valuable property depends. Aware that he has many enemies, and that flight is his only chance for life, the water-rat has not made a 'single' entrance to his spacious habitation, but, being amphibious, finds it positively necessary to have two portals, one under water, the other by the side of the bank, or on the top of the bank, and on this account it is very difficult indeed to catch him. When a boy at Winchester, I used often to go out into the water-meadows to hunt rats. Having marked them to their holes, sharp stakes were thrust into the soft grassy banks, which generally dislodged the quarry. He would first come up to his land-hole to see if the field were clear, if not, rush out into the water through his aquatic portal, and swim away as quietly as he could. The great art was at this moment to slip over his head, as he swam, a thin loop of brass wire tied to the end of a long stick, and whisk him out of his native element, to become a prey to the scholars on the bank, by some of whom water-rats' skins were collected on account of their beauty and silk-like softness. When hunting about a stream under a viaduct at Hanwell, for creatures for a vivarium, a boy told me that once he saw a big water-rat, as he thought, enter a hole. He put his hand up and caught it, but the creature bit

him severely. It turned out to be, not a water-rat, but a polecat. He sold it in the village; but his hand was so bad that he was obliged to go to the doctor, and the doctor's bill came to more than he got for the polecat. I asked him if he ever caught any more. 'No,' says he, 'I be afeard on 'em.'

The water-rats are nocturnal in their habits, and prefer coming out at night for their food, which is entirely vegetable. They are, however, often tempted out on a fine day, and I have watched them for hours feeding on a large patch of floating weed on the river Itchen, near a place well known to Wykehamists as the 'Waterman's-hut,' and most amusing were their gambols and petty disputes about some dainty morsel of cabbage or potato-skin. I had some difficulty in obtaining water-rats for dissection from Islip, near Oxford; Mr. Blick, my friend, who resides there, informing me that the man who leases the river thereabouts destroys all the water-rats he can, as they eat up his young osiers, which he sells to make baskets, &c.

Water-rats 'are said' to eat the eggs of the moor-hen, and the poor bird has no defence against its enemy. The rat himself gets eaten sometimes by a large and hungry pike, who will snap him up as he swims across the water. Herons, too, will eat him. Mr. G. Berkeley writes: 'In a small stream inland I have caught many herons in hard weather, laying the bait—a little eel, or the tail only of a larger one, with a hook in it—so that it would gently play in the stream on the shallow which the herons used in search of the little trout. In the maw of one heron so caught were seven small trout, a thrush, and a mouse. I once killed a heron with a large water-rat in his belly, which effectually prevented

my dressing them again at table, though the heron, in former days, was considered a princely delicacy.' The heron's bill is a most formidable, dagger-like weapon. I once very nearly got a severe peck from a bittern, which has a similar bill, in Leadenhall Market; it was in a cage, and darted its bill at my eyes just as I was passing. I have seen, in a museum at Cambridge, the bill of a heron mounted on a handle brought from some savage country. It makes a formidable, sharp-pointed, conical weapon, very like a bayonet in shape, when both portions of the bill are tied together. Herons stand motionless in the water when fishing; they do not go after the fish, but wait for the fish to come to them. By some it is supposed that there is a peculiar scent in the heron's legs which attracts the fish, and with this idea it is the custom in some countries (I heard of it in Oxfordshire) to cut off the legs of a heron and obtain from them the oil, which is used by the fisherman to anoint his bait. I should be inclined to doubt its efficacy. The heron has a very peculiar and beautiful structure in its neck, which enables it to turn its head almost at right angles to its neck. It is a peculiar formation in the junction of one of the neck-bones with its neighbour. In pictures of hawking we generally see a heron represented with its bill pointed directly upwards from its back, so as to transfix the hawk who is about to pounce down upon it from above. It is this peculiarly beautiful construction of the neck-bones which enables it to do so.

My friend, Mr. Bush, of Clapham, tells me he once saw a heron make good use of his powerful neck. He had a pugnacious fighting-cock, which attacked everything he saw. One day the cock caught sight of the

heron, and rushed at him with outstretched neck and drooping wings. The heron could not make him out at all, his great long legs keeping his body out of the way of the cock's spurs. The cock made a second charge, but this time the heron was ready for him. He placed his long neck quite back on his body, so that his head was over his tail feathers. Mr. Cock advanced bravely: just when he was within reach, the heron let fly his neck and head with the power of a steel spring, and caught the cock's body as he was coming onward. Lucky it was for the latter that he was not nearer, or the heron's bill would have gone through him. The cock had had a lesson; he never molested the heron again, and slunk out of the way when he saw him coming.

Herons have on one claw of each leg a serrated edge of horn, like a small-tooth comb. The use of this comb has been generally stated to be to enable the bird to hold the fish he catches; but a heron does not use his feet as organs of prehension as a hawk does. The more probable use of it is, as observed and made out by Mr. Bush. In a wood near Witney, in Oxfordshire, called Tarwood, of fox-hunting notoriety, there are, or there used to be, some herons' nests; from these nests Mr. Bush procured some young birds. Under the feathers of the heron is a layer of a sort of mealy down, which, I imagine, acts as a greatcoat for the bird when standing out in the cold, waiting for the fish by the side of the water. When Mr. Bush's birds pruned and cleaned themselves with their bills, he observed that this mealy down adhered to their bills. To get rid of it they used the comb of the claw, given them for that purpose, always moving it from the tip towards the base of the bill, and not in the reverse direction. They also used

it to clean off the slime which adhered to their bills after they had eaten an eel or a slimy fish. The gannet, or solan goose, has its middle claw serrated or combed, and Mr. Montagu remarks on this point: 'The serrated middle claw cannot be indicative of its habits, since many land birds are equally furnished with a similar formation, the use of which has never been discovered.' I consider, therefore, that Mr. Bush's observations on its real use, viz., to act as a comb to clean the plumage of its owner, to be important, if not quite original. We see a similar comb on the foot of the night-jar. This bird has bristles on each side of its bill, to which the scales of the night-moths, on which he feeds, will adhere. With the comb on his foot he can clean these his whiskers after a night's hunting.

Another instance of a serrated claw is to be found in the capercailzie, or cock of the wood. Here, however, we find all the claws on each foot armed with stout whalebone-like projections. The use of these, unlike the former cases, does not refer to the cleanliness of the possessor, but the combs are given him as a means of supporting his heavy body on the snow, which for many months in the year covers the regions he inhabits. Thus to those who observe, and reason upon what they observe, arises the great and delightful privilege of seeing, in apparent trivial matters, proof of the beneficence of the Creator towards his creatures.

The water-rat is probably the original rat of Great Britain, the black rat even being an intruder. The teeth of the water-rat were found in abundance by my father, the late Dean of Westminster, in the cave at Kirkdale, and were figured by him in his 'Reliquiæ Diluvianæ,' published 1824. He savs: 'But the teeth

which occur perhaps in greatest abundance are those of the water-rat, for in almost every specimen I have collected or seen of the osseous breccia there are teeth or broken fragments of all the larger bones. These rats may be supposed to have abounded on the edge of the lake which I have shown probably existed in this neighbourhood.' This Kirkdale cave was proved beyond a doubt to have been the den of hyænas, who, in times long antecedent to the appearance of man upon the face of this planet, inhabited this Yorkshire cave, and made it their head-quarters, whence they started on their foraging expeditions. Arguing on this subject, the Dean goes on to say: 'Though the idea of hyænas eating rats may appear ridiculous, it is consistent with the omnivorous appetite of modern hyænas, and with the fact quoted from Johnson, that they feed on small animals as well as carrion and bones. Nor is the disproportion in size of the animal to that of its prey greater than that of wolves and foxes, which are supposed by Captain Parry to feed chiefly on mice during the long winters of Melville Island. Hearne, in his "Journey to the Northern Ocean," mentions the fact "of a hill called Grizzle Bear Hill, being deeply furrowed and turned over like ploughed land by bears in search of ground squirrels, and perhaps mice, which constitute a favourite part of their food." If bears eat mice, why should not hyænas eat rats? and in masticating the bodies of these small animals with their coarse conical teeth, many bones and fragments of bones would be pressed outwards through their lips and fall neglected to the ground.' In the copy of the 'Reliquiæ' which is in my possession, and which is interlarded with notes and letters on the subjects mentioned

in the book, I find, at the page whence the foregoing passage has been quoted, the following important note in MS., written by my mother, but evidently at my father's dictation.

'On my presenting a living house-rat to a Cape hyæna in London,* one evening at its usual feeding-time, the hyæna refused to touch it, but on a subsequent occasion I presented it with a rat again when it had not been fed for thirty-six hours; the rat was soon devoured. In fifteen or sixteen minutes after, the hyæna became sick, vomited up the skin and bones of the rat, together with fragments of other bones which it had swallowed immediately after the rat. This experiment explains the presence of so many bones and teeth of rats in the cave of Kirkdale. They had probably been swallowed and vomited up again on the floor of the den. Had they continued in the stomach they would have been digested and reduced to the state of album græcum. We know that cats and dogs usually become sick if they swallow the skin of a rat.'

Wishing to know if there were any anatomical difference between the Kirkdale rat and the modern water-vole, I consulted Professor Owen's valuable work on British fossil mammalia, published many years after the 'Reliquiæ;' the following passage gave me the required answer. 'The like antiquity of another and smaller rodent of the beaver family still existing in most of our British rivers and smaller streams and ditches, is more abundantly testified by the numerous fossils of a species of arvicola, which I have been unable satisfactorily to dis-

* This was Billy, the celebrated hyæna, who lived just a quarter of a century in this metropolis, first at Exeter Change and afterwards at the Surrey Gardens.

tinguish from the arvicola amphibia, or common water-rat.' Dr. Buckland appears to have been the first to have noticed the fossil arvicolæ in British localities, in his 'Reliquiæ Diluvianæ.'

As in the modern day the rats in the London warehouses gnaw the ivory, so in the ancient caves did the rats gnaw the bones which lay about. Dr. Buckland found marks of teeth upon the ulna of a wolf and the tibia of a horse in one of the caves at Oreston.

A Wykehamist friend ascertained most practically that the water-rat was a nocturnal animal. He was out late one night fishing for trout—for the largest fish always feed at that time—and had cast his line across the river. In a few moments he felt a tug and a jerk, as though the fly had been taken by a large fish; accordingly he played his line in the most scientific and judicious manner, and had unwonted sport with his supposed five-pound trout. He landed it, and put down his hand to grasp it: instead, however, of encountering the scales of a fish, he received a severe bite on the fingers. Certain, from this proof, that if it were a fish it must be of a very extraordinary breed, he dropped the net, and ran off to the 'waterman's hut' for a lantern. On returning to examine his capture, he found coiled up in a most dreadful tangle of his best silk-worm gut, and his best-made flies, a large water-rat. The rat must have been unsuspiciously swimming along, when the line happened to drop directly over him. One of the hooks had caught in his fur, and had given a jerk to the rod, which the fisherman had mistaken for a trout rising, and had naturally struck the supposed fish, thereby firmly fixing the sharp-pointed hook into the body of the unfortunate rat, who must have been greatly

surprised at being so suddenly and unceremoniously dragged to the shore.

It has been said, and with much truth, that it is an easier task to learn a proposition of Euclid than to catch a rat. The love of self-preservation is particularly developed in this beast, and being surrounded by enemies, he becomes very suspicious and ever on his guard against treachery. The brain of the rat, as stated in the 'Quarterly Review,' is small in proportion to its size. I do not agree with this statement, for I have examined the brains of many rats, and find that though the head appears small externally, yet it contains a large brain. Moreover, if a section be made of the brain, I find that the grey matter (the thinking portion of the brain) is highly developed. The clever tricks, therefore, that we hear of rats avoiding poison and traps are accounted for; their natural cunning arising from their mental faculties (if I may use the expression) being of a high order, amounting more to reasoning than to instinct.

To exterminate rats entirely (even if it were desirable in a sanitary point of view) I believe to be quite impossible. We can only keep their race in check, and make them confine their ravages to our leavings. They can be destroyed principally in three ways, viz., by traps, by poison, and by animals naturally their enemies, such as dogs and ferrets. Among poisons may be mentioned phosphorus (a good receipt for preparing which is given in a little book entitled 'The Pests of the Farm'), arsenic, corrosive sublimate, strychnia, &c. But I should not recommend any poison to be used in a dwelling-house, because the rat's natural instinct is to die in privacy, if he can, and he generally, when poisoned, manages to

get into a hole; there his body remains, and, as I know from personal experience, a dead rat in a room is by no means a pleasant subject, the odour proceeding therefrom being none of the nicest.

The best way, I believe, to get rid of rats is, as an old rat-catcher said to me, to 'make the place too hot to hold them.' As we have seen, they will migrate in bodies. To catch single individuals is no use, unless there be an outlying rat about the premises; our efforts must therefore be directed to call their habit of migration into play and make them go off in a body. To produce this effect it is a good plan to tar their holes well, or to do as Mr. Waterton did, tar a single rat and let him run: he will cover the sides of the runs with tar. Rats cannot bear tar, it sticks to their fur and they cannot get it off again, nor, indeed, do they like the smell. Another way is to catch two or three, or if you cannot catch them, buy them, cover them well with horse turpentine and let them go. They will scent the runs well with it, and the suspicious inhabitants thereof will be off forthwith, thinking there is treachery about, and their quarters are becoming dangerous. The smell, too, is probably unpleasant to them.

In 'The Vermin Catcher, 1768,' the author gives the following prescription, acting upon the idea that it is a good plan to make them migrate: 'I shall here give the reader another maxim I have often followed very successfully. Take a pint of common tar, half an ounce of vitriol, and a good handful of common salt: mix them all well together in any old deep pan. Get some pieces of paper, and put some of the above mixture very thick on the paper, and place enough of this into the holes, sufficient to stop them, and then let the bricklayer make good after you;

and if you should find any of the holes opened again, it is quite certain you had not put in a sufficient quantity; then put in some more, and if it is done as it ought, they will never approach there any more while either taste or smell remains in it. Now by stopping in the shores [quære, sewers?] in town with the above mixture, I have kept a gentleman's house entirely clear and have never caught a single rat.'

Again, he gives a capital plan for smoking them out when they get up behind the wainscot. 'Find out a small hole or crack, then take a handful of common salt, and put it in at the hole or crack, and pour upon the salt a spoonful or two of oil of vitriol, and this will make such a fumigation or smoke that they cannot bear it. Then stop the hole or crevice again, that the smoke may not come out. Do this in two or three places as near where you hear they are as you can, and it will cause them to forsake those places. This method is very safe, as no damage can possibly ensue to the wainscot from the smoke.'

The iron wire cage traps and the common hutch traps are sometimes useful in houses, but they soon lose their efficacy, because after one or two rats are caught the others find out that it is a dangerous machine, and do not go into it. The traps then do more harm than good, because the rats, smelling the bait, come to it from all parts; and as we have seen news flies quickly among them, you get your neighbours' rats as well as your own into your premises. They play round the bait, but do not go into the trap; then being hungry, both the strangers and the original rats of the place begin foraging about, and make holes in the corn-bins, cupboards, &c.

The same thing holds good with the fly papers; it is true you catch some of the flies, but you get double your share of flies in the room, as they are attracted by the poison placed for them.

The most ingenious and simple trap I know to catch rats is made with a common tub or barrel and a little bit of board. A tub or barrel without a head must be procured, deep enough to prevent a rat getting out of it when he is once in; then cut a bit out of its upper edge, and to this fit a bit of board about a foot long and an inch or more broad; through the centre of this board run a bit of wire, and so fix it by its centre into the notch in the tub that it is perfectly balanced, like the boards on which the boys play see-saw. On to the end which overhangs the tub fasten firmly a bit of bacon or cheese, and let the other, the free end, rest against a shelf or any projection, so that the rats can get on it to eat the bacon. By means of a nail or two, or an upright bit of wood, fix the swinging board, so that it becomes perfectly steady and immovable. Let the rats become accustomed to get upon it and eat the bait without its being moved by their weight, for two or three nights, till they gain confidence; then, on the night that you wish to catch them, simply remove the supporters from under that half of the board which overhangs the barrel, leaving the supporters of that half of the board which is outside the tub still in their places. The bait must remain in its place at the end overhanging the tub; the rats will come as usual, and run along the board to get to the bait; but directly they get upon the inside half of the board, which is now no longer supported, it will tip up with them and precipitate them into the barrel below. This done, the board, if properly

balanced, will return to its proper position, and be ready for another rat. In this way an indefinite quantity of rats may be caught in a single night. The barrel may be half filled with water, if it is desirable to kill the rats, for they cannot swim about very long without being drowned, and can get no purchase for their claws or solid place from which they might make a spring to get out. When swimming about they will probably make a noise of distress, and the other rats (for they are inquisitive animals) will come to see what is the matter. The inquirer will probably go on to the treacherous board to look, and will become a victim to his curiosity, for he will fall in as well as his brethren who have preceded him. This is the plan adopted by the captain of the slave-ship when he makes his unfortunate fellow-creatures 'walk the plank.'

There is another efficacious way to catch rats about farm-yards, dog-kennels, &c., which has the merit of simplicity as well as of cheapness. It has been kindly mentioned and explained to me by a gentleman who has used it with great success. It is made with an elastic twig of willow, or any other tree, two bits of wood, a bit of string, and a noose of wire.

The first thing to be done is to ascertain the run of the rat, which is easily found out, as their pathways are generally well trodden down; then fix the twig, which ought to be about two yards and a half long, into the ground by its thick end, and fasten a bit of string on to it; to the end of the string fasten a bit of wood cut in the shape of Fig. 6, Plate II. On to this bit of wood fasten your wire, which must have a noose at its end a little larger than the body of a rat. By the side of the run thrust firmly into the ground a stout

bit of wood, having a finger to it, as at Fig. 7, Plate II., then bend the twig over so that the bit of wood at the end of the string fastened to it shall catch under the finger of the peg of wood in the ground; adjust the noose of the wire at the right height from the ground—about an inch and a half—and your trap is set (Plate II. Fig. 3). It requires some nicety to arrange the distances, &c., but a little experience will soon teach this. When the rat comes along the run he will put his head into the wire, and in his struggles to get loose will let free the twig, which will whip him up into the air, where he will remain till you come to take him out. These traps are best set at night, when the rats cannot see the wire very well. The finest copper wire is the best to use, and if the wire will not stand in its proper position over the run, it may be supported by a little forked stick underneath it.

This trap has been used with great success at the Rufford kennels, Notts. The best night's sport showed fifteen rats in the air, with twenty traps down; and the sum total in about three months was upwards of two hundred rats. One great merit of this trap is, that the rats do not seem to be the least aware of the danger they are in from the snares, as, when caught, there is no noise. If the rats get at all shy, spring the traps for a night and change the place of setting.

THE COBRA DI CAPELLO.

'Tum vero tremefacta novus per pectora cunctis.
Insinuat pavor; et scelus expendisse merentem
Laocoonta ferunt, sacrum qui cuspide robur
Læserit et tergo sceleratam intorserit hastam."*

VIRGIL, Æn. II. 228.

WITH these lines might have ended a paragraph of 'The Times,' as published in the famous city of Troy many a long year ago, and handed thence down to posterity by the poet Virgil, detailing a full and true account of the dreadful accident which had just happened to Mr. Laocoon and the two Master Laocoons. Mr. Laocoon, it appears, held the office of high-priest to Apollo, and probably was superintendent of detectives in that far-famed city. The Greeks were encamped before the ramparts, and had been so for some time. They were nearly tired of such fun, and being unable to get in by fair means and the force of arms, and not having brought with them Captain Warner's long-range, or a lot of Minié rifles, they adopted a most peculiar and original notion. They built a great wooden horse, such as might have been seen in the studio of the late Sir Francis Chantrey, when he was modelling the statue of George the Fourth, now at

* 'Amazement seizes all; the general cry
Proclaims Laocoon justly doomed to die,
Whose hand the will of Pallas had withstood,
And dared to violate the sacred wood.' DRYDEN.

Charing Cross. What the exact shape of this Trojan steed was we are not informed. Virgil was not well up in Tattersallian phrases, so he contented himself by saying that he was 'Instar montis,' as big as a mountain, and that his ribs were made of cut fir. So big was he indeed that he could not go through the Trojan Temple Bar, and the walls had to be pulled down to let him in.'

The crafty Grecians having constructed this noble animal, adopted that piece of advice often given to Sunday cockney equestrians by small boys, 'Hadn't you better pay the difference, sir, and get inside?' They accordingly filled their helmets with food—they had no pockets in their armour—soldiers never had, and never will have pockets—and in they tumbled—how many we are not told—close quarters it must have been for these brave Greeks. They dared not abuse each other for squeezing, or poke holes in the horse's sides for breathing, as they overheard Mr. Laocoon, who was haranguing the assembled Trojans close by, propose to set fire to their equestrian prison, and see if there was anybody inside. The Master Laocoons were seen by the serjeant of the company, who was looking through the animal's ear, piling up trusses of straw in the manner of burning pigs, if the Trojans singed their bacon. While Laocoon was striking a light, he was assailed by cries of 'shame' from the crowd, and being in a rage took up a spear and hurled it into the nag's side. The fat corporal

'Ipse doli fabricator Epeus,'*

was hit in the leg, and while his comrades were trying

* 'The famed
Epeus who the fatal engine framed,' DRYDEN.

to put a pocket-handkerchief in his mouth to prevent him crying out, their heavy metal coats clashed together—

'Insonuere cavæ gemitumque dedere cavernæ.'*

No sooner had Laocoon done this, than two snakes appeared out at sea making their way from the island of Tenedos, for the place where the horse stood. (Strange to say, these monstrous sea-snakes are described by the poet as having crests, such as are generally attributed to modern sea-snakes, by those who have been lucky enough to see, or fancy they saw them.) Away went the crowd—

'Diffugimus visu exsangues.'†

The poor Laocoon family seemed to have been fascinated, as birds are by the rattlesnake in South America. The great sea-monsters came gliding up with vibrating tongues; and, entwining their muscular folds round the two younger branches of the family, fixed their teeth in their young limbs (the snakes were evidently of the boa-constrictor tribe, or they would not have used this mode of attack). Laocoon, like a brave father, came to the rescue; in vain did he hack at the scaly limbs of the monsters: they caught him in their folds; and he perished miserably, a great example to the pious Æneas, and the Trojans in general, of the necessity of obeying the will of the gods. This scene has been so admirably represented in marble by the

* 'The sides transpierced return a hollow sound,
And groans of Greeks enclosed come issuing through the wound.'

† 'We fled amazed.' DRYDEN.

sculptor, and so wonderfully painted in words by Virgil, that we here introduce his admirable lines, not to be read over with a schoolboy listlessness, but as a truthful, accurate, and grand description of a serpent seizing a human victim:—

'Post ipsum, auxilio subeuntem ac tela ferentem
Corripiunt, spirisque ligant ingentibus; et jam
Bis medium amplexi, bis collo squamea circum
Terga dati, superant capite et cervicibus altis.
Ille simul manibus tendit divellere nodos
Perfusus sanie vittas atroque veneno.'*

Having done the cruel deed, the snakes did not attempt to eat the slain, but quietly glided away into the sacred part of the city—

'Delubra ad summa dracones
Effugiunt, sævæque petunt Tritonidis arcem
Sub pedibusque Deæ, clypeique sub orbe teguntur.'†

By a somewhat similar and shocking occurrence were the good folks of this modern Troy, the city of London (who are now by means of the press united, as it were, into one family), disturbed by reading in 'The Times' of October 21st, 1852, the following

* 'The wretched father running to their aid
With pious haste they next invade;
Twice round his waist their winding volumes roll'd,
And twice about his gasping throat they fold.
The Priest, thus doubly choked, their crest divides,
And towering o'er his head in triumph rides:
With both his hands he labours at the knots
His holy fillets the blue venom blots.'

† 'Their task perform'd, the serpents quit their prey,
And to the tower of Pallas make their way;
Crouch'd at her feet they lay protected there
By her large buckler and protended spear.' DRYDEN.

account of a Laocoon-like proceeding, which had occurred at the Zoological Gardens, Regent's Park, the previous day. It runs as follows :—

'Edward Curling, aged 31, was brought to University College Hospital yesterday morning, October 20th. His occupation was that of a keeper at the Zoological Gardens, and the care of the reptile-house was his special duty. About 8 A.M., while engaged at his work in this department, he commenced a series of rash familiarities with some of the venomous serpents. After removing an African cobra from its cage, and twirling it about his head, he replaced it without having received any injury, and took out an Indian cobra. This he also played with for some time with impunity, allowing it to crawl round his body beneath his waistcoat. Shortly afterwards, however, while he was holding the snake before his face the creature made a dart at him, and inflicted a wound on the upper part of his nose, &c. In forty minutes past 9 A.M. he was a corpse.'

It is not my intention to go into all the circumstances of this case, as this has been already amply done by the various letters we have seen in the newspapers on the subject. We may, however, usefully and profitably employ our time in examining, admiring, and wondering, at the structure and conformation of the snake tribe, with special reference to their small but effective apparatus of death, as developed in that most poisonous of all snakes the cobra di capello. Although deprived of feet, fins, and other obvious members for walking, the serpent glides on the earth, ascends trees, or even directs its course through the waters, with surprising agility, and with graceful evolutions: yet the serpent was 'cursed above every beast of the field,'

and man, as if remembering the curse, turns from the reptile with disgust and horror, or seeks to effect its instant destruction. Let us examine how all this is effected, and first as to the spinal column.

The numerous bones or vertebræ which form this chain, are united together by ball and socket articulations, or, in other words, the rounded head of each is fitted into a cup-like cavity in its predecessor, so that the whole column is a chain of these joints, capable of the utmost mobility compatible with the safety of the spinal cord enclosed within. The articulations can only be moved from side to side; and their progress by vertical undulations, as is seen in many old prints of serpents, is anatomically impossible.

So also it is impossible for the snake to perform the feat which has been ascribed to him, when he wishes to go quickly down a hill; for, according to an absurd story, he is said to put his tail in his mouth, and roll himself down, being in the form of a hoop. It is just as well to recollect the fact that a snake cannot turn himself directly upwards when held by the tail. He can wriggle famously from side to side, but certainly not upwards. Hence it follows, that the best way to handle a snake is to hold him out at arm's length: in this position he can do no harm.

But how, it will be asked, does the snake contrive to get along the ground so fast, as he has no perceptible legs or arms to help him? This is managed as follows:—To each vertebra—and a large snake has many dozen vertebræ—is attached a pair of ribs: the small ends of these ribs are not attached to a sternum, or breast-bone, as in man, but to a single scutum or scale on the abdomen, by means of a slender cartilage and a set of

short muscles. It is on the points of these ribs, which may be compared to the legs of a millipede, that the snake rests, and they act in progressive order, just like the legs of that creature, each pair bringing forward the plate or scutum to which it is attached. This row of scuta may thus be regarded as one long ample foot. Sir E. Home, in his 'Comparative Anatomy,' gives an account of the muscles which, arising from the ribs, give motion to the scuta. He observes, that the rib in the snake performs two functions; the upper half is concerned in respiration, the lower in locomotion.

If a snake be allowed quietly to crawl over the hand, the progressive movement of the ribs may be easily distinguished, and also if it be watched while crawling over any raised edge (as the back of a book), requiring the firm application of two or three scuta in succession as the body glides over it.

If you put a snake on a bit of plate-glass he can get no hold with the scuta, and becomes powerless.

Snakes are often in the habit of climbing trees, and we see them represented in engravings, particularly in old pictorial Bibles, where the serpent is seen tempting Adam and Eve, and in stuffed specimens in museums, as coiling their bodies round the branches, in corkscrew-like folds. Now the snake (when alive) never does this: it simply glides up with the whole body extended in a straight line, clinging by means of the tips of the expanded ribs with the scuta atached, as has been above explained. Mr. Gosse tells us that 'the black snake in Jamaica will allow the greatest part of its body to hang down in the air, and thus remain still, while little more than the tail maintains its position by clinging (straight, not spirally, and not half round it, but longitudinally

along it) to the upper surface of a branch; and it will often pass freely and gracefully from one branch to another at a considerable interval, projecting its head and body with the utmost ease across the interval. The motions of a snake in a tree are beautifully easy and free, and convey the impression that the reptile feels quite at home among the branches.'

The apple on a branch, with a snake coiled round it, is used as an emblem of the fall of man, or original sin. Again, the snake is used as an emblem of the devil, in allusion, probably, to Revelation xii. 9: 'And the great dragon was cast out, that old serpent, called the devil.' The figure is generally drawn in the form of an enormous crocodile, or hideous lizard.

The virgin, trampling on the head of the serpent or dragon, is the usual figurative manner of representing the Conception. The chalice is the sign of the priestly order, because the cup was forbidden to the laity, and only received by the priests. With a snake or scorpion in it, it is usually the attribute of those saints who are said to have drunk off poison without being affected by it, as St. John the Evangelist and St. Benedict.

I recollect the late lamented Sir Henry De La Beche telling me that in Jamaica, when the fowls go to roost, the young chickens always take up their position at the end of the branch furthest from the trunk of the tree, the oldest birds occupying that part of the chosen branch which is close to the trunk; the reason of this being, that the snakes frequently, in the stillness of the night, glide up among the branches of the trees, and along the trunk. As the first birds they would attack would be those nearest the trunk, these crafty old sentries, piquet themselves a night-guard over the tender

and inexperienced chicks, whom they have, with a wonderful instinct, posted at the point furthest away from danger, viz. at the extremity of the branch. Fowls are very wakeful creatures; a very little noise will cause them to set up their 'cluck, cluck;' and we have often thought, that if made to roost in the area of a London house, they would give the alarm should any person attempt an entry in that direction. Geese, as we well know, once served an important turn to the Romans in olden time, giving an early alarm of the approach of the enemy.

Another curious, and to me inexplicable point in the instinct of birds, is this: it is mentioned in that most interesting book of the great observer of the habits of animals, the Hon. Grantley Berkeley. In 'The Reminiscences of a Huntsman' he writes:—

'When the electric wires *were first put up*, a vast number of birds, which in windy weather fly swiftly and low, killed themselves in their flight by concussion with the wires. These victims consisted chiefly of golden plovers, black game, grouse, woodcocks, snipe, partridges, &c., and occasionally wood-pigeons, pheasants, and a few other birds; but since the wires have been up, now a space of some years, the deaths by birds flying against them have considerably decreased.'

Mr. Neil, who is much occupied with railways, tells me that it always happens where wires are placed on the poles, in situations where they never have been erected before, that many dead birds are picked up, killed by flying against them; but this only for a few weeks. When the wires have been up some time, the birds avoid them: this looks like profiting by experience.

Next, as to the skin of the snake. The patterns

and structure of the skin vary in each tribe of snakes. In some parts of India the skins of snakes are used for ornamental clothes, on account of their uncommon beauty; and being extremely rare they are valued in proportion. Several years ago Dr. Russell wrote a book on the snakes of India, his object being to show Europeans which snakes were poisonous and which not. The native Indians are skilful colourists; and he took native artists into the woods with him, to colour the snakes directly they were killed. These artists were not good hands at perspective, so they have drawn all the snakes quite flat, but the colours are amazingly like nature. The snake requires no tailor when, after remaining under some stump all the winter, he comes out to enjoy the bright sun of a spring morning, and thinks that his old, dirty, last year's coat is much too shabby to be worn any longer; he therefore literally casts it off, and, lucky fellow, finds a new one underneath. Every one is familiar with the appearance of this cast-off garment; but if we examine it carefully, we shall ascertain a curious and interesting fact, namely, that the eyes of these beasts, which, not being protected by eyelids, are always liable to injuries from the thorns and bushes among which they creep, are defended by a hard and firm membrane, which, however, is transparent, and forms a complete and close-fitting protection for these delicate organs.

Just before a snake casts his skin he is, on this account, nearly blind, as there are then two membranes over his eyes, the old one, not yet gone and now become opaque, the new one underneath not yet quite formed. At this period, too, they are always sleepy and out of condition, and if in confinement not unfrequently die.

The same poor man whose unfortunate death we have above recorded remarked to me, in one of my visits to the gardens, not long before his death, that one of his snakes (which he pointed out to me) was very sickly, and that he was afraid he should lose him, as he was 'casting his coat unkindly.' It was, in fact, peeling off in irregular scales, some quite detached, some still adherent; whereas it ought all to come off as perfect and unbroken as a glove from the hand. If this snake had been at home among the brushwood and rough grass of his native jungle, instead of in a smart mahogany cage with plate-glass windows, he would soon have got rid of his encumbrance by pushing himself between two conveniently-situated obstacles.

I have read that a Hottentot convert, when holding forth to his brother blacks, used this fact of the snake's changing his skin, as a simile of the immortality of the soul. 'When,' said he, 'we find the skin, we do not call it the serpent—no, for we know it is alive, and has only cast its skin: the serpent is the soul, the skin is the body.'

Snakes in captivity are subject to a disease which kills many of them; it is a peculiar fungus-like substance which grows upon their lips, and this fungus sometimes grows to an enormous extent. No cure is known for it, nor, indeed, if we did know a cure would it be easy to apply a remedy. Who would undertake to doctor a cobra's teeth? and even a boa-constrictor would be an awkward patient. I understand that the snakes at the Zoological Gardens at Bristol are never troubled with this disease: this is a very remarkable fact. It is curious, also, that most of the animals breed better at Bristol than in London. Our London gardens are most un-

favourably situated, for they are upon the London clay, and are much subject to fogs. As regards snakes' skins, Mr. Quekett kindly showed me two specimens, one of the common English snake, the other of the boa, in which the blood-vessels had been filled with red-coloured injection. I could hardly believe that a snake's skin was so vascular till I saw these preparations. Being fully extended, the scales were seen separated one from the other, a wise arrangement to allow extension when the animal has fed. These scales were in an hexagonal form, and the blood-vessels were also of the same shape: the points of the hexagons formed by the blood-vessels corresponded to the centres of the scale hexagons, forming a most beautiful transparent pattern, much like a first-class glass window. In the common snake the peculiar leaden hue of the skin was beautifully preserved.

In the *rattlesnake* we find the skin performing a new function. I say the skin advisedly, for the rattle of this snake is composed of a hard horny material, similar to the common skin hardened. This rattle is composed of links, fastened together by a most peculiar and beautiful joint, which I wonder has never been applied to the arts. I here throw out the suggestion, which may be of use to some one. I showed Mr. Hancock, jeweller, of Bond-street, the exquisite neatness and workmanship displayed in the vertebræ or back-bone of the snake, and he promised to make me a chain after the model. He found that the little prominences of bone projecting naturally from each vertebra would interfere with its being generally adopted, as they would be always catching in things. Still a snake back-bone modelled in gold would make a pretty watch-chain or bracelet.

When examining the cast-off skins at the Zoological Gardens, we observed some white-looking substance in a box. This is the dejecta of the snakes. It is a perfectly white substance, looking very like plaster of Paris, and is composed of nearly pure uric acid. It is bought by a doctor (I imagine a chemist) for the high price of nine shillings a-pound. What he can do with it is as yet a mystery to me, not to remain so long, I trust. Some of these pieces were well marked with circular depressions, the casts of the lining membrane of the snakes' intestines. The coprolites, the dejecta of the ancient ichthyosaurus and plesiosaurus, were marked in this way, as described by my father in his Bridgewater Treatise. I was much pleased to find such a capital modern illustration of this phenomenon. When in a herbalist's shop in Covent-garden, I observed a large glass bottle nearly full of common snakes of all sizes and ages, varying in price from ninepence to two shillings. I found that my friend, 'the doctor,' had been here too, and that he bought many snakes. What he did with the snakes the herbalist could not tell me, but he imagined he boiled the oil out of them, and mixed it up with some kind of ointment. In one season 'the doctor' was supplied with over thirty pounds *weight* of snakes. Most of the snakes supplied to London come from Harrow and the woods to the north of London.

The man also informed me that he sometimes sold vipers for some medicinal purpose, but they were 'nasty customers,' and he did not much like having them in his shop. In former times vipers were much used in medicine. In a curious old book entitled 'Physico-Theology; or, A Demonstration of the Being and Attributes of God, from his Works of Creation, being the

substance of sixteen Sermons preached in St. Mary-le-Bow Church, London, in the years 1711 and 1712, by W. Derham, Canon of Windsor,' I find the following among what he calls 'the large notes.' 'That vipers have their great uses in physick is manifest from their bearing a great share in some of our best antidotes, such as Theriaca * Andromachi and others; also in the cure of Elephantiasis and other like stubborn maladies, for which I shall refer to the medical writers. But there is so singular a case in the curious collection of Dr. Ol. Worm, related from Kircher, that I shall entertain the reader with a translation of the passage. Near the village of Saffa, about eight miles from the city Bracciano, in Italy, he saith there is a cavern commonly called La Grotta del Serpi, big enough to hold two men, perforated with many pipe-like holes after the fashion of a sieve, from which a great number of parti-coloured snakes come forth at the beginning of the spring of each year; none of these snakes, it is said, are imbued with the power of poisoning.

'In this cave they are accustomed to expose persons afflicted with elephantiasis, leprosy, paralysis, diseases of

* The word Theriacum is often used in the present day in prescriptions, and when the chemist reads it, he knows 'treacle' is meant. I find in an old dictionary, 'Theriacum, good against the biting of vipers, or other venomous beasts, either because it is an antidote to poisonous beasts, or because it is made from their poison, from a wild beast, a "viper."' The original preparation, was, I imagine, of a viscid nature, and dark colour, and when treacle was invented, they probably wanted a Latin name for it, so they christened it Theriacum, from its appearance. I see there were several kinds of Theriaca in use formerly, as Theriaca cœlestis, liquid laudanum; Theriaca Londinensis, a cataplasm of cummin-seed, bay-leaves, germander, snake-root, cloves, and honey; Theriaca rusticorum, the roots of the garlic.

the joints, gout, &c., who, presently falling into a perspiration from the warmth of the subterranean exhalations, are said to be so divested of all vicious and virulent humours by the suction and licking of serpents casting their sloughs (propullulantium), which twine themselves about the whole of the body of the sick man, that this treatment having been applied for some time, they are at length restored to perfect health.'

This cave Kircher visited himself. He found it warm and every way answering to the description he had of it. He saw the holes, and heard a murmuring hissing noise in them; but although he missed seeing the serpents, it not being the season of their creeping out, yet he saw great numbers of their exuviæ or sloughs, and an elm growing hard by laden with them. The discovery of this cave was by the cure of a leper going from Rome to some baths near this place; who losing his way, and being benighted, happened upon the cave. Finding it very warm, he pulled off his clothes, and being weary and sleepy, had the good fortune not to feel the serpents about him till they had wrought his cure. Now this story is pretty clear. The cure was put down to the snakes when it was due to the hot vapours, possibly containing sulphur, for the cave is in a district abounding with hot volcanic springs and cracks, from which issue all sorts of vapours, the results of volcanic action. The snakes found out this cavern to hybernate in, for it is particularly remarked by Kircher that they are most abundant in the beginning of the spring. They had hidden themselves in the warm cracks all the winter, and coming out simultaneously in the spring would appear in great numbers. Again, 'the elm laden with the sloughs' testifies to this fact, for they shed their old winter coats previously to

dispersing themselves over the country for the summer season. A continued repetition of medicated vapour-baths provided by nature herself would possibly cure many of those afflicted with the various diseases mentioned, particularly the gout, the skin and joint cases, and the snakes got the credit for the cures. From the following passage it appears that vipers, in Dr. Meade's time, 1745, were used frequently by apothecaries: 'Whosoever reflects on what has been said on this head, will very readily acknowledge that our physicians deal too cautiously or sparingly with a remedy which may be applied to very good purposes, when they prescribe a few grains of the powder of dried vipers, or make up a small quantity of their flesh into troches,* whereas that service may really be done in this way, the patient ought to eat frequently of viper jelly or broth; or rather, as the ancient manner was, to boil vipers and eat them like fish. If this food will not go down (though really very good and delicious fare), to make use at least of wine in which dried vipers have been digested two or three days in a gentle heat, from which I have seen very good effects in obstinate Lepra (a skin disease): or lastly, where wine is not convenient, to take either the powder, or good quantities of the viperine salt, in which alone the virtue of all medicines made from this creature resides. And therefore the salt of any other animal which is still more pungent and stimulating than this, is yet a more powerful remedy in dry and scaly leprous eruptions, which may without any inconvenience be given in the form of a tincture made with spirit of wine, *vide* Pharmacopœia, London.' Æsculapius, the god of medicine, is generally represented with a rod

* Lozenges.

wound round with two snakes, because they were supposed by the ancients to contain many medicinal virtues. He is also represented on ancient Greek coins with a large matted beard, and a knotty stick in his right hand, a symbol of the difficulty of his art.

The crow, too, owes his black colour to Æsculapius, for his mother, the nymph Coronis, had a tiff with his father Apollo, who killed her then and there. Apollo, sorry for the murder, changed the crow's feathers, which were white before, into black, that he might mourn for the death of Coronis.

Even in our time snakes are used medicinally. We read in Notes and Queries: 'Many Cambridge people still remember an old man called the Duke of York, who earned his living by sitting on the steps of King's College and exhibiting to the strangers, who went to see that far-famed building, live specimens of the common English snake, which abounds in this neighbourhood. This man added to his earnings by selling the sloughs or cast-off skin of these reptiles as sovereign remedies for all pains in the head when bound round the forehead and temples. My informant has frequently seen him dispose of them for this purpose.'

When in the woods at Weybridge, near London, a boy told me he had just killed an adder, but he had thrown away the body. He showed me the fat he had preserved, and which he reserved 'for cuts, burns, &c. I do not imagine that 'adders' fat,' 'goose grease,' and other popular formulæ for animal ointments, are quite as efficacious as the ointments of the Pharmacopœia; at all events, they can do no harm if used before they become rancid. The days of ointments are now passing away; lint, wet with water and covered with oiled silk, being generally more healing and more soothing than greasy applications.

After the operation of shedding his skin, the snake recovers his lost spirits, and glides about as if proud of his personal appearance. Virgil observed, and has recorded this fact in the following beautiful lines:

'Cum positis novus exuviis, nitidusque juventâ
Volvitur, aut catulos tectis aut ova relinquens,
Arduus ad solem et linguis micat ora trisulcis.'*

This operation of skinning is performed by man in a much more clumsy way than by nature. This has been described by Captain Stedman, and we insert it here that our readers may appreciate the difference between nature and art. The gallant captain had, with some difficulty, managed to kill a large boa in a jungle on the border of a river in Surinam: the brute measured twenty-two feet seven inches, though the natives declared it to be a young one. He says: 'We now secured the snake by passing a rope round over its head and towed him, at the end of the canoe, to the shore; here, upon due consideration, it was determined to have him skinned, for the sake of the oil. In order to effect this purpose, the negro David, having climbed a tree with the end of a rope, let it down over a strong forked branch, and the other negroes hoisted up the snake and suspended him from the tree. This done, David, with a sharp knife between his teeth, now left the tree and clung fast upon the monster, which was still twisting, and began his operation by ripping it up and stripping down the skin

* 'When he, renewed in all his speckled pride
Of pompous youth, has cast his slough aside,
And in his summer livery rolls along,
Erect and brandishing his forky tongue,
Leaving his nest, and his imperfect young,
And, thoughtless of his egg, forgets to rear
The hopes of poison for the following year.'—DRYDEN

as he descended. Though I perceived that the animal was no longer able to do him any injury, I confess I could not, without emotion, see a man stark naked, black, and bloody, clinging with arms and legs round the slimy and yet living monster. This labour, however, was not without its use, since he not only dexterously finished the operation, but provided me, besides the skin, with above four gallons of fine clarified fat, or rather oil, though there was wasted perhaps as much more.' The adventure was concluded by the negro spectators making a grand feast on the body, and very good it was, no doubt.

Virgil, in the lines quoted above, mentions the eggs. There is often present in the minds of people who are afraid of objects of natural history, a very vague and obscure idea of the mode in which the said objects of their alarm are propagated. I recollect showing, on one occasion, a dead bat to a schoolboy of this character, who, standing as far off as he could without pretending to be alarmed, and holding his handkerchief to his nose, asked in the most innocent manner what colour bats' eggs were. This same timid youth, when I suddenly presented a coiled-up hedgehog to him, exclaimed, 'If you bring that thing near me, I will break it.'

However, though bats don't lay eggs, snakes do. They are generally deposited in a long string, connected together by a sort of viscous matter. I have seen as many as thirty in one string. The mother generally deposits them in a dunghill or heap of decaying vegetable matter, and gives herself no more concern about them. The shell of the egg is of a beautiful white colour, like a common hen's egg, and feels like a very soft white kid glove. If we cut open these eggs just before

they are hatched, the young snakes will come out quite lively and attempt to escape. I tried this experiment last summer, and I have been credibly informed that a gentleman, fond of natural history, while taking a ramble on the coast of Essex, killed a viper full of eggs. He took out his penknife and let out a string of eggs, fourteen in number. In each of these was a young adder, perfectly formed, and enveloped in a glutinous fluid. The little creatures, although they had never seen the light before, raised themselves up and evinced an inclination to bite, an absurd proceeding on their part, as they soon afterwards ended their short lives in a bottle of spirits of wine.

Hens' eggs, we know, are good to eat, but I never tried a snake's egg. I may, however, say with the small boy in the street, 'I knows somebody wot has.' Some years ago, I obtained several eggs of the common English snake, and put them on a shelf of a greenhouse to see if the heat of the sun would hatch them. One morning I found several of my eggs gone; everybody denied touching them. At the same time a certain young lady, then an inmate of the nursery, was suddenly taken ill. The doctor was sent for, but was puzzled to ascertain the cause of the illness. At last the confession reluctantly came out from the sobbing culprit, that she 'had eaten some large sugar-plums she had found on a shelf in the greenhouse.' She had, in fact, made a repast on the snake's eggs, under the delusion that she was robbing the cook of preserves put out to dry. The young lady aforesaid would, I think, now feel uncomfortable if her partner at a ball-room supper, in picking out the nice bits of egg from a lobster salad, should, by way of keeping up the lagging conversation, hazard

the observation, 'Pray did you ever try a snake's egg?'

In May, 1857, the body of an enormous boa-constrictor was sent to me from the Zoological Gardens, at Bristol, for examination, previous to its being made into a skeleton by Mr. Flower, articulator to the Royal College of Surgeons. This snake contained from forty to fifty eggs, each about the size of a large hen's egg. I could find no cause for its death, and agree with my friend Mr. Coulson, of Bristol, that the possible cause of the death of the animal was, that it wanted to lay its eggs and had no proper place provided for that purpose. This snake was sixteen feet long, and had been in the Bristol gardens seven years. Mr. Flower has now made a skeleton of it as white and as beautiful as that under the glass case in the College Museum.

Snakes may be broadly divided into two classes—the venomous and the non-venomous. It is of great importance to be acquainted with some general external appearances by which at a glance we may be enabled at once to say whether a snake may be handled with impunity or not. Thus, in the non-poisonous species we find, for the most part, the form of the head and body cylindrical and the scales comparatively small. The tongue, which is generally protruded when the beast is alarmed, in order to intimidate the bystander, is thick and short when compared with the tongue in the poisonous reptile; this is well exemplified in that most harmless, yet most persecuted, of the snake family, the blind worm, or, as it is sometimes called, the slow-worm.

In the venomous species, on the contrary, we find the head and body flattened, the head particularly broad, and the neck behind, in consequence, narrowed in a

marked degree. They have, moreover, an unmistakably ferocious aspect (as though conscious of their powers), which announces their malevolent nature. When irritated or alarmed, these poisonous beasts assume an attitude of defiance, whereas the harmless snake generally seeks safety in flight.

I cannot here refrain from observing how very careless artists and jewellers are in making their snakes' heads, whether the snake be intended as an ornament for a lady's wrist or a monster bronze python on a marble pedestal. These artistic snakes are like nothing ever created; witness the head of the dragon on the parade in front of the Horse Guards. Certainly the artist must have searched a long time before he could have found a model dragon; but, nevertheless, this brute's head bears no resemblance to anything which creeps or flies. He might surely have found some snake or lizard whose head would have been hideous enough for his purpose, and certainly more like nature than the nondescript placed there to astonish, and doubtless frighten the public.* Who ever saw a lion's head door-knocker bearing the least resemblance to the noble head of the king of the beasts? or a bear's paw on a hammer-cloth like the paw of the most miserable representative of the race who was ever slaughtered for bear's grease in Oxford-street?

A most marked instance of this want of observance is to be seen, '*I have been told*,' in the fountain erected to the great father of natural history, Cuvier, outside the gates of the Jardin des Plantes, at Paris. Here is represented, first, an anatomical impossibility, viz., a crocodile turning his head at right angles to his body;

* There is a good specimen of an ideal flying dragon placed as a weathercock on the steeple of Bow Church in the city.

secondly, a zoological absurdity, viz., a walrus, a graminivorous rather than a piscivorous animal, holding a fish in his mouth, and that a fresh-water fish. Surely Cuvier, if he could see his own fountain, would be much pleased to observe the good use that had been made of his investigations into the secrets of nature by the artist.

When in a plaster of Paris shop near Drury-lane, I saw a magnificent cast of a lion's head, which, I was informed, was intended as a study for artists. Upon examining the teeth, I found that the sharp and formidable canine teeth were certainly not like those we see in a lion's mouth. I mentioned this, and was told that it certainly was a cast from nature, *but that most likely the modellers had touched up the teeth afterwards.* What a pity it is these worthies will try to improve on nature. The molar teeth were quite copies of nature: they had not been 'touched up.' If the reader ever goes to the new and magnificent cattle-market at Islington, let him notice the lamp-posts. Models of the heads of oxen in iron are affixed to the upper part of the posts, but, strange to say, they are all about as unlike oxen's heads as it is possible to imagine. The reason is, I suppose, that in this neighbourhood an ox is rarely seen, and the artist had no opportunity of studying a living animal, from which he might model. Again, in a monument to a veterinary surgeon, I have seen a horse's head, or what is intended for a horse's head; could the poor man come to life again, I doubt if he would recognise the head of his favourite animal on his tomb.

Human hair is above all things best calculated for making models of some kinds of dark-coloured snakes. I have observed in Farrer's shop in Regent-street, where they work up hair into all sorts of devices, several very

good models of snakes. Black, white, and brown hair being intermixed, give exactly the appearance of the common viper. One hair snake, in particular, has its marks perfectly correct, whether by design or accident I know not, but there it is, a model of a viper, only unfortunately it has the ideal head fashioned by an unobservant artist. A shop close by presents some beautiful bronze models of snakes coiled up, which, being heavy, are intended for paper-weights. These are no ideal snakes; they are, I am certain, casts from the original; and I have heard that lizards are put into plaster of Paris alive and left to die there. When dead the plaster is put into a furnace, and the body of the lizard being consumed is shaken out in the form of powder, through a hole made for the purpose; the metal is then poured in, assuming, of course, the accurate shape of the lizard. I have in my possession a sprig of common English prickly furze made in this way, and also an electro-plated hollow model of a toad. I am certain, from marks in the model, that the metal was deposited on the actual body of the toad, and also that in this case the toad was dead before operated on.

Silversmiths are not always very careful about their models. I once saw on the top of an enormous silver dish, intended for a haunch of venison, two deer modelled in silver. I was sorry to see how these deer had been imagined by the artist: their legs looked dropsical, and their bodies like the bodies of cows, clumsy, and devoid of that grace peculiar to the deer tribe. As an offset to these, I have seen in Mr. Elkington's window a beautiful bit of presentation plate, made by an artist who took the animal itself as a model. It is a palm-tree under which stands a giraffe. The limbs and shape of

the animal are perfect, and he has hit off the great peculiarity of the giraffe, the long black prehensile tongue which the animal uses to pull down the leaves into his mouth; even the tongue itself is a perfect model of nature. Quære. Were giraffes ever used as beasts of burden? I have seen an ancient picture in the palace of the Luxembourg, where a giraffe is represented being led by a man, and upon its back is a package fastened with ropes.

I have also seen a pretty idea; viz., the model of the merrythought bone of a bird made in gold with a pin attached to it so as to form a brooch. In Mr. Hancock's shop, too, is a capital group in silver, of the death of a fox. It was made as a testimonial to Lord Forrester by the members of the Belvoir Hunt; it represents an incident that really took place. A fox had given the hounds a remarkably long run, and at last escaped into a tree. The whipper-in got up the tree, and succeeded in driving the fox down, not, however, to be killed, for he made his escape after a second severe gallop. The horsemen, horses, and hounds are all perfect; so also is the fox, who is up in a tree concealing himself behind a branch. The head, with the expression peculiar to a fox, has been hit off exactly by the artist.

Lastly, in the city—a very proper place for it—I have seen a capital silver soup tureen in the shape of a turtle. The great sprawling silver turtle is placed on the table, his carapace, or upper shell is lifted off, and his body is found to contain soup fit for Jove himself.

Nature, frequently prone to produce in inanimate substances models of her own living creations, has produced a plant that resembles a snake in a most remarkable manner. Some four years ago I received a draw-

ing, said to be that of a cauliflower, from a gentleman who kindly forwarded it to me. The history of this cauliflower accompanied it; it is as follows:—'Sitting one day, in the year 1848, in the Palazzo Buttera in Palermo, which opened upon the orangery, a lady walking there exclaimed that a snake was in her path. We rushed to the rescue, and killed the snake as it retreated upon a bed of small cauliflowers. Its head was beaten into the earth beside one of them, which was injured thereby, but we heaped the earth again round its roots, and so covered the snake. Two years afterwards, I saw, in the same apartment, a large glass with something indescribable floating in it, when the same lady said, "Don't you remember, when you were last here, killing a snake in the garden? that is the cauliflower at whose roots you smashed its head, and there you see the snake almost as you left it, and in its natural colour, but found transformed into the vegetable substance of the plant. We watched its marvellous growth, and then preserved it in spirits, after an artist had made an accurate drawing of it."'

I confess I was surprised at the story, and put the drawing away: but a few days ago, passing through Covent Garden, I suddenly found the explanation of this extraordinary phenomenon. Growing in a pot was the fellow specimen to the Palermo snake cauliflower, and this a simple house-leek (*Sedum Commune*), which in certain stages of its growth remarkably resembles a snake; but consider for a moment, how is it possible that a snake should be converted into a vegetable substance such as the cauliflower? for where did the bones of the snake go to? where the skin? how could a cauliflower mould itself into the narrow skin of a snake

which had not even an opening in it, and which would, under an Italian sun, become decomposed in a few hours? There is, however, a genuine case of a living creature becoming converted into a vegetable. It occurs in a caterpillar that lives in New Zealand and in Australia. There are several specimens at the College of Surgeons. We see a caterpillar as hard as if it was carved out of wood; and from it is growing a long stem. The history of it is as follows. The caterpillar eats a fungus, or the sporules of a fungus, and these immediately begin to grow in its inside. The beast feels uncomfortable, and possibly thinking it is going to turn into a chrysalis, buries itself in the ground, and there dies. The fungus goes on growing and absorbing the entire contents of the skin, taking the exact form of the creature. Having done this it throws out a shoot, and this always at a certain fixed spot, namely at the joint at the back of the head. My friend Mr. Quekett has kindly shown me many specimens, and has explained them to me. This caterpillar is found also in China, where it is used as food.

A most marvellous snake was brought to the village of Islip, my father's parsonage, for exhibition, the charge for seeing it was one penny. The handbill was as follows:

'To the lovers of natural curiosities. Just arrived, one of the largest Hottentot adders ever brought into England, being one of the most curious species in nature. A native of the Hottentot country, and that quarter of the globe alone, it has been well denominated the Hottentot adder, from the fact of its being a most ferocious animal, and attacks the poor Hottentot natives when on their way home from market. This singular curiosity is upwards of three feet in length, having a very curious tail turned round, is supplied with four feet, and on each

foot five hooks, and is beautifully scaled like a salmon. The face resembles that of a human being, and has a fan under the jaw, with which it fans its victims to put them to sleep. It was brought in a vessel to Liverpool, where it was bought by the proprietor, who now goes round to exhibit it to the public for their inspection.'

This Hottentot adder was a wonderfully ingenious composition. The head was made of an eel's skin, and into the forehead were inserted the sharp hooked bony spines from the back of a common skate. Two staring glass eyes were fixed in, giving it a hideous appearance: the mouth was made of the jaws of the skate, so common in museums. The feet were those of a tortoise, the tail that of a skate, covered with spines, and was arranged in an elegant curve. The proprietor did not seem at all aware that his animal was not the skin of a real creature.

One of the country folks who went to see this exhibition, shortly afterwards, knowing that I was fond of such things, sent me the following letter, together with a kitten that had six legs. It is a literary curiosity. 'Sir. I hope you will cuse the liberty in Wrighting But By graite chance I drapped a Cross the kitn I have sent to you. I shoed it to Mr. B—— who said it was a good Speriment' (experiment).

In the 'Observer' of January, 1852, I find the following story of a 'Hairy Viper,' a good pendent to the Hottentot adder. 'In the Algerian paper we read that a hairy viper was seen a few days ago near Drariah, coiled round a tree. It resembled an enormous caterpillar, and was of a brownish-red colour; its length was about twenty-two inches. The moment it saw that it was observed, it glided into the brushwood, and all

attempts to discover it were unavailing. The authorities of the Museum of Natural History of Paris have sent off orders to their agents in Algiers to get a specimen of this viper.'

We do sometimes find real monstrosities among snakes. As there are monstrous sheep, pigs, &c., so are there born monstrous snakes. We have all heard of the many-headed hydra. In the museum of the College of Surgeons there are two specimens of real veritable double-headed snakes. No. 264 is a little *Coluber natrix*, or common English snake, about four or five inches long. This creature has two heads, each about a quarter of an inch long, united together at one neck. The creature must have lived some time in this condition for, from its appearance, I should consider it to be three or four months old. I should be curious to know if it has a double gullet. Alongside this preparation is another of a double-headed snake, and one description will answer for both. Coming out of the College I saw in a shop-window an advertisement of a play about to be acted, entitled 'Two Heads Better than One.' I wonder if the author took the double-headed snakes for his theme.

Curiously enough, not far from the place where the bottles stand in the College containing the above-mentioned creatures, is the double skull of a child, the upper head being placed upon and inserted into the lower one. The label on this head states that the child was born of native parents in Bengal in 1783, and that it lived to the age of four years. It is an odd coincidence that the label states that the child did not die from natural causes, but from the bite of a cobra di capello.

There are certain anatomical distinctions which are well marked, especially as regards the teeth, by which we may at once pronounce whether a snake is poisonous or not. It would be a dangerous undertaking to examine these teeth in the living subject; let us, therefore, adjourn to the museum of the Royal College of Surgeons, in Lincoln's Inn Fields, and examine with safety the apparatus which the omniscient Creator has given to the class of snakes to enable them to procure their food.

Let us first direct our attention to the skull of the non-venomous snakes, and take for our example the Python, or boa-constrictor, of which we shall find a most beautiful skeleton in the splendid new room of the museum. If we examine the conformation of the head, we shall find that the bones of which it is composed instead of being locked together, as in mammalia, are separate, and retained in their places only by skin and ligaments. The lower jaw is composed of two separate portions, united at what we should call the chin, not by bone, but by a lax membrane. By the above arrangement it follows that, literally, the whole head is capable of enormous distension, and of admitting a body which, apparently, it would by any mechanical means be impossible to stuff in without killing the snake. Between the lower jaw and the upper jaw we do not find, as in our own heads, and the heads of other animals, a 'single' joint straitened and confined in its movement: but to enable the under jaw to be extended to a very great extent, so that the snake shall swallow its prey with ease to itself, an extra bone is inserted between the head and the lower jaw, and thus the 'gape' of the snake becomes incredibly large.

The teeth in the tribe of non-venomous snakes are arranged in four rows in the upper jaws; two corresponding to the rows of teeth in man, two fixed on the palate. These teeth are imperforate, that is, they have no hole piercing them, as in the case of the cobra di capello, presently to be described.

In the boa, the teeth are directed backwards, in such a manner, that, should anything once get into this trap, it would with difficulty be got out again. This was well illustrated in the case of the boa who, the other day, most unserpent-like (for they are the emblems of wisdom among many nations) swallowed the blanket at the Zoological Gardens, thinking, no doubt, that it was a particularly hairy goat. The teeth being directed backwards, the poor beast was obliged to swallow it, in order, as he foolishly thought, to get rid of it. After it had remained in his stomach some time, it was vomited up again; but this time it could pass the barricade of teeth, for it was thickly covered with a layer of mucus, and tightly twisted together by the vain attempts of the muscles of the stomach to digest it.

The same arrangement of the teeth, pointing backwards, prevails in the mouth of the common pike. The following story will illustrate its action.

When at Oxford, I had in my rooms the dried head of a very large pike, captured in Holland and sold at Hungerford Market. It was kept underneath a book-case. One evening, while reading, I was much surprised, and rather alarmed, to see this monstrous head roll out spontaneously from under the book-case, and tumble along the floor; at the same time piteous cries of distress issued from it. The head must be bewitched, thought I; but I must find out the cause.

Accordingly, I took it up, when, lo and behold! inside was a poor little tame guinea-pig, which was a pet, and allowed to run with two companions about the room. With an unsuspecting curiosity Master Guinea-pig had crept into the dried expanded jaws of the monster, intending, no doubt, to take up his abode there for the night. In endeavouring to get out again he found himself literally hooked. Being a classical guinea-pig he might have construed 'Facilis descensus Averni;' it is an easy thing to get down a jack's mouth; 'Sed revocare gradum,' &c., but it is a deuced hard job to get out again.

In vain did the poor creature cry and push with all his might backwards; the more he tried, the faster the teeth stuck into his devoted hide. What was the remedy? I could not get him out the way he got in, that was certain; he must be made to go forwards. I accordingly cut away some of the gills that were left dried on the head, and poking and pinching him *a tergo*, made him come out at the hole where the gullet ought to have been, but, luckily for the guinea-pig, was not. He must have told his two companions of his night's adventure, for although the head was again put on the ground, they never attempted to repeat the experiment of their companion.

To illustrate this point further;—I recollect hearing of a large, hungry boa-constrictor at the Surrey Zoological Gardens seizing the hand of the keeper, who was cleaning out his cage. The snake would have twined his folds round the man's body had he not wisely withdrawn his arm, still however, in the snake's mouth, and shut the glass door on the snake's neck, thus preventing the body, the dangerous part of the boa—who kill their prey

by crushing and not by biting—from doing him any harm. It was only with the greatest care, and by means of wedges of wood, that the hand was extracted from the snake's mouth. It was, however, fearfully lacerated.

I find, in reference to this subject, a manuscript note, to the following effect: it is dated 'The Tower of London, March, 1825,' and is addressed to my father.

'I am sorry to say the calls of hunger made it necessary to feed some of the snakes this morning, but I have desired the keeper to keep back the rest until Saturday, for you at three o'clock. A few days since the largest snake was so hungry that when the keeper went near his cage with a fowl in his hand, the animal darted at the bird, but, missing his aim, seized the keeper's hand, and before he could extricate himself the snake wound round his neck, arm, and body, and threw him on the floor, so as to render him quite helpless. It was with the utmost difficulty that two other keepers got the animal off, which was only effected at last by breaking some of his teeth in the hand of the keeper.'

Be it known to any person to whose lot it should fall to rescue a person from the crushing folds of a boa-constrictor, that it is no use pulling and hauling at the centre of the brute's body; catch hold of the tip of his tail,—he then can be easily unwound,—he cannot help himself;—he 'must' come off. Again, if you wish to kill a snake, it is no use hitting and trying to crush his head. The bones of the head are composed of the densest material, affording effectual protection to the brain underneath; a wise provision for the animal's preservation; for, were his skull brittle, his habit of crawling on the ground would render it very liable to be fractured. The spinal cord

runs down the entire length of the body; this being wounded, the animal is disabled or killed instanter. Strike, therefore, his tail and not his head; for at his tail the spinal cord is but thinly covered with bone, and suffers readily from injury. This practice is applicable to eels. If you want to kill an eel, it is not much use belabouring his head: strike, however, his tail two or three times against any hard substance and he is quickly dead.

In the two stories above mentioned we see that the boa was both ready and willing to eat the man if he could. The following passage quoted from a wonderfully entertaining book, 'Twenty Years in the Philippines, by M. Gironiere,' shows that boas do sometimes succeed in actually swallowing men—a dreadful death for a human being. 'A criminal hid from justice in a cavern; his father, who alone knew of his hiding-place, went sometimes to see him and to take him rice. One day he found, instead of his son, an enormous boa asleep. He killed it and found his son's body in his stomach. The priest of the village who went to give the body Christian burial, and who saw the remains of the boa, described it to me as of almost incredible size. Many other similar facts were told me by the Indians. They told me of men who, whilst passing through the forests, had been seized by a boa, crushed against a tree, and afterwards devoured. It is not surprising that a serpent that can swallow a deer can swallow a man.' In reference to the crushing power of the boa, I find the following note: 'Mr. Wise says, that when at anchor on the coast of Ceylon, a python slid along the cable and entered the mate's cabin. When perceived, some of the crew threw a noose of rope round it, but it contrived to turn itself round a butt of water. By fixing a rope to a

pulley, they, with infinite difficulty, disengaged it from the butt, but not until it had so compressed it that the hoops from the middle sunk to the bottom.' Snakes are sometimes cannibals, and devour one another. I went one wet day to the Zoological Gardens, when I knew there would be few visitors about, and the animals, not having their attention distracted by the curious, would relapse more into their natural state than when disturbed by moving about. When I came to one of the cages in the snake-house, I found it contained many harmless snakes of the common English kind (those with a yellow ring round their neck), and also about an equal number of the French common snakes. One of the English snakes, I found, was murdering a Frenchman, or at least trying so to do; for in the centre of the cage there he lay with his body enormously distended and half another snake down his throat. How he managed to catch the Frenchman by the head I know not, but certain it was the head had gone down foremost: the teeth in the jaws of the English snake, which project backwards, sticking into the scales of the victim, prevented his retreat. I watched them. Every now and then the English snake gave a gulp, and down went a bit more of his living dinner. The dinner did not seem to relish the dark hole he had got into, for at the same time he generally gave a wriggle and a twist, as though anxious to escape, a foolish move, for it only helped his downward passage. This went on for some minutes, the Frenchman gradually disappearing inside the Englishman, till at last more than half was swallowed and the swallower became enormously dilated. I then called the keeper, who took the English snake by the tail and gave him two or three good shakings, hit-

ting him, at the same time, gently against the wall, as if to loosen the contents of his abdomen. The French snake, finding deliverance was at hand, began to coil about, till at last out he fell on the floor, again restored to daylight. He seemed rather stupid, but otherwise none the worse for his trip down what the children call 'the red lane' of his English brother snake. The cannibal, disappointed in his wicked deeds, when put into the cage, glided about with head erect, hissing, and putting out his tongue, apparently in a great rage at having been interfered with. The French snake slunk under some carpet that was in the cage, not wishing to repeat the experiment. It is remarkable that the snake swallowed was about the same size as that of the swallower.

Boa-constrictors will also swallow boa-constrictors.

On the 21st of March, 1841, a python, nine feet long, swallowed his living companion of eight feet, both being apparently in the same state of health. When the keeper made his morning visit he saw but one in the box, and 'he' was distended for about a yard beyond the head to treble his ordinary dimensions, having doubled up his victim in the gullet. In the course of the week much copros was ejected, of which I have a fine specimen, containing scales and small bones of the one swallowed; it illustrates the case of the coprolites with scales from fishes.

Snakes sometimes miscalculate the stretching powers of their stomachs, and swallow not only more than is good for them but even so much that they actually burst from repletion. In the museum of the Royal College of Surgeons are three preparations illustrating this point, viz. No. 308, a small snake from Demerara, with the

stomach exposed, which contains a fish, the diameter of which equals the ordinary breadth of the snake itself. The tail of the snake is rounded and slender, showing it to be a land species, which, occasionally at least, seeks its food in the water. Again, preparation 508 B. A small snake with the stomach exposed, showing a rodent quadruped more than twice the size of the snake itself. The skin of the muzzle has been lacerated where the animal was seized by the snake. Thirdly, we have a snake with a toad projecting from an opening in the belly. I have read somewhere of a boa-constrictor who was found dead having swallowed a goat; the horns of the goat had not been digested and had ulcerated a hole through its side, thus killing it. This story reminds me of the Esquimaux plan of catching Polar bears. A bit of strong whalebone is coiled up and inserted into the centre of a bit of whale's fat and left in the bear's track: the bear swallows it. The fat soon becomes dissolved, and the whalebone springing out straight in the stomach, ultimately destroys the unfortunate animal!

We now come to the poisonous class of snakes, and I will say a few words regarding the venom apparatus as developed in this class. There are, I believe, many persons, who, not having paid much attention to the subject, imagine that the snake stings with his tongue. The real fact is, that no snake ever stung anybody, for he has no sting; a wasp, a bee, and a scorpion, may be said to sting, but a snake can only be said to bite. The one class has stings, properly so called, the other simply teeth. Both the sting and the teeth can only be regarded as transmitters of the poison from the gland above. This difference, also, is to be remarked, that stings, properly so called, are generally situated in the tail of the crea-

ture, whereas the serpent is to be dreaded, not on account of the sting in his tail, for he has none there, but for the teeth in his mouth.

In Holy Writ, however, we find both words mentioned as regards snakes; for example, they occur side by side in the following passage in Proverbs: 'At last it biteth like a serpent, and stingeth like an adder.'

Johnson defines the word 'sting,' as 'to wound or pierce with a point darted out, as that of wasps or scorpions.' Being further inquisitive on this point, I consulted a learned friend, deeply versed in classical criticism, upon the true meaning of the word 'sting.' He kindly gave me the following information: 'The word translated in our version "stingeth," is met with nowhere else. It may, to a certain extent, be explained by its Syriac and Arabic kindred roots; and they convey the meaning of "puncturing," "slitting," or "piercing," so as to cause an open wound; and hence, in a secondary sense, we get the notion of "spreading," "diffusing," and such like words, evidently drawing their meaning from the natural results of such piercing, &c. And it must be, I think, from this manner of construing the Hebrew word, that we find the text Proverbs xxiii. 32, construed into the Latin words, "Sicut regulus diffundet venena." Moreover, our word "sting," is directly derived from the Anglo-Saxon word *Styng-an*, which means to pierce or puncture, without any reference to head, tail, tongue, or any other corporeal part whatever.'

The scorpion is a beast that really stings. He carries his weapon, as is well known, at the end of his tail. The last joint of his tail is hollowed out, and contains two little white glands that entirely fill the cavity. These

glands secrete the poison, and it is conveyed into the body of its enemy by means of a curved, sharp-pointed, horny sting, which he brandishes about at the end of his long and elastic tail. With his sting the scorpion becomes a formidable beast. Luckily, however, his poison is not so dangerous in its effects as the poison of snakes. It is a curious fact that, although the scorpion secretes poison from his body, yet if that poison be introduced through a wound into his body, or into the body of another scorpion, it will prove fatal. This same fact holds good, I believe, as regards snakes. If a snake be made to bite himself, he will die from his own poison. I have an extract from an African traveller, who writes that his native staff, wishing for amusement, and knowing the natural pugnacity of scorpions, got a couple and put them into a hole whence there was no escape. They set to work fighting directly, seizing each other by their claws, and endeavouring to strike with the poisonous tail: at last one got a chance, and with a vigorous lunge stung his adversary. The wounded scorpion, as if aware of the fatality of the wound, resisted no more, but lay down till he expired. The victor, couscious of the fatality of the sting, gave himself no further trouble. The scorpion has been picked out of the numerous creatures which live on the face of the earth to figure among the signs of the zodiac. Virgil, in his flattering address to Mæcenas (see Geo. I.) proposes to make a constellation of him, and suggests, as a good place, that next to the scorpion. He is

'Ipse tibi jam brachia contrahet ardens
Scorpius, et coeli justâ plus parte reliquit.*

* 'Where in the void of heaven a space is free
Betwixt the scorpion and the maid for thee,
The scorpion, ready to receive thy laws,
Yields half his region, and contracts his claws.—DRYDEN.

wise in advising his patron to give the scorpion a wide berth.

In India, scorpions are naturally fond of secreting themselves in holes, and have a nasty habit of getting into Wellington boots. One day an officer was putting on his boot. He felt something in it, and thinking it was a scorpion, he pulled it on instantly and stamped violently on the floor, thus killing the scorpion. He narrated this at mess. A few days afterwards another officer was pulling on his boot, when he, too, felt something in the boot. Recollecting the scorpion story, he thought he could not do better than stamp his foot down also in the boot. He did so, but the experiment did not succeed, as there was no scorpion this time, but a regimental spur with the rowel upwards.

Centipedes also have an apparatus for inflicting a poison wound, but their weapon is neither the sting in the tail nor the tooth in the head. Having so many legs, the pair which are next to the head are adapted to this purpose. They are largely developed, and being curved inwards towards each other, look not unlike two scorpion, stings facing each other. Colonel De Bathe, of the Scots Fusilier Guards, tells me that when encamped before Sevastopol he kept a great many chickens, but he found that his chickens used to die in the most unaccountable manner. One day, however, the mystery was explained, for he saw an old hen running about with a centipede fastened on to her neck: the brute had got tight hold, and had evidently fixed his poison-claws into her flesh. It appeared that the chickens wandering about, pecked at the centipedes, taking them, probably, for large caterpillars, thereby losing their lives. The sting of the bee, again, is peculiar: it consists of 'a horny scabbard, which

contains two bearded darts. This sheath ends in a point near the extremity through which, at the time of stinging, these two bearded darts are protruded. One is a little longer than the other, and fixes itself first, but the other follows immediately afterwards. They penetrate alternately deeper and deeper, taking hold of the flesh with their beards till the whole sting becomes buried in the wound, and then a venomous juice is injected through the same sheath from a little bag at the root of the sting.'—Cat. Royal College of Surgeons. *

As regards the subject of stings, I must not omit to mention the very peculiar poison apparatus which is found in that most remarkable of Australian animals, the Platypus, of the existence of which some of my readers may not be aware. The male animal has a gland on the back part of the thigh, communicating, by means of a duct, with a sharp spur, very like a cock's spur. This spur is perforate like the cobra's tooth, and the secretion of the gland, doubtless poisonous, is thus transmitted into the wound formed by the spur.

The tongue of the snake is generally imagined to be his sting; it is not really so. It appears to be concerned in the function of voice, that is to say, hissing: it also acts as a sort of intimidation to its aggressors, for the snake generally puts out his vibrating tongue and hisses at the same time. This performance alone would make nine people out of ten run away. Upon examining the tongue carefully, we find that it is long, moist, deeply forked, not into three parts, but into two only, and capable of being moved in all directions. When with-

* A good drawing of this may be seen in the South Kensington Museum.

drawn it is received into a sheath, which can either be elongated or contracted. Ovid has observed this bifid form of the snake's tongue. Cadmus, he informs us, was changed into a snake, and during the transformation he endeavoured to speak. In this he singularly failed, because—

'Lingua repentê
In partes est scissa duas ;' *

an uncomfortable sensation, I should think, for poor Cadmus.

Shakspeare uses the word 'sting' frequently as regards snakes. He was a good observer of nature, and therefore probably used it in a poetical sense. This, however, has doubtless led many persons into the belief that snakes really do sting, and thus the popular error is partially accounted for. I subjoin two passages from his writings. The first is certainly very much calculated to mislead ; it is—

'For never tongue
Than thine, thou adder, more severely stung.'

Again, in Hamlet, the Ghost says—

'Now, Hamlet, hear :
'Tis given out, that, sleeping in my orchard,
A serpent stung me.'

Sophocles, however, says nothing about stinging in his play of 'Philoctetes :' he plainly writes it otherwise—

'Αγρὶα
Νόσῳ καταφθίνοντα, τῆς ἀνδροφθόρου
Πληγέντ' ἐχίδνης ἀγρίῳ χαράγματι.†

* 'His tongue was immediately cleft into two halves.'

† 'Me brought to naught by a cruel disease, and wounded by the malignant bite (χαραγμα, any mark, engraved, printed,) of a viper'

The snake, therefore, has no sting; his tongue is harmless, but his teeth are to be feared. Let us say a little more about them. On examining the skull of a venomous snake, we shall find an arrangement of teeth prevailing, different from that above described as peculiar to the harmless tribes. Instead of a long row of imperforate teeth on each side of the mouth, we shall find two teeth only, and these fixed at the extremity of the upper jaw. The arrangement of the palatal teeth, and of those in the under jaw, is the same in both classes. The reason why this row of numerous teeth exists in the one class, and is represented by two only in the other, becomes obvious, when we consider the way in which they severally secure their prey. The non-poisonous snake literally catches his victim, and entangles him in his teeth; whereas the poisonous snake gives a dart, inflicts the wound, and waits quietly till the poison has done its work.

The teeth of the snake are not always found in its mouth. There is a snake in Africa that lives upon the eggs of birds, which he purloins out of the nests. This snake has no teeth proper in its mouth; if he had, they would be much in his way, for they would break the egg when he caught hold of it. Instead, then, of teeth in his mouth, he has them in his belly; and they are formed in a very curious manner. Certain little bits of bone, parts of the vertebra, are made to perform the function of teeth: they project one from the centre of each vertebra. The ten next to the mouth point in a forward direction, the last ten backward. The ends of these bits of bone go through the wall of the stomach, and then become covered with enamel like real teeth; so that, on looking into the stomach, a row apparently of real teeth is seen

at its back part. The egg, when swallowed by the snake, goes down into the stomach, and there meeting with the teeth, is broken against them by the pressure of the walls of the stomach. The contents of the egg being thus broken cannot escape; had there been teeth in the mouth the egg would have broken there, and most of the fluid contents been lost. A preparation exhibiting this structure is in the College of Surgeons, No. 638. It was presented by Dr. Andrew Smith, the present Director-general of the Army Medical Department.

The details of the poison-fangs are so well marked in the subject of this article, the cobra di capello, that I will here describe the mechanism as found in that reptile, and which will apply equally to the whole class of which it forms a well-marked example.

The remark of Horace will well apply to this case, that a thing seen by the eyes is better understood than by the most lucid description in words. He says:—

'Segnius irritant animos dimissa per aures,
Quam quæ sunt oculis subjecta fidelibus.'*

I would therefore advise my readers, who wish to understand these fearful weapons, to pay a visit to the College of Surgeons—a visit which will well repay their trouble.

In the beautifully-dissected head of the cobra in that Museum, No. 2164, we shall find a fine specimen of these poisonous teeth. It requires rather a careful examination at first to see these poison-fangs at all, for

* 'What we hear,
With weaker passion will affect the heart
Than when the faithful eye beholds the part.'—Francis.

they lie, when in a quiescent state, quite parallel to the jaw, concealed in a fold of the gum, which forms a case for them, protecting their sharp points from injury, and preventing them from impeding the passage of food down the throat. Their habitual position is recumbent, protected by a scabbard, if I may use a metaphorical term. We will now remove the sheath, and expose the fangs themselves. In the preparation above mentioned the largest tooth on each side is nearly half an inch long, and the second behind is nearly the same length. If we gently move these teeth when *in situ*, we shall find that they are fixed firmly and immovably into a distinct bone; they therefore follow its movements, and cannot, as is often imagined, move independently. By a peculiar and very beautiful arrangement of the bones and muscles about the head, this bone, with the teeth attached, either lies at rest or is raised instantly into an erect position ready for action; suffice it to say, that its action is very like that seen in the lock of a gun, and that the snake, in opening its mouth preparatory to striking, as a mechanical necessity elevates its fang into the most favourable position for inflicting the blow.

In a preparation near the former, we see the teeth separated from all other surrounding parts, and also in a dried preparation of the skin, with head attached, of a cobra killed in India, and presented to the College by a gentleman formerly resident there. He had seen the brute for several days about his premises, but had been unable to kill it; he was, in consequence, obliged to have wire blinds with thin meshes put on all his windows, fearing that the snake might crawl up the ivy surrounding the house and get into some one of the

rooms. He at last caught him asleep under a tree, and sent him to the museum. The teeth of this snake are remarkably large and well developed, the largest tooth being nearly an inch long: no wonder he was a cause of alarm to those who knew he was about the premises.

We find, on examining this preparation, that, running down the outer side of each poison-tooth, is a canal large enough to admit a pig's bristle. The upper opening of this duct is connected closely with the duct or pipe which conveys the poison from the gland secreting it. The lower aperture is oblique, presenting the form of a narrow elliptical fissure, and is situated at a short distance from the point of the fang. It follows, therefore, that this tooth performs the office of a dagger. It makes an aperture in the flesh of the victim struck, and, while fixed there, the poison is injected through the tooth into the wound, thus ready made for its reception.

The poison itself is secreted by a large gland which occupies nearly the whole of the posterior part of the head; it seems to be simply analogous to the salivary glands found in mammalia, and the secretion is carried on in the same manner. This gland has the peculiarity, however, that it is covered by a strong layer of muscles which, on the snake's opening his mouth, firmly compresses its substance, and forces the poisonous contents out into the wound through the perforated teeth. I have myself made two or three dissections of this muscular covering, in snakes taken out of spirits. Though easily explained when before the eyes, it is difficult to describe. I find in the 'Tasmanian Journal,' 1844, a paper on the teeth and poison-apparatus of snakes, by Dr. J. Agnew, who had many opportunities of

dissecting fresh specimens of snakes. He has very neatly described this muscular coat in the following words :—

'The provision made by nature for forcing the poison out of the gland is at once simple, elegant, and effectual. It consists in a single muscle which rises from a ridge of bone, that sweeps in a slightly-curved line from behind the orbit of the eye in front to the back part of the skull. The anterior fibres of the muscle descend downwards, and somewhat backwards, and are inserted along the upper margin of the gland; whilst the posterior fibres, describing a considerable circuit, sweep round the gland behind to become inserted into its posterior surface or base. When all these fibres, therefore, act in unison, they must necessarily press the gland from behind forwards, and thus force the contents into the duct, to be thence conveyed to the tubulated fang. The *compressor*, or *ejaculator* of the gland would, therefore, be an appropriate name for the muscle.'

I learn from another quarter that, when the snake is about to bite, and is irritated at the anticipation of wounding its prey, these muscular fibres can be seen contracting and expanding with a wave-like motion.

If we examine some of the poison itself, we shall find it to be a transparent fluid, of a yellowish colour, of about the same consistency as the human saliva: it has a sharp taste but no odour.

I have had the opportunity of examining some recent poison from the head of a large puff-adder, one of the most poisonous of snakes. It had been dead about four days. Upon turning up the pouch or fold of gum by which the poison-fangs are covered when in a quiescent state, I discovered a quantity of this thick yellowish poison

saliva. This saliva I placed under the microscope; it revealed a few fine spicula or hair-like crystals, and which, as the fluid containing them dried, became more apparent. I then made a section of the duct, but the spicula were fewer in number. Anxious to obtain more perfect specimens, I examined the tooth itself, and in the hollow was a firm white-looking substance, easily pushed out by means of a bristle: this proved to be, as it were, concentrated essence of poison, for it consisted of one mass of the most beautiful spicula. They were scattered about in all positions, and at all angles one with the other. In one or two places I saw bundles of them tied together in the centre as it were by a cord. There is a common mode in London of darkening shop windows on the inside, not by painting them with white paint, but by covering them on the inner side with a mass of the most beautiful crystals. These are made by washing the glass with a 'saturated' solution of sulphate of magnesia or Epsom salts. Having the appearance of the snake's poison in my eye, I happened to pass one of the windows so operated on. The resemblance between the two was very remarkable, so that if my reader wishes to have an idea of the poison under the microscope, let him notice the next 'salted' window he passes.

Dr. Mead, who wrote a treatise on poisons in 1745, also observed these crystals. He writes:—'I have oftentimes, by holding a viper advantageously, and enraging it till it struck out its teeth, made it to bite upon somewhat solid, so as to avoid its poison, which, carefully putting upon a glass plate, I have with a microscope, as nicely as I could, viewed its parts and composition.

Upon the first sight I could discover nothing but a parcel of small salts, nimbly floating in the liquor, but in a very short time these saline particles were now shot out as it were into crystals of an incredible tenuity and sharpness, with something like knots here and there, from which they seemed to proceed.' These crystals can, I believe, be seen also in the poison from a bee's sting.

These preparations of snakes' poison were carefully mounted for me by my brother, as microscopic objects, both in a wet and dry state; but in a few days the crystals had quite disappeared.

Wishing to try whether the poison of this puff-adder still retained its virulent power after the death of the animal, I inoculated both a sparrow and a guinea-pig with it. I obtained the poison from three places—from under the sheath which covers the teeth, from the duct, and from the gland itself. The guinea-pig was fairly inoculated with poison from all three places, but beyond a slight difficulty in breathing, it did not seem to suffer in the least. The sparrow was killed by the poison from the tooth sheath, but remained alive nearly twenty minutes after the first dose. It is not impossible that the poison had lost much of its power in consequence of the progress of putrefaction, for I received the snake in very hot weather, and decomposition had already begun in the body: the poison also might have been partially decomposed, and have thus lost its deadly properties. If the poison had been taken from the tooth immediately on the death of the animal, and had been dried, the results to the guinea-pig would probably have been fatal; for Dr. Christison dissolved a grain and a half of it in ten drops of water, and

introduced it under the skin of a rabbit; in twenty-seven minutes the poor beast was dead.

Mr. Stone, of the College of Surgeons, happening to have some arrows, the tips of which were covered with wourali poison, made so famous by Mr. Waterton's experiments, kindly presented me with some of them, and also a bit of the poison itself, in a lump looking like a bit of pitch. I bought a bird, a thrush, in St. Martin's lane, and having made a solution of the poison in water, placed a drop on the tip of a sharp-pointed instrument and wounded the bird. I waited five or ten minutes but it did not seem any the worse. I then cut off a very small portion of skin of the bird, and placed the poison on the muscles of the breast; in about three minutes the bird began to pant and open its beak, the nictitating membrane, at the same time, coming forward over the eye. In six minutes it suddenly sprang up into the air and fell down dead. This poison had been kept in the College many years, yet it seemed not to have lost any of its efficacy. A post-mortem examination revealed effused blood at the point where the wound was inflicted, as was the case with the rat struck by the cobra (see page 225); the lungs were not gorged with blood, but the heart was full of thick black clots. Animals killed with the poison are not injurious when eaten.

I have also killed frogs with wourali; they take from five to twenty minutes to die. I killed a rat also with it, and continued artificial respiration for one hour and twenty minutes. The rat so far recovered as to be able to crawl along, but it soon afterwards died; I had great hopes I should have recovered it. As Mr. Waterton mentions the fangs of snakes as forming part

of the wourali poison, I placed a solution of it under the microscope, but I could find neither traces of powdered bone, nor of spicules peculiar to the poison itself: it appeared to be composed of vegetable matter.

This poison would have been fatal to the animals in a much shorter time had it been fresh instead of having been made some thirty years ago; even at this length of time it preserves its fearfully poisonous powers. What must they have been when it was freshly made!

All poisonous snakes shed their poison-fangs, but not their other teeth; the reason being, that often, when they catch hold of an animal, the tooth gets broken off. Now if another tooth did not come up in its place, the snake would be deprived of its weapon, whether of offence or defence. In a little bag behind the tooth which is in working order, are other teeth in all stages of development, from that ready to come into work to-morrow to that the size of a small hair. The snakes at the Zoological Gardens frequently shed their teeth, which are found about on the floor of the cage. Not unfrequently, too, they get broken off when a victim is seized, and get swallowed with that victim: they are then passed out in the dung.

Wishing to ascertain whether these shed teeth were poisonous, I inserted underneath the skin of a rat the separate tooth (given me as a separate tooth), and left it in the wound above an hour. It had no effect whatever upon the rat, except to make him hungry. I did not much expect it would have any effect, for there were marks at the top of the tooth, showing that it had been thrown off by absorption, and not broken off by violence. The tooth is simply a poison-conductor, and if the owner had not ejected poison lately through it, it

would, of course, be as harmless as any other non-venomous tooth.

I well recollect a story impressed upon my mind in infancy—but I know not the origin of it, or where to look for it—of a farmer in America having been bitten in his boot by a snake; he went home and died. His son soon 'stepped into his father's shoes;' he died also, and, I believe, a third person also died, having worn the boots. My interpretation of this story is, that 'the boot' was a thin leather mocassin, as is generally worn in America. The snake bit the farmer through the mocassin, and the tooth being ready for shedding, was torn out, and remained highly charged with poison, which poison was emitted by the snake when he made his bite. The second man put on the mocassin, thereby receiving a slight scratch in the foot. He would probably take no notice of this, but continue working; the heat and perspiration of the foot would then dissolve the poison still adhering to the fang, and it would find easy access into the body through the scratch made by the tooth, and the man would die. This might happen a third time, if the dose of poison on the tooth was very strong.

In confirmation of my theory, I would adduce the fact that vaccine matter is allowed to dry on to the tip of a lancet. When introduced into a puncture made in the human skin, it is found not to have lost its efficacy; but this vaccine matter must be fresh when first placed on the lancet, or it will not prove to be of any use.

The Scythians must have been aware that this poison of snakes would retain its venomous effects after it had been taken from the animal and dried, for they were accustomed to dip their arrows in it when re-dissolved in

water, and allow it to remain there ready for use. The South American Indians also are aware of this fact; for Mr. Waterton tells us, that 'in preparing that most deadly of all poisons, the "wourali," besides pounding together with certain roots two species of ants—one of which is very large and black, and so venomous that its sting produces a fever, the other a little red ant, which stings like a nettle—he adds the pounded fangs of the Labarri snake, and those of the Counacouchi snake: these he commonly has in store, for when he kills a snake he generally extracts the fangs and keeps them by him.'

The flesh of snakes is not uncommonly eaten by the poor Bushman, and also by the Australian natives. Wandering along their vast deserts, and having but the bow and arrow to rely upon to kill an animal for their dinner, they often go many hours, nay even days, without flesh. The wild creatures soon find out that man is their enemy and avoid him. Great as may be the natural cunning of the savage in the capture of his prey, greater still is the wariness of the wild deer or kangaroo to get out of the way. The puny arrows, without poison on them, of the Bushman would fail to bring down any large animal, it would only go away and die of the wound; he therefore tips his arrow with poison. This poison is easily soluble in the blood of the victim, and his exertions to escape by flight only hasten the operation of the poison; as the motions of the muscles, and the accelerated action of the heart, soon distribute the fatal fluid throughout the system, and the animal quickly falls.

Mr. Campbell, in his travels, narrates that one of his attendant Bushmen was shot with a poisoned arrow

between the shoulders. His head swelled up to an enormous size, and he died with all the symptoms of snake-poison. The arrow was probably armed with poison extracted from the puff-adder or some other poisonous desert snake. Again, Mr. Gironière, in his 'Twenty Years in the Philippines,' tells us that he paid a visit to the Agetas or Negritos—a savage people living in a state of nature, the true aborigines of the Philippines. He was obliged to fly from them under a shower of poisoned arrows. He says: 'On emerging from the forest I noticed a slight scratch and a few drops of blood on the first finger of the right hand, a scratch which I attributed to an accident during my hasty flight: I thought no more of it.' The scratch, however, was determined not to be forgotten: it soon became a serious wound, and nearly cost Mr. Gironière his life. Doubtless, a poisoned arrow had just grazed his finger, and, as his body was in a heated and excited state, had quickly been absorbed.

Sir T. Mitchell, in his interesting book, gives us direct evidence of the Australian natives eating snakes.

I myself once had the opportunity of tasting a snake; a boa-constrictor had been killed by an accident, and came into my possession. I tried the experiment, and cooked a bit of him: it tasted very like veal, the flesh being exceedingly white and firm. If I had had nothing else, and could have forgotten what I was eating, I could easily have made a dinner of it. In November, 1829, my late father, then canon of Christchurch, met in the High-street, Oxford, Black Will—who was then a celebrated coachman, and drove the 'Defiance'—carrying, not a coachman's whip, but tugging along in each hand a crocodile about four feet in length. Will had bought them on speculation in London, and my father

purchased them from him. The first thing he did was to prove (which he never doubted) the possibility of turning the crocodile's fore legs backwards, so as to make a sort of bridle, thus confirming, if indeed it required confirmation, that a crocodile could be so treated. Both the crocodiles were put into hot water: one died in the water, and the other lived but a few hours. They were taken over to the anatomy school at Christchurch, and dissected by the late Dr. Kidd. Both Dr. Kidd and my father, thinking they would never have such a good chance again, agreed that they would taste a little bit of the crocodile, and see whether its flesh was good or not. They did so, and without suffering from the experiment. Many persons assisted at this feast, and the flesh was pronounced to be excellent, much resembling sturgeon or tunny. At that time there lived in the anatomy school, all among the skeletons and preparations, a very old man named William. I don't believe he ever had any other name, for he was always known in Oxford as William. Now this William was the most curious weazen old fellow ever beheld. He wore the old-fashioned knee-breeches, gaiters, and broad-tailed black coat. His face looked exactly like a preparation, and on his little round head (more like a skull than a head) he wore a very old wig. Altogether he looked much like an injected skeleton with clothes on; and I confess that, when a little boy, I had the greatest awe and respect for William, particularly when he let down from its aërial position the skeleton of the man who murdered the lady at Abingdon. This skeleton had a rope attached to it, and it was suspended high up in the air, in the centre of the anatomy school. It was William's favourite lion

and when I went to see him he always let down the skeleton to give a lecture on the beauties of anatomy, and the atrocity of the murder. The rope was just long enough to allow the skeleton's feet to touch the ground, and it used to come down thump on the floor, making its articulated bones rattle again; and then when on the floor, the slightest touch would make it reel and roll about, swinging its gaunt arms in all directions. Little did I then think what labour was in store for me in the shape of 'grinding at the bones' (as studying human osteology is called in medical-student parlance), previous to appearing before the examiners at the Royal College of Surgeons:—but to return to the crocodile. William, with his hands in his pockets, watched narrowly the dissection going on, and still more narrowly did he observe the steak sent away for a gastronomic trial, resolving in his own mind to have, as well as his master, a slice off the crocodile. In the middle of the night there came a furious ringing at the bell, and a messenger from the anatomy school to say that William was dying. Poor William was found with his wig off sitting up in his bed with his hands to his stomach, looking the picture of misery and ugliness. The only answer he returned to questions was, 'Oh that crocodile! oh that crocodile!' It was soon seen what was the matter, and by proper remedies William was cured of his crocodile. In the morning, being now quite recovered, he confessed that, as the gentlemen had taken home a bit of the crocodile to eat, he did not see why he should not have some also, so he had a bit for supper. He found it so good that he had saved his butcher's meat, and made *a meal off it*. He declared, and I believe in all honesty, that he would never again eat crocodile for supper. The reason why

William suffered from the crocodile, and his masters did not, was that William ate enough for five people, and his masters merely had just tasted it for curiosity. That crocodiles can be eaten without injurious results is evident from the following passage from Madden's 'Travels in Egypt:' 'I got a small portion of young crocodile, six feet long, broiled to ascertain its taste. The flavour a good deal resembles that of a lobster, and, though somewhat tougher, it might certainly be considered very excellent food.' The most striking peculiarity in the crocodile is its digestion. In the one I dissected I found several pebbles in the stomach: on each side of the fore shoulder I found a follicle containing musk, or at least a substance which does not differ from it in smell. One weighed two drachms, the other something less. This, in Cairo, fetches a large price, being used as a stimulant. In reference to these stones the Arabs, I understand, say that the crocodile swallows a fresh one at each birthday. Mr. Quekett showed me a box full of pebbles about the size of marbles: these are from the gizzard, or rather from the place where the gizzard was before it was decayed, of that most curious gigantic New Zealand bird, the Dinormis or moa.

The cobra di capello, whose other names are the Nag, El Haje, or Haje Naseler, in Arabic, has received its name, capello, from the appearance it presents when viewed in an irritated state, or when preparing to bite, at which time it bends its head rather downwards, and seems, as it were, to have a hood on. The head is comparatively small, and at a slight distance behind it is a lateral dilation or swelling of the skin. This part can be extended at the will of the animal, and is marked by a

very large and conspicuous patch, resembling a pair of spectacles. This is produced by a thick layer of black pigment underneath the skin, as may be seen in a preparation at the College of Surgeons. At this same place may be seen a beautiful skeleton of a cobra in the act of striking, from which it will be seen that the distension of the skin above mentioned is produced by the ribs below the head being perfectly moveable at right angles to the spine, so that the act of elevating the ribs stretches out the loose skin of the neck, after the manner of a fan.

One would think, from the following lines, that Virgil must have seen a cobra in its well-known menacing attitude. It is a beautiful description of a man killing his sworn enemy, a snake; and the very words he uses express the haste and fright of the one, and the proud inturgescence of the other:—

'Cape saxa manu, cape robora, pastor,
Tollentemque minas, et sibila colla tumentem
Dejice.'* *Geor.* iii. 421.

Our great poet, Milton, also describes this remarkable fact, at the same time starting the supposition that, previous to the fall, the snake

'Addressed his way; not with indented wave,
Prone on the ground, as since, but on his rear
Circular base of rising folds, that towered
Fold above fold a surging maze.'

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* 'Take, shepherd, take a plant of stubborn oak,
And labour him with many a sturdy stroke;
Or with hard stones demolish from afar
His haughty crest, the seat of all the war;
Invade his hissing throat and winding spires
Till stretch'd in length the unfolded foe retires.
He drags his tail, and for his head provides,
And in some secret cranny slowly glides.'—Dryden.

It has often struck me to consider a curious point as regards the mode of progression of the serpent before the curse was pronounced upon him. Milton, in the above lines, tells us how this progression was, but his description seems rather vague. We read in the third chapter of Genesis, 'And the Lord God said unto the serpent, Because thou hast done this, thou art cursed above all cattle, and above every beast of the field; *upon thy belly* thou shalt go, and dust shalt thou eat all the days of thy life.' If this passage be taken literally, it would appear that before the curse the serpent did *not* go 'upon his belly.'

Anxious to obtain high authority on this point, I consulted a learned divine, an old and sincere friend of my father's, who most kindly and candidly informed me that, having looked into commentators ancient and modern, he could arrive at no satisfactory conclusion.

All the pre-Adamite snakes whose bones have hitherto been discovered have certainly the same conformation of vertebræ or back bone, viz. the ball-and-socket joint, as those of the present day; which conformation is expressly adapted to their moving along upon their bellies; and their internal organs must have necessarily been in conformity with their vertebral structure.

If, then, the serpent before the curse progressed by any other means than upon his belly, his structure, especially that of the back bone, must have been different to that proved to have been present by geological researches; in fact, it must have been a different animal altogether.

I cannot here help quoting the following remarkable speculative passage relative to this matter, in which I

find a description of the creature called the 'Nahash.' I find it in a Memoir of the Rev. Robert R. Francis Walker, curate of Purleigh, Essex.

Now there was as we have already intimated, one most superior and beautiful animal (and not improbably a whole genus or family of the same description) among those which Jehovah-God had curiously formed from the ground. Of the original shape or appearance of this animal we are not now informed. The name of it, according to its acceptation in after-times, has hitherto served rather to mislead than to help us in this respect. The name given to it was the *Nahash*, a name which seems to import that its sparkling and variegated beauty resembled that of native copper. It is also most probable that it walked erect. This animal then was *more intelligent* than any freely-roaming animal which Jehovah-God had produced; that is, more intelligent than every other animal.

And now, as suddenly as Moses' rod was changed into a real serpent, so appears the fairest of all animals, the Nahash, to have sunk down at this word of God, into what we henceforth behold, to wit, a serpent's real form and real nature. The change might be as instantaneous as was that of the barren fig-tree, withered by a word from the mouth of the same Jehovah. The name of Nahash may have been perpetuated to the race of serpents from the original name of this animal, in natural remembrance of so momentous an occasion.

Thus the Hebrew language retains it as the common name for serpent. The nahash may have been anything but a serpent before; but its excellency of dignity was now withered below that of every other animal, by the holy curse of God.

The present appearance of serpents, therefore, can supply no adequate, or even distinct notion, of what the Nahash originally was. If many of the more remarkable species of them are venomous, noxious, revolting to human instinct, and naturally, to a proverb, unsocial with human kind, we may conclude, as we have already anticipated, that the original qualities of the Paradisical nahash were the very opposite of these.

He could well understand by the animal-sounding but symbolical sentence, "On thy belly shalt thou go," that he himself, once the soaring "son of the morning," was amazingly degraded into the

meanest and most odious of reptile spirits, and should hence be expressly called "the ancient serpent;" that by the words, "Dust shalt thou eat continually"—he, instead of enjoying those exalted and refined pleasures which he once knew, and some shadow of which even he, perhaps, had hitherto retained; or instead of realizing any of the gratifications he had sought by his subtlety, he should perpetually meet with the reverse, as little agreeable to his strange desires as dust to the serpent's palate.

Upon the whole, however, it is more probable that the curse has a figurative meaning; and that, as explained to me by the gentleman above mentioned, the passage may be thus paraphrased: 'Thy original formation, moving upon thy belly, shall henceforth be a mark of thy condemnation, as it will facilitate the predicated evil,' 'It shall bruise thy head, and thou shalt bruise his heel.' In a similar way the rainbow probably appeared in the clouds to mankind before the flood; but after the flood it was made a 'token of a covenant' that the earth should not again suffer from a flood. The woman, too, would always have brought forth, but after the curse she was to bring forth in sorrow. Upon this I would submit the remark that the words are 'Unto the woman he said, I will greatly multiply thy sorrow,' which would give the notion that even before the curse the sorrow was not altogether absent.

The second part of the curse, 'Dust shalt thou eat all the days of thy life,' may be said to be literally fulfilled in the present day, even though it has (as is most probable) a deeper figurative meaning. That the snake actually swallows much dust when feeding I have frequently observed. His head being of necessity on the ground when he gorges an animal caught on the ground, the dust would naturally adhere to the prey as

it was being gulped down. This fact was more forcibly impressed upon my mind when, examining a box full of the dung of many different kinds of snakes, I found adhering to the dung, and also mingled with it, numerous stones, from the size of a pea to fine sand, which the snake had swallowed when gorging his prey.

These remarks upon the literal meaning of the words quoted, I write with all deference to higher authorities than myself: it is, however, a subject upon which speculations may be harmlessly entertained.

Milton alluding to the cobra's hood, says:—

'His head
Crested aloft, and carbuncle his eyes;
With burnish'd neck of verdant gold, erect
Amidst his circling spires, that on the grass
Floated redundant.'

Further on, when the snake is leading the way to the forbidden fruit, Milton says of him:—

'Hope elevates, and joy
Brightens his crest.'—*Paradise Lost*, Book ix.

From its frequently moving along with the greater part of its body erect, and with its head in continual action, as if looking round with great circumspection, this species is regarded by the East Indian as the emblem of prudence, and they seldom name it without some epithet, as 'royal, holy.' The ancient Egyptians also observing the habits of this serpent imagined that it guarded the place it lived in; accordingly they made it the emblem of Cneph, the divinity whom they supposed to govern the world (ὁ ἀγαθὸς δαίμων), and with this idea represented it in their temples, sculptured on each side of a winged globe.

The cobra was also employed by them as a mark of regal dignity, and is seen on the fore part of the tiara of almost all Egyptian statues of deities and kings, as may be observed on the caps of Memnon and other figures in the British Museum. We frequently see the figure of this serpent in the hieroglyphic records of this wonderful people, where it seems to have two meanings, according to the bend of its body. First, it simply signifies the form and power of the letter S; secondly, it indicates the planets on account of the obliquity of their course, whereas the sun is represented by a beetle.

The cobra still abounds among the rocks and ruins of ancient Egypt, and in its native untamed state (that is, when it still has its poison-apparatus intact) it is regarded with well-founded dread by the inhabitants. It is very fond of getting into houses, or rather mud-huts, which abound in Egypt. The mud cracks with the heat, and these cracks form convenient resorts for the cobra's domicile. We find a passage in the prophet Amos that distinctly alludes to this fact:—'As if a man did flee from a lion, and a bear met him; or went into the house, and leaned his hand on the wall, and a serpent bit him.' Amos v. 19.

It is nearly certain that this is the snake which the ancients described under the name of Cleopatra's asp; and its predecessors were probably the serpents chosen by the magicians of Pharaoh when they imitated the divine miracle wrought by Moses. Genesis vii. 10.

I have heard an explanation of this false miracle as performed by Pharaoh's magicians. They took the snakes tight round the neck, and, by compressing the parts with their fingers, prevented the return of blood from the head, thus producing pressure on the brain,

and for a time insensibility. A snake thus operated on would remain quiet some time on the ground, looking not unlike a rod.

In the book of Numbers we read that serpents were sent to punish the children of Israel: 'And the Lord sent fiery serpents among the people, and they bit the people, and much people of Israel died.' This took place near Mount Hor in Arabia, and as a confirmation of the fact, I find in Herodotus a curious passage relating to the abundance of snakes in Arabia and the plague of serpents. 'Arabia is the last inhabited country lying to the southward, and the only region which produces frankincense, myrrh, cassia, and ledenum. All these things the Arabians gather with some difficulty, myrrh only excepted. They collect the frankincense by burning styrax, which the Phœnicians export into Greece; for flying serpents, small of body and with variegated skins, guard the trees which bear the frankincense, a great number round each tree, &c. As for vipers, they are found in all parts of the world; but flying serpents are found in thick swarms in Arabia, and nowhere else, and therefore they appear to be very numerous.'

From our earliest infancy we have all heard of the snake-charmers of India, who are said to handle these venomous reptiles with impunity; some believed it, some did not. In the year 1850, however, the Londoners had an opportunity of seeing with their own eyes (since the invention of the pseudoscope this, however, has been proved a dubious test) this wonderful performance. We have most of us seen it at the Zoological Gardens; but Mr. Broderip, in his 'Note Book of a Naturalist,' has so graphically described the scene, that I may be pardoned for introducing it here. He says:

'Standing in the open space in the reptile-house, the old Arab said something to the young one, who stooped down under the reptile-cases on the north side of the room, and took out a large deal box with a sliding cover. Having withdrawn the cover, he thrust in his hand and pulled out a large, long "Naia Haje." After handling it, and playing with it a little while, he set it down on the floor, half squatted close to it, and fixed his eye on the snake. The serpent instantly raised itself, expanded its hood, and turned slowly on its own axis, following the eye of the young Arab, turning as his head, or eye, or body turned. Sometimes it would dart at him, as if to bite. He exercised the most perfect command over the animal. All this time the old Arab stood still, passively regarding the operation; but presently he, too, squatted down, muttering some words opposite to the snake. He evidently affected the reptile more strongly than his more mercurial relative, though he remained motionless, doing nothing that I could see but fixing his eyes on the snake, with his face upon a level with the raised head of the serpent, which now turned all his attention to him, and seemed to be in a paroxysm of rage. Suddenly it darted open-mouthed at his face, furiously dashing its expanded whitish-edged jaws into the dark hollow cheek of the charmer, who still imperturbably kept his position, only smiling bitterly at his excited antagonist. I was very close, and watched very narrowly; but though the snake dashed at the old Arab's face, and into it more than twice or thrice with its mouth open, I could not see the projection of any fang. Then the youth brought out a cerastes, which I observed seemed overpowered, as if, as the country people say, something had come over it.

He placed it on the floor, but this serpent did not raise itself like the naia, but as the charmer stooped to it, moved in a very odd, agitated manner on its belly, regarding him askance. I thought the serpent was going to fly at him, but it did not.

'He then went to another box, drew the lid, and took out more snakes, one of which was another naia, and the others of a most venomous kind. Now there were two naias with heads and bodies erect, obeying apparently the volition of the charmers. One of the snakes bit the youth on the naked hand and brought the blood, but he only spat on the wound and scratched it with his nail, which made the blood flow more freely.

'I observed that the charmers only used their own serpents, which they had, I presume, brought with them, and I confess that the impression on my mind was, that they had been rendered innoxious by mechanical means.' Mr. Broderip afterwards makes this observation:—'There is no longer a shadow of doubt that the subjects operated upon by the serpent-charmers at the Zoological Gardens had been deprived of their poison-fangs.' It is therefore pretty clear that these cobras were harmless, and that these Indian fellows, who, as we all know, are the best conjurors in the world, take advantage of the habits of the cobra to gain a livelihood, blinding the eyes of the bystanders by telling them that their music, such as it is, causes the snakes to dance, and that their lives are defended from the poison by some supernatural gift.

I must here add that no doubt these Indian gentlemen are up to the fact that the snake's fangs, although once removed, will quickly grow again, so that a snake whose bite may be innocent to day will, in the course

of a short time, have a fresh supply of poison-fangs, and will become a dangerous customer to handle. If I were a snake-charmer I should look to the teeth of my operatees every other day. I must also beg to add to Mr. Broderip's observations that the Arabs wore red buskins and drawers, with the evident purpose of exciting and teasing the snakes, who can't bear this colour near them, and, as in the case of the common viper, always fly at it when brought in contact with them. Let the reader wave a red handkerchief before the snake-cages in the Zoological Gardens and he will, if they be in an excitable state, see the creatures' attention immediately attracted.

Red seems either to be very attractive or else very disagreeable to most creatures. Fishermen bait for mackerel with a bit of red cloth; and I have read a story of a shark having been attracted by the red frock which a poor little child had on when playing about the sands at the mouth of the Buffalo river. The shark had come close to the shore to eat the entrails of an animal which had been thrown into the sea: the brute saw the child, and made a plunge at it, but providentially missed its aim.

I have requested a friend in India to report to me his observations on the tame cobras. He tells me that the men make a cut under the upper lip of the cobra they wish to tame: they then turn up the lip and expose the parts which secrete the poison, or rather the duct and the reservoir for the poison just above the teeth: this they completely eradicate with a knife, and then apply the hot iron, effectually destroying the parts. A snake thus operated on would be for ever afterwards harmless, as the burnt parts could never recover themselves.

At the College of Surgeons, in the cabinet containing the preparations of the parts of snakes, is a very interesting specimen, which fully explains, further, how these

Egyptian and other serpent-charmers tame their snakes. It is labelled thus:—'No. 651. The skull and anterior vertebræ of a poisonous naja which had been deprived of its fangs, together with part of the short maxillary bone which contained their matrices. This was one of the specimens exhibited by the snake-charmers in India. Presented by Dr. Wallich.'*

In a pretty little paper entitled 'Anecdotes of Serpents,' published by Chambers, we read the following story, fully confirming the idea that the fangs of the charmed snakes are removed:—

'In Madras, while I was there,' says a correspondent, 'this belief (that the charmers can handle poisonous snakes without suffering hurt) received a sad shock by a circumstance which occurred. One of the most noted serpent-charmers about the district chanced one morning to get hold of a cobra of considerable size, which he had conveyed to his home. He was occupied abroad all day, and had not time to get the dangerous fang extracted from the serpent's mouth. In the evening, he returned to his dwelling, considerably excited with liquor, and began to exhibit tricks with his snakes to various persons who were around him at the time. The newly-caught cobra darted at his chin and bit it, making two marks like pin points. The poor juggler was sobered in an instant. "I am a dead man," he exclaimed; "nothing can save me." His professional knowledge was but too accurate. In two hours he was

* It has been suggested to me that if the cobra be irritated and made frequently to bite some object, just before the juggler's performance, the fangs, no longer supplied with poison from the exhausted glands, would be innocuous; I think the experiment would be dangerous, for physiology teaches us that the secretion from many glands, particularly the salivary, is instantaneous under fresh excitement

a corpse. I saw him a short time after he had died; his friends and brother jugglers had gathered round him. "No, no; he only forgot one little word, one small portion of the charm." In fact, they declared that he was not dead at all, but only in a sort of swoon, from which he would recover in seven days. But the officers of the barracks close to which the deceased had lived interfered in the matter. They put a guard of one or two men on the house, but of course the poor serpent-charmer never came to life again.'

Besides showing off these tricks with the cobras, the Egyptian mountebanks have another mode of deceiving the spectators. There abounds in Egypt a very small, but very venomous, snake called the cerastes, of which there are three specimens at the Zoological Gardens. This species of snake these men pretend to handle with impunity, but in reality they procure from Turkey a snake that very much resembles the Egyptian, with this difference, that the former is perfectly harmless and has no horns on its head, whereas the latter is very venomous, and, as we may see at the Gardens, has a little horn projecting on each side from the summit of the head. The use of these horns is probably to act as a sort of bait for small birds, who imagine them to be worms, and thus become an easy prey to the cerastes. Be this, however, as it may, the mountebanks place the spurs of the common lark, or other small birds, on the head of the harmless Turkish cerastes, and handle it as though it were a true native of the Egyptian desert.

There remains, however, another, and that an important point, which must not be passed over in silence. It is, what can be done to save the life of a person who has been bitten by a cobra or any other poisonous serpent? It is within the bounds of possibility (may it not

be so?) that the reader of these pages may be so unfortunate as to be bitten by a snake; my advice to him would be, instantly to suck the wound as hard as he can for some time. Care must at the same time be taken that the skin inside the mouth be perfect and unbroken; for, by a wise provision of Nature, no external poison is an internal poison, and *vice versâ*. Whether the saliva decomposes the poison or not, we are as yet ignorant; suffice it to say, that the poison of the snake, as has been frequently proved by experiment, is innocent when taken into the stomach, most deadly when applied to an external wound, however minute.

M. Humboldt has observed that in some experiments performed with the poison of vipers, one person swallowed the whole of the poison that could be extracted from four large Italian vipers, without suffering from it. In the same way, the poison from the poisoned arrows of the South American Indians can be swallowed without deleterious consequences, provided always that there is no wound on the lips, then it would be fatal. Writing on this point, Fontana, who in 1737 published a book upon poisons, remarks: 'These contradictions reduced me to the philosophical necessity of tasting the venom myself. I did so, but not without repugnance, and, as the celebrated Morgagni observes, I shall advise no one to try it in the gaiety of his heart, lest he should happen at the time to have some excoriation on the tongue, which is a circumstance not always easy to determine.' Fontana tasted the poison himself; I myself have had a dose of it, and would rather not repeat the experiment. He says: 'I could find no taste in it, except of a very insipid liquor.'

If the sucking operation cannot be performed instantly, put on a cupping-glass. This answers the same

purpose, it abstracts the poison from the wound, and, at all events, prevents its going far into the system, and poisoning the blood. The sucking, however, is the safest and most efficient remedy. The African cupping instrument is the horn of a cow. Small cuts are made on the skin, and then the horn is applied, the tip of which is cut off. The operator then exhausts the air, and, finally, he stops the opening in the horn with a bit of wax, which he holds in his mouth for that purpose We all of us recollect the story of Queen Eleanor sucking the poison out of the wound in her husband's arm; and a wise and physiological queen she was; she could not have done better under the circumstances. Ladies are often the best doctors, after all: they were so formerly, it appears, and in many cases prove so even now. So well aware were the ancients of the efficacy of suction in such wounds, that when Cato made his expedition through the African deserts, abounding in snakes, he employed certain native wild tribes, called Psilli, to follow in the rear of the army. These fellows pretended to have a charm against snakes: they were, however, great impostors, for all they did was to suck out the poison from the wound. Knowing human nature, however, they, like wise men, ascribed their cures to certain awful, mystic rites performed over the patients, and, I have no doubt, exacted fees accordingly. It appears that there are to this day tribes in the East who practise these same arts. Savory relates, that when at Rosetta, he was present at a procession, the rear of which was brought up by a crowd of savage-looking outcasts, who held snakes in their hands, and played all manner of tricks with them, to the astonishment of the natives. These fellows were professed curers of snake-bites. I have myself witnessed the good effects

of suction in snake-bites. When house-surgeon at St. George's Hospital, I was called on to treat a boy who had been bitten in two places in the forefinger of the right hand by a viper which he had caught on Wandsworth Common. He had carried it up to London by the tail without its touching him: he then, out of bravado, put it on the table of a public-house, and began to play tricks with it; in an instant it bit him. I ordered him (half-an-hour after the infliction of the wound) to suck it as hard as he could. This he did for nearly two hours. Some slight inflammation of the arm followed, but in four days he was quite well, and went about his usual occupation again. The viper, it being the middle of summer, was in good condition, and on dissecting him I squeezed only two or three drops out of the poison-glands, showing that the boy must have had a full dose of the venom. I have carefully examined all the evidence on record, as regards the most efficacious internal medicine that can be given in such cases, and have come to the conclusion that nothing is so good as ammonia; that is, the common hartshorn, which everybody is so prompt to suggest in fainting-fits. The best form of it is the preparation called 'Eau de luce.' The dose is half a teaspoonful in water, frequently repeated. This eau de luce, be it known, is composed of hartshorn, spirits of wine, and oil of amber. Those whose travels lead them into places frequented by venomous snakes would be wise to carry a bottle of it in their pocket.

Talking the other day to my friend Mr. Frœhnert bandmaster of the regiment to which I have the honour to be attached, he related to me the following most interesting story which is worthy of all credit. Mr. Frœhnert is a most intelligent and observant gentleman, who has

seen much of India, when serving there in another regiment. He said that when travelling over a desolate plain in India, forty miles from Bangalore, he saw three men at some little distance moving about as if something was the matter. He went up to them, and found that they were natives, catching cobras among the rocks and stones, and that the cause of the disturbance was that one of them had been bitten by a cobra. One of his companions, however, had the means to cure him in his pocket, for he took out two small round balls, one of which he applied to the wound, and, at the same time, made passes from the shoulder towards the fingers, that is, in a contrary direction to what the poison taken up by the absorbents would go, with something that looked like a small stick. In about five minutes the sufferer began to get better, and ultimately recovered. Mr. Frœhnert, thinking this very extraordinary, obtained the balls from the man. Knowing that the native Indians are wonderfully quick at changing things, he expressed his doubts as to whether the balls just used were those he then had in his hand, even though he had never let them go out of his sight. The proprietor of them then took an oath that they were the same, the form of swearing being peculiar. He took the tail of the cobra which had inflicted the bite upon the man, and had been killed, and twisted it round a leaf of the betel-nut, and upon this he swore that he was telling the truth.

Some time afterwards, at quite a different place, a man happened to be bitten by a cobra, and Mr. Frœhnert volunteered the use of his little balls and stick. They were applied, and with good effect, and the man soon recovered.

Mr. Frœhnert has most kindly given me the two little balls, each the size of a large pea, and the bit of wood-like material. Upon one of the balls the dry blood of the man who was bitten is still to be seen. The stick I have ascertained to be a little bit of common gamboge, used in our pharmacopœia as a drastic purge: no anti-poisonous virtues have hitherto been ascribed to it. The two little balls I took to the College of Surgeons, where Mr. Quekett kindly examined them for me. We could make out nothing of them but that they were composed of some vegetable material, for vegetable hairs were seen in abundance.

Now, what is to be said to this story? That the natives of India have remedies suited to the diseases of the country is quite certain; certain also is it, as I have it from several persons, that a native doctor can cure where a European fails. Snake-bites are not uncommon in these regions, and it is reasonable to suppose that long experience should have led to the discovery of some antidote to the poison, so fatal to human life. It is an unwise and an unphilosophical act to laugh at and leave unexamined as good for nothing the native remedies of any country, and I am quite certain that there are many substances, particularly in the vegetable kingdom, which are successfully used in the cure of disease by the natives of India and other countries, long experience having taught their value; yet these remedies remain unknown to our Pharmacopœia simply from want of observation on the part of Europeans. It might be said that the men Mr. Frœhnert saw were cheating and wishing to deceive; but yet this seems unlikely, for they were far away from any human habitations, catching cobras, their stock in trade for their performances. A

European was the last person they would expect to see in this spot, and they could not have seen Mr. Frœhnert coming, for he was under a canvass covering to the carriage or cart he was travelling in.

The accident had happened before Mr. Frœhnert came up, and the man was rolling about in agonies when he came on the scene; his arm swollen and useless: it was a case of life and death. Was, then, this the time for a trick? Again, on a second occasion, the balls and stick were used with success. I confess I cannot explain this, but I shall endeavour to test their efficacy by direct experiment. Any how, I shall present the blood-stained balls and stick to the College of Surgeons, with their history appended, for the use of others interested in this subject.

About four years ago I myself, in person, had painful experience of the awful effects of snake's poison. I have received a dose of the cobra's poison into my system, luckily a minute dose, or I should not have survived it. The accident happened in a very curious way. I was poisoned by the snake, but not bitten by him. I got the poison second-hand. Anxious to witness the effects of the poison of the cobra upon a rat, I took up a couple in a bag alive to a certain cobra. I took one rat out of the bag and put him into the cage with the snake. The cobra was coiled up among the stones in the centre of the cage apparently asleep. When he heard the noise of the rat falling into the cage, he just looked up and put out his tongue, hissing at the same time. The rat got in a corner and began washing himself, keeping one eye on the snake, whose appearance he evidently did not half like. Presently the rat ran across the snake's body, and in an instant the latter assumed his

fighting attitude. As the rat passed the snake, he made a dart, but, missing his aim, hit his nose a pretty hard blow against the side of the cage. This accident seemed to anger him, for he spread out his crest and waved it to and fro in the beautiful manner peculiar to his kind. The rat became alarmed, and ran near him again. Again cobra made a dart, and bit him, but did not, I think, inject any poison into him, the rat being so very active; at least no symptoms of poisoning were shown. The bite, nevertheless, aroused the ire of the rat, for he gathered himself for a spring, and measuring his distance sprang right on to the neck of the cobra, who was waving about in front of him. This plucky rat, determined to die hard, gave the cobra two or three severe bites in the neck, the snake keeping his body erect all this time, and endeavouring to turn his head round so as to bite the rat, who was clinging on like the old man in Sinbad the Sailor. Soon, however, cobra changed his tactics. Tired, possibly, with sustaining the weight of the rat, he lowered his head, and the rat, finding himself again on terra firma, tried to run away; not so, for the snake, collecting all his force, brought down his erected poison-fangs, making his head tell by its weight in giving vigour to the blow, right on to the body of the rat. This poor beast now seemed to know that the fight was over, and that he was conquered. He retired to a corner of the cage, and began panting violently, endeavouring, at the same time, to steady his failing strength with his feet. His eyes were widely dilated, and his mouth open as if gasping for breath. The cobra stood erect over him, hissing and putting out his tongue as if conscious of victory. In about three minutes the rat fell quietly on his side and expired: the cobra then moved off and

took no further notice of his defunct enemy. About ten minutes afterwards the rat was hooked out of the cage for me to examine. No external wound could I see anywhere, so I took out my knife and began taking the skin off the rat. I soon discovered two very minute punctures, like small needle-holes, in the side of the rat, where the fangs of the snake had entered. The parts between the skin and the flesh, and the flesh itself, appeared as though affected with mortification, even though the wound had not been inflicted above a quarter of an hour, if so much.

Anxious to see if the skin itself was affected, I scraped away the parts on it with my finger-nail. Finding nothing but the punctures, I threw the rat away and put the knife and skin in my pocket, and started to go away. I had not walked a hundred yards before all of a sudden I felt just as if somebody had come behind me and struck me a severe blow on the head and neck, and at the same time I experienced a most acute pain and sense of oppression at the chest, as though a hot iron had been run in and a hundredweight put on the top of it. I knew instantly, from what I had read, that I was poisoned; I said as much to my friend, a most intelligent gentleman, who happened to be with me, and told him if I fell to give me brandy and eau de luce, words which he kept repeating in case he might forget them. At the same time I enjoined him to keep me going, and not on any account to allow me to lie down. I then forgot everything for several minutes, and my friend tells me I rolled about as if very faint and weak. He also informs me that the first thing I did was to fall against him, asking if I looked seedy. He most wisely answered, 'No, you look very well.' I don't think he

thought so, for his own face was as white as a ghost; I recollect this much. He tells me my face was of a greenish yellow colour. After walking or rather staggering along for some minutes, I gradually recovered my senses, and steered for the nearest chemist's shop. Rushing in, I asked for eau de luce. Of course he had none, but my eye caught the words 'Spirit. ammon. co.,' or hartshorn, on a bottle. I reached it down myself, and pouring a large quantity into a tumbler with a little water, both of which articles I found on a soda-water stand in the shop, drank it off, though it burnt my mouth and lips very much. Instantly I felt relief from the pain at the chest and head. The chemist stood aghast, and on my telling him what was the matter, recommended a warm bath. If I had then followed his advice these words would never have been placed on record. After a second draught at the hartshorn bottle, I proceeded on my way, feeling very stupid and confused.

On arriving at my friend's residence close by, he kindly procured me a bottle of brandy, of which I drank four large wine-glasses one after the other, but did not feel the least tipsy after the operation. Feeling nearly well, I started on my way home, and then, for the first time, perceived a most acute pain under the nail of the left thumb: this pain also ran up the arm. I set to work to suck the wound, and then found out how the poison had got into the system. About an hour before I examined the dead rat I had been cleaning the nail with a penknife, and had slightly separated the nail from the skin beneath. Into this little crack the poison had got when I was scraping the rat's skin to examine the wound. How virulent, therefore, must the poison of the cobra be! It already had been circulated in the body of the rat, from which I had imbibed it second-hand.

FISH AND FISHING.

The cold winter months have arrived; yet we have been out fishing on the days apparently the most favourable for sport, though without much success. The fish have retired into winter quarters among the reeds and mud, so we content ourselves with recollections of past sport, and dip our pen into the inkstand instead of our hook into the Thames.

We well remember, one fine day in August last, going out on a gudgeon-fishing expedition. A luxurious dog-cart carried us quickly to Surley Hall, well known to Etonians. There we found the Charon of this part of the river, Finmore by name, waiting for us in his punt. This old man's family has had the fishing of the water for more than a hundred years; and the old man himself knows every hole and patch of weeds in the river just about Windsor as well as a Londoner does the shops of Regent Street.

In the punt were placed three chairs and three fishing-rods, two punt-poles with sharp iron spikes on their ends, called in these parts 'rypecks:' why or wherefore they have received this name we cannot ascertain; lastly, an enormous iron rake. Three anglers occupied the three chairs; two of them were great salmon-fishers, who, but a few weeks ago, thought a fish under twenty pounds nothing: they were now pleased by catching a little gudgeon not a quarter of an ounce in weight. The laziness of gudgeon-fishing is in-

deed laziness. 'If' (as most aptly remarked at the time) 'you exert yourself in the least, the whole thing is spoilt.' It is quite contrary to the rules to put on one's own bait, to alter one's own float, to take the captured fish off the hook: all is done by Charon, who not unfrequently has quite enough to do. Everything prepared, the boat is pushed out into the middle of the river, the two rypecks are fixed firmly into the ground at the bottom, and the boat is fastened to them across the stream. The first operation is to rake up the bottom well with the big rake. Immediately this is done, all the gudgeon in the neighbourhood flock to the place, and if they are in a biting humour, begin instantly to be caught. Bold biters are these gudgeon: they take the hook with a rush, and down goes the float deep into the water. This is capital fun when the fish are on the feed: so pleased, indeed, was one of the salmon-fishers aforesaid, that he exclaimed, 'Well, there are only two kinds of fishing, salmon fishing and gudgeon fishing,' a dictum worthy of the respected speaker. When we first went out, not a fish could we catch, though we knew there were plenty close under the punt. The reason was that we had not got the hook at the proper depth; it ought to be an inch, or rather less, from the bottom; if it is more, the fish, who feed only at the bottom, don't see it, and it passes over them untouched. Gudgeon are curious fish as regards biting; some days they will bite furiously, another day they won't look at the bait. Even when they are biting well, they will suddenly leave off. The remedy then is to 'scratch their backs,' as Charon says, 'with the rake.' This will often make them begin again. We have been out and caught

eight or ten fish in one day, and a few days afterwards, with two rods in the same place, we catch fifteen dozen —the best day's sport we ever had. Much, however, depends on the bait; worms, we find, are decidedly the best, and those the small red worm from the dunghill. They will be taken by the fish better if they are kept in moss a day or two beforehand, than if used directly they are dug up. We have found that a little cream poured on the moss causes the fish to bite at them with eagerness; the reason probably is, that the worms feed on the cream and thereby acquire a fine transparent look. Something, too, depends on the line: this must not be too thick, nor of a colour easily seen in the water. The finest line that can be used is made of human hair; it is much finer and much stronger than gut made from silk-worms; but it must be made by the fisherman himself; it cannot be bought anywhere that we know of. It is difficult, also, to get human hair long enough; the hair-merchants in the City are the only people who sell it; it is, moreover, very expensive. In the New Museum at South Kensington I see some very fine specimens of human hair among the 'Animal Products.' The label affixed to it gives the following interesting information: 'Human hair is much used for curls, wigs, &c. It is an article of commerce in many countries, young women selling their tresses for trinkets and dresses. A head of hair weighs from ½ lb. to ¾ lb.; its wholesale price is from 30*s*. to 60*s*. per lb. The light coloured and most valuable hair comes from Germany and the Scandinavian States. The darker shades are supplied by the female peasants of France, from whom the spring harvest of hair is stated to average 200,000 lbs.' I understand that very light-coloured hair is the most expensive.

I learnt casually that some anglers, who are very fastidious about their lines, prefer above all things hairs out of the tails of the Queen's cream-coloured horses; but as the tails of these horses seemed in pretty good condition the last time I saw them, I imagine the favour of pulling them is granted only to a few.

Very often, in gudgeon-fishing, I have caught a most beautiful little fish, covered with scales in which all the colours of the rainbow are visibly glittering. This fish is called a 'Pope,' and is, as Charon informed me, a breed between a gudgeon and a perch—a very excusable mistake, for it presents characteristics of both its reputed parents. It resembles the perch (unfortunately for itself) in having a very long and prickly fin on its back, advantage of which is taken by the boys about Windsor, who are very fond of 'plugging a pope.' This operation consists in fixing a bung in the sharp spines on the poor pope's back fin, and then throwing him into the water. The pope dives and swims away merrily; but immediately he ceases swimming the bung brings him to the top of the water; astonished and frightened, he dives again—again to be brought to the surface. The dead bodies of popes which have been thus cruelly plugged are frequently seen floating down the river. I suppose there must be some relic of Catholic persecution about this; but Charon knew no more than how to operate upon the unfortunate fish.*

* The fish (but I cannot name any fish in particular) is well known as an emblem of our Saviour, from the fact that the Greek word for fish, Ἰχθύς, contains the initials of His name and titles, viz., Ἰησους Χριστὸς Θεοῦ ὑιός Σωτήρ; Jesus Christ the Son of God, the Saviour. Again, the idea has been enlarged

When the gudgeon are caught, they are placed in the well of the boat, which communicates with the water outside by means of an open grating. The fish seem to know they are captives, for they all crowd to the grating when one attempts to take them out of the well. I have also observed, about all the kinds of fresh-water fish that I have caught, that they will, when placed on the bank, always jump towards the water. I once saw a fine barbel, that was covered with grass by the water side and thought to be quite defunct, suddenly begin a series of jumpings towards the river; and a fine race I had to prevent his getting back again into the hole whence he had just been taken. How is this to be accounted for? I have placed a fish where he can neither see nor hear the water, even supposing that he has the power of seeing and hearing when out of his own element; yet he has always jumped in the proper direction towards it.

In a letter published for private circulation from the son, since unfortunately deceased, of one of our greatest naturalists, to his father, I find the following interesting description of a mode of fishing in India, which I have never seen described elsewhere: '*The* peculiarities and the lions of the Indus are the "*pullah*" and the pullah fishers. The pullah is a much-esteemed fish, said to be found only in the Indus. It is something like the grey

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upon, for the two curved lines which form the outline of a fish are joined at their ends, and used to enclose either the figure of our Saviour, the Virgin, or the patron Saint. Fishes are also emblematic of Christians in general, in allusion to the call of the Apostles, or to the supposed meaning of the miraculous draught of fishes recorded in the last chapter of St. John's Gospel.

mullet in appearance, and in taste little better than a mackerel; but it is thought a great deal of. Every one eats pullah. It is caught in the following manner, by a particular caste of natives brought up to the business. A large earthen vessel is procured, shaped like a lentil seed (or rather a saucer with a dome to it) with an aperture at the top: the vessel is about a yard in diameter, and half a yard deep, the orifice eight inches across. This of course floats on the water, and will sustain a considerable weight. Pushing it off from the side, the fisherman throws himself on his belly across it, and so closes the aperture, with his body thus forming a kind of boat, which is propelled by the motions of the arms and legs, as in swimming. This buoys him up on the rapid stream, and prevents his being swallowed up by the eddies of the river, and also enables him to use his net, which is stretched across a kind of fork attached to the end of a long pole. This machine is held perpendicularly in the water, the ends of the fork touching the bottom. The current causes the net to bag and spread out as the man floats on his earthen pot down stream. The pullah, lying head up, cannot see the net from the muddiness of the water; so that it comes upon him unawares. The fisherman feels a tug, and instantly closes the net by means of a string he holds, and the pullah is caught. The next process is to haul him up, and stick the poor brute with a skewer; and shifting his belly to one side, the pullah wallah drops the fish into the pot, and resumes his employment. Would not this do for ——— ? He might catch scores of gudgeons in the Thames by this means, besides astonishing the natives.'

When the water is low and there is no wind the marks

of the gudgeons' snouts can be seen on the mud by the sides of the river, or even in the centre of the river if the water is low enough. These gudgeon-tracks are interesting to the geologist, for they might afford a key to many marks found in a fossil state in several districts of England. Witness the block of stone in the British Museum, showing the marks of the retiring tide and the indentations of the rain which must have been falling at the same time. If an antediluvian gudgeon had been grubbing on this stone, I trow his marks would have puzzled many of the learned.

Upon the mud in shallow pools, curious marks can often be observed, as if a person had been drawing patterns on it with a small stick. These are the tracks of the common caddis-worm, that curious worm which forms for its unprotected body a covering of sticks, small stones, and even shells, which house it carries about on his back; it is these houses that make the grooved marks in the mud. Relative to these marks of fishes made in geological periods, I here insert a communication made by my father to the Ashmolean Society at Oxford, June 1843.

'Dr. Buckland made a communication on other modes of locomotion than swimming in the family of fishes, and showed that the fins in certain genera perform the functions of feet and wings. Several fishes of the Lophius family, or "fishing frogs," have the fins converted into feet, or paddles, by means of which some species have the power of crawling and hopping on sand and mud, whilst the Lophius Histrio can live three days out of the water, and walk upon dry land. The climbing perch, Perca, or Anabas Scandens, of the Indian rivers, is known to live a long time in the air, and to

climb up the stems of palm-trees in pursuit of flies, by means of spinous projections on its gill covers. Fishes of the Silurus family have a bony enlargement of the first ray of the pectoral fin, which is also armed with spines; and this organ is not only an offensive and defensive weapon, but may also give ambulatory movements along the bottom of the fresh waters which these fish inhabit. The flying fishes are notorious examples of the conversion of fins into an organ of movement in the air. M. Deslongchamps has lately published, in the Transactions of the Linnæan Society of Normandy, 1842, an account of his observations on the ambulatory movements of the gurnard (Trigla) at the bottom of the sea. In 1839, he had an opportunity of observing these movements, in one of the artificial sea ponds, or fishing traps surrounded by nets, on the shore of Normandy. He saw a score of gurnards closing their fins against their sides, like the wings of a fly in repose, and, without any movement of their tails, walking along the bottom by means of six free rays, three on each pectoral fin, which they placed successively on the ground. They moved rapidly forwards, backwards, to the right and left, groping in all directions with these rays, as if in search of small crabs. Their great heads and bodies seemed to throw hardly any weight on these slender rays or feet, being suspended in water, and having their weight further diminished by their swimming-bladder. During these movements the gurnards resembled insects moving along the sand. When M. Deslongchamps moved in the water, the fish swam away rapidly to the extremity of the pond; when he stood still, they resumed their ambulatory movement, and came between his legs. On dissection, we find these three anterior

rays of the pectoral fins are supported, each with a strong muscular apparatus to direct their movements, apart from the muscles that are connected with the smaller rays of the pectoral fin. Dr. Buckland then stated that Miss Potts, of Chester, had lately sent to him a flagstone from a coal shaft at Mostyn, bearing impressions, which he supposed to be the trackway of some fish, crawling along the bottom by means of the anterior rays of its pectoral fins. There were no indications of feet, but only scratches symmetrically disposed on each side of a space that may have been covered by the body of the fish whilst making progress by pressing its fin bones on the bottom. As yet, no footsteps of reptiles or of any animals more highly organised than fishes, have been found in strata older than those which belong to the Triassic or New Red Sandstone series, of which the Cheirotherium of Germany and Cheshire and the Ornithichnites of Connecticut are notorious examples. The abundant remains of fossil fishes, armed with strong bony spines, in strata of the Carboniferous and Old Red Sandstone series, would lead us to expect the frequent occurrence of impressions made by their locomotive organs on the bottom of the ancient waters in which they lived. Dr. Buckland proposes to designate these petrified traces or trackways of ancient fishes by the term Ichthyopatolites, or Fish-tracks (Ιχθυς, a fish ; πατος, a path).' How pleased my father would have been with the Windsor gudgeon marks!

It would appear that fish have the power of altering their colour, so as to resemble the colour of the water in which they have been confined: this is the case particularly with minnows, sticklebacks, and trout. Mr. Grove, the fishmonger at Charing Cross, will tell

you where a trout comes from, by his colour. The trout which live in peat-coloured water are sometimes nearly black; those from fine running streams, such as the clear chalk streams about Winchester, are of a beautiful silvery colour. Gudgeons placed in a glass bowl will become very white, and lose the beautiful brown colour on their backs. Not long ago, I observed some very woe-begone, pale, debauched-looking carp in the tanks of the Regent's Park Gardens. I remarked to my companion that I was sure, from their pale colour, they had been in captivity somewhere. The keeper soon afterwards told me that they had been presented by Mr. Albert Smith, who had had them in his artificial pond, in the Egyptian Hall, for many weeks: the poor fish had been all this while living in gas-light. I am anxious to see if they will recover their colours: they probably will in course of time.

In a cheesemonger's shop, in Tottenham-court-road, is a large glass bowl full of gold fish: these fish look ghastly pale and white, poor things! They cannot help so doing, for their transparent habitation is fixed on a stand which is painted dead white, and they sympathise with the colour. In the same street, a fishmonger has a vivarium, but he wisely has placed in it several of those beautiful Venus-ear shells that exhibit such wonderful iridescent colours: the fish have benefited by this, and they look as well again as the cheesemonger's fish. A fishmonger at Billingsgate-market told me he generally knew from what part of the coast fish came by the colour of them. This observation was apropos to a quantity of Dutch Jack that were displayed on his slab; and which looked very dingy and dark-coloured, as though they had lived in stagnant and dirty water;

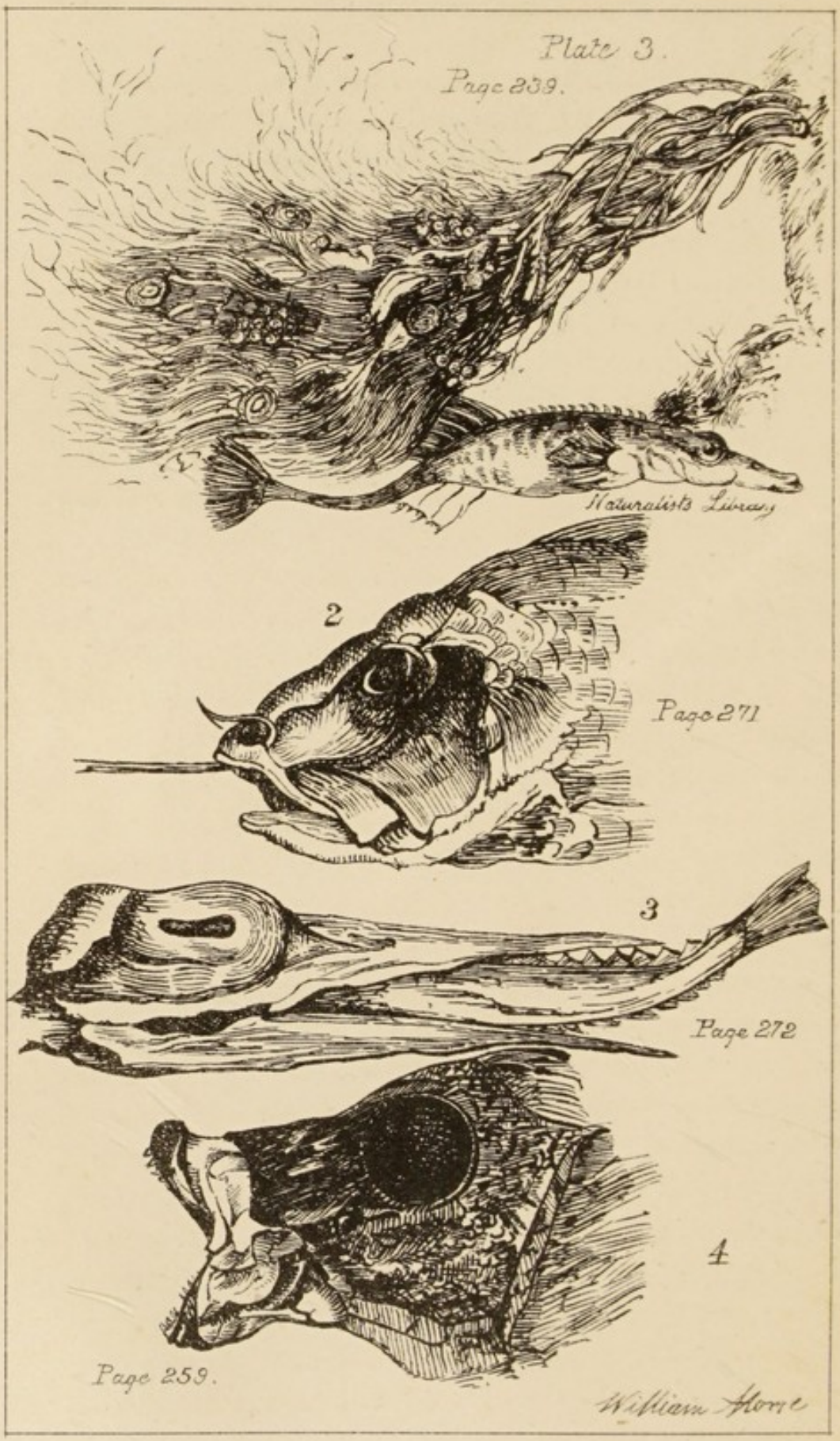
very different from a clean and bright-coloured Thames Jack. Dutch Jack never look to me the same fish as the English Jack: there is no real difference, I believe. The fishmonger said there was about as much difference as there is between an Englishman and a Dutchman. Some of the trout in Scotland, which live in water discoloured by the peat, become quite black, but they do not appear to be the worse as regards eating. In some of the Scotch lakes, I understand, trout of two kinds are found, viz., the original inhabitants of the lake, which are of a bright fresh colour, and also black-looking fish which have come down the streams into the lake.

Mr. Quekett also tells me that in these Scotch lakes the trout which live in the deep water in the centre of the lake are of a dark colour, and those which are found along the shallow margins are of a bright colour. The reason of this probably is, that the fish near the margin receive more light—both that which comes directly through the water and that which is reflected from the stony bottom—than those which live in the deeper parts of the stream.

While upon the subject of black fish, I must introduce a curious instance of a white man's body, or rather his bones, being turned black. The African slavers call their human cargo, 'black ivory,' and in the following story we have a genuine case of 'black ivory.' It was frequently mentioned by my father in his lectures, but is, I believe, not generally known. In the year 1834, a large tumulus or barrow was opened in the village of Gristhorpe, near Scarborough, and in it they found a coffin made of the trunk of an oak tree, the bark of which remained perfect, and even the lichen upon the

bark. Over the coffin had been placed oak branches the thickness of about one foot, likewise covered with bark. When the coffin was opened they found a skeleton of a man, who must have stood not less than six feet three or four: the marks upon the bones indicated that the muscles that had been attached to them had been very powerful, and that he must have been a very strong man. His head was examined phrenologically by Professor Elliotson, and he pronounced, from its configuration, that the owner had been well calculated for command; and it is reasonable to conclude from this fact, and from the evident attention paid to his burying-place, that he had been a great chief; other evidence also adduced rendered it probable that he belonged to the tribe of ancient Britons called the Brigantes. The body was enveloped in a strong skin, the hair of which was soft and fine, much resembling that of the sheep, or of a goat, but not quite so long.* It was much decomposed. Among the portions of skin were found a few foot-bones of some small animal, supposed at first to be those of a small hunting-dog; but they were afterwards examined by my father, who pronounced them to be the bones of a weasel, and accounted for their presence by supposing that, as the savage tribes of North America and elsewhere, at the present day, use the skins of animals with the feet attached for purses and bags (Mr. Catlin figures them in his book under the name of medicine-bags), so the ancient Britons probably used the skins of small animals as convenient receptacles for their flint arrow-heads, food, &c. But the most curious part of the story is, that the bones, being naturally white, were

* The microscope would have set this point at rest had it been used.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William Home

found to be of an ebony colour, quite black, and also in a marvellous state of preservation. The water had dissolved out the tannin from the oak bark, and the tannin had combined with the iron of the soil, making tannate of iron, or, in other words, ink. These bones might have been polished and passed off well as 'black ivory,' in the common acceptation of the term.

Sticklebacks are wonderful fish to change their colour. I have seen sticklebacks at the tail of a mill-pond at Islip, of the most beautiful iridescent colour: the bottom was composed of clean white gravel stones. Again, there is a ditch running round Christchurch meadow, at Oxford: here the water is black and dirty, and the sticklebacks are of a brown and almost black colour. It is in this family of sticklebacks that we find an instance of a fish making a nest. At first this sounds curious, 'fish's nest' being in the same category as 'a mare's nest;' but I do not see anything contrary to reason in it, as the idea of a nest is usually associated with eggs, and everybody has heard of fishes' eggs or spawn. The fifteen-spined stickleback is known to build its nest along our shores; it is a sea-fish. In the Naturalists' Library, in Vol. V. of British Fishes, I find a picture of one of the nests of these fish (see Plate III. Fig. 1,) and a description as follows: 'The nests are to be found in several parts of the coast (of Berwickshire) in spring and summer, in rocky and weedy pools, between tide marks: they are about eight inches in length and pear-shaped, formed of branches of common fucus with various corallines, &c.

'These are all bound together in one confused compact mass, by means of a thread run through and round in every conceivable direction. This thread is of great length and as fine as ordinary silk, and somewhat elastic,

whitish, and formed of some albuminous secretion. The eggs are laid in the middle of the nest, in several irregular masses of about an inch in diameter, each consisting of many hundred ova, which are of the size of ordinary shot, and of a whitish or amber colour, according to their degree of maturity. It would appear that the fish must first deposit its spawn amid the growing fucus, and afterwards gather its branches together round the eggs; at the same time weaving and incorporating all the rubbish that is lying or floating around the nucleus.'

Mr. Peach, a great observer, wrote to my father on this subject in 1845, as follows: 'Mr. Crouch, of Penzance, was the first that I heard of noticing a fish's nest, and it was that of the fifteen-spined stickleback: he has paid great attention to the habits of this fish. It is a most determined warrior, and will give battle to a fish of much greater size than himself: they are plentiful in this harbour. (Fowey in Cornwall.) The nest is composed of the Coralina officinalis, and it is a difficult matter to find it out. There is also a fish which deposits its ova in the fissures in the rocks, and this fish watches both ova and young.' The nidification of fishes does not rest on the testimony of Mr. Crouch only, for they have been frequently found after the ova have been hatched; and similar observations made by several on the Cornish coast, so that which was at first doubtful, is fully proved. Mr. Crouch and myself have frequently found specimens when we have been out 'fish-nesting.'

Again, Mr. Moggridge, who lives near Swansea, writes to my late father on this subject: 'Mr. Crouch, of Penzance, was the first to observe the fishes' nest.

In May and June six nests were discovered near that town. They are formed in ledges or recesses of the rocks. The Corallina officinalis is laid in strata the shape of a compact ball, but rough and not easily distinguished from the adjacent weeds. Others are made by bringing together with a glutinous thread the broad leaves of Ulva, somewhat after the manner of the tailor bird, only that the process is by lapping and not by stitching. The eggs have been examined by the microscope both before and after birth. They are easily hatched by changing the water every day, but the little fish soon die. Mr. Crouch has seen the old fish in the act of nidification; if the fabric is damaged it is repaired the next tide.'

I am aware that the fresh-water stickleback, so common in our ponds and ditches, makes a nest like his salt-water relation. I have never been lucky enough to find one.

Mr. Albany Hancock has, however, recorded in the Magazine of Natural History, 1852, many interesting observations on this curious subject; and as he himself watched the whole process, I take the liberty of inserting an abstract of his observations: 'I had the pleasure of seeing the nest built from the very commencement, and through all its stages. The place selected for the nest was the bare, flat top of a piece of oolite, where it formed a right angle, by resting against the glass partition which separated two ponds (in a tank), in one of which were kept four minnows and two small eels, and in the second the sticklebacks. Now he (the male fish) arrives with a large fibre in his mouth, deposits it, re-arranges the whole of the materials, already accumulated, with his mouth; removing one fibre to this place,

and another to that, and departs in his search for more. Now he returns, carrying a small piece of gravel, which is carefully placed on part of the fibres, as it were, to keep them down; he then draws himself slowly over the whole, and is off again. Now he brings another fibre, which he dibs in with his snout, so as to make it interlace with the others. Now he is busy poking a circular hole in the middle of the accumulated materials with his snout; thus he conveys, without cessation, decayed rootlets, gravel, sand, and whatever he can find that will answer his purpose.

'But I must observe that the specific gravity of his materials is continually tested; for, having found what appears a suitable fibre, it is carried a little way, then projected to a short distance from his mouth, and watched as it falls; if it falls rapidly, it is tried again in the same manner; and if it then proves too light, it is abandoned altogether, and another selected. If there should be any strong fibre, which he has a difficulty in causing to remain in the position he requires, a small quantity of sand is brought in his mouth, and adroitly placed on the top of the fibre to keep it down: if this does not effect the purpose so as to please him, the refractory piece is taken out, and rejected altogether. At the same time he hangs or hovers close over the surface of the nest, and throws his whole body into a curious and rapid vibratory motion, by which he causes a rapid current of water to be projected on the materials as though to prove their stability; and when this operation is performed, the lighter particles and light mud, as it were, fanned or winnowed out by the generated current may be seen floating away. Another very curious operation is the action of drawing his body

slowly over the surface of the materials which form the nest. I believe that at the time he excretes a glutinous matter, which acts as a species of cement, and tends to keep the materials together; at the same time that the pressure of his body may render them more compact; or it may be that the whole surface of the nest is by this action charged with the milt, and thus the impregnation of the eggs more perfectly insured. The whole time occupied in accumulating the materials for the nest was about four hours, during which interval a goodly quantity had been obtained. If we wish to study to advantage the nidification of this species, a few specimens should be placed in confinement about May or June.' As these fish are so common, and so easily observed, the above passage may induce some of my readers to make further observations on this comparatively new subject.

But lately I made an expedition to the Isle of Dogs, opposite Greenwich. I found (end of July) thousands of young sticklebacks in the shallow ditches which intersect the island. They were all very minute; only two full-grown sticklebacks did I see all day. One was dead, and the other was very nearly dead. Query, what becomes of all the full-grown fish? The waterman who pulled me across the river said that shoals of sticklebacks come sometimes to the landing-steps, close by where the steamers stop; he thinks they are washed out of the ditches of the Isle of Dogs opposite. I did not see any when I was there, but the water was very muddy, and the wind was blowing.

The male stickleback, in the breeding season, is really a most beautiful little fish. His skin is quite iridescent, with magnificent red and green colours blended together. These colours, as is the case with most fish, are very

evanescent, and soon fade away after the animal's death. The best way I know of to preserve them is to skin the fish, as soon as they are taken out of the water, varnish them carefully directly the skin is dry enough to receive it, and hang them up to dry, *in the dark.* I never yet saw a stuffed fish in a fishing-tackle shop or elsewhere that had not lost its colours. If these fish had been dried in the dark the colours would have remained much more perfect. This rule will apply to the skins of snakes and lizards as well as to fish.

Mr. Rowell, the intelligent subcurator of the Ashmolean museum at Oxford, tells me that the best dressing for preparations of fish, crocodiles, &c., which will never get perfectly dry of themselves, is painters' knottings: it is made of shell-lac and naphtha. He says: 'The specimen I tried it on is a crocodile's head, that was always damp in wet weather, but now feels dry at all times. I made it very dry and hot, and then put the varnish on with a brush, giving it two or three coats, as it dries in a moment. It is now about three years since the head was varnished, and it looks as well as when first done.'

In the fishing-tackle shop of Mr. Gouland of Crooked Lane, near London Bridge (Mr. Gouland, by-the-by, makes the best roach-hooks I ever fished with), I saw several stuffed fish. Fish stuffed are, generally, hideous objects, but these were beautifully prepared, their shape being well cared for, and their colours preserved in an extraordinary manner. I inquired who had stuffed them, and was told that the stuffer's name was Cooper, and that he lived in Radnor Street, St. Luke's. I would advise my readers, if they ever want a fish stuffed, to employ him.

In our gudgeon-fishing expeditions I often observed large islands of rushes, of which Charon seemed very careful, not allowing the punt to break or otherwise injure them. These rushes are valuable for two things: firstly, they are sold to make chairs and baskets; secondly, they harbour the jack, which the knowing Charon catches. A few days ago I saw a man making chairs with this sort of rushes; he informed me that he bought them at Maidenhead, and that they were very dear, as he had to give four shillings 'a bolt' for them, a bolt being about as much as he could grasp with both arms.

In these rushes, too, the otters live. I much doubted their existence so near London, till I saw their spoor or foot-marks under the high muddy banks; and having taken the impression of a dead otter's foot in clay, I know it again when I see it. Charon says, when he is out in the grey of the morning, taking up his nets, he hears them barking and calling to one another. On cross-examination, he 'supposes' there must be *twenty* otters between Windsor and Maidenhead. If they exist, they must be very wary animals, and don't often show.

A famous hiding-place are these rush islands for the jack; as many as twenty-six jack have been caught in a net in one day, and some of them fine fish; but the king of the jacks was caught in the autumn of 1855 at the first lock above Windsor. Charon informed us that he had 'been after him' many days. A big fish has as much chance of escaping our friend as a noted pickpocket of escaping the detectives at Jullien's concerts. At last the big jack was marked down behind the lock-gate, and was immediately captured. When in the net,

he made no resistance at all, but lazily gave up the ghost at the bottom of the punt; and so proud was Charon of him, that 'he sat up all night' watching his body; why or wherefore we can't conjecture, except that he was looking forward to getting a guinea for him in the morning. This immense fish was in beautiful condition; he weighed upwards of thirty pounds, and had a barbel three pounds weight in his stomach. He was caught a few days after a flood, when the water was beginning to run off. It is therefore probable that he escaped out of some pond higher up the river and swam downwards in search of adventures, which adventures turned out unfortunately for him. Charon is also of this opinion; for had he been a river fish, he says, he would have had his wife near him, as jack generally live in pairs. Nets and divers devices were put into requisition to catch the female fish; but she, like a wise fish, had remained at home to be 'preserved' in water, not, like her husband, to be 'preserved' in a glass case in varnish.

But this is not the only large fish Charon ever caught; it was he who captured the last salmon ever seen in the Thames above London. Forty years have passed since the last of his species, in the Thames, became a victim to the cupidity of man. This poor fish had a favourite hole near Surley Hall, which was at last found out, and his destruction determined upon. Accordingly one day the hole was surrounded with nets on every side, and the fishermen made sure of their prey; but they were mistaken. The salmon discovered suddenly that there was treachery, and, like a brave and wise fish, he made a jump, not into the net,—he was too knowing for that,—but right over it, escaping triumphant, for a time at least.

Some days afterwards he returned home to his hole; the nets were again put round him; but this time, on to the cork lines of the nets which were in the water, was fastened a net, which remained suspended in the air by a string. Again the salmon made a rush and a jump; he got well over the net in the water, but fell, of course, into the net suspended in the air. He died an inglorious death, but his remains were honoured by becoming 'a dainty dish to set before a King;' for he was taken to the King, then residing at Virginia Water, who gave the lucky netter a guinea a pound for his fish: twenty guineas for a few hours' work! But, alas! salmon in the Thames are now as extinct as Dodos in the Mauritius. It is Charon's opinion that the salmon are kept away from the Thames, not by the steamers or by the sewage matter in the water, but by the drainage from the gas-works. He gave his reasons at the time he told us this, and we were persuaded to back his theory.

Not many years ago there came a great flood, and this flood had no respect for the royal fish-ponds, but flooded them also. We understand that when the water subsided very many fine specimens of fish were caught in the Thames by our friend Charon: these fish had escaped from the royal preserves, never again to return there. A somewhat similar instance has occurred at Oxford, where, within the last two years, great numbers of Prussian carp have been caught, where no carp were caught before. I understand that the original stock came from a gentleman's pond, and the fish got out in the flood time. That terrible weed which has done so much harm in Cambridgeshire has got up to Oxford, and is filling up the ditches in Christchurch meadow, and the shallow water where the boats are stationed, very

fast; we wonder swans are not turned down to eat it, for they thrive upon it. Mr. Quekett informs me that a species of mussel (Dreissena polymorpha) has been imported from abroad, and began by making a colony in the docks, in the neighbourhood of London; thence it has gradually spread, and is now working its way up the Thames and its tributaries.

Among thick banks of weeds in shallow places, in the neighbourhood of deep water, the jack delights to bask—a fatal habit for him: many a jack have I wired in the neighbourhood of Oxford when basking in this way.* On watching a jack in a vivarium I re-

* Capital jack trolling may be had in the neighbourhood of Windsor during the autumn and winter; and I have known many fine fish taken by a single rod in one day. Jack trollers would do well to examine a very pretty little contrivance invented by Mr. Andersson, fishing-tackle maker, of 72, Long Acre, to facilitate the running out of the line, when a dead or other bait is attached to it. Ordinarily speaking, the fixed loop on the top of the rod is not placed in such a position as to allow the line to run freely when a cast is made in a side direction. Mr. Andersson has invented a loop of solid metal, which, by a very pretty but simple contrivance, moves readily either to the right or left according to the direction in which the line is cast. He calls it 'the steel swivel loop.' To effect the same purpose, and to ease the friction of the line through the ordinary wire loop, he has invented a very neat little roller, like that inserted into a common pulley: this he calls the roller loop. I am no fly-fisherman myself, never having had the opportunity to practise the art; but I have seen in Mr. Andersson's shop a very neat-looking fly-rod, the lengths of which are fastened together by exactly the same sort of joint as that used for ladies' parasols; the advantage being, that all the lengths of the rod can be folded up parallel to the bottom length, even without removing the line. It might also prove useful in getting through a hedge, as the rod could be unfastened in the centre or at any other joint and re-fixed in a minute without disturbing the line.

marked a curious provision given him, to enable him to thrive well in this stagnant water. All fish breathe by means of their gills. The little red slips we see forming the gills contain blood-vessels, and the blood becomes aerated by means of these quasi lungs being waved backwards and forwards in the water. A fish, like a man, requires a perpetual supply of air to his breathing apparatus, whether that be gills or lungs. A fish gets his air from the water, a man gets it from the atmosphere around him. Reverse the position of the fish and the man, and the former becomes what is called 'drowned' in the open air, the man is 'drowned' in the water. Sir B. Brodie writes: 'Although a diversity of opinions may have existed formerly as to the mode in which submersion in water produces death, there is no such diversity at the present time. Death from drowning is similar to death in consequence of strangulation; and the want of the due oxygenation, or decarbonization of the blood, is the sole cause of the animal's destruction. A fish taken out of water dies from drowning, the cause being equally 'the want of the due oxygenation or decarbonization of the blood.' In both cases the air cannot get to the breathing apparatus; in the case of the man because the water intervenes, in the case of the fish because the numerous little blood-containing filaments which compose the gills become stuck together, and of course cannot act. This is the meaning of the violent gasping of the fish when taken out of water: it is endeavouring to separate the gill filaments, but cannot do so without the intervention of water. We have heard of fishermen drowning the fish, and drowning him in the water. Immediately a fish is hooked, he begins rushing about in a state of alarm, and thus,

every minute, takes more and more out of himself, till at last he begins to get tired, and to flag. Then the fisherman wakes him up, and causes him to continue his exertions to get free; and, of course, the faster he moves the faster he breathes, and the more exhausted he becomes. After a while the strength of the rod and line, or, rather, of the man's arm at the end of it, becomes superior to the strength of the fish; and the fisherman gently pulls the fish's head to the surface of the stream, between wind and water. Then, upon the exhausted system of the fish is superadded obstruction in breathing, and the creature becomes more and more faint as its head is elevated out of the water. His gills stick together, and he ultimately becomes an easy prey—a fish drowned in the water. I believe, too, that if a fish be held by a hook in a very rapid stream he would be drowned, the water rushing on each side of him not allowing the coverings of the true gill substance to expand, so that the breathing-apparatus becomes enclosed as it were in a tightly-fitting box.

Now the jack living in a favourite stagnant shallow requires water to be brought perpetually to its gills. The water does not come of itself, so the fish, I have observed, keeps continually moving the two fins nearest its gills, to create a perpetual change in the water, propelling that which has already passed through the gills, and bringing fresh in its place. We see in this provision an admirable instance of the foresight and benevolence of the great Creator, ever adapting the structure and habits of the creature to the locality intended for it to occupy. Again, to go back to the common stickleback for an instant: this little fish living in shallow stagnant water, by means of a continuous motion of his pectoral fins

keeps up a current of fluid towards his gills. Neither to the jack nor the stickleback does the motion appear to cause any exertion: it seems natural to them, and a distinct function apart from the motion of the fins for swimming purposes. It is somewhat analogous to the perpetual motion of the heart, lungs, and internal viscera in our own bodies. All this is accomplished by a set of nerves,—the sympathetic,—over which we have no control. It is no exertion to us to keep our hearts or lungs moving, they are not subject to our will, but sympathise with the emotions of the body. There is in reference to this a passage in the book of Job, which I consider to be very remarkable. In the thirty-sixth verse of chapter xxxviii. we find it written, 'Who hath put wisdom in the inward parts? or who hath given understanding to the heart?'

The chapter in which this passage occurs begins with these words:—

'Then the Lord answered Job out of the whirlwind, and said,

'Who is this that darkeneth counsel by words without knowledge?

'Gird up now thy loins like a man; for I will demand of thee, and answer thou me.'

The verses which follow, among which are the words quoted above, at verse 36, are all put in the form of questions, and refer to the power of the great Creator, as exemplified in the creation. Phenomena never yet understood by man—such as the movements and order of the heavenly bodies, the mysteries of the sea, of thunder, of lightning, of the clouds, of the snow, of the hail, of the rain, of the ice, of the hoar frost—all are vividly portrayed to mortals as things beyond their comprehen-

sion. Let the reader ponder over this and the two following chapters, and he will be led to feel his own ignorance of the ways of the Almighty and the thunder of his power. Many of the passages in Job referring to physical phenomena, though at first sight unimportant, may have a deeper sense belonging to them, which requires only a knowledge of actual facts to render every word full of meaning. Thus we read, chapter xxxvii.,

'Out of the south cometh the whirlwind; and cold out of the north.

'Also by watering he wearieth the thick cloud: he scattereth his bright cloud:

'And it is turned about by his counsels: that they may do whatsoever he commandeth them upon the face of the world in the earth.'

Now what is this but an epitome of the theory of the circular motion of storms, now so fully made out, understood, and acted upon, to the great advantage of those who have the necessary knowledge? It would also apply with equal force to that wonderful regulator of temperature on the face of the earth, the trade wind.

As regards geological phenomena, we find an observation in the book of Job insisted upon by the Director-general of the Geological Survey, Sir Roderick I. Murchison, F.R.S., &c., in his beautiful work on Siluria, who at the end of the chapter upon Job, after telling us 'that the indisputable fact is, that the chief quantities of gold originally embedded in the upper parts of the vein, have been broken up and transported with the débris of the mountain tops into adjacent slopes and valleys. Silver and argentiferous lead, on the contrary, expand so largely downwards into

the bowels of the earth that they must yield enormous profits to the miner for ages to come. Sir Roderick writes: 'Modern science, instead of contradicting, only confirms the aphorism of the patriarch Job, who has shadowed forth the downward persistence of the one, and the superficial distribution of the other. "Surely there is a vein for the silver." "The earth has dust of gold."'

In a similar way I would explain the passage, 'Who hath put wisdom in the inward parts? or who hath given understanding to the heart?'

As regards the first half of the verse, let me instance the wonderful process of digestion, whereby nature, in her secret and living laboratories, works out such marvellous results. At the lower end of the stomach is a valve called the pylorus or gate-keeper (πυλη, a gate; οραω, to overlook). The office of this remarkable valve is that of a sentry (a sentry, too, that is never relieved, and yet is always on the alert) to prevent any portion of food not thoroughly acted upon or dissolved in the stomach from passing onwards until it is in a fit state to do so. The dissolved food is caused to traverse the length of the intestines, which in man is about thirty feet, or between five and six times the length of the body—a pretty long tube—by means of what is called the peristaltic action (περι, round about; στελλω, to draw in, contract). These peristaltic movements continue quite unaffected by the *will*, which has no influence whatever over them, but yet, curiously enough, the *emotions* seem to affect them. We are not conscious of the passage of the alimentary matter along the canal so long as it is in a state of health; but directly anything is wrong, notice is given by the coming on of pain, or

in other words, a stomach-ache, nature's mode of attracting attention, and letting us know that her machinery is out of order.

Along the whole course of the intestinal canal we find the lining or mucous membrane furnished with very numerous folds, or minute tufts, called villi: these project inwards among the food, now converted into a pulpy substance, and absorb from it what is nutritious, allowing to pass what is not so. I might give other instances of the meaning of this word 'wisdom,' if it be regarded as having a literal sense applicable to the functions of the 'inward parts,' but let the above suffice.

I am well aware that the word 'understanding,' as applied to the heart, is generally taken in a figurative point of view, the heart being regarded as the centre of life. But the heart cannot properly be called 'the centre of life.' Life is, so to speak, supported on a tripod, the three divisions of which have been so ably pointed out by the learned Dr. Watson in his 'Principles and Practice of Medicine.' 'First, there is an hydraulic apparatus distributed throughout the frame, consisting of the heart and other blood-vessels. Next there is a large pneumatic machine, forming a considerable part of the whole body. Lastly, the power by which this machine is to be worked and regulated is vested in the nervous system (the brain and nerves). Each of these systems must continue in action, or the circulation will stop and life will cease.' The heart, therefore, cannot, in the true acceptation of the word, viz., 'intellectual powers of mind, faculties of the mind, especially those of knowledge and judgment,' be said to have understanding. But it has understanding

when it alters its pulsations and regulates the flow of blood according to circumstances, either external or internal. If it were not to do so the animal economy would be upset by its means. Thus, in fever, it accelerates its action, as a means of throwing off the poison. The act of blushing is but a minor and temporary form of the same thing. Both these actions are quite out of the power of our will, and the heart performs them of its own accord.

Another kind of fish common about Windsor is the roach, and these will bite well in the winter time; but they are most uncertain feeders. Some days they will bite as fast as the hook is put in; another day, the weather the same, the wind the same, the water the same, and not a bite will the angler get.

These fish run from two ounces to a pound in weight; and capital sport they give. Being delicate biters, a very small hook must be used, a line of the finest silk-worm gut, and a small porcupine-quill float. An inexperienced hand will hardly ever catch fish the first time he goes out; for if he expects to see his float suddenly disappear, he will be disappointed; a slight jogging of the float is all he will see. Let him strike quick and sharp, for Mr. Roach has a very small mouth, with no teeth in it, so that he sucks in the bait with his prehensile lips. If we examine the lips of fish, we shall find another proof, were it required, of beauty and design, everywhere apparent in the works of the Omniscient Creator. The roach lives principally upon small insects and spawn of fresh-water mollusca, which he finds adhering to the weeds. Unless he had these prehensile lips, how would he manage to get his dinner? Again, examine the mouth of a sprat (an un-

cooked one, mind); it looks a little tiny mouth, not large enough to admit a pin's head; but just push down the lower jaw, and what will you see? Why one of the most beautiful insect nets that it is possible to conceive; a net into which you can get the top of your little finger, and, of necessity, terribly destructive among the minute sea creatures which the sprat feeds on: those pretty little animals which cause the sea to be luminous at night forming, doubtless, part of the bill of fare.

Lately, when going over to Guernsey in the steamboat, the captain was feeding the gulls, which followed the boat, with sprats, of which there were many baskets full on board. Sending coals to Newcastle, thought I; but I soon learned there were no sprats caught near the Channel Islands. I showed the captain the mechanism of the sprat's mouth, and he informed me that, when opened, it much resembled the net used by fishermen in catching the sprat itself; so that the fish has furnished his captor with a pattern for an instrument to work out its destruction.

On my return from Guernsey, I determined to try to catch one of these gulls. I accordingly procured a very long fishing-line, and some fine hooks, tied to common gut; on these hooks I placed bits of fish, and cast my line behind the steamer. It was quite wonderful how soon a gull would see the bait, and dart at it. But, alas! I never got a single bite at my hook; the birds were too sharp-sighted; in every instance just as the gull was about to seize the hook, he suddenly turned aside as if suspecting that all was not right: and, although hovering over the tempting morsel for many minutes, his quick eye detected the thin gut or the string, and wisely

he did not try the experiment, but left the bit of fish to jump up and down in the steamer's wake, and myself at the other end of the string, looking foolish, and well exemplifying Johnson's definition of an angler—a worm at one end and a fool at the other. What made me more angry was that the gulls would pick up instantly any bit of fish that was thrown out without a hook, however small it was. How keen must be the sight of these birds to discern a bit of fish not so big as a shilling, in the frothy sea, at the wake of the steamer! How, again, did these beautiful birds manage to keep up with the vessel, which was going pretty fast through the water? They never seemed to move their wings as in flight, but simply to glide onwards, as though attracted to the ship's stern by some magnetic power. Let the reader examine the pectoral or breast muscles of the next gull he kills, he will find them one solid mass of firm hard muscle admirably adapted to sustain and work the wings. What models of beauty and lightness are the wings of the gull! The bones are composed of the hardest possible kind of bone material arranged in a tubular form, combining the greatest possible strength with the greatest possible lightness. If we make a section of the wing bone of a gull, or, better still, of that of an albatross, we shall find that it is a hollow cylinder like a wheat straw; but in order to give it still further strength, we see many little pillars of bone about the thickness of a needle extending across from side to side: these buttress-like pillars are in themselves very strong, and do not break easily under the finger. Again, at the top of the bone we find two or three holes which communicate with the interior: through these, when the bird is alive, pass tubes which are con-

nected with the lungs; so that when the bird starts for a flight, he fills his wing and other bones with air, causing them to act somewhat like a balloon on each side of him. This explains one of the chief reasons why man will never be able to fly; his arm bones are filled with marrow of which he cannot by any means get rid, should he be ever so anxious to fly like a bird.

The gannet or solan goose is a bird that seems perfectly indifferent to stormy weather and to cold; if any bird is abroad battling with the elements it is the gannet. This is by some considered as a sign of courage on the part of the bird, but it is not so much pluck as confidence in its powers. The air-cells which give lightness to its body are developed in an extraordinary degree, so much so that Mr. G. Montagu writes (1808): 'The gannet is capable of containing about three full inspirations of my lungs, divided into nearly three equal portions, the cellular parts under the skin on each side holding nearly as much as the cavity of the body.' Now, as a full or extraordinary expiration of the human lungs has been considered to occupy a space of about sixty cubic inches, so the gannet is capable of containing not less than 180 cubic inches of air at one time, subject to its will. And it must be recollected that the gannet is not a very large bird, to contain all this air. This bird is accustomed to dart suddenly down from a considerable height upon the fish which it sees on the surface of the water: its air-padded skin and body lessens the concussion, and prevents its being dashed to pieces. Again, nothing could possibly conduce more to its security against intense cold, or be better adapted to preserve its animal heat, than this intermediate space of air between the skin and the body—on the same princip.e

that we sometimes put double windows to our houses in very cold weather. The Russians, I hear, have their panes of glass sometimes three or four double, with an interspace between each pane, to keep out the cold, so intense in northern latitudes.

I had brought a fish with me, when gull-fishing from the steamer, to cut up for bait for the gulls: it was of the species called rock fish, its habitat being among the rocks. Upon examining the head of this fish, I found that it had a beautiful contrivance in the conformation of its mouth. Its food consists of small shell-fish, spawn of shells, &c., which adhere firmly to the rock: now how was the fish to pull these off? In the anterior part of the mouth, both in the upper and lower jaw, we find several teeth projecting in a forward direction; but this is not all: suppose a dainty bit of food is espied snugly concealed deep down in a small hole, how is the fish to get it out? It has the power of prolongating both its jaws to nearly the extent of half an inch from their natural position; this is done by a most beautiful bit of mechanism, somewhat on the principle of what are called 'lazy tongs.' When the jaw is in a natural position, the mouth looks not unlike the mouth of an ordinary fish; but pull the teeth, and out will come half an inch of retractile jaws. Thus this fish is fully equipped with a contrivance, by means of which he obtains his daily food. Who can look at this without seeing in it a proof of an omniscient and kind Creator? In Plate III. Fig. 4, is a drawing of the head of the rock fish, with the retractile jaws well expanded: the teeth are seen arming the front edges of both jaws. If in a fresh state the finger were pressed against the teeth gently, the jaws would go back, and the fish's head would assume the look of an ordinary round-mouthed

fish. Take, again, another form of mouth in the fish tribe—the common gurnard. This fish lives at the bottom of the water, and hunts about among the sand and mud for its food. To enable him to do this, the bones of the head are composed of a bone-like material, like the skin of a sturgeon, and not of a soft substance like the head of a mackerel. These bones end in a shovel-shaped projection, almost amounting to a snout, at the top of which there are eight very hard bony pegs. With this snout he probably pokes about among the mud, and stirs up the animals he feeds on, which he then easily catches with his capacious mouth. He has also three things like fingers on each side of his head, which probably assist him to feel about, for he lives in very deep water, where there cannot be much light. The position of his eyes tells us this also, for they are placed quite at the top of his head, and in an upward direction, so as to catch every ray of light coming from above.

The only fish that is, so to speak, domesticated—viz. the gold-fish—is a capital example of an infusorial feeder. These poor things when kept in glass globes, live apparently upon nothing. Give them, however, fresh water frequently and they will get fat—that is, as fat as fish ever will get. The bits of bread thrown in they seldom eat. Upon what, then, do they thrive? Why, upon the small, invisible animals, that abound in the water. If the exuviæ of these fish be examined with a microscope, the flinty skeletons of these said small, invisible animals will be seen in abundance, their bodies having been digested by their devourer, the gold-fish. We can no more deny that the fish has fed upon infusoria, under these circumstances, than we can deny that an owl has eaten a rat when we pick up the rat's

skeleton and fur matted together, as ejected from the crop of this benefactor to the farmer.

I once lost a pet hedgehog. High and low I hunted for it, but nowhere was it found. The next day, when going to feed an eagle I kept tied up in the garden, I found a large ball underneath his perch, which turned out to be composed of poor hedgehog's bristles, bones, and skin. The unsuspecting brute had gone out at night into the garden to look for slugs and beetles, but had unluckily come across the eagle, who had made mince-meat of him, though it is still a puzzle to me why the hedgehog's sharp bristles did not stick in the eagle's throat and choke him.

I was informed by a man, who wanted to sell me five gold-fish, and the bowl in which they were, for ten shillings, that the fish he buys are bred by a gentleman near Amsterdam, and sent over by hundreds, in zinc tanks, on board the Dutch eel-boats. From another source, I learn that there is a breeding-pond near or at Bradford, in Yorkshire, and the fish are sent up thence by rail to London. Gold-fish are said to have been originally confined to a lake near the mountain Tsien-tsing, in China. They were first brought to Europe in the seventeenth century, and continued very rare in England till the year 1728, when a fresh accession was received. The first which were seen in France were brought for Madame de Pompadour.

When they were cleaning out the basins of the fountains at Charing-cross, I asked the foreman if he ever found any fish at the bottom, when the water had been drawn off. He told me that sometimes gold-fish were found, and that he imagined they got there out of the glass globes of the men who go about the streets selling

gold-fish, and who come to the Charing-cross fountains to change the water. During this operation, a gold-fish or two might easily escape; or, if the glass bowl got broken (they are not made of very thick glass) against the side of the basin the pool would at once become well stocked.

Some four years ago, I bought in Hungerford-market a quantity of small eels, and taking them home, placed them in a large tub; but they did not thrive, so I tied them up in a handkerchief, and transferred them to the Charing-cross basins. I heard no more of them till a friend told me of a paragraph he had seen in a newspaper, stating that some good-sized eels had been found in the basins at Charing-cross; and that the newspaper correspondent accounted for their presence by supposing 'that they had escaped from the fishmongers' shops at Hungerford-market, and had gone to the nearest water by instinct.' Now, in the first place, this is not the nearest water; the Thames is nearer to the market than Charing-cross. Next, imagine an eel escaping from a fishmonger's, crossing over the crowded Strand, and climbing up the sides of the stone basins to get into the water! I know that eels will travel from place to place; but I much doubt their ever taking such a journey as attributed to them by the newspaper correspondent, who needed not to have resorted to such an ingenious, but impossible theory, had he seen me put the eels into the basins some months before.

In the fountain in the Temple Gardens, eels are frequently found. The water comes from the New River, and it is quite probable that they get into the pipes when quite small, and afterwards grow in the fountain. Mr. Quekett had an eel some years since that stopped

up a water-pipe leading to a fishmonger's shop in Clare-market. The pipe was taken up, and examined, and in it was found a *blind eel* nearly two pounds weight. The largest eel I ever saw was found dead in a pond at Mr. Drury's house, at Shotover, near Oxford. It was supposed to have died of old age, for no marks of injury were found on it. It is now preserved in the Ashmolean Museum. I understand, from a friend just returned from New Zealand, that enormous eels are found in the rivers there, larger than any he ever saw in England.

In the museum of the College of Surgeons there is a bottle, containing a curious-looking cake, composed of many hundreds of small eels: close by in another bottle are several of these little eels, separate. They are about two inches long, white, and transparent. These eels are found at Langport, in Somersetshire, where, at certain seasons of the year, they are caught in thousands, and after being placed in scalding water, are pressed into a mould, and are then, as Mr. Quekett tells me, the most delicious eating. The air-bladder of the eel is very remarkable. Mr. Quekett has published a paper on this subject in the Microscopical Transactions. He injected the bladders of many fish, and, from the peculiar distribution of the blood-vessels in them, is led to believe that they perform some function connected with respiration. In the eels, the structure of the bladder much resembles that of the lung of the snake; but the real function of the air-bladder in fish, though the subject has been deeply inquired into by many physiologists, remains a mystery.

It is well known that eels are very sensitive to changes in the weather; and they are generally on the move when thunder is about, or, in other words, when

the atmosphere is charged with electricity. This fact is curious, in connection with the so-called electrical eel, which seems to have a store of bottled electricity always ready for use. Eels, too, are much affected by frost. On this subject I learn from my friend Mr. Turner, of St. Leonard's, who, in his capacity of surgeon on board ships going to and from India, has made many curious and good observations in natural history, that, in the months of January and February, 1855, the conger-eels, in the sea opposite St. Leonard's, were affected by the frost in a most remarkable manner. He writes to me: —

'During the intense cold (Jan. 1855), some few miles out at sea, *thousands* of conger-eels were found floating on the surface of the water. They could progress readily in any direction, but could not descend, and consequently fell an easy prey, the boatmen catching them by means of hooks on the end of a long stick. In this manner no less than *eighty tons* were captured, of all sizes, some being as much as six feet long, and of a surprising circumference. The greater part of them were sent to London per rail. One of them I opened, and found the air-vessel distended with air to the utmost, so as to completely close the valvular opening. It was this, evidently, that buoyed them up. No other fish were observed in the same condition. The thermometer at this time was very low, and one night went down to 16°. On the 17th Feb., I have a note, that as the tide receded, the beach was left as if covered with snow, but on an examination, this appearance was found to be owing to crystals, as if of frozen sea-water.'

I learn that these congers are eaten in London, principally by the Jews, who are very fond of them. The

neighbourhood of Petticoat-lane is the great market for them.

The fisherman at Teddington lock, Mr. Kemp, a very civil and intelligent man, tells me that the Jews, during 'their holidays' (I suppose some festival of their church) eat nothing but fish, and at that time they will buy as many barbel as he can catch. Barbel is a coarse-flavoured fish, but the Jews do not seem to mind that. The Jews are the best judges and cooks of fish in the world. I have ascertained that they generally fry them in *boiling* sweet oil.

Fish, in general, are very difficult to transport, but I can readily imagine that a gold-fish would bear a long journey, as they are of the carp tribe, and will exist, and thrive too, in very foul and dirty water: when even taken completely out of water they will live a very long time. The conformation of their gills explains this. The gill filaments do not readily adhere together, and so they continue to breathe if there is any moisture at all left in their gills, whereas most other fish soon get suffocated out of water, as previously explained. I once had a curious confirmation of this fact. I was invited to the clearing out of a pond in the neighbourhood of London, which was full of gold-fish. I arrived late in the day; the work had been all done, and in an out-house I was shown a common water-cart, such as is used to water the roads, quite full of gold-fish, nearly all of them alive, all quite small, none weighing above three ounces. The owner kindly gave me a dozen, which I placed in wet grass, and then in a cloth in a carpet-bag. There the fish remained all night. On my arrival in London, the afternoon of the following day, I placed them in water, and found, to my surprise, that half of

them were still alive, having passed a night and half a day in a carpet-bag. Those that were dead, I cooked: they were like carp, and I cannot say good eating. Those that were alive, I transferred to a glass bowl. In a few hours they were well and swimming about, though at first they rolled about in the water as if intoxicated. I was informed that the pond having been cleaned out, the water-cart was wheeled to its margin, and the gold-fish turned in again. Two-thirds of them recovered, and are living in the pond to this day. These fish were taken out of the water on Monday morning early, and remained in the water-cart till Tuesday afternoon! Who, after this, will doubt the vitality of the gold-fish? I understand that no young gold-fish are ever seen in this pond: they do not seem to breed. I believe they do breed, but the spawn never comes to anything; because the ducks get at it, whilst it adheres to the weeds in the pond, and eat it all up. Another cause why these fish do not increase, is that they devour each other. The spawn is eaten, and the young fish also, by their comrades.

Well aware that gold-fish will live in very high temperatures, I was anxious to obtain further particulars on this point, and I applied to my friend Dr. Warden, of Manchester, who kindly obtained from Mr. Hall, of the marble works, Derby, the following particulars, which he has obligingly allowed me to print. 'You have been correctly informed as to the breeding of gold-fish in reservoirs used for cooling down the water from the condensers of steam-engines. I have myself a small tank or reservoir in a yard where I have kept gold-fish for the last thirty years. It was at first stocked from a pond in the neighbourhood with half-a-dozen

fish, which were about twelve years old then;—the longest survivor of them only died about ten months ago, June 1857, and I have many now from twenty to twenty-eight years old. As my place was constructed to keep them for amusement only, and not for breeding them rapidly, it was not made of a proper form for the latter purpose, having walls square up from the bottom; but for breeding it should have been run out into shallows. These fish (and I presume others also) eat up all the spawn they can find, and should any spawn escape they eat the young fry; and even the young ones three months old will devour their younger brethren only just born: so that, in a tank with upright sides, there is little chance of any escaping; but if the receptacle run out into shallows, the smaller fish can easily keep in a small depth of water out of harm's way. The propensity of these fish to devour their own young is no doubt a provision of nature to prevent their over increase; however, to enable some to escape, they are born nearly the colour of the moss which grows on the sides of the pond, and begin to change to red in the course of a year, when they are about an inch in length. The old ones seem to take very little notice of them. To keep up the stock I have been obliged to take out the spawn and keep the young fish during the first few months of their lives in separate vessels.

'These fish live in extremes of heat and cold. The water in my place flows in at the top, and consequently all the hot water keeps uppermost. The temperature of this has occasionally been as high as 90° and at the bottom not more than 30°, yet all the fish keep close to the top in the hottest part. Then, again, in winter, when the conducting pipes have been frozen up, the pond also

has been frozen, and all we do is to break the ice every day to give a supply of air.'

The Serpentine in London contains some fish, but not many. I see men and boys frequently fishing on the south bank, but they never seem to catch anything except a few roach and bream. It has been said that the reason why fish do not abound in the Serpentine is that the water-fowl eat up the spawn before it has time to hatch, but there does not appear to be a sufficient quantity of birds to do much execution in this way. Ducks are, however, terribly destructive to fish-spawn in some places, as the fish generally place it in the shallows, just where the ducks love to hunt for food. The most probable reason why fish are scarce in 'Loch Serpentine,' as it has been aptly called, is that the water is so very dirty, and charged with decaying animal matter, that they positively cannot live there. This summer I bought three good-sized bream, from a man who had caught them in this dirty pond, and I had them cooked for dinner; they tasted so strongly of the foul mud, that to call them simply 'nasty' would be a stretch of politeness. From the Knightsbridge barrack window I have a capital view of the Serpentine. In April, it was of a dark mud colour seen from the distance; about June, it assumed a greenish hue: and now (August) it has the same appearance as the sea in a calm. This is due, I imagine, to the hatching of thousands of minute infusoria, and the generation of minute vegetable matter. Both the animals and the plants assimilate and convert into their own forms what would otherwise fly off in the form of gas and miasma, and be injurious to the Londoners who walk on the banks. Thus nature partially works her own cure. In reference to

this point, a gentleman who has been much engaged in engineering works in Holland, informs me that the canals and ditches in some of the Dutch towns smell most offensively till the water becomes green, and then the smell disappears: the same thing that happens in the Serpentine happens in Holland. I have lately seen a blue book containing drawings of the little beasts and the vegetable matter from the Serpentine. These little animalculæ are generally looked upon as being the cause of all the foulness of the Serpentine, but the saddle is put on the wrong horse. If these little creatures and plants did not come into existence, the miasma from the decaying matter would be insupportable. The Serpentine is capable of being improved in many ways, into which it would be foreign to the subject now to enter.

Frogs are seldom found in ponds where ducks are kept. The ducks devour the tadpoles, and have no objection to young frogs, even if they have got over the tadpole state. Mr. Quekett tells me, that in the neighbourhood of Willesden there are no wells, and each householder has a pond: these are kept free from newts and frogs by the keeping a jack in them, who eats up every frog and newt that makes its appearance. I once saw a little boy fishing in the Serpentine with very primitive tackle. All of a sudden there came a tug at his line, nearly pulling the rod out of his hands. He gave a jerk upwards in answer to the unexpected bite, and out came a lively black eel about two pounds in weight. The boy was so frightened at the writhing eel that he put down his rod and ran away, leaving the eel on the grass.

Night lines are forbidden in the Serpentine. We have all seen the pretty little model sailing-boats scudding

across the Serpentine, with all their neat white rigging glistening in the sun. Who would imagine that some of these harmless little craft are up to mischief? I have learnt that towards the close of the evening, when it is getting dusk, a night line is neatly coiled up on the deck of the pigmy frigate, and she is set to sail across. As she sails, the night line plays out, unseen by anybody, from her stern. One end of the line is tied to a stone, which is thrown a little way into the water, at the moment the ship starts: this acts as a weight to keep the line at the bottom, the other end of the line is loose on deck. By the time the frigate nears the opposite shore, all the line has been payed out, and she sails in right under the nose of the park-keeper, with nothing on her deck. She has, nevertheless, been transgressing the laws, though she looks so innocent. In the morning the owner comes and fishes out the stone which he has thrown in with the line attached, and sometimes gets rewarded with an eel for his trouble. In the evening between eight and nine bathing is permitted, and on a warm day hundreds of boys get into the water. They are principally, I imagine, boys who have been employed all the day in manufactures, judging from their dress. About half-past eight the water is alive with them, and they look, from the barrack windows, like a lot of white tadpoles clustering along the shore.

Again, to return to the perch. Its mouth will admit two fingers, also a minnow or a gudgeon, when the perch wishes to catch one. Ask for a perch-hook at the fishing-tackle shop, and you will find you will be presented with a pretty large one.

The best bait for perch is a live minnow; the perch can't resist it; he comes at it with a rush, and is caught by

the hook, which is only just run through the upper lip of the minnow. In order, therefore, to be hooked, he must swallow the bait, beginning at the tail end; this his capacious mouth enables him well to do.

I have lately heard of a capital plan to catch perch, and likewise to keep the shoal together while you are pulling out the individual fish. It is to place several live minnows in a decanter of uncut glass, and then sink it, with a string attached, deep into the water. The perch, who can't make out the glass, keep rushing at the encaged minnows, which they cannot, of course, reach; they lose their tempers, and their appetites are sharpened; therefore the more readily do they take the baited and spinning minnow, which you artfully troll close to your decoy bottle.

A fine perch was found floating dead, on the top of the water in a pond, in one of the gardens at Oxford: upon examination, it was found to be very thin, and apparently starved to death. Some devotee of the 'gentle art' had been the unconscious cause of the sad fate of this poor fish; for a hook was found firmly fixed in his upper jaw, the shank of which projected so far beyond his mouth that his efforts to obtain food must have been useless: the hook always projecting forwards, kept him at a tantalizing distance from the desired morsel. The fish I have dried, and preserved with the hook fixed in his mouth. I give a drawing of this head, Plate III. Fig. 2.

But fishes which, like perch, are provided with sharp prickles, occasionally cause the death of those creatures that feed upon them. A kingfisher was brought to me in the summer of 1848, by a boy who had found it dead on the banks of the river Cherwell, near Oxford. No

shot or other marks of injury were found on it, the feathers being perfectly smooth, dry, and unstained. What, then, was the cause of death? Upon a careful examination, I found the end of a small fish's tail protruding from one of the corners of its mouth. I endeavoured to drag it out but in vain, it was firmly fixed. By dissection, I found that the fish in question was one of the finny tribe which abound in shallow water, and which are called in Oxford the bull's head, or miller's thumb. They have a strong prickle, nearly a quarter of an inch long, with very sharp and firm ends, projecting on each side of the gills. The fish had, in its struggles, protruded its prickles, which, sticking in the enemy's gullet, had effectually stopped up the entrance, and pressing on the windpipe caused its death. Plate III. Fig. 3.

Mr. Quekett has observed a case exactly parallel to this. When fishing at Great Marlow, he saw a dabchick floundering about in the water, as if something was the matter with it. He secured it, and found that it was choking with a miller's thumb in its throat. The bird is now stuffed, and can be seen at the College of Surgeons, with the fish still in the gullet. When the same gentleman was angling for perch in a Scotch lake, he sent a boy for some minnows; the boy brought back sticklebacks. One of these was put on the hook, and a perch was caught; another perch then bit at the hook and carried the bait, but was not taken. Mr. Quekett afterwards went to another spot, but returning in the evening cast in his line where he had missed the perch. He caught a perch immediately, and, upon examining his mouth, found the stickleback he had lost off his hook some hours before firmly fixed in the perch's throat. The stickleback had erected the

spine on his back, which had caught and fixed him firmly in the gullet of his devourer.

An intelligent lady tells me she once had a pet owl. The bird all of a sudden refused its food: it sat upon its perch, and got thinner and thinner every day, and at last it died. The hard horny bill of a chicken was found sticking right across its gullet: thus the poor thing was starved to death.

Should you ever be lucky enough to catch a large jack, mind how you take the hook out of his mouth; for it is lined with a terrible array of long, sharp teeth, all set backwards; once inside, it is very difficult to get out again, whether the captured object be a man's finger or a fish. Sharp points have these teeth, as the troller knows well, when he pulls up his bait scored on both sides, after he has had an unsuccessful run.

The barbel, on the contrary, has not a tooth in his head: his mouth is made for poking about among the stones at the bottom of the river and procuring his prey, which consists of almost anything. He is a regular fresh-water pig, and lives by picking up what he can find, be it animal or be it vegetable: a good big lob-worm, however, he can't resist, as I have discovered to my great delight. That most observant of poets, Hood, has aptly recorded this grubbing propensity of the barbel in the following lines:

> 'In they went and hunted about,
> Open mouthed, like chub or trout,
> And some with upper lip thrust out,
> Like that fish for routing—a barbel.'

When a barbel is hooked, he always endeavours to strike at the line with his tail, to break it. Now if we

examine the back fin of the barbel, we shall find that the first ray of it is cut out into deep notches, just like a saw, and I always fancy that the barbel in these struggles is endeavouring to use this saw-like fin. It can be of no use to him, however, as regards severing the line, for the serrations are quite covered by the membrane which envelopes this first ray of the fin, in common with the other rays. The use of it I imagine to be to steady and steer him in the rapid currents and mill streams in which he lives. If we move the serrated ray upwards, we find the whole fin follows it, and is kept tense by it; let it go, the fin again sinks down. In the mast of the London barge we find a parallel contrivance; when about to pass under a bridge, the men let down the sail (the fin), which is attached to a strong mast (the serrated ray), and which works from the deck by means of a joint. Having passed under the bridge, the men hoist up the mast, and the sail becomes tense. This is exactly what the barbel does, only that his sail (as it were) is opposed to water, and not to wind. The barge makes headway by means of this contrivance, so does the barbel. This, again, is a pretty instance of adaptation of means to ends.

The boys at Windsor have an ingenious plan of their own to catch barbel: they throw out their line into the stream, generally in a shallow at the tail of a rapid current, and attach it to a strong and flexible twig of willow. They then, having fixed several of these rude kind of rods, retire to a distance, where the fish cannot see them. The moment the fish takes the hook, the top of the twig begins to bend, then they come up and play him. They generally have good sport, as there is no noise and no shadow on the water, and the fish's suspicions are not

roused. In France, they fix a fishing-rod which has a little bit of whalebone at the top, with a bell attached; when a fish strikes the bell gives notice.

At St. Leonard's I picked up a dog-fish, and found that this fish, also, has a spine in his back fin. My father, in his Bridgewater Treatise, mentions this fact: 'The common dog-fish, or spine-shark, has a horny elevator spine on each of his dorsal fins, but without teeth or hooks.' By means of this fact he explains what some curious fossil objects really are. These have been called Ichthyodorulites (a hard name, but easily explained by the help of a Lexicon, ἰχσύς a fish, δόρυ a spear, and λιθος a stone, fossil fish-spears, therefore). He writes: 'The bony spines of the Port Jackson shark throw important light on the history of fossil spines, and enable us to refer those very common but little-understood fossils, which have been called Ichthyodorulites, to extinct genera and species of the family of Cestracions (a kind of shark). Several living species of the great family of sharks have smooth horny spines connected with the dorsal fin. In the Cestracion Philippi alone we find a bony spine, armed on its concave side with tooth-like prickles, similar to those which occur in fossil Ichthyodorulites. These tooth-like prickles, or hooks, act as points of suspension and attachment, whereby the dorsal fin is connected with the bony spine and its movements regulated by the elevation or depression of that spine during the peculiar rotatory action of the body of the shark.* The great variety of fossil spines, from the Silurian series to the

* This rotatory action I have observed in the barbel also, when I have been playing him on the end of my line in a mill tail.

chalk inclusive, indicates the number of extinct genera and species, of the family of the sharks, that occupied the water throughout these early periods of time. Not less varied are the forms of palate bones and teeth, in the same formations that contain these spines; but as the cartilaginous skeletons have usually perished, and the teeth and spines are generally dispersed, it is chiefly by the aid of anatomical analogies, or from occasional juxtaposition in the same stratum, that their respective species can be ascertained.' Writing about sharks, I may be pardoned for giving an account of a creature which was said to be a veritable sea-snake, and which, upon examination, turned out, as most other sea-snakes have done, to be something else, and not a sea-snake.

In the year 1808 a great sea-snake was reported to have been cast ashore on the island of Stronsa, one of the Orkneys. Dr. Barclay published an account of it in the Memoirs of the Wernerian Natural History Society. In order to substantiate his account, he appends the affidavits of four of the inhabitants of the island, and thus we read: 'Compeared Thomas Fotheringham, house-carpenter in Kirkwall, who solemnly declared that he went to see the strange fish which had been driven on shore in Rothiesholm Bay; that he measured it with a foot rule, and found it to be exactly fifty-five feet long; that the wings of the animal were jointed near the ridge of the back; that the mane or bristles of the back extended from the shoulder to within two feet and a half of the tail; that part of the bones of the lower jaw, resembling those of a dog, were remaining; that the stomach was about the size of a ten-gallon cask; and the bowels about the bulk of those of a cow, &c. Compeared John Peace,

George Sherar, and another.' These men all 'solemnly declare,' certainly not untruths, but what they actually saw. They were under the idea that it was the great sea-snake they were describing, so they evidently have taken pains about it; only, unfortunately for the romance of their story, all their descriptions exactly fit, not a sea-snake, but a huge basking shark. Sir Everard (at that time Mr.) Home examined the bones, and made out clearly that they belonged to a Squalus Maximus, or basking shark. A figure of the supposed sea-snake is given in the Wernerian Memoirs, alongside a figure of a basking shark: the former is simply a caricature of the latter, with a tint of the marvellous added. The under-jaw of the creature having fallen off through putrefaction, the head, according to the drawing, resembles more that of a snake than it would have done before the jaw fell off: the back fin is extended down the lower half of the back: the fins are converted into legs, and an extra pair of legs is added.

Most of the codfish sold in London are caught on the Dogger-bank, with line and hook. The dogfish are great plagues to the fishermen, for they take the bait intended for the cod, being in themselves worthless, except that an inferior sort of medicinal oil, passed off as 'pure cod-liver oil,' is made from them. The fishermen's boys, however, take the spines out of their backs, and string them together to make necklaces.

Like the roach, the barbels require an invitation in the shape of ground bait to assemble together: for the barbel, worms and clay mixed are thrown into the place where the angler intends fishing; for the former, bran and bread, well mixed up with sand, to

make it sink, are used. In the summer I had observed by the river's edge several large holes dug in the sides of the bank. They looked like incipient foxes' earths, or gigantic rabbit holes; yet there were no foxes or rabbits about. These, I have since found out, are made by the good folks who come fishing. They bring the bran and bread in a basket, and mix them up with earth at the nearest point to the place where they are about to commence operations. Once a good place for roach always a good place, is the rule; and successive generations of anglers coming to the same fishing-holes, have in places made excavations like small stone, or rather earth-quarries. Often I have found out a good roach-hole by observing the excavations for earth close at hand.

These excavations form capital shelters should rain come on. The ancient Britons were in the habit of digging holes like these, not for fishing's sake but for shelter. Not many weeks ago some labourers, when digging gravel at Brighthampton, near Oxford, came across several such excavations: they were simply pits dug in the earth, large enough to hold one or two persons. From the sides of each of these pits a certain quantity of earth had been removed, so as to form a seat. They were, in fact, nothing more than what were used by the riflemen before Sevastopol in our day. The ancient Britons made them probably only for shelter. At the bottom of these pits were found a few rude arrow-heads made of flint, and a quantity of bones. I examined these bones, and found them to be of frogs and shrew-mice. I suppose that these creatures fell into the open pits, long after they had ceased to be used by their original makers, and anterior to the

time that they were finally filled up. Frogs and mice in their nocturnal peregrinations would very likely fall into such holes, and remain there till they died of starvation.

Since writing the above, I have heard a story from my friend, Mr. Bush, which may account for finding the bones of the frogs and shrew-mice in the same place and under the same circumstances. He was riding home one evening when he heard, by the hedge-row, cries as of an animal in distress: he got off his horse and saw a frog close to a patch of grass, something having got hold of its leg, so that the frog was a captive. He struck with his riding-whip behind the frog, and then found he had killed a shrew-mouse,* whose sharp teeth were still firmly embedded in the muscular substance of the frog's leg. Now I do not know whether the fact of shrews eating frogs has been observed, but I think this would lead us to imagine that they did. His teeth, though insectivorous, are quite capable of eating flesh if he could get it. I hope shortly to set this at rest by experiment. However, had a deep hole been near the scene of the fight described above, both frog and mouse would have fallen in, and their bones been found together, as in the case of the Brighthampton pits. It is extraordinary how often dead shrew-mice are found about our hedge-rows, but rarely are common mice found. This is, I believe, to be put down to the cat. Cottagers' cats are very fond of getting out at night and hunting in the hedge-rows: they see the shrew-mouse, also a nocturnal animal, and kill it, but they will

* A so-called shrew-mouse is not a true mouse, for he has simply insectivorous teeth, somewhat like a hedgehog, and not gnawing teeth, like the common mouse.

not eat it, as it has a peculiarly nasty effluvium about it, which makes it an unpleasant subject for dissection. The cats have found this out also. For the same reason, many cats will not eat rats.

On one occasion, when intently watching my float, I heard an odd sound as of grinding teeth at my back, but did not take much notice of it, being otherwise interested. Soon I turned round for more ground bait: it was nearly all gone; and where? Why down the throat of a great cow, who, I suppose, must have had a fancy for bran and brown bread. She did not evidently much relish the admixture of sand with the two former ingredients, for she often shook her head, and looked much puzzled, when she found the sand grating harshly on her teeth—a lesson to her never again to eat ground bait, look it ever so tempting.

Not long ago I was informed, at Andersson's fishing-tackle shop in Long Acre, that a party of fishermen had just arrived from the midland counties to fish for barbel in the Thames, and that these gentlemen had brought with them 'a large tea chest' quite full of lob worms. What a sight for a custom-house officer!

Some time ago, during the frosty weather, when the roach were biting freely, I was compelled to buy some 'gentles' (Anglicè, maggots): they were very dear and scarce; so I got only 120 for two shillings—a very bad investment; for, two days afterwards, I found that every one of them had most provokingly turned himself into a chrysalis. Having been placed on a table near the fire, they probably imagined, from the warmth, that summer was coming, and that it was high time for them to see about becoming blue-bottle flies. In the chrysalis state they were of course useless, or comparatively so, for fishing.

Some months afterwards, in turning out a cupboard, I again came across this box, and opened it: it was summer-time, and out flew immediately a crowd of great blue-bottles—all that I got for my two shillings.

It is extraordinary how difficult it is to keep these gentles from becoming hard and useless chrysalids, even when they are placed in a cool place. They are most liable to transform themselves when the weather is changeable, and when they have not much to eat. I never knew them turn as long as they had abundance of food. The fisherman Rogerson, at Thames Ditton, tells me that he can earn a few shillings in the winter time, roach-fishing from a punt, as then the largest fish are on the feed. He always manages to have plenty of gentles during the winter. To keep them alive, he gets several small tin boxes, such as bait-boxes, and puts the gentles in with bran, saw-dust, and greaves from the tallow-chandlers, and then buries them about six inches under ground. He takes up a box at a time as he requires them, leaving the others undisturbed. He says, when first dug up they are quite torpid, but soon begin to move about when exposed to the air. Rogerson also, having a great demand for worms, has made a place where he breeds them, so as to have them always fresh and ready to hand. He makes his worm bed in the winter, with about equal parts of pigs' and horse dung and road dirt, well beaten down together: it does not require stocking, the worms come there of themselves. There are two kinds of gentles sold in the shops—the liver gentle and the carrion gentle—and they appear to be distinct creatures. The former are bred from sheep's livers and are plump and white, the latter are much longer and coarser looking: they are

sold at a cheaper rate, and thrown in for ground bait to attract the fish. When the carrion gentle turns into a chrysalis, it is nearly black; the liver gentle chrysalis is of a clear mahogany colour, and roach will bite at it: they will not do this with the other kind. There is a third kind of gentle which I have heard of but not recognised—it is the gut, or paunch gentle. It is the opinion of a man who breeds great quantities of these gentles for fishing, that the liver gentle is deposited by the great blue-bottle fly, that the carrion gentle is from the common house fly, and that the third kind is from the flies intermediate in size, between the blue-bottle and the common fly, which have a shiny green-coloured body, and I am inclined to back his opinion. There is a man at Bermondsey who gets his living entirely by the sale of these gentles; he also deals in worms, and they tell me he gets on well with the proceeds of his trade. Most of the London fishing-tackle shops are supplied by him. Gentles seem to be most attractive when fed upon fish previous to being used as bait. They should always be kept in moist sand, as that seems to harden their skins, so that they do not fall so readily off the hook.

When the floods are out, it is no use angling for roach, or any other fish in their usual haunts; they go away, as the flood rises, on to the meadows, to pick up worms and insects, and are not to be found at home in their holes. But lately I received a kind invitation to dine, and to fish after dinner. This I gladly accepted, and, after a sumptuous repast, we adjourned to the river, where we found a punt waiting, also a man, with an immense casting-net ready on his shoulders. In vain did we cast in the holes—nothing did we catch

but a few gudgeons, who were there in winter quarters, little expecting to be disturbed in fifteen-feet water. But on the flooded meadows, in two-feet water, the catch of roach and bleak was very satisfactory. Cold work it was—out in a punt, on flooded meadows, till nearly midnight—but very pleasant withal. Very many bleak did we catch on this occasion. At Oxford they call these fish 'Tailor-Blays;' but by the time they have got so far down the river as Windsor, they have lost one of their names, and are called simply 'Tailors.' There is, however, no resemblance in any respect to a tailor that I can see or learn. 'Blay,' the great Johnson defines as a 'small white river fish, also called a bleak.' Walton calls him the fresh-water sprat, and says he is ever in motion, and is therefore called by some the river swallow. He adds: 'His back is of a pleasant, sad, sea-water green; his belly white and shining like the mountain snow.' A very beautiful description this is!—but it is an unfortunate thing for this fish that he is so beautiful. Ever-designing man hunts and entraps him for his scales, wherein constitute his beauty; and what does he do with these scales? Why he robs the fish to adorn his own species; he makes with them artificial pearls. A Windsor fisherman tells me he recollects the time when men went out poaching bleak all over the river at the dead of night: and many a bloody battle has there been, and many a head has been broken, over a bucketful of these fresh-water sprats.

Mr. Yarrell gives more particulars of this curious trade. We read: 'On the inner cutaneous surface of the bleak, roach, dace, white-bait, and similar fishes, is found a silvery pigment, producing the lustre which

their scales possess. The ornaments manufactured from it bore the name of patent pearls, and their use was universal in the bead trade, being employed in the manufacture of necklaces, ear-drops, &c. So great, formerly, was the demand at particular times, that the price of the quart measure of fish-scales varied from one guinea to five. The Thames fishermen caught the fish, took off the side scales, and threw them immediately into the river again; and it was the custom of hawkers, regularly, before selling any of these fish, to set apart the scales for the bead-makers. The method of obtaining and using the pigment was, first, thoroughly to clean the scales by exposing them to a current of water, and then to soak them for a time; after which, the colouring matter was deposited. When thus procured, small glass tubes were dipped in the pigment and injected into hollow glass beads of various forms and sizes. These were then spread upon sieves, and dried in a current of air. If greater weight and firmness were required, a further injection of wax was practised. Of this pigment the white-bait afford the most delicate and beautiful variety, and used to obtain the highest price. The bleak was next in esteem, and the roach and dace the least valuable. The French were the inventors of the art; and Dr. Listre informs us that one artist in Paris, during the course of the winter, used thirty hamperfuls of these bleak scales in this manufacture.'

The drainage of Oxford for the most part is conducted into the Thames by a stream that runs alongside a wall on the west end of Christchurch meadow; this stream is called Pactolus. The original Pactolus was a river in Lydia (also called Chrysorrhoas, or golden-streamed, because it contained sands of gold). The story is, that a

certain foolish king, named Midas, entreated Bacchus that everything he touched might be turned into gold. His prayer, being granted, his meat also became gold, which caused him to see his folly. Having given him a lesson, Bacchus kindly restored him to his former position, and ordered him to wash in the river Pactolus, the sands of which immediately became gold.

'Sis pecore et multâ dives tellure licebit
Tibique Pactolus fluat.'*—HORACE, *Epod.* Ode XV. 20.

The modern Pactolus does not contain gold, but something convertible into gold, if used by the farmer as manure, viz. κοπρος, (manure), convertible into χρυσος, (gold). Now where this stream joins the Thames there are thousands of bleak always swimming with their heads up stream and feeding upon what floats down. When quite a little boy, I recollect the bleak at this spot; and but the other day, when I went to Oxford, there was Pactolus still rolling down his golden sands, and the bleak exactly in their old place, just as they were twenty years ago, and at exactly the same work; nobody seems to molest them, as it is pretty well known what they feed upon.

I find a parallel instance to the above in a work, 'Ancient and Modern Fish Tattle,' by the Rev. Dr. Badham: 'Most rivers were thought to impart flavour and to improve the condition of his solids; but as tawny Thames has the pre-eminence amongst rivers for the quality of its porter so had the Tiber for the quality of its basse. The Tiber had its noted holes, and haunts, and there was one special spot

* 'Though wide thy land extends, and large thy fold,
Though rivers roll for thee their sands of gold.'—FRANCIS.

often mentioned by Latin writers "between the two bridges," whence all the finest specimens used to be fetched. Here they acquired that delicate bouquet so appreciable by Roman connoisseurs, who, according to Horace, knew at a bite whether what their fishermen had supplied had really come from this dainty site or from some more distant reach of the river towards Ostia.' The author saw an old ague-stricken man fishing in this very place, just as the Romans did centuries before him.

To take the opposite extreme to the bleak, fishes with rough skins are also deprived of their jackets. The dog-fish and the shark, worthless in other respects, are skinned by the fishermen, and the skins sold to be used in the process of polishing various articles, and also to bind round the handles of swords. In the actual skin are set numerous small tooth-like plates, each distinct from its fellow, of a very hard and durable nature, forming, in fact, a sort of natural file. The polisher buys this natural file to finish off his fine work; the sword-maker puts it on the sword-handles to afford a firmer grasp to the soldier; and, lastly, the man who makes lucifer-match boxes buys it to put round his boxes, so as to afford a rough surface—always handy to the housemaid when she wants to strike a light; thereby saving the expense of sand-paper, and preserving the walls of the house from the lucifer-match marks so characteristic of a careless householder.

The South Sea islanders have found out this fact also, for in the Ashmolean museum at Oxford I observed a bit of shark's skin rolled up in a circular form and evidently intended as a polisher. In Paris, I have seen walking-sticks covered with fish's skin, probably those of

the dog-fish; they look very neat, and the roughness gives a good hold for the hand. The new trolling spoon baits, which are spoken of so highly by anglers, are nothing more than an improved copy of the savage's hook; he ties on to his hook portions of the iridescent shell of the Venus-ear, which, glittering in the water, attracts the fish. In the British Museum are some good specimens of Esquimaux fish-hooks made of walrus-ivory and bone. In the Ashmolean museum at Oxford is a capital net made of the twisted intestines of the walrus: the knot is the same as that used by the English fishermen of the present day. This gut net was brought from the Arctic regions by Captain Parry.

The cook, too, takes advantage of the rough skins of the sole; she buys them from the fishmonger, and puts a bit in the coffee when boiling up. She will tell you the rough skins entangle the falling 'grouts,' and so make the coffee clear; but my own idea is that the albumen boiled out of the skin, like isinglass, is coagulated by the heat, falls to the bottom, carrying with it the impurities, and so accounts for the clearness of the coffee. I once gained a prize, when a fag at Winchester school, for making coffee, and therefore have a right to an opinion on the art.

The material called shagreen is composed of the skin of a species of ray. In former times, surgical instruments, cerate, and other cases were almost invariably covered with it. The skin, in its unmanufactured state, is studded with little bone-like plates: these are all filed down level, and the interspaces filled with some pigment material, which may be red, green, or any other colour. The boxes covered with this are everlasting wear, as they are, so to say, encased in a bony armour.

The fishes with hard skins, have, however, one advantage over the soft-skinned fishes, to a greater or less degree. They are not so much troubled with parasitic animals adhering on them. To sickly fish do these parasites principally adhere, just as the bill-stickers in London select a tumble-down house, or else premises in chancery, to stick their paper parasites, in the shape of advertisements, upon.

Not long ago, when trolling for jack at a pond called Ash Mills, near Slough, I observed that the dead roach with which I was fishing, became, after two or three casts in the water, covered with little worms, long and narrow, and having, I should judge, excessively sharp teeth. So tightly did they stick to the slippery scales of the roach, that they would allow me to pull them asunder rather than let go their hold, so I left them alone. They soon, however, disappeared from off the fish as I went on trolling; finding out, probably, that they had hit upon a dead fish, and that they could squeeze no blood out of it, suck they never so hard.

A few days afterwards, when preparing a large jack's head for stuffing, I found several of these same little worms sticking fast to the roof and sides of the jack's mouth; but they were quite dead. I may here mention that I fully believe the story of the insects inside the Egyptian crocodile's mouth; nor do I think it improbable that the small bird, as related by Herodotus, picks them off. An analogous case nearer home is the starling on the sheep's back, hunting for the little tormentors of the sheep, who quietly go on grazing during the operation.

Upon the head of a decapitated cod, in Mr. Groves's shop, I not long ago found some very curious worms with

star-like mouths — these were sticking to the gills. They were presented to me, and I took them to the College of Surgeons, where they were pronounced to be interesting and not very common specimens.

At Teddington lock I caught one day this year three barbel. I observed that the bellies of these fish were covered with little, round, red spots, as though they had been pricked with a needle. I could not understand what these spots were, till I caught the third barbel; on to its belly was still adhering a little leech-like beast, that curled himself into a ball when touched, like a wood-louse. With some difficulty I got him off the barbel's belly, and in the place where he had been sucking was one of these little round, red spots. The mystery was thus fully cleared up: this parasite had an amazingly sharp pair of nippers, wherewith to pierce and hold on to the barbel's thick skin.

When fishing at the weir at Thorney broad fishery, near West Drayton, in the month of May, a gentleman who was angling above me cried out: 'Look out, there is a great fish coming down the weir!' and sure enough there was a fish coming down in the rapid stream, *tail* foremost as fast as it could. I just managed to catch him with the landing-net, and found that he was a large roach weighing one pound and three-quarters. The poor fish had been wounded in the back, probably by a punt-pole, and was in a bad way. It was quite covered with the same kind of parasites that I found on the dead trolling bait, so that these little creatures perform in the water the same office that the flies, by means of their maggots, do on land: they devour the offensive animal matter which would otherwise pollute all around.

The gold-fish in the round pond at Hampton Court are also much troubled with a parasitic fungus which grows upon them, but I never had an opportunity of examining one out of the water.

Mr. Hall tells me that his fish are much troubled with this fungus; 'occasionally they are attacked with a disease of the eye, causing it to bulge out like a small bladder, and sometimes the scales stand up. The most fatal complaint they have is a sort of ulceration which takes place on the body on which this vegetation occurs and shortly covers the fish, after which very few recover.'

This is doubtless a vegetable fungus. Near Hammersmith, there are several flood-gates communicating with the Thames, round which the roach and dace collect: these fish are covered with this parasitic fungus. It ultimately causes the death of many of them, as it becomes adherent to the gill substance, and prevents their breathing. Mr. Quekett tells me that he has seen a stickleback come up to a newt in a vivarium, and the newt has eaten off the fungus, the fish remaining quiet all the time. The newt, too, sometimes suffers from the same disease. I have seen frequent cases of it.

Those who are fond of a day's fishing, I would certainly advise to go and try Windsor; whether for gudgeon in the summer or jack in the autumn. At Surley Hall, two miles from Windsor, they will find boats, every accommodation for eating and drinking, and a remarkably civil landlord; but the boat ought to be engaged the day before. At Monkey Island, also, further up the river, about five miles from Windsor, good fish of all sorts are to be caught, and the water there is more or less preserved by the landlord of the inn on the island, for the benefit of his customers.

MY MONKEY JACKO.

Those who have visited the French sea-port of Havre-de-Grace must well recollect the innumerable curiosity shops which therein abound; curiosity shops, not like those in the Wardour or the Dean Streets of London, where are exposed for ignominious sale the cast-off Penates of London folk, both rich and poor; but real curiosity shops, on whose shelves are arranged in a strange medley the products, animal, vegetable, and mineral, of far-distant and little-known climes; brought home by the sailors who navigate the numerous and busy trading ships which line the quays, and we may almost say the streets of this French Liverpool. Let us enter one of these and examine its contents. On the one shelf we see curiously-carved baskets, cut with ingenuity from a cocoa-nut brought from the South Sea Islands, and beside it armlets of the same all-useful nut, from the Storrs and Mortimers of the islands aforesaid.

On the neighbouring shelf are displayed the products of the Arctic Regions, snow spectacles used by the Esquimaux in his journeys over the frozen snows of his ice-bound but well-beloved home, bartered most likely to the mate of yon tall-masted whaling ship for a drink of brandy from his flask, or a sixpenny Birmingham knife. Teeth of that monster of the deep, the cachelot whale, lie here, mixed with the whalebone from the capacious mouth, or, as we may justly call it,

infusorial trap of the true, or right whale; the oil from whose sides fills those greasy-looking barrels just hoisted out of the hold of the floating oil-shop close by.

On the longest 'fin' of this whalebone, behold a rude but correct portrait, carved with a sailor's jack-knife, of the oak and iron-bound vessel whose comfortable berths formed the only home of the artist when daring the perils of the Northern Ocean.

From the ceiling are suspended cages full of tropical birds. Here, in a dark and gloomy-looking wired box—we can hardly call it a cage—huddle together a crowd of Java sparrows and wax-bills, thinking of their native jungles, and making, in their own language (could we only understand it), unpleasant comparisons between the stale and mouldy food in their feeding-troughs and the sweet and pleasant fruits so agreeable to their epicurean palates, when free and at liberty in their far-distant homes.

What is that harsh and unearthly noise as of a duel between two rabid cats, which brings the proprietor (probably not a fat one, for this sort of business is not the most profitable in the world) breathless to the door? 'Bella, horrida bella!' the tailless, green-coated, African monkey, who hangs suspended from an old parrot's cage outside the window, has seized the incautiously-protruded tail of his prettier, and therefore more favoured brother, the monkey from South America; he, unfortunate creature, has crossed the 'herring pond' in a hen-coop, which is much too small to contain himself tail and all. This appendage, which in his present condition of life is neither useful nor ornamental, is perpetually getting him into scrapes which the honourable representative of Africa, being, *per naturam*, tailless, escapes.

Conscious of his condition, the poor Yankee monkey pulls in his tail, coils it up as well as he can, and gives it a most malicious bite, as much as to say, 'I wish you were off: you are of no use to me now, and you look terribly shabby.' He then covers it up with straw and looks miserable.

'How much for that monkey,' I say; 'the one in the hen-coop?' The monkey looked up as though he understood what was said, and with a face which evidently says, 'Please buy me.' The merchant's price is too high: the African rascal he will sell for half the sum, but this gentleman grins so maliciously at the customer that the bargain is off.

The wanderings of the Yankee are not, however, yet finished. He is bought by a knowing innkeeper at Bayeux, near Havre, and for half the price previously set upon his head; and over he goes to his new home. His master, finding out his fond and quiet nature, turns him out with a light chain round his neck, into a comfortable stable, where he can nestle under the hay, and get his sea-worn coat into a respectable condition.

The recollection of this poor monkey haunted me for some time, and I often thought I should like to own him. In the course of time, the celebrated tapestry of Bayeux, worked by the hands of the wife of William the Conqueror, attracted me to that ancient and venerable city. After seeing and wondering at the lions of the place, I went into the stable to find out the coachee, and to order the horses to be re-fastened to the rickety vehicle which had brought the sight-seers there — carriage it could not be justly called. What was my delight to see my old friend of the hen-coop perched on

the manger, looking as happy as a monkey could look. He really was a pretty little fellow; his bright eyes sparkled like two diamonds from beneath his deep-set eyebrows; his teeth were of the most pearly whiteness, and of these, whether through pride or a wish to intimidate, he made a formidable display on the entrance of visitors. His hands were certainly not similar to those of Fair Rosamond's, of Woodstock renown, but more like the shrivelled and dried-up palms of the old monks at St. Bernard, whose mortal remains are made an exhibition of in that far-famed convent. A more wicked pair of pickers and stealers we may, however, with confidence, say, were never encircled with the Queen's bracelets by Sir Richard Mayne. His tail, which had now recovered its good looks, gave additional charms to his personal appearance, and, moreover, was most useful, inasmuch as it performed the office of a third hand to its owner. With this he could cling on to the bar of the rack above the manger, and swing himself about, a perfect living pendulum. Well, too, he knew the use of it, for if a nut or apple thrown to him lodged just out of the reach of his hands or feet (for he could use the latter quite as cleverly as the former), he would run to the full length of his chain, and turn his face round to the place where it was attached, so as to get as much length as possible stretch out this member, and pull towards him the coveted delicacy. If pursued, moreover, and the chain, dangling after him, got in his way, he would invariably coil it round the links, and carry it high over his head, by means of this most useful extremity, out of the way of his spider-like legs. Should human beings, blessed with tails, be ever discovered in some hitherto

unexplored regions, as certain travellers insist, we doubt much whether these appendages will be as useful to their proprietors as Jacko's was to him.

After some considerable amount of bargaining (in which amusing, sometimes animated, not to say exciting, exhibition of talent, Englishmen generally get worsted by the Frenchmen, as was the case in the present instance), Jacko became transferred, chain, tail, and all, to his new English master. Having arrived at the hotel, it became a question as to what was to become of Jacko while his master was absent from home. A little closet, opening into the wall of the bed-room, offered itself as a temporary prison. Jacko was tied up *securely*—alas! how vain are the thoughts of man!—to one of the row of pegs that were fastened against the wall. As the door closed on him, his wicked eyes seemed to say, 'I'll do some mischief now;' and sure enough he did, for when I came back to release him, like Æneas,

'Obstupui, steteruntque comæ et vox faucibus hæsit.'*

The walls, that but half-an-hour previously were covered with a finely-ornamented paper, now stood out in the bold nakedness of lath and plaster; the relics on the floor showed that the little wretch's fingers had by no means been idle. The pegs were all loosened, the individual peg to which his chain had been fastened, torn completely from its socket, that the destroyer's movements might not be impeded, and an unfortunate garment that happened to be hung up in the closet was torn to a thousand shreds. If ever Jack Sheppard had

* Aghast, astonished, and struck dumb with fear,
I stood; like bristles rose my stiffened hair.—DRYDEN.

a successor, it was this monkey. If he had tied the torn bits of petticoat together, and tried to make his escape from the window, I don't think I should have been much surprised.

Conversing with the proprietor of the 'Happy Family,' which stands on Waterloo Bridge, I was informed that this exhibition had been in his family upwards of thirty years, and that his mode of socializing the animals was simply by placing young ones in the cage in lieu of those who died. The magpie was the patriarch of the cage; he had had this bird five years hopping about and chattering. The next to the magpie was the starling; he had been in the cage two years. He left all the creatures in the cage together regularly every night, owls, rats, rabbits, jackdaws, dogs, &c., but he was obliged always to take the monkey out and put him in a different place; he was so very mischievous, and kept all the other animals awake, teasing them when they were asleep. 'Ah,' said he, 'them monkeys is awful blackguards.'

It was, after Jacko's misdeeds, quite evident that he must no longer be allowed full liberty, and a lawyer's blue bag, such as may be frequently seen in the dreaded neighbourhood of the Court of Chancery—filled, however, more frequently with papers and parchment than with monkeys—was provided for him; and this receptacle, with some hay placed at the bottom for a bed, became his new abode. It was a moveable home, and therein lay the advantage, for when the strings of it were tied, there was no mode of escape. He could not get his hands through the aperture at the end to unfasten them, the bag was too strong for him to bite his way through, and his ineffectual efforts to get out

only had the effect of making the bag roll along the floor, and occasionally make a jump up into the air, forming altogether an exhibition which, if advertised in the present day of wonders, as 'Le bag vivant,' would attract crowds of delighted and admiring citizens.

In the bag aforesaid he travelled as far as Southampton on his road to town. While taking the ticket at the railway station, Jacko, who must needs see everything that was going on, suddenly poked his head out of the bag, and gave a malicious grin at the ticket-giver. This much frightened the poor man, but with great presence of mind, quite astonishing under the circumstances, he retaliated the insult, 'Sir, that's a dog; you must pay for it accordingly.' In vain was the monkey made to come out of the bag, and exhibit his whole person; in vain were arguments in full accordance with the views of Cuvier and Owen, urged eagerly, vehemently, and without hesitation (for the train was on the point of starting), to prove that the animal in question was not a dog, but a monkey. A dog it was in the peculiar views of the official, and three-and-sixpence was paid. Thinking to carry the joke further (there were just a few minutes to spare), I took out from my pockets a live tortoise I happened to have with me, and showing it, said, 'What must I pay for this, as you charge for *all* animals?' The employé adjusted his specs, withdrew from the desk to consult with his superior; then returning, gave the verdict with a grave but determined manner, 'No charge for them, sir; them be insects.'

Not long ago I met a man in Oxford Street who was wheeling along a truck full of tortoises of different sizes. He said he had bought them as a speculation,

from the captain of a ship, then in the Victoria Locks, who had got a cargo of them. In order to get customers he assured the passers-by that they were capital things to 'keep the kitchen clear of black beetles.' This was simply untrue, for this kind of tortoise is purely a vegetable eater. However, he sold not a few to those who believed him. He told me that the tortoises were brought over on trays fixed inside the ship, and that the captain had many thousands of them. I bought the largest of the lot, and took him home on the top of an omnibus. The driver had evidently not had a zoological education, for he could not make out the nature of my prize at all. After patiently hearing my lecture upon tortoises in general, he relapsed into silence; then, suddenly stretching out his hand asked for the tortoise. I gave it him, and he weighted it, or, as a countryman would say, 'heifted it,' as the housekeeper does her goose when she is choosing one for her Michaelmas dinner. At length he returned it to me, with the remark, 'I wonder, sir, how it would eat biled with sage and ineons!'

Though these tortoises are not often eaten in England, I believe they are in France. I have a receipt for cooking them given me by a Frenchman, a patient of mine while I was house-surgeon at St. George's Hospital. A friend, who went to Bulgaria with the English cavalry, during the last war, tells me that the Zouaves are very fond of tortoises, but they are difficult to kill, as they retract themselves into their shells. The mode the Zouaves adopt to get them out was simple, but cruel. They put a red-hot coal on the poor brute's back, and when he puts his head out from pain, they cut it off with a knife.

I well recollect many years ago, when the Duke of Wellington was made Chancellor of Oxford, a live turtle was sent down from London to be converted into soup, for the banquet given to the Duke in Christ Church Hall. In the middle of the quadrangle at Christ Church is a circular pond. Somebody tied a rope to the turtle's fin, and let him have a swim in this pond previous to his execution; and mightily the poor thing seemed to enjoy it. I recollect, too, that my father made me stand on the back of the turtle while he held me on (I was then a little fellow), and I had a ride for a yard or two as it swam round and round the pond. I have got the head of this turtle now in my collection. A few weeks ago, when on my way to see the great iron ship opposite Greenwich, a boy got into the steamer at London Bridge carrying a turtle on his back. The turtle was a very large specimen, and it was as much as the boy could carry. I observed that the boy had got the rounded back of the turtle and not the flat side towards his back. This, I thought, was a clumsy way of carrying it, as the turtle did not seem to sit at all easily, but continually rolled about, even though the boy had got a tight hold of its flippers. I soon got into conversation with the boy, particularly as I observed that his hand was tied up as if injured. He told me his business was to fetch turtle from London when wanted for one of the hotels at Greenwich (I forget which), and that he generally carried the creatures with the flat side towards him; but the last turtle he so carried 'caught hold of his hand, and nearly bit off four of his fingers,' and it was a long time before he could get it out of his mouth. I examined the hand, and sure enough four of his fingers

were frightfully lacerated. For the future, he intended always to carry the turtle with its flat part outermost, as it could not then turn its head round and bite him.

When Jacko arrived at his ultimate destination in England, a comfortable home was provided for him in the stall of a stable, where there was an aperture communicating with the hay-loft, so that he could either sleep at his ease in the regions above, or, descending into the manger, amuse himself by tearing to pieces everything he could get at. This stall was usually unoccupied, except by his serene monkeyship; but he was not destined to remain lord of the manor *in perpetuo*. One cold winter's evening, when the snow lay thick on the ground, the family donkey was brought up from the field, where it was endeavouring to keep itself warm by the side of a haystack, and placed in these more comfortable quarters. A plentiful supper of hay was placed before the hungry animal, which it began to devour with great eagerness. About an hour after, the groom happened to go into the stable to see that all was right. What was his great astonishment to see Jenny, without any apparent cause, pulling away at her halter, and trying to keep her head as far away as possible from the bundle of hay, which had suddenly acquired some invisible noxious properties.

Not knowing what to make of it, the man gave the poor donkey a blow, to make it 'come up,' in the stable parlance; no sooner had the long ears approached the hay than the mystery was explained. A tiny pair of hands were suddenly thrust out from under the cover, and the ears seized: at the same moment master Jacko's face appeared, chattering his teeth as though he had an attack of ague, and as quick as thought their sharp

points met in the unfortunate Jenny's aural appendages. Jenny instantly retreated with force enough almost to break the halter, and Jacko covered himself up again in the hay, keeping, however, a small opening patent, through which he could observe the movements of the enemy. The little rascal, from the hole in the loft, had seen the hay spread out by the man, and thinking it would make a capital warm bed for himself, had quietly taken possession, quite regardless of the inward cravings of poor Jenny, who would, if she dared, have most greedily devoured the signor's bedclothes. I remember well in an old Æsop's fable-book, illustrated with quaint woodcuts, the fable of 'The dog in the manger,' and also a pictorial representation (certainly not after Landseer) of this same well-known event, but I never had hoped to see the actual drama performed by two quadrupeds. I must not, however, omit to say, that I, and doubtless the reader also, have frequently seen a very fair representation of this scene admirably performed by two bipeds. If Jacko had lived in the time of Æsop, doubtless the former would have been immortalized by the latter, and 'The monkey in the manger' been as familiar in our mouths as 'The dog in the manger.' It is, however, a curious fact, that this monkey, at the same time that he conceived too great an animosity against the donkey, took a great liking to a dun pony of a neighbour, who, on paying his visits, usually tied him up on Jacko's territory. On these occasions Jacko seemed delighted to see his four-footed ally, running frantically about as far as his chain would allow him, and when the pony was fastened up, and the corn placed before him, jumping on his back and nestling down there, or searching eagerly in the mane for imaginary parasites.

Speaking of donkeys, there is a poor old man living in the neighbourhood of Albany-street, who is in the habit of coming up with his donkey-cart full of flowers to the Regent's-park barracks. Old Joe—for that is his name—is very proud of his donkey, and boasts that he and his donkey together are 103 years old. I suggested that when the donkey died he should send him to the British Museum. 'No, sir, he ain't old enough for the British Museum. I expect that there are older things in the British Museum than my donkey,' was his reply. Thinking 'Old Joe' would be a good authority on the old story of nobody ever having seen a dead donkey, I questioned him, and he confessed he never had seen a donkey dead from natural causes. Wandering one day about the race-course at Epsom, I came across two post-boys of the genuine old sort, thin, weazen, old fellows, whose garments seemed held together by pipeclay only. Thinking these might be about the last real post-boys I might ever meet, I got into conversation with them, and asked what had become of all the old post-boys. 'What, don't you know that?' said the oldest, thinnest, and ugliest of the two; 'why, they are all changed into donkeys, and turned out on Blackheath.'

When sitting on the manger, Jacko had one peculiar amusement, and that was catching mice. These unsuspecting little animals would come out to pick up the corn left by the horses in the next stall. To get at their feeding-ground they had to run the gauntlet of Jacko's premises. He was up to this, and would pretend to be asleep, keeping, however, one eye half open. The trick answered, the mouse made a rush—in vain; Jacko, as quick as lightning, had his paw upon him, and with a tight squeeze crippled the poor little brute;

he would then play with him for some minutes, every now and then giving him a pat to make him go faster. When the poor victim thought he had got away, Jacko caught him again, made a complete search through his hair for parasites, and then—oh, carnivorous representative of the class Quadrumana!—ate him up (as a child described it to me) like a sugarplum. The fun over, he would again assume his manœuvres and catch another member of the murine family, to be treated in a similar way as the last unfortunate. In this way I have known him catch as many as seven or eight mice in one afternoon. The servants having observed Jacko's talent in this line, bethought themselves that they would turn it to some account; and as the cat of the house, the *Felis domesticus* of the place, was ill, and unable to perform her duties, they, not having undergone a severe training in the logical school of Aristotle, or committed to memory the rules which are summed up in those most delightful, and at the same time most poetical, lines of dreaded Little-Go memory, viz.,

'Barbara celarent Darii ferioque prioris,' &c. &c.

reasoned to themselves as follows: Cats catch mice in the dark: Monkeys catch mice in the dark: therefore Monkies are Cats.

Acting upon this syllogism, they one evening took poor Jacko out of his comfortable bed in the loft, and chained him up in the larder, having previously removed every eatable or drinkable thing, except some jam-pots, which were put seemingly out of reach, and, moreover, were well secured with bladder stretched over the tops. The night passed long and miserably to poor Jacko, who was evidently much astonished at this unwonted treatment. All

night long the mice scampered about the place, regardless of their enemy, while he, most uncatlike, was coiled up in a soup tureen fast asleep. The morning waned, the mice retired to their holes; Jacko awoke, scratched his shivering hide, and having first pushed the tureen, his bed, from the shelf, to its utter demolition, looked about for something to eat. The jam-pots attracted his notice. 'There is something good here,' thought he, as he smelt the coverings. 'I'll see.' His sharp teeth soon made an aperture; he was not disappointed. The treasured jams, raspberry, strawberry, plum, the vaunted Scotch marmalade, the candied apricots, the pride and care of the cook, disappeared in an unaccountably short time down into the seemingly small gullet of the sweet-toothed Jacko. Not if I had a hundred mouths and a hundred tongues could I describe the imprecations hurled at the devoted head of the now sick and overgorged gourmand by the disappointed and illogical cook, the owner of the jams, as she opened the door of the larder at breakfast time to see how many mice the monkey had caught. Great was the anger of the female gaoler; great the malicious grins of the captive. Mischievous boys will sometimes open jam-pots as well as monkeys, and in London they often run off from applestalls and sweetstuff stalls with a purloined something. There is a poor old woman who sits in the Strand selling boiled pigs' feet. She is a decrepit person, and cannot run after the boys if they come and pick while she, poor soul! is snoozing. She has, therefore, gone on the principle that 'prevention is better than cure,' and has covered her basket all over with a net, leaving only one aperture for her hand, to fetch out the pigs' feet for her customers. At Hyde Park Corner there sits a man who sells sweetstuff.

When he runs away to get a glass of beer, he leaves his dog on guard, a white mongrel-looking beast, sagacious withal, for he sits in his master's chair with his head over the goods. He looks all importance, as passers-by glance at the stall; but should any *boys* come near (he knows the street boys well enough), he curls up his lips, and shows his sharp teeth at the intruders, and would doubtless bite them if they came too near. Tastes differ as much in animals as in man, and, moreover, there is no accounting for them in either case. Some few days after this *affaire de jam*, Jacko, having been reinstated in favour, was warming himself before the kitchen fire. A cricket that had been singing merrily in the ashes came a little too far out on to the hearthstone: his fate was sealed—the next jump he made was down the throat of Jacko, who munched him up as an epicure does the leg of a woodcock. The next tit-bit was a blackbeetle, who ran out to secure a crumb dropped from the servants' supper-table: he, too, became a victim to his rashness; and not he alone, but many of his black friends and relatives, who incautiously exposed themselves before the candles were put out. Having ascertained that these beetles were nuts to Jacko, I one day gave him a great treat by upsetting the kitchen beetle-trap in his presence. Both paws instantly went to work — whole bunches of the unfortunate insects he crammed into the pouches (which he, like most other monkeys, has on each side of his mouth, and which serve as pockets), munching away as hard as he could, at the same time. His paws could not catch the prey fast enough, so he set his feet to work, and grasped with them as many as he could hold. This was not enough. He swept a lot together with his tail, and coiling it up closely, kept them there close pri-

soners till his mouth was a little empty, and he had time to catch and devour them. This was really too greedy. I took him away from the feast, still, however, munching with all his might, and looking back at the box with wistful eyes. If we wanted at any future period to make him in a good humour, his flagging spirits were instantly roused by the sight of the beetle-trap.

Almost all monkeys have pouches in their cheeks. I recollect, one Saturday night, hearing a man who was selling riddles at a penny per yard, in long slips of paper, in the neighbourhood of Westminster, propose the following enigma, as a specimen of the best of the pennyworth—'Why does a dog carry a bone in his mouth?' He volunteered the answer immediately afterwards:—'Because he has no pocket to put it in.' Now the monkey, like the dog, carries his food in his mouth; but that mouth contains a pocket. The skin of the cheek is very loose; when empty it falls in wrinkles, which gives the 'old-man like' appearance to his face. In this natural pocket he places his food, and keeps it there till he wishes to devour it. Now this is a beautiful provision given to the monkey by its all-wise Creator. Trees are the monkey's proper habitat, but he often descends to the ground to get roots, and to catch beetles under the stones. While his attention is taken up by looking for his food, he might be surprised by his enemy, and be obliged to make a precipitous retreat, so, as he catches his beetles, he puts them in his pouch; and thus he can carry off his earnings with him if surprised; or, if not surprised, can take them up to his home, the top of a tree, to devour them at his leisure. I find a MS. note to the effect that the monkeys which

live on the rock of Gibraltar have, in course of time, somewhat altered the features of the ravines about, by rolling stones down from the heights, in their search for insects, which they find underneath. Thus a formation is made, which would be difficult to account for by any ordinary geological theory.

But not only does the monkey make use of the pouch in his cheeks when hard pressed; the creature next above him in the scale of creation does the same thing, as proved by the following observed circumstance:—

Passing one day along the Strand, on an omnibus, two ragged urchins came running alongside. In an instant one of them sat down on the pavement, and the other turned a very clever summersault over him, their hands just touching in mid-flight. I observed that one cheek of the boy who jumped over the other projected considerably: I suspected the cause, and threw down a halfpenny; in a moment, the boy put it in his mouth, and, with a dexterous twitch of his tongue, lodged it within his cheek. Anxious to carry out the experiment, I continued throwing down coppers to him, stipulating that he should perform a summersault for every copper, which he readily did. Every penny and halfpenny went into his mouth, till at last his cheeks looked ready to burst. At length we came to a halt at Charing-cross, and I gave him a threepenny piece to show me what he had in his mouth. He quickly turned out all his earnings, consisting of fourpence halfpenny in coppers, and one bit of silver. The poor little fellow seemed mightily pleased with the contents of his mouth. I asked him why he put his money in his mouth. 'Cos, sir, I ain't got no pockets; and if I ad, my money would fall out when I turns over,' was the reply. 'It's a

wonder he don't get canker in his mouth,' was the remark of the driver of the bus, a very fatherly-looking man. A fine specimen of muscular development, and perfect figure, did this little, hard-working, active child of eleven exhibit, uncramped by clothes, and always in high training for running. Nature had in his person her full development; and a marvellous and beautiful form she had produced in this specimen of a neglected English boy.

As a contrast to this boy, I recollect, when walking, one cold and wet day, in the neighbourhood of St. Giles's, passing a baker's shop, and remarking how, from the heat of the oven below, the stones in front of the shop quickly dried, when all the paving-stones around remained quite wet and muddy. As I stood looking at the dry stones, a poor little, miserable, shivering boy, very slightly clad, and looking very ill, came wandering by: he, too, saw the dryness of the stones, but he went a step further in his inquiry than I; for he felt them with his hand, and immediately lay down on them at full length, close under the window, to get all the warmth he could. At the same time he cried to another little boy, who was on the other side of the road, 'Come along, Billy; here's a nice warm stone.' Billy came, and warmed himself on the stone by the side of his friend. A roll a piece each from the baker's shop made them both for the time happy. I have heard of sailors, when on deck all night, pricking the boards to find a soft place to sleep on. The theory is exemplified by the boy's choice of a stone to warm himself by.

Jacko's insectivorous propensities were not confined to blackbeetles alone. Spiders formed a pleasant variety; not a spider was left alive either in the stable or outside

the stable where he was confined; and most enormous stones would he pick out of this wall with his little fingers, in search of a runaway web-spinner. He was really of great use in clearing the house of this housemaid's pest. I often used to put a bit of string to the end of his chain, and make him run up the curtains of the rooms of the house. He would then completely rummage out and devour every spider, who, having frequently had their webs so frequently knocked down by the relentless broom, had thought to spin them in security on the top of the cornices and among the curtain-rods.

On one of these occasions, he watched his opportunity, and suddenly snatching the string out of my hand, straightway bolted out of the window, the top part of which happened to be open. Away he went, the chain held up aloft in his tail, as was his wont when he found it in his way, over the garden-wall, down the village road, up into the village. The parish school turned out from their lessons at this moment, and a regular pursuit took place: the boys shouted and threw up their parochial caps, the girls did not know whether to laugh or be frightened. In an instant Jacko was on the top of the nearest cottage, and returned the derisive shouts of the boys by angry and incessant chattering; he grinned from ear to ear, and showed an array of sharp teeth, as much as to say, 'Touch me if you dare.' His hair was all erect—as was always the case when he was alarmed or excited—so that he looked double his natural size, and he shook his tail in angry defiance. The numerous stones and sticks thrown at him in fun by the boys, for they knew him well and did not want to hurt him, soon made him decamp, and off he went along the roofs of the cottages, his chain making a fearful clatter

on the tiles, to the alarm of the aged inmates sitting at their ease within. The crowd collected, the excitement became immense; the police were not called out, because there is only one constable; he, being a baker, turned out in his white cap, and sleeves tucked up, armed with the official wand of office, determined to take up somebody. Next came the churchwarden: 'Lay hold of the rascal, boys,' cries he, 'and we will put him in the pound.' 'Likely I'll stay there,' clatters Jacko, 'and, moreover, you must catch me first,' and off he goes again, followed by the whole village. The fun gets warm, Jacko begins to repent, jumps on to a tree, and slips down one side while the boys are watching on the other. He bounds across the road, over the garden gate, through the broken stable-window, to his own bed in the hayloft, where he lies, his eyes closed, his little sides ready to burst from running, and his mouth half open. Doubtless, at this moment he came to the determination never to leave home again, for he certainly never did, and likewise to have his revenge upon the parish boys for persecuting him, for from this day he always flew at, and tried to bite, any boy wearing the parochial livery.

I had at one time a very large fine ape, which was caught, when quite young, on the rock at Gibraltar. This monkey is still alive and well, and lives in the garden of a friend of mine at Clapham. Poor Jenny has now lived out of doors day and night, summer and winter, for the last seven or eight years, and has never had a day's illness. She has a dog-kennel into which she can retire at will; but until lately she did not often make use of it. She is getting old now, and feels the weather more than she did formerly. Her coat in winter is wonder-

fully thick, and she has an enormous quantity of hair round her face, like a beard and moustachios all in one. Once I had a terrible fight with her: it was soon after she came into my possession, and she was not aware that I intended to be master. She began to chatter at me and make faces, so I threatened her with a stick. In an instant she came at me like a bull-dog, and gave me a sharpish bite. I caught her round her neck immediately, and gave her such a shaking as she never had before nor since. I made her quite giddy, but I never struck her; I then put her down gently, and patted her: she never flew at me again. One day, when I was mending her chain, she watched the opportunity, and jerked it out of my hand; in a moment she was up at the top of her pole, and, finding herself loose, made off as fast as she could. She climbed up a water-pipe and got on to the roof of the Deanery. After a hunt there, she bolted down on to the top of the Chapter-house, and thence along a wall to the top of the houses on the west side of Dean's Yard. Here she sat on the coping, chattering at me. I ran back for my coat and hat but when I returned she was nowhere to be seen. I ran round into the street, and found an immense crowd collected, shouting and throwing at her. Fearing she would be hurt, I determined to try to catch her again. Some bricklayers' tall ladders were placed not far off; so I went up the longest: it did not quite reach to the height of the house, and shook fearfully with my weight as I neared the top. I then wished for the agility of Jenny; but determining not to be beat, I managed to climb on to the roof of the house, and by getting round the chimney-pots, succeeded in getting close up to her. Though her attention was quite taken up with

the people below, she heard me coming, and made off again. I pursued her over the roofs of several other houses, but could not get near her. At one time her chain, which was still attached to her neck, hung down over a window below. Without making any gesture, I said to a woman who was looking out of a window, 'Please put your hand out and catch hold of that chain.' She attempted to do so, but Jenny, who was too quick for her, hauled it up hand over hand, as a sailor does a rope, and was off again. This is curious, because I was careful to make no motion or sign of my intentions, and merely spoke the words. The monkey seemed to understand what I said, for she hauled up her chain, even before the woman put her hand out of the window (which was already open) to catch hold of it.

After a long and tiresome chase, I drove her up to the end of the houses close by Dean's Yard. Here I thought I had her, but she made a most frightful jump on to some leads below. I expected she would have fractured some of her limbs, but she merely shook herself, and was off again. However, by this time she had had enough, for she ran along the pavement right away home to her pole; and there quietly awaited my arrival to tie her up again. I don't know which was the blackest, Jenny or I, after our trip among the chimney-pots. At Clapham she again got loose, and lived several days up among some high trees. Nothing would persuade her to come down, and no sooner did a man climb up into one tree, than she jumped on to the next. At last matters came to extremes: a gun loaded with a few shots was fired at her. She received a shot in her body, and thus learned that the gun could hurt her.

After this, whenever it was pointed at her, she crouched down on a branch, so that it was very difficult to hit her. At length, after repeated firings, she became so frightened and subdued that she seemed to have lost all presence of mind, and allowed a man to get on the tree and catch her.

Three years ago, when passing through Leadenhall market, I saw in a hen-coop a pretty little cub fox, and began to ask questions about him. The man said if I wanted a fox 'he could show me some more;' accordingly I went with him to the back of the shop, and he lifted up the lid of a large, shallow, square box. To my astonishment, this box was as full of cub foxes as it could hold. There were from fifteen to twenty little beauties, all crowded together in one corner, and their small bright eyes shone like diamonds. I picked out the finest of the lot, and took him home. The little brute got loose in the night, and it took me an hour the next day to catch him again, as he got into the cellar among empty boxes, potatoes, and wine bins. The next day I sent him off to a friend at Clapham; but in a few days he slipt his collar again, and got loose, wandering about the neighbourhood of Clapham many weeks. Wires were set for him in the same manner that poachers set them for hares, and the fox was taken several times in these wires, but he generally managed to escape. At last he got into a stack of wood, and there he was, with difficulty, captured. On examination, a bit of wire was found sticking out of the skin close to his hind leg, and apparently firmly fixed in the flesh. After some pulling at it, it became evident that there was a wire firmly fixed round his loins, for the poor brute's body was contracted into an hour-glass form. The poor animal

had been caught in it some weeks previously, and had by its struggles broken it off from the stick by means of which it was fastened to the ground. The wire had been so tightly drawn that it had eaten its way right into the flesh, and the skin and the hair had grown over it, so that its presence was indicated only by a hard line under the skin. The wire was taken out, and the fox is alive and well, but still retains an hour-glass shape, the result of his adventure.

Jacko once got loose again. Remembering his previous adventure with the school-boys, he ventured not beyond the premises, but quietly sneaked into the knife-house, and tried his hand at cleaning the knives. In this attempt he was evidently not successful, inasmuch as the handles were the parts he attempted to polish on the brick-board, and a cut was found in the middle of his hand the next day. Resolved, however, not to be defeated, he set to work to clean the shoes in imitation of the man William, his kind and indulgent *custos* here. Again, he had not distinctly recollected the various steps necessary for the right performance of the operation, for he covered an unfortunate shoe all over, sole and all, with the blacking which he got out of the blacking-bottle, and then he emptied what was left of the precious Day and Martin into the hollow of the shoe, nearly filling it: his coat was in a nice mess for some days afterwards. One morning, again, when the servants returned from the parlour into the kitchen, they found Jacko had taken all the kitchen candlesticks out of the cupboard and arranged them on the fender, before the fire, as he had seen done before. Finding the black-lead in the same place, he took it to a bowl of water which was at hand, wetted it, and was diligently rubbing the

table all over with it when he was caught in the act. On the entrance of the servants, he immediately retreated to his basket in the corner, and tried to look as though nothing had happened. A great treat to this would-be kitchenmaid was to have a large bowl of warm water given him. He would first of all cunningly test the temperature with his hand, and then gradually step into the bath, first one foot and then the other, finally, completely sitting down in it. Comfortably placed, he would then take the soap in his hands or feet, as the case might be, and rub himself all over. Having made a dreadful mess on the table, and finding the water becoming cold, the next part of the play was to get out and run as quickly as he could to the fire, where his coat soon became dry. If anybody laughed at him during this performance, he would chatter and grin at them, and frequently even splash water out of the bath towards and sometimes over them.

There was a story told of this pattern of cleanliness in animals, for the truth of which I cannot vouch, but it is, that Jacko one day nearly committed suicide in a most extraordinary way, namely by boiling himself to death. The large kitchen kettle was left on the fire to boil for tea: after a time Jacko jumped up and took the lid off. Finding it becoming warm, he got in and sat down with his head only appearing above the water. This was all very comfortable for some little time, but the water, heated by the flames beneath, began to get hot: Jacko raised his body a little, but finding it very cold, immediately sat down again. This he continued for some time, never having, or rather being able to summon up the courage to face the cold air. The consequence was that the poor little wretch was nearly boiled

to death, and, if it had not been for the timely interference of a bystander, who took his parboiled carcase out by main force—for he never would have got out of his own accord—he would have become a martyr to his own want of pluck and firmness in action.

Monkeys very frequently eat their own tails: it would seem that captivity is not a favourable state for the development of that organ. I once bought a monkey for a few shillings, whose tail was in a very bad condition. This animal had naturally a long tail, but had lost a considerable portion, and what remained was as hard, and as dry, as an old stick from a hedge-row. Not liking the appearance of this, I gave the monkey an apple to eat, and while his attention was thus taken up, I proceeded to cut away his tail with a sharp knife, joint by joint. During the operation, he looked on quietly and composedly, as I removed bit by bit, about three inches. He did not feel it in the least, and seemed rather satisfied than otherwise. At last, as I approached to that portion of the tail which was still alive, I proceeded very cautiously; but, unfortunately, not enough so, for I touched a tender bit, which was not dead. The monkey dropped his apple, and scampered round and round the room, chattering furiously, till the pain was over; he then quietly sat down, and inspected his tail, holding it between his hands. He seemed none the worse for the operation, and was certainly improved in personal appearance.

If phrenologists had made out that there was a part of the brain especially devoted to mischief, I am certain that it would have been found largely developed in Jacko. He was for ever tearing things to bits. Whenever ladies came near him, his first object was to get

hold of their dresses, and bite or pull a hole in them. Being a most ungallant monkey, he never could bear the approach of any except one lady; with the exception of my good mother. Why or wherefore he took particular fancy to her I don't know, except that he followed the example of all, whether biped or quadruped, who came near her. In this lady's lap, he would quietly repose, when she allowed him to take this liberty; but the little rascal very frequently took unfair advantage of this privilege, by quietly munching up a portion of her dress when not closely watched.

This destructive propensity was nearly bringing vengeance down on his master's head, and his own at the same time. On going to Oxford of course I took Jacko with me. His presence was soon ascertained by the sharp-sighted regulator of fines for dogs, and many a fine I paid for Jacko, who has already been demonstrated to be a dog in the sight of railway as well as college authorities. However, I kept him in my room, teaching him to retire into his bag at the word of command, when any suspicious footsteps approached. The end of term arrived, and with it the day of examination, (commonly called collections,) to be dreaded by delinquents, as then all the evil deeds during the term of the examinee were summoned up by the tutor, and judgment pronounced by greater authorities. For some days previous to this ordeal I had feared that I should be called to task for harbouring such an unclassical animal as a monkey, and therefore redoubled my exertions; principally by taking great pains to make a very careful written analysis, in a well-ruled note-book, of one of the tutor's lectures; so that were the monkey mentioned, the note-book might by chance

save me from presentation to the good-natured but strict interpreter of the law.

The *vivâ-voce* examination on the appointed day went off well; 'Where is your note-book, sir?' was the question. Woe be to the man who has no note-book on such an occasion! Off I went to fetch it. On opening the door of my rooms, oh, horror, the note-book was torn into a thousand pieces!

'Jacko, we are both ruined!' I exclaimed. Jacko did not seem to mind it in the least, but continued his work of destruction; not a page was left in the book. The diagrams were torn into shreds, and even the paper from the covers had not resisted his relentless fingers. The perpetrator of all this ruin simply grinned a grin of delight, while watching me pick up the bits, which I did with a trembling hand and misgiving heart. I had not even courage to scold him or pitch him out of the window, so terrific might be the consequences to his master, resulting from this rascal's misdeeds. Gathering up the scattered relics of many an hour of weary writing, I made as decent a bundle of them as possible, and pale, partly with anger against Jacko, half with fear of impending circumstances, re-entered the hall, and presented them to the expectant tutor, who wondered what had kept me so long away. Still more did the good man wonder when he saw such a note-book presented to him. In a few words I explained what had happened, and awaited my doom in silence. Most kindly, however, he examined the fragments, more particularly the diagrams (which, by-the-by, I had not drawn myself, but had intrusted to the clever hand of the good-natured lady mentioned above as taking such notice of Jacko), and said, 'You have evidently taken much pains with your

notes, sir; you may go.' So great was my glee, that I had mercy on Jacko, and did not shake him well, the greatest punishment I could inflict on him, but merely shut him up in his bag, and for three hours hung him up for penance on a hat-peg.

> 'Pallida mors æquo pulsat pede pauperum tabernas,
> *Monkiumque tubbos.*'*

And Jacko escaped not; he lived some two years after this, but alas! he got an attack of bronchitis, was wrapped in flannel, and placed before the fire. Invalids' diet was administered, but in vain,—he died, and his remains were sent up to London. Not wishing to lose sight of him altogether, and knowing what hideous objects stuffed monkeys generally are, I made his skin into a mat for the table, and the rest of him into a skeleton. The blackbeetles on this occasion had their revenge, for placing them in a box where they could get no other food, they very soon cleaned the bones of their enemy and devourer.—And now,

> In a cabinet, high on a shelf
> He lies as a monument rais'd to himself.

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* 'With equal pace, impartial Fate,
Knocks at the palace, as the cottage gate.'—FRANCIS.

APPENDIX.

Shower of Fish, p. 8.

A REVIEWER of the first edition of the book in "Blackwood," No. IX., March, 1858, says of my interpretation of frog showers:—"The explanation given of this phenomenon is as old as Theophrastus, and was adopted by Redi, the celebrated naturalist; why should Mr. Buckland smile at the credulous rustics swallowing showers of frogs?" The reviewer, I believe, was right; and I was wrong, to a great extent, in attributing the showers of frogs entirely to the sudden hatching of these young creatures from the spawn. I have since published, March 9, 1859, in the Naturalist's Column of Notes and Queries of "The Field" newspaper, a case of a fish shower, which I believe to be fully authenticated.

The account sent by the Hon. Grantley Berkeley, together with those which have appeared in the "Times," relative to the above phenomenon, are most interesting. Nothing definite is known about these showers of fish; and Sir Charles Lyell, in whose works we find records of the operations of most of the extraordinary phenomena of nature, writes concerning them as follows: "The showers of small fish stated in so many accounts to have fallen from the atmosphere require further investigation." In the case which has just happened, we have luckily something definite, observed by several independent witnesses.

I by no means feel myself competent to give a conclusive opinion on this subject; but as Mr. Berkeley has mentioned my name in connection with it, and as the columns of "The Field" are always open to the comments of the lovers of natural history, I would beg to say a word or two. I have certainly stated that the sudden appearance of innumerable little frogs and toads in unusual places might often be accounted for by a shower having brought them out of their holes from their places of concealment from the heat of the sun; but it

is not at all impossible that in some instances they may have actually fallen from the air, as did the fish at Merthyr Tydvil, on Feb. 9, 1859.

The only instances that we know of solid substances falling upon the face of this earth, and possibly from other planets, are Meteorolites. These are heavy, black-looking stones, and contain a substance hitherto not found in any stone composing part of our own earth, viz., nickel. When these meteorolites come to the ground they are exceedingly hot, from their passage through the air. Not many years ago one of them fell in the garden of a labouring man, near Bicester, in Oxfordshire, and nearly frightened him out of his wits. There is a model of it in the Oxford Museum. These meteorolites have been found in such abundance in South America that they have been melted up for the sake of the iron they contain.

The fish which fell near Merthyr Tydvil were for the most part "alive and kicking;" so that there can be no doubt but that they are denizens of our earth, and not, like the meteorolites, the belongings of some other planet. They certainly fell upon the earth from the sky, but *from* off the earth they had most certainly been swept before their fall; nor do I follow the doctrine of their aerial generation as propounded by a philosopher of 1658 in the following words:—

"For it cometh to passe by the rage of the windes in the tops of the mountains, or the uppermost part of the seas, which many times taketh up the dust of the earth and congealeth them into stones, so also doth it take up frogs and fishes, which, being kept aloft in the air among the whirlwindes and storms of shewers, do there engender and bring forth young ones, which afterwards fall down upon the earth, there being no pool for them in the air."

Mr. Berkeley's words, that "it is impossible for a whirlwind to take up slight and delicately-formed fish from either salt or fresh water, which happen, at the time of its passage to be on its surface," are, I believe, endorsed and received by most who inquire into such matters. There was a paper, not long ago, in "Chambers's Edinburgh Journal," on the rotatory motion of storms, wherein is described the progress of these "cyclones" from west to east, and whence it appears also that these cyclones not unfrequently touch our shores. It is within the limits of possibility that the whirlwind which passed over Merthyr Tydvil was the remains of one of the terrible West Indian tornadoes, which (having at its birthplace lifted off the roofs from houses and uprooted trees) retained, after its long journey across the Atlantic, enough of its stupendous force to lift up in a body any shallow water submitted to its influence, and not only the water, but even the fish in the water? A writer in the "Cardiff and Merthyr Guardian" seems to think that the whirlwind that carried up the fish had its origin at no great distance; and he thus sensibly remarks:—

"When two winds moving in opposite directions, and in a narrow space, as in one of our valleys, happen to meet, a vortex is the result:

any cloud that happens to lie between them is condensed into a conical form, and turned round with great velocity; this whirling motion drives from the centre of the cloud all the particles contained in it; a vacuum is thereby produced, and water, or any other body, is carried into it. Supposing such a vacuum to have been formed at the mouth of one of the rivers, there need be no great difficulty in accounting for the suction of small fry, &c. The day was a rainy one, and in moving along the side of the mountain the cloud might have escaped observation."

Small whirlwinds not unfrequently take place in England: in fact, when we see the dead leaves, dust, and bits of paper whirling about in a corner of a London street, we have a miniature of the great West Indian tornado; and looking around nature, we find them assuming more material forms. The travellers in the African desert tell us of whirlwinds composed of sand, and sailors well know and dread the "waterspout" of the vast ocean.

About the month of August, 1857, Mr. Girdwood, of the Grenadier Guards, when standing in the South Camp at Aldershot, was witness to a pretty strong English whirlwind. It came up over the brow of a hill behind him, and passed close to him; it was about thirty feet high, and about nine or ten feet broad; it went with considerable swiftness, lifting up everything not heavy enough to resist its force—sticks, straws, and good sized bits of sand. Its shape was curved, like a comman sickle, and the lower part went faster than the upper part; and as the objects taken up got towards the top of the whirlwind, and so out of the influence of its rotatory motion, they fell to the ground. Mr. Girdwood watched the whirlwind go right away across the canal, through the North Camp, and ultimately lost it at the edge of a plantation. Now, if there had been a shoal of sticklebacks or minnows sunning themselves in the canal (for it was a bright, clear day when this took place), there is no reason why they should not have gone up in it, and have treated the inhabitants of the North Camp to "a shower of fish."

The circumstances attending the fall of fish in Wales are somewhat different to what was observed of the Aldershot whirlwind. The Rev. Aaron Roberts, of Carmarthen, has most kindly sent me the following particulars, which are as follows. The fish fell in and about the premises of A. Nixon, and nowhere else, and that in a shower of heavy rain about 9 A.M., which lasted from twenty minutes to half an hour. They fell in such abundance that they were noticed coming down the water-pipes from the tops of the houses thickly, and as falling with and in the rain upon the roofs. A man holding a bucket at the end of the pipe stated that the bucket filled quickly with rain-water accompanied with the fish, at the proportion of two or three hundreds to a bucketful of the water. They fell all at the same time, and without any interval. It had rained heavily before, and continued to do so afterwards in the course of the day and morning with-

out interval, but no fish, either before or after the particular shower referred to, came down in the rain. The fish had the appearance of very small gurnets, but they say there were two species of them: they die in salt-water instantaneously. The sea-coast is distant from Mountain Ash about twenty miles. The wind was blowing very hard at the time, and, as far as I can well judge, from the south. Whether it was spiral in its motion or not I cannot at present state, but you shall hear again on this point."

Here, then, we have capital evidence of the fall of the fish in numbers, and of the cause of their fall, viz., a violent wind, which lifted up both fish and water. Their gill fibres would not have become unfit for breathing purposes when suspended in the air amid the water in the form of rain, and they did not, therefore, lose their lives in air, having water to accompany them in their journey through the air. Through the kind offices of Mr. Berkeley, I have since received specimens of these fish from Mr. Robert Crawshay, of Merthyr Tydvil; they arrived in the form of dried bits of skin, but a night's soaking in water developed them into the fry of the common minnow—little bits of creatures, the largest about the size of a small Greenwich whitebait, the smallest a little tiny fellow indeed, all of them very light loads for a good strong wind. The sticklebacks described by Mr. Francis were probably the second kind of fish mentioned by Mr. Roberts; and I specially invite an unknown poet, whose ardent imagination has prompted him to write "Fishes from Cloud Land" in a weekly paper, that he may see what insignificant ambassadors his aerial monsters have sent down to visit us:—

"May it not rain great fishes,
So called—but wanting scales—
Too bulky for our dishes?
May not the sky rain whales,
Sharks, grampuses, and morses,
Seals, dolphins, and sea-hogs?
Or porpoises, sea-horses—
Nay, why not cats and dogs?"

It would be important to find out the nearest ditch, pool, pond, or river from whence the Myrthyr Tydvil fish could have set out on their aerial journey, so that we might have some idea how long they had been suspended, doubtless to their great astonishment and terror.

Since the above was written, some of the fish which fell in the shower on Feb. 9 were sent by the Rev. T. Griffith, of Aberdare, to Mr. Nares, of the Athenæum Club, and taken by him to Professor Owen. These fish are now alive and well in a vivarium in the Regent's Park Zoological Gardens.

A few weeks after the appearance of the above, Mr. John Joseph Briggs, of Derbyshire, wrote the following:—

That it was possible for fishes or frogs to descend in showers has been accounted by numberless people as impossible as that it could rain cats and dogs. It would really seem, from the well-attested accounts of your correspondents, that the occurrence of a shower of fish is placed beyond question. I remember a few years ago a gentleman of great intelligence, living at Melbourne, Derbyshire, communicating to me what he believed to be a singular fact, viz., that he and numerous other persons had witnessed a great number of frogs which had descended in a heavy shower. Not having at that time much faith in the belief that such a phenomenon could occur, I pooh-poohed the matter; but still it was strongly asserted, by those who saw the frogs, that the ground was completely covered with them, and that they might be seen on the flat tops of walls, and even sprawling on the top of the pruned fences of gardens—situations to which they could not by any possibility have climbed. The spot where this fall of frogs occurred was at no great distance from Melbourne Pool; and it seems just possible that, at the time when the frogs had changed from the tadpole to the perfect state, at which period thousands are occasionally seen together, a whirlwind might have passed over the pool or brook where they were, picked them up, and deposited them in the manner described. To show the power of a whirlwind, I may mention that a few summers ago I saw one twirl round a cock of hay—probably four feet high, and four feet in diameter at the base—take it up in the air until it became a little speck, and carry it away out of the reach of vision. The same power which was sufficient to accomplish this could easily have removed a body of water with its fishes, and deposited them at a considerable distance.

We all know how easily high winds will carry up common wheat-straws in the farm-yard; and in order to test how much actual *weight* had to do with the matter, I weighed several small frogs, and at the same time several wheat-straws. I found that a big "little frog" did not weigh more than three grains (Apothecaries'); a smaller frog not two and a half grains; whereas long straws, picked at random from a truss, averaged between fifteen and twenty grains. Of course a straw is a much better flying shape than a frog, nevertheless it is in most cases actually heavier.

Newspaper Naturalists, p. 8.

This expression, I fear, has caused some discontent among my brother naturalists, and I here subjoin my explanation of the term. *See* "Field," July 3, 1858:—

I consider it my duty to step forward and explain, to the satisfaction of Mr. Briggs and others, what I meant by these words. Be

it known that I have two or three volumes of scraps cut out by various individuals from newspapers, both of ancient and modern date; and having derived from them much information, I would beg to indorse Mr. Briggs's observations on the immense importance and value of the smaller veins which convey the element of knowledge—"the newspapers." Still, however, I could not but be struck with some of the exceeding absurd stories I find in the pages devoted to natural history; and if truth be the foundation of many of the paragraphs, the verbal description has been generally so very flourishing, and couched in such high-flown terms, that we could not help occasionally smiling.

My collection is gathered from all kinds of papers, and the matter of many of the paragraphs is, for the most part, evidently written by persons who, hungry for news of any sort or kind, pick up and appropriate anything that will cause wonder and astonishment in the minds of their readers.

These "profound philosophers," (for I own to these words also) careless of results, pick up their fact, which may of itself contain more or less of the strange and marvellous, and then deck and garnish it, not only with high-sounding words and phrases applicable to other subjects, but also not unfrequently add the lustre of their own imaginations to burnish the general effect of the whole story.

That I may rightly be understood, I have looked over my collection, and now give specimens of the writings of "newspaper naturalists" picked out hap-hazard. The headings of the paragraphs are generally the best part of the composition.

Thus:—"Extraordinary Affair between a Hen and Partridge;" a "Piscatory Cat;" "A Tender-hearted Cat;" "An Agile Bullock;" "A Whale with the Toothach;" wherein we learn that "Whales are subject to the jumping toothache, which renders them crabbed and captious;" "Trait of Mentality in a Minnow." This wonderful fish, when its water is changed, after swimming once or twice round the top, "enters its habitation as systematically as a sheep to its fold, or a horse to its stable." Under the head of "A Valuable Interior," we learn that a certain lucky individual killed a "bird like a turkey," and that he found in its gizzard nine hundred diamonds worth 1,500 dollars. A "Singular Fatal Combat" details a battle royal between two pigs, and concludes by telling us "that they fought bravely for upwards of an hour, when the clergyman's pig fell prostrate on the ground, quite dead." We are also instructed in a new way of killing eels, and told that if the operation be rightly performed, "the fish will, immediately after a few convulsive throes, sink into insensibility, and the process of skinning may be performed with convenience and humanity."

The "War Horse" is a wonderful creature, who once a charger, now an ignominious 'bus horse, "starts off at the sound of a gun, and there is the greatest difficulty in reining it in." A paragraph on the

"Hunting Cat," records that "A rabbit rose twelve yards before the cat, which instantly gave it chase, and in ten minutes was seen making her way home, holding her prey securely by the collar." An unfortunate snake appears in St. Pancras, and one of the "parochial officers," acting upon his first impulse, dictated by personal fear, hastened to arm himself with a weapon; but upon returning, arrived only in time to see it dart into a hole under the wall." "Canine Revenge," tells us that the writer "happening to be in the country, had his attention drawn to the approach of two sanguinary dogs, who were worrying each other most furiously. The furious brute" is, "with the aid of some good Samaritans," chased away; it comes back at night and kills its enemy; and then we read that "the strangest part of the affair was the cunning anxiety displayed by the murderer to obliterate all traces of the deed, which, according to its own sagacity, it accomplished by carrying the dead carcase to a neighbouring pool and plunging it therein."

"The Rattlesnake" boy lived in North Carolina, and "was in many particulars very like a snake." After a description of his person we understand that "when winter has gone, and summer comes with a smiling sun, caution is required to prevent his running into the woods, there to enjoy himself by lying on old logs." The cause of this boy's peculiar appearance and tendencies, is that his mother heard "the chilling rattle" of a rattlesnake, and transferred the mark of the "squamous monster" to her infant.

I confess, that after the perusal of the above, and many other such descriptions, I was tempted to coin the expression "newspaper naturalists." I acknowledge at the same time most fully that I have learnt much from these little slips of paper, inasmuch as they preserve from oblivion many facts and observations that would otherwise be overwhelmed by the ever-flowing stream of human events which occur daily between the rising and the setting of the sun, and of which the one-millionth part is never recorded.

F. T. Buckland.

Sudden appearance of Toads, p. 8.

At the paper-mills at Clapton, about six miles from Windsor, is a pond where thousands of our little toads are annually hatched. When old enough to crawl, they come out of the water, and assemble at the garden and stable gates till they are opened for them to go out. The proprietor of the house is well aware of their habits, and at their migrating time kindly allows the gates to be left open, that they may follow the promptings of their instinct, and become dispersed all over the country.

If any person wished to make out a story of a "shower of toads," this would be a fine chance. I saw the toads waiting at the gates in countless numbers; and the moment they were opened for my dog-cart to go through, they hopped away out as fast as they could.

Voice of Toads, p. 16.

The following letter I wrote to "The Field" on behalf of my friend—

The Toad under Herne's Oak.

DEAR MR. AQUATICUS,

WHEN I was a tadpole I had neither lungs nor voice, but I breathed by what are called bronchiæ, which were external to my body. When I arrived at toadhood, after mature consideration I absorbed my tail, as I thought it would be in my way in after-life, and I converted my bronchiæ into true lungs, which I packed inside my body for safety's sake. My windpipe is very short, but I have a well-developed Adam's apple, or larynx, at the back of my mouth, from which, assisted by the palate, I can produce a very short note, which you would call plaintive and flute-like. Some of my relations have folds of skin at the corners of their mouths, which they can puff out, and which act like drums when they sing. These are well developed in one branch of my family, which lives among the vines abroad, viz., the green tree-frog. He comes from an ancient family, for his powers are thus recorded by a Greek poet:—

"When from the tree tops, O frog,
You sing like a king."

But who this musical king was I cannot say. Virgil, not only a poet, but a farmer also, classes me, I am sorry to say, among the "pests of the farm;" the others in the condemned list being the mouse, the mole, the ant, and the weevil. But instead of being a pest, I am a benefactor, and eat up hundreds of beetles, the parents of the wireworm. As you say, I am too diffident, I will now be bold, and assert that if you were heathens you ought to consider me "sacred." The ancient Egyptians (who must have been a very cleanly people, as we may conclude from the nature of the plagues wherewith they were afflicted) made "sacred" a much more insignificant but quite as useful a creature as myself, viz., the scarabæus, or dung beetle; and they worshipped it second only to the snake-devouring ibis; their reason for doing so being probably that it acted as a scavenger, and buried and hid the offal, &c., which in that hot climate would soon become a serious nuisance. In this country, on the contrary, I was, in 1665, considered by some to have a hand in the Great Plague of London; for in Bacon's "Natural History" it is recorded of my ancestors that, "in the great plague there were seen in divers ditches about London many toads that had tails three inches long, whereas toads usually have no tails." Now these were no toads at all, but water newts, and as there were ditches so near a populous city, where these newts could find a home, it follows that the drainage was not over and above good, and that the subjects of King Charles II., like many subjects of Queen Victoria (prone to blame anybody or any-

thing rather than themselves), owed their misfortune rather to their own want of attention to sanatory matters than to the "long-tailed toads."

I am right glad that we are likely to be protected and encouraged by the readers of "The Field," and we promise that if we have a fair trial we will not belie the statements made as to our powers of doing them good instead of harm.

THE POOR TOAD.

"*The Hole*," *Herne's Oak, Windsor Park.*

Frog Market at Paris, p. 18.

During a late visit to Paris, I found that the head quarters of the frog-dealers were in the Marché au Poissons, near the church of St. Sulpice. In this market they keep a great quantity of fresh-water fish alive in tanks, through which a stream of water is always running. Under the tanks are boxes, containing the frogs. I bought several of Madlle. Marie, an uncommonly pretty girl. She dived her arm into the box, and catching them one by one, gave them a slight tap on the head, and then, having stunned them, arranged their legs knight-templar fashion, so that they could not untie them. "Voyons, c'est comme ça, comme ça; ils sont bien arrangés," using her delicate fingers as though she was dressing the ribbon of a wedding bonnet: "vingt sous la douzaine, s'il vous plaît. Monsieur, voulez-vous des 'escargots' édibles?" *i. e.*, land snails which make very nasty, slimy soup, and taste like tough periwinkles.

Hunt in Horse Pond. Hybernation of Newts, p. 23.

If the newt-pond be visited in the winter, not a newt will be seen, though there may have been thousands of them there in the summer. The question as to their hybernation has been raised, and by the kindness of a great naturalist I am enabled to give the following particulars relative to this point in their economy:—

Newts hybernate; but I suspect our popular Natural History books are wrong as to the mode. (*See* Carpenter's "Zoology.") They seem not, in so far as my knowledge goes, to spend the winter in *social* sleep, but lie alone in *single unconsciousness*, if not blindness. Five years ago, I traced the footprints of several on half-dried mud, at the edge of a pond. The prints indicated that they had left the pond, and had not returned, at least by the same way. Forgetful of newts, I was busy tearing some indurated shale from its overlying

freestone, in search of good specimens of *Sphempteris affinis* and *Sph. latifolia*, ponds of which I had met with, when out came newt No. 1, from a crevice between the shale and the sandstone. Had I been a believer in frogs imprisoned since the Deluge in the heart of rocks, here I had a true antediluvian eft ushered into the wondrous world of 1853. A further search brought out newt No. 2, who had stowed himself away for the winter in total isolation from No. 1. No. 1 looked stiff and stupid; No. 2 had all his *instincts* about him, and made an effort to escape *in the direction of the pond.* No. 1 was brought home and kept in a vessel for five or six weeks without improvement in liveliness. Thinking it had come by some accident and needed the doctor, I resolved to try the cold-water cure. In vain: hydropathy did it no good—therefore, I concluded, that it must be indisposed—for this mode of treatment never fails to cure those who have nothing the matter with them! The vessel was needed for another purpose, and No. 1 thrown into a rivulet not far off. I had not at the time associated hybernation with this creature, but now regret that I did not preserve it till spring.

Aquatic Larvæ, p. 33.

The following note has kindly been sent to me by my father's old friend, Mr. Stowe, of Buckingham:—

Last summer I dropped on a curious aquatic larva—that of the *Elophilus pendulus*—a dipterous fly. He is about half an inch long, and called the *rat*-tailed larva: his tail is cocked up, and within it is a sliding air-tube more than an inch long, very flexible and fine, which he can push up to the top of the water for respiration, and it is terminated by a fine hair fringe, by which he can suspend himself from the surface if too deep for him when crawling.

There seems a coil of air-tubes within the abdomen which may enable him to protrude the tube. A young lady who sent me them with a metrical inquiry for Class and Order, got the following answer:

THE ELOPHILUS PENDULUS.

See here the larva of a two-winged fly,
Which sports on hedges in the month July;
His rat-tail darting up for air,
Making the microscopist stare.
A sliding tube of wondrous length
Protruded by his tiny strength,
Befits him for his watery station;
Another marvel of the Great Creation.

Page 35.

I have received the following story from a gentleman, as

a good "pendant" to the story of the Lancashire man and the newt:—

In page 35 of your book, entitled "Curiosities of Natural History," there is an anecdote which so much resembles a circumstance that is said to have occurred in the Peninsular war, that I cannot resist the inclination to make you acquainted with it, although you may be disposed to class it with the Lancashire story. A friend of mine, the late Colonel Leach, commanded a company in the 95th Regiment, during the most arduous part of the campaign, under the Great Duke, in Spain and France, and as a portion of the light brigade, Captain L. was constantly in advance of the army with his regiment.

One of the privates, a most energetic and gallant fellow, ever forward in the performance of his duty, became ill, attenuated, and debilitated, so as to be entirely unfit to continue his active co-operations with his gallant comrades. The medical men, after attempting various remedies, were utterly unable to relieve the poor fellow, and he was generally with the sick, unfit for duty.

In this hopeless state of things the surgeon of the regiment one day came to the quarters of Captain Leach and his subaltern, the present Sir Henry Smith, and requested them to accompany him; they found the suffering soldier and a torpid lizard, which, it was stated he had voided from his mouth, to the astonishment of himself and those around him.

From that time the man recovered and became as active and intrepid as ever.

It was, I believe, stated that, against orders, spirits in some shape had been introduced, and that the suffering private had been persuaded to swallow a dram, when the lizard, *or something very like it*, very soon made its appearance.

The words "something very like it" should be remarked. I have notes of many curious things, which were said to be animals, &c., coming from the human body; but they are rather too professional to be introduced here.

Gigantic Salamander of Japan, p. 41.

Since the passage relative to this creature was written, a fine specimen has arrived in this country, and is now in a splendid glass tank in the Boa-constrictor House at the Regent's Park Gardens. I thus described it on its arrival in "The Field" for March 17, 1860:—

On Monday last there arrived in excellent health and vigour a living specimen of the "Gigantic Salamander from Japan." This creature, in external appearance, is not unlike the ordinary English water-newt, which we see in stagnant ponds and ditches, but instead of being three or four inches long, this Japanese creature is a little over thirty inches

in length, and is expected to attain a much larger size. When swimming about at the bottom of the water, it looks like a large brown-coloured eel; it does not like the light, and generally remains in the darkest corner of the tank. Upon close inspection, I found its colour to be a sort of dark chocolate, interspersed with black spots, giving a sort of piebald appearance. Its head is certainly most hideous. I can liken it only to the head of an ugly toad, considerably flattened out. It is about four inches across at the broadest part. The head and upper part of the body is studded with projecting wart-like tubercles. The mouth is difficult to get a peep at; it is shaped somewhat like a coalheaver's shovel. Two exceedingly minute eyes are placed on the fore part of the head, and are exceedingly like two white or gray-coloured glass pin heads. There are four toes on the front feet and six on the hind, these latter being slightly webbed. There are no nails to the toes, and they are very similar to the toes of a toad or water-newt.

It was bought by Captain Taylor, in the town of Nagasaki, in Japan, being exposed there for sale in the public market. These creatures are very rare, even in Japan, but a French captain having given a considerable sum for a specimen a short time ago, in the market at Nagasaki, the Japanese procured this specimen which Captain Taylor has now brought over. He has had it on board his ship nearly two years, having made a sort of pet of it. He fed it with fish, taking with him a stock of live eels when he left Japan. When there were no eels, the salamander would eat flesh, the entrails of fowls, &c. It is now fed with eels and small fish. The native habitat of this remarkable salamander is in the lakes and stagnant pools among the basaltic mountains of Japan. The specimen brought to Leyden by Dr. Seibold is still alive, and is now nearly a yard long.

Dirge of an Immured Toad, p. 54.

The following verses were written by my father's friend, Mr. Duncan, during the progress of his experiments, p. 46:—

Croak, croak your fun'ral odes
Ye night-fans, frogs, and toads,
Who flit, or hop, or crawl
By moat or ivy'd wall!
On dark St. Michael's night,
Six toads immured from light,
Excluded fast from air,
Must breath of heaven forswear;
Deep fixed in stony tomb,
Till Buckland break their doom.
Down oolite clay sealed
Anointed, and annealed

Within the womb of earth
Wait for second birth.
They sink in darkness deep,
To waken Truth from Sleep.
On six St. Michael's days,
From darkness Truth shall blaze;
Till eighteen hundred thirty-one
Announce their trial duly done:
And Death, six times defeated, own
That toads can live immured in stone.
For oft the truth full well
Is proved by monk in cloistered cell;
In darksome college corner, Duncan
Can prove this truth if ever monk can.

Rats found in a Dried State, p. 67.

It is astonishing what a number of rats I have had brought to me in a dried state. They have probably been wounded, or have become diseased, and have gone away to die in secrecy. I have also seen several cats in the same condition. One had a rat in its mouth, where it still remains firmly fixed. When they were repairing the organ in Westminster Abbey, they found a dry cat in one of the recumbent big wooden pipes, which had been *out of tune* for some time, and no wonder, as it contained a dead cat. But lately, in one of the rooms at the Foreign Office, there was for several weeks a most offensive smell, and nobody could guess whence it came, as the drains, &c. were in good order. At length some heavy folios were taken down, for the purpose of reference, and behind them was found the body of a dried cat. Puss had got into the vacant place some weeks before, and when the books were put back (probably in a hurry) she became shut in between them and the shelves, and so met with the fate of the beautiful lady who so unwisely shut herself up in a corn-chest (for such the prints represent it) on her wedding-day, and so perished miserably.

Rats as Scavengers, p. 81.

Every one knows how dirt heaps are allowed to accumulate in the streets of Paris; hence the occupation of the poor fellows who go picking about these heaps with a crooked nail on to the end of a stick. These "cheffoniers" have rivals in the rats. When walking in Paris, after

twelve at night, I saw hundreds of rats running about in all directions. They doubtless do much good in eating up the bits of garbage, which would otherwise become offensive. The image-sellers in the streets have on their trays a capital figure of "Le Père des Rats," an old man clad in rats' skins, and rats running all over him. Who this worthy was, whether ideal or real, I could not ascertain.

Bones of Invading Danes, p. 84.

In "Leisure Hour," No. 410, Nov. 3, 1859, I have given an account and an engraving of a remarkable collection of the bones of Danes and Anglo-Saxons, which I visited in the crypt of Hythe Church, near Folkestone. There had been a battle fought near the place in ancient times, and these are said to be the bones of the combatants. Upon one of the skulls I found skin and red hair still remaining. The place is well worth a visit.

Burrowing Rats, p. 87.

I have received the following confirmatory story of Mr. Bishop's account of burrowing rats :—

Combe Royal, Kingsbridge,
June 25, 1860.

DEAR SIR,

PERMIT an old Wykehamist of '30-'34 to endorse Mr. Bishop's rat story at p. 87 of your "Curiosities." Towards the end of last autumn, and yet rather too early for harvesting them, I discovered a bed of beetroot evidently dying away, root after root. I observed, as I supposed, the track of a mole through it, and on taking up a root, found all the lower part eaten away: a second, which I took up, was found exactly in the same state. I had a *mole*-trap set in the usual manner, and was much pleased to find it "sprung" the following morning; *but*, to my surprise, the captive was *not* a mole, but a very fine *rat*.

I remain, dear sir,
Yours faithfully,
E. TURBERVILLE WILLIAMS,
Incumbent of Caldicot, near Chepstow.

Deformed Teeth of Rats, p. 89.

The deformities mentioned in this passage are not very uncommon. I have lately had a fine specimen brought to me, which I figured and thus described in "Leisure Hour," No. 408, October, 1859.

"This rat was killed at Clewer Mill, near Windsor, a few weeks ago,

and brought to me as a great curiosity. I found that the jaw, through some injury, had become dislocated, and the teeth, obedient to the law of nature, as above described, had grown in the fantastic form they now present. Of course, with his disabled set of teeth, this rat was unable to gain his living by gnawing; so, like a wise animal, he had gone to a place where he could find his food ready prepared for him; and where could there be a better place than a cornmill? I found, upon examination, that he had been *living on flour, which required no biting, and could be easily picked up, even with his disabled set of teeth.* His cleverness in going to the right quarters had procured him an easy living, for he was quite fat and in excellent condition, and in a state of plumpness which he would not have exhibited had he taken up his home anywhere but in a cornmill, where flour was abundant.

"The man who brought me this curious rat is 'rat-catcher to her Majesty,' at Windsor: the moment a rat is heard of about the Castle, or the outlying premises, he is sent for to exercise his official capacity; and I must give him credit for great cleverness in his profession, which he has practised many years. And let me here state, that it requires great experience to catch a rat who is out foraging for himself away from his companions, and especially so in royal premises, where he is so closely watched, as his presence might annoy the regal inhabitants of the ancient Castle. This man, one Bradshaw, tells a story with great glee, of royalty once noticing him at work and approving of his plan of operations."

Eating Rats, p. 122.

Bradshaw, who "catches for the queen" at Windsor Castle, tells me that on one occasion he was out "catching" at a farm-house. They had put some young rabbits on the fire to broil, and while they went away some labouring men found out the dinner preparing and ate up the rabbits. The next time they went to the farm-house the labourers were paid out, for Bradshaw put some nice big old rats on the gridiron, and left them as before. The bait took; the labourers appeared, and ate up all the rats, taking them for rabbits. There were not a few broken heads that evening over this practical joke.

Rats in Ships, p. 132.

I wrote the following in "Leisure Hour:" it forms parts of an article on the "London Docks:"—

"Opposite to where we stood was a large ship, painted a dead-white colour, looking like a ghost; her name was 'The White Eagle.' She had come from Penang, and there was a lawsuit about her. This was a rather curious coincidence, for the idea generally associated in

one's mind with Penang is a 'Penang lawyer;' and this is a species of tough and elastic bamboo, which is used extensively for walking-sticks or for defence. These canes, according to an ancient legend, were once the principal administrators of justice in that country, and hence their name, 'Penang lawyers,' to this day.

"The cargo of this ship was not touched for some time pending the lawsuit, and the rats had had a fine time of it. Our informant told us that after dark he had seen sixty or seventy enormous rats sitting on the galley of the ship, as 'oudacious as could be;' and they would not move out of the way even if you kicked them. However, they met their match in an ingenious man who 'catches for the ships.' He does not catch one or two rats at a time, but a large proportion of the whole colony: he has large traps, and he gives the rats the run of the traps (that is, he allows free ingress and exit to the bait therein contained) for three or four nights; and when they have come to the conclusion that there is nothing to fear from the trap, down goes the door, and he catches sixty or seventy rats at a time. This is no bad haul, as rats are worth from fourpence to sixpence each for the 'dogs to kill'—the normal and natural use of a rat, according to the idea of a certain class of Londoners. The bait he uses, it should be noticed, is simple and inexpensive, being only common cabbage leaves. The rats, after a sea-voyage, are as greedy for green vegetable food as are the sailors themselves. This bait (the secret of which, I think, I ought not to have told) might be tried in ordinary houses. The rats make fine runs down into the holds of the ships, and they eat everything that is eatable. My informant told me that, in unlading a ship, they discovered a large package, which, on moving, was found to be as hollow and as empty as a big drum. The rats had so entirely eaten up the contents (whatever they might have been), that they had not left a single grain whereby it could be known what the package originally contained. The sides of the package remained erect; and, preserving its form, the ropes were tied and in their places, yet the inside was desolate emptiness.

"Besides the rats, there are other nautical plagues, in the shape of cockroaches—monstrous brutes, as big as two ordinary kitchen black-beetles tied together. They come from 'all parts,' but more particularly from Ceylon and the Mauritius. They can fly as well as crawl, and they crawl into odd places; for my informant told me that, somehow or another, one gigantic fellow crawled down his waistcoat, and gave him 'such a nip in the back.' However, luckily for us, the cold 'nips' these cockroaches in return; and as the cargo is gradually taken out of the ship, the cockroaches get uncomfortable; they come up and die in hundreds, from the cold. This is a fortunate circumstance; for otherwise we might have them in our kitchens, gnawing holes as big as mouse-holes, and eating whole basinfuls of sugar at a time. We should have to enlarge our beetle-traps, and the cats would sit watching for them, thinking they were a new kind

of mouse. A friend tells me that in the East he has seen a cable of hide, externally looking like any other cable, but when it is suddenly used, and a strain put on it, so as to tighten it, the cockroaches come swarming out of the interstices of the cable, thus escaping sudden death by squeezing. He has seen them fall out of the cable into the water, swim to the shore, and then climb up in readiness to get back into the ship at the first opportunity."

Food of Water Rats, *p.* 136.

These rats injure not only the young osier-twigs, but more particularly the bulrushes (used also for making baskets, bottoms of chairs, and matting), which they bite off level with the water, and collect together, so as to form a floating bed, which rises and falls with the water, being secured to three or four rushes standing upright: and which, consequently, cannot float away.—*Letter from Mr. Buck, of Islip.*

Methods of Catching Rats, *p.* 144.

I published the following in "Leisure Hour," No. 408, 1859:—

Innumerable are the poisons that are made and sold for rats; but if you poison one or two, the survivors take warning from their fate, and you kill no more. I have a note of a well-authenticated instance, where some poison had been placed in a hole, in order to destroy a mother-rat and her young family, who had established themselves in a room. The hole every morning was found stopped up, and it was ascertained that the mother-rat stopped it up, in order, as was supposed, to prevent her inexperienced young getting at it and devouring it. It does not *pay* the professional rat-catchers to poison their victims: a live rat is worth fourpence, and can be sold sometimes even for sixpence to people in London, to kill with dogs; the consequence is, that in the neighbourhood of London there is great competition among the fraternity as to who shall "catch" (that is the professional term) for farmers Jones or Brown. After a good day's sport, the successful rat-catcher goes to London by train with a sack half full of live rats, for which he is sure to find a speedy sale, as fresh-caught country rats are more active than London sewer rats. There is not the same demand for live rats in Paris; and when I arrived in that city very late one night, I saw them running about the public streets at every turn. They do a great deal of good in this city, for they eat up much of the refuse and rubbish which the Parisian householder empties at his door.

Every now and then there appear in the newspaper advertisements, "How to secure and entice rats, without traps or poison, &c." I am in possession of one of these marvellous secrets, which, as I am not bound to secrecy, and as I paid pretty high for it, I give for the

benefit of my readers. The first step to be taken is to allure the rats all together to a proper place: having done this, a large bag, or sack, must be provided, having a strong case all round the top, in which a clothes-line must be run: the bag must be capacious enough to cover nearly the whole floor of the place where the rats are to be collected together. The string must go from the centre of one end of the bag up to a pulley fixed in the ceiling of the room, and be continued along the ceiling to the furthermost corner of the room, and then hung down into the corner. Having stopped all the holes in the room, take one pound of good flour, three ounces of treacle, six drops of the oil of rhodium; mix well together, and add one pound of the crumbs of bread. Just before dusk, put a little of the above food upon the centre of the bag, then take a red herring, and broil it a little before the fire; tie a piece of string to it, and trail it along the ground, by the corn-stacks, outhouses, &c., where the rats frequent, and let them thus, by following the scent, find out the meal, &c., in your room. Continue feeding them in the room, and trailing for them every evening for a week, and allow them to regale themselves on their food and go quietly away.

At the end of the week, put on an old cloak or gown, so as to make you appear as much like a post as possible. Just before they come to feed in the evening, sit yourself quietly down in the corner of the room where the food is laid, take the string in your hand, and sit perfectly still; wait until you think the rats are all at feed, then pull up the string sharply; up goes your bag; secure the mouth immediately, and you have the rats prisoners.

Numerous cautions are given in order to make this troublesome plan (of which I have only given an abstract) succeed, and even then I much doubt its answering. I give it more as a specimen of a "rat-catching secret" than as a useful receipt.

I would, nevertheless, recommend the householder who is troubled with rats, to try the following plan, the discovery of a Norfolk farmer lad. He made some thin mixed meal for the pigs one evening, and left it in a tub; the next morning he was surprised by finding a rat or two drowned in it; as he had mixed it unusually thin, the rats had probably taken it for solid meal, and jumped upon it. The next night he caught more rats in the thin meal, throwing some dry on the top; the third night he put some solid meal to encourage them; soon after he again put fluid meal, and caught all those that had been attracted by the solid meal, which would support their weight.

If the reader thinks of trying this plan, let him do it at once, for I have such an opinion of the rat's cleverness, that I almost believe he takes in our weekly newspapers and periodicals, and will thus learn this newly-discovered plan for his destruction quite as quickly as the reader, who, I think, has now had enough about this sagacious and much persecuted little animal.

Oil of rhodium is a famous thing to attract rats, but it is expensive,

as it costs nearly one penny a drop. At Newcastle-on-Tyne I met, standing in the market, a rat-catcher, who was selling boxes of poison to the farmers. In order to attract the rats to it he mixed up the fat of a female rat, which he procured by roasting the fattest female rat he could find, and mixing up the dripping with his poison paste, which certainly smelt very "ratty." He told me that rats had nine and eleven at a litter; mice, seven, eleven, and fourteen. Both rats and mice breed every month.

Cobra di Capello. Snakes Swimming, p. 151.

A snake swimming in the water is a most graceful object. My friend, Lord Powerscourt, 1st Life Guards, was lucky enough to see a snake family taking their morning's bath. He writes: "I saw a curious thing this morning when out with the watering order, near the Bells, Ousely, a public-house on Magna Charta Island, near Windsor, viz., two large snakes, and four young ones, swimming right across the river Thames, and go to a field-day the other side." I well recollect watching two snakes hunting along a ditch for frogs; they swam in the most easy manner, and poked their noses into the holes at the side in search of frogs, etc. One very hot day, when fishing for jack, I caught three snakes in about three minutes, and fastening a hook and a light line to one, fished for jack with him, but without success; a young duckling would have been a better bait.

Handling Poisonous Snakes, p. 153.

There is, I believe, only one safe way of handling poisonous snakes, to remove them from box to box, &c., communicated to me by Mr. Bartlett, of the Zoological Gardens. It is to pass a string through a hole in the top of a stick, like a twitch for a horse's nose. As the snake is quietly reposing at the bottom of the cage, pass the noose round its neck, and gradually twisting the stick till the string has firm hold of the prisoner; it can then be removed without danger; and being placed in a cage intended for it, the string can be gradually untwisted, and the snake let loose.

I lately heard of a rattlesnake being made use of in a curious way. A traveller coming from America, brought a quantity of cigars with him in a large box. Not wanting to pay duty for these cigars, he had a false top made to his box, in which he placed a couple of big rattlesnakes. On arriving at the Custom House, the keys were demanded and given up, with a warning that the box contained poisonous snakes. The official, being credulous, opened the lid of the box in an off-hand careless manner. Hearing the noise of the key in

the lock, and seeing daylight admitted, the rattlesnakes woke up, and began to hiss and rattle away with their tails at a grand pace. Down went the lid of the box in an instant, and the box, rattlesnakes, cigars, and all allowed to pass without further and more minute examination.

Use of Snakes' Coprolites, *p.* 161.

A gentleman has kindly sent me the following note as regards this point:—

Sir,

In your entertaining and instructive article on the Cobra, in the "Curiosities of Natural History," you say that what "the doctor" does with his 9*s.* per pound dejecta of the Zoological Gardens snakes, is a mystery to you. In the last monthly number of "Chambers's Journal," in the article "Science and Art," the mystery seems unravelled, as I find "that a magnificent crimson colour, called murexide, has been obtained from guano: a result which may be said to have been initiated by Prout's discovery of purpurate of ammonia in the fæces of serpents.

Hatching Snakes' Eggs Artificially, *p.* 169.

The hydro-incubator is a most useful instrument, and will hatch anything. Last year, at Windsor, a wandering showman brought one of these instruments to the fair, and exhibited it at a penny a head. He made not a bad living by hatching chickens, but he also hatched snakes. He had six or eight young snakes just come out of the egg. He buys the eggs at Liverpool, London Docks, &c. Out of one of the eggs once came, to his great surprise, "a nasty customer," in the shape of a poisonous snake of some kind, which he killed immediately. When first he began to hatch snakes' eggs, he did not succeed.

When at Paris, the keeper of the snakes in the Jardin des Plantes showed me a common ringed snake, which had hatched her eggs for three successive years. She placed them in a pyramidal shape, and coiled her body round them. He was obliged to squeeze warm water over them from a sponge every now and then. He also had hatched several broods of young boa-constrictors. If the temperature was kept high, it required from sixty to eighty ways to hatch the eggs; if it were lowered, about ninety days.

History of the Boa-constrictor that died at Bristol, *p.* 169.

Mr. E. S. Horsley Stedder, Secretary to the Bristol Zoological Gardens, kindly sent me the following particulars relative to this snake :—

All I have been able to collect is, that the serpent was 16 feet long, and 19 inches in girth: it was presented to this Society by Messrs. Burford and Dyer, African merchants here, in the year 1850, and was trapped by the latter gentleman about fifteen miles up the River St. Paul, Monrovia, Liberia, West Africa, with another female of greater length and age, which laid several eggs the morning after its capture, and was brought to the United States by an American officer, who assisted in taking them. Ours had not materially increased in growth whilst with us. About two years ago a smaller serpent of the same species was given to us, and kept in the same den with it, and was probably a male, from the impregnation of the dead one, which was in great health and beauty to within an hour of its death, which we conjecture must have arisen from the retention of its ova, in consequence of not having a sufficient depth of sand to enable it to deposit them.

Carelessness of Sculptors, *p.* 171.

In his lectures in Jermyn-street, spring, 1860, Professor Owen remarked :—

The lower canine teeth are *always* in front of the upper canine teeth in carnivora. It *gives one a shudder* to see sculptors reverse this order, which they nearly always do.

Human Hair, *p.* 172.

I have in my possession, belonging to the College of Surgeons, what may well be called a *terrible* preparation of human hair, which, at the same time, is a warning to lady visitors to manufactories. A young girl not long ago persisted in wearing her "back" hair down when at work; she was warned of the danger, but still wore it loose hanging down her shoulders. One day, when she was at work, the wind blew her hair between cog wheels, and in an instant tore off the whole of the scalp from the top of her head. One ear even was taken bodily off. She ultimately recovered.

Men Devoured by Snakes, *p.* 182.

We read also in the "Bombay Courier" of August 31, 1799, that a Malay prow was making for the port of Amboyna, but the pilot finding she could not enter it before dark, brought her to anchor for

the night close under the Island of Celebes. One of the crew went on shore in quest of betel-nut in the woods, and on his return lay down, as it is supposed, to sleep on the beach. In the course of the night he was heard by his comrades to scream out for assistance. They immediately went on shore, but it was too late, for an immense snake of this species had crushed him to death. The attention of the monster being entirely occupied by his prey, the people went boldly up to it, cut off its head, and took both it and the body of the man on board their boat. The snake had seized the poor fellow by the right wrist, where the marks of the fangs were very distinct; and the mangled corpse bore evident signs of being crushed by the monster's twisting itself round the head, neck, breast, and thigh. The length of the snake was about thirty feet: its thickness equal to that of a moderate-sized man; and, on extending its jaws, they were found wide enough to admit at once a body of the size of a man's head.

Cobra di Capello, p. 185.

I have received the following communication relative to the boa-constrictor who swallowed the goat :—

"In reading at page 185, 2nd edition, of your interesting and amusing work, you state that you had read somewhere of a boa-constrictor found dead, who had swallowed a goat, &c. I beg to suggest to you to read a work, which made a great talk some forty years ago, by Dr. Abel, giving an account of Los Chos—he was the physician who accompanied our then ambassador to China, and came home with Captain, afterwards Sir Murray Maxwell, by the Los Chos Islands, and the book describes the voyage home and the islands. They had a boa on board, which swallowed a large-horned goat on the passage home; and Dr. Abel well describes the gradual progress of the horns down the snake's throat, and the way they bulged for weeks afterwards."

The following is from an old book on natural history :—

"One of these serpents has been known, in the Island of Java, to kill and devour a buffalo. In a letter printed in the 'German Ephemerides' there is an account of a combat between an enormous serpent and a buffalo, by a person who assures us that he was himself a spectator. The serpent had for some time been waiting near the brink of a pool in expectation of its prey, when a buffalo was the first animal that appeared. Having darted upon the affrighted beast, it instantly began to wrap him round with its voluminous twistings: and at every twist the bones of the buffalo were heard to crack almost as loud as the report of a gun. It was in vain that the animal struggled and bellowed: its enormous enemy entwined it so closely that at length all its bones were crushed to pieces like those of a malefactor on the wheel, and the whole body reduced to one

uniform mass: the serpent then untwined its folds to swallow its prey at leisure. To prepare for this, and also to make it slip down the throat the more smoothly, it was seen to lick the whole body over, and thus cover it with a mucilaginous substance. It then began to swallow it at the end that offered the least resistance: and in the act the throat suffered so great a dilation, that it took in at once a substance that was thrice its own thickness.

Travellers have also asserted that these animals are sometimes found with the body of a stag in their gullet, while the horns, which they are unable to swallow, are seen sticking out at their mouths. Happily for mankind the rapacity of these creatures is often their own punishment; for whenever they have gorged themselves in this manner they become torpid, and may be approached and destroyed with safety. Patient of hunger to a surprising degree, whenever they seize and swallow their prey, they seem like surfeited gluttons—unwieldy, stupid, helpless, and sleepy.

They at that time seek for some retreat where they may bask for several days together, and digest their meal in safety. The smallest effort will destroy them: they scarcely can make any resistance; and, equally unqualified for flight or opposition, even the naked Indians do not fear to assail them. But it is otherwise when the sleeping interval of digestion is over; they then issue, with famished appetites, from their retreats, and with accumulated terrors, while every animal of the forest flies from their presence. They never bite, however, from any other impulse than that of hunger, and when they do, their bites are destitute of venom."

Poisonous Snakes poison one another, *p.* 187.

Mr. Coulson, of Clifton, has sent me the following curious story:—

Our puff-adders, at the Zoological Gardens, were fed this day week. They both at the same time made a dart at the same bird, and in doing so one has slightly touched the other in the back of the head; in two minutes he was rolling most awfully about his den—and the others ran off like mad. The keeper tells me he lay as if dead after a short time, yet he is still alive, but paralyzed; his head is almost at right angles, turned to one side where the bite was made: he cannot straighten it; and the moment he is touched, he becomes much enraged.

Catching a Cobra with a Hook, *p.* 194.

A friend of mine, who is an angler, tells me that when in India there was a cobra about his wooden house which he never could manage to catch. Being a fisherman, he bethought himself of a gorge bait. He therefore got an ordinary gorge-bait hook, and inserted it into a frog, as

though he were going to fish for jack. He tied a bit of string to it, and attached the other end to his hand, and went to bed, having placed the bait near the cobra's hole. In the night master cobra came out to look for his supper; he found the frog, gorged it, and went back home again under the boards. In doing so he jerked the string: knew he "had a bite," and struck sharply. Master cobra was hooked, and kicked up a fine row under the boards before he could be hawled out and "landed."

These cobras are dangerous creatures about the houses in India. A fellow-student of mine at St. George's, now an assistant-surgeon in India, tells me that he was one morning called up very early, as a gentleman was found dead on the floor of his apartment. He examined the body carefully, but could find nothing except two small punctures on his hand. It afterwards turned out that the poor fellow had come home the worse for a good dinner, and had fallen on the floor to sleep. In the night he must have flung out his arm suddenly, and hit a villainous cobra that was crawling about the floor in the darkness of night. The cobra had bit him in the hand, and thus caused his death in an awfully sudden and unexpected manner.

Stones from the Gizzard of an Ostrich, *p.* 205.

I lately helped to examine an ostrich which died at the Zoological Gardens. In the "proventriculus," a sort of stomach to which the gizzard is attached, as the "hopper" is to the mill-stone in a flour-mill, I found a large quantity of stones. I carried these home, and when they got dry, was surprised to find how beautifully they had been polished by the action of the gizzard. They were ordinary gravel-stones the bird had picked up at the Gardens: the edges were worn quite smooth, and three or four of the larger stones were as highly polished as an agate marble—such as boys use.

The Art of Stuffing Fish, *p.* 244.

As many readers may feel inclined to stuff and preserve the results of their angling expeditions, I here give an excellent notice on this point from a writer in "The Field," March 26, 1857:—

Having been in the habit, for some years back, of preserving fishes in the manner desired by H. E., I can without hesitation offer him a

method which never fails in producing a respectable and—what is often of more consequence—an endurable specimen.

I believe that Dr. Richard Parnell, author of the "Fishes of the Forth," &c., was the first to put this plan extensively into practice; and he has been followed by many naturalists north of the Tweed. As the method I adopt is precisely that given in "Davies's Practical Naturalists' Guide," I shall simply quote the passage on the subject from that book:—"When practicable, the fish, as soon as taken out of water, should be wrapped in fine silk-paper. In all cases it should be skinned while perfectly fresh, because the colours are very evanescent. A clean soft deal board, of convenient size, a quantity of pine, a knife or scalpel, a pair of scissors, some corrosive sublimate in spirit (two drachms to the ounce), a shallow basin of water, and a quantity of fine tow or flax, must be first provided. Having determined by previous examination which side is to be preserved, the fish is laid on the clean board with that side uppermost, and the dorsal, caudal, and anal fins distended, and with a blacklead pencil its outline is accurately traced on the board, indicating by diverging lines the anterior angles of the fins. Placing the fish in the shallow basin, and beginning at the head, an incision is made in the skin down the middle of the back to the tail, and a similar one down the belly. The dorsal, anal, and caudal must of course be left attached to the side to be preserved. The head is next split in two, and the half to be preserved detached from the vertebræ. The skinning is now proceeded with, commencing at the head.

The interspinal bones, which support the dorsal, anal, and caudal fins, are cut through with the scissors close to the skin. Having removed the half desired, so much as possible of the internal bones and muscles of the head are cleared away with the scissors. The eyes are removed from within, so as to leave entire the integument which, in many fishes, as the gadidæ, covers them. The skin and skull are now brushed internally with the preservative, and any superfluous fluid carefully wiped away. On no account must the solution be allowed to touch the scales, as it immediately dims them. When the skin is yet moist and pliable, the back edge is to be pinned to the dorsal line on the board. In doing this it is necessary to commence with the head: having fixed it, a pin is to be put in at the base of the anterior margin of the dorsal fin, and another at the upper edge of the tail fin, distending them thereby; the remainder of the back is then pinned down. A quantity of tow is taken and rolled into a shape somewhat resembling that of the fish, but more slender, and pressed well back between the skin and the board. A pin is fixed in the front under the margin of the skin, and we continue to pin down to the pencil-line on the board until the tail is reached, all the while stuffing in tow, so as to give the fish a proper rotundity. Should the anal fin be dry before reaching it, a damp sponge will immediately restore its pliability. The pectoral and abdominal fins are now to be moistened

and distended, by means of pins on pieces of cork. When dry (which will be in the course of a day, or at most two) the pins are removed, the eyes are put in, and the skin fastened to a strong cardboard by means of glue, and coated with turpentine-varnish.

I may add to the above that the pencil outline is of the first importance, seeing that all fish-skins stretch longitudinally on being taken off, a fact first prominently brought before my notice by finding that a plump pike under manipulation gradually assumed the proportions of an eel. In the absence of corrosive sublimate, arsenical soap may be used; but it is as far inferior to the former in fish-preserving as it is superior in bird aud quadruped stuffing. H. E. need hardly be reminded that some fishes, on account of the thinness of the skins and softness of the scales, cannot be stuffed in anything like a respectable way, the only plan of preserving them as skins being to press the skin between blotting-paper until dry, and gluing it directly on the card. The varnish I use is copal.—B. D.

Salmon in the Thames, p. 246.

My friend, Mr. Legrew, veterinary surgeon of his regiment, tells me that his mother (who would be ninety years old if she were alive now), well recollected the Thames fishermen hauling up the boats at Barnes, and emptying out the salmon that they had caught in the neighbourhood. An old man at Sunbury tells me that thirty years ago he recollects coming down from Laleham with three live salmon in the well of the boat. When a salmon was seen, the fishermen were nearly sure to catch him, as he kept about much in the same place for days together. He never knew a salmon caught in the Thames with a fly.

Bait for Roach Fishing, p. 255.

The following hint may be useful to some of my readers:—

There is a small brook which empties itself into the Trent near to Hoveringham, at the mouth of which roach congregate in great quantities for about three weeks at this season of the year for the purpose of feeding on a particular kind of weed that is continually swimming down. An old roach-fisher visited this spot on Monday with a good supply of creed wheat and malt, and although the fish have been taking these baits freely for the last fortnight, he could not persuade them to bite, their attention being all on the weed, and the angler was fairly beaten. At last the thought struck him to put a portion of the weed on his hook: he did so, and the result was that every time he threw it in a fish seized it, to the surprise alike of himself and other fishermen who came up at the time and witnessed it. The angler re-

turned to Nottingham with a good basket of roach. I have long been aware that in the early part of the season most fish feed on the weed, but I never knew it to be used as bait. Great credit is due to Mr. Blythe, of Sneuton, for the discovery, and for freely revealing the secret to the angling fraternity, and thus adding another wrinkle to the many concerning the gentle art.—"Bailey, Fisherman" (Nottingham, August 2), 1860.

Introduction of Carp into England, *p.* 261.

We read in "The Field" that carp is one of the naturalized fish in England, having been introduced here by Leonard Mascal, about the year 1514, to whom the English are indebted for that excellent apple, the pippin.

Turkies, carps, hops, pickles, and beer came all into England in one year.

The carp is now naturalized in America, and is there protected (as I understand) by stringent regulations.

Gold-fish in Hot Water, *p.* 267.

The following note has been kindly sent me :—

Sir,

I have just been reading your delightful book on Natural History, and have taken the liberty of mentioning the following fact respecting gold-fish, thinking it may interest you,—

Some years ago, I saw a vast number of gold-fish in a factory "lodge" at Preston, in Lancashire : at the end of the lodge was a pipe conveying the warm water which had been used in condensing. On Sundays the supply of warm water of course ceases : and the manager of the works told me, that in cold weather, the fish are to be seen every *Monday morning*, waiting for it to flow again, as soon as the engine begins working.

Fish and Fishing. Carp in Hot Water, *p.* 268.

I find the following passage in Spallanzani's "Treatise on the Nat. Hist. of Animals and Vegetables," p. 74 :—

Carp in Water at 106°.

"From some observations, we know there are carp living in warm springs that experience blood heat (Haller, Physiol., tom. ii.). I took several river carp for experiment. When the water they were in had *been heated to* 106°, they exhibited *no sign of uneasiness.* At 109°, *they began to struggle, and died at* 116°. Experiments were made on other fishes, as eels, tench, lampreys, but none could bear so much heat. Whence, by analogy, those inhabiting warm springs should

support greater heat; and of this the fishes we have just mentioned afford ample evidence."

It has been a question as to how far fish will bear cold as well as heat; and we often read in arctic voyages passages such as the following: "When the men fished in the river, the fish froze as they were taken out of the nets; in a short time they became a mass of solid ice, and by a blow or two with a hatchet were easily split open. If in this completely frozen state they were thawed before a fire, they recovered their animation." The great John Hunter tried experiments on the subject, which will be interesting to my readers who keep carp, gold-fish, &c., in their garden ponds which are frozen in the winter, in order that they may see how far the facts hold good. There was a joke current at the time these experiments were made, for we read "Whilst John Hunter's friends, Lynn and Benjamin West, were warming themselves with a bout of skating on the Serpentine, Hunter staid at home freezing his fingers in ice in pursuit of his enquiries." John Hunter thus writes: "These experiments were not originally instituted with any expectation of the event which resulted from them, but for a very different purpose; which was no other than to satisfy myself, whether an animal could retain life after it was frozen, as had been confidently asserted both of fishes and snakes. If I had succeeded, I meant to have tried the effects of freezing on living animals, to a much greater extent than ever can happen accidentally. For that snakes and fishes, after being frozen, have still retained so much of life, as when thawed to resume their vital actions, is a fact so well attested that we are bound to believe it.

"I. The first experiment was made on two carp. They were put into a glass vessel with common river water, and the vessel put into the freezing mixture; the water did not freeze fast enough; and, therefore, to make it freeze sooner, we put in as much cooled snow as to render the whole thick. The snow round the carp melted: we put in more fresh snow, which melted also; and this was repeated several times, till we grew tired, and at last left them covered up in the yard to freeze by the joint operation of the surrounding mixture and the natural cold of the atmosphere. They were frozen at last, after having exhausted the whole powers of life in the production of heat. That this was really the case, could not be known till I had completed that part of the experiment for which the whole was begun, viz., the thawing of the animals. This was done very gradually; but the animals did not, with flexibility, recover life. While in this cold they showed signs of great uneasiness by their violent motions.

"As it is confidently asserted, that fishes are often frozen and come to life again, and as I had never succeeded in any of my experiments of this kind upon whole fishes, I made some partial experiments upon this class of animals; being led to do this by having found a material difference in the result of the experiments made upon the whole animal, and of those made only on parts of the more perfect animals.

"I froze the tail of a tench, which became as hard as a board: when it thawed, that part was whiter than common; and when it moved, the whole tail moved as one piece, and the termination of the frozen part appeared like the joint on which it moved.

"On the same day I froze the tails of two gold-fishes till they became as solid as a piece of wood. They were put into cold water to thaw, and appeared for some days to be very well; but that part of the tails which had been frozen had not the natural colour, and the fins of the tails became ragged. About three weeks after a fur came all over the frozen parts; their tails became lighter, so that the fishes were suspended in the water perpendicularly, and they had almost lost the power of motion; at last they died. The water in which they were kept was New River water, shifted every day, and about ten gallons in quantity.

"From some of these experiments it appears, that the more imperfect animals are capable of having their heat and cold varied very considerably, but not according to the degree of heat or cold of the surrounding medium in which they can support life; for they can live in a cold considerably below the freezing-point, and yet the living powers of the animal will not allow their heat to be diminished much beyond 32°; and whenever the surrounding cold brings them so low, the power of generating heat takes place; and if the cold is continued, the animals exert this power till life is destroyed; after which they freeze, and are immediately capable of admitting any degree of cold."

Unhooking a Jack, p. 273.

Having had my hands and arms so frequently cut all over with jacks' teeth and the back fins and gills of perch, I would advise all young anglers to carry with them, when they expect large fish, a *small* iron hammer, with a short handle, as a tap with this on the fish's head quiets him, and enables the angler to take the hooks out of his mouth. But lately, when "unhooking" a large jack which had not been treated with the hammer, he suddenly jumped, and caught my hand in his mouth, and nearly jumped into the water again. If there be no hammer present, a penknife should be run in between the head and the back-bone. The fish should be held down with the foot during this operation, or the blade will most likely break off short.

Bell Rods, p. 275.

A party of Frenchmen have had (summer, 1860) capital sport with the barbel with these "bell rods," which are about two feet long. They set several by the side of the

punt. If the fish are on the feel, the bells keep on ringing, and the Frenchman hauls them up with "Ah! M. Barbeau, you at home, eh! I ave got you now, M. Barbeau!"

Lampreys Bait for Cod, p. 277.

Mr. Kemp, of Teddington, tells me that the Thames fishermen catch lampreys, which they take to Billingsgate, and sell to the Dutch fishermen to catch cod on the Doggerbank. They are found to be the best of all bait for these fish.

Shrew Mouse Carnivorous, p. 279.

"Your notion of the shrew-mouse being carnivorous, I can confirm by a singular circumstance that came under my own notice. In a house that we once lived in near Bury, the cellar was very wet, and generally full of little frogs. One day the man-servant went down to draw some beer, and was very much amused to see a little mouse hunting a young frog. He took hold of the frog, but so intent was the mouse on his prey that he jumped after it, and both were brought up struggling to the upper regions. It was at this crisis that we were called in to look, and there was the mouse sitting on the kitchen-dresser like a monkey, munching away at poor frog most unconcernedly. It was afterwards induced to change it for what we then thought less cannibalistic food for a mouse. We did not keep the mouse long, as he made his escape."—*From an old schoolfellow at Winchester.*

I have also received the following confirmatory of the fact:—

I venture to make known to you, in corroboration of your belief that shrew-mice will kill and feed upon frogs, a contest which I once witnessed, in which a shrew-mouse was doing his best to worry and destroy a very large and vigorous frog. It was on a bright sunny day in the month of April when, being in a plantation at this place, my attention was excited by the splashing of something in a "letch," or very small runnel of water, that trickled through the young herbage and the fallen leaves of the preceding year. The water did not exceed an inch or two in depth, but with here and there a saucer-like pool deep enough to cover one's foot, where the leaves had dammed up the sparkling little current, and in these places there was a little sand or mud at the bottom. On looking to the spot whence the splashing of water, accompanied with a low but eager squeaking of a mouse, proceeded, I perceived a black water-shrew, with white breast, biting at the thighs and flanks of a frog, and endeavouring to pull it away from the water, sometimes hanging on like a little bulldog, and some-

times snapping at fresh parts of the skin as if to obtain a better hold. The frog, though not at all hurt, was evidently much alarmed. It repeatedly shook off the enemy by jumping, and then, by taking a second spring, threw himself out of pursuit for half a minute; for the mouse was so dazzled by the sun that he evidently could not see the frog when but twelve inches distant, and knew nothing of my presence though I was but a single pace from them. On these occasions he made casts exactly like a hound until he came upon the poor frog again. The latter kept as much as possible to the water, and twice or thrice buried himself in the little pools; but the mouse dived with equal ease, and seizing him by the hind foot, jerked till he had dislodged him from the insufficient stronghold. Probably in twelve inches of water a frog of this size would have baffled the enemy by maintaining his position at the bottom.

I witnessed the struggle for about a quarter of an hour, wondering whether old Homer had not seen just such a *Batrachomyomachia* ages and ages ago. When, being obliged to go away, I revealed myself to the mouse by giving him a flap from a soft glove, and taking up the frog, which by this time was not quite so vigorous as at first, I examined his wounds, but could not discern that the skin had as yet been broken anywhere. He was then thrown into deep water, where he might congratulate himself on rare good fortune. I think it would have taken an hour or two for the mouse thoroughly to exhaust and kill so large a frog as this was, but the fatal result was easy to be foreseen. Frogs of smaller size would be easily overpowered.

I have little doubt but that the common bay-coloured shrew will equally attack frogs, especially since it is numerous as a species, and several may join in the struggle.

The poor shrews which we find dead upon walks and paths near to houses where cats are kept, have been killed by these animals, which, having taken them among the grass, carry them for their cruel sport to paths and roads where the poor mouse cannot escape by hiding itself.

I am, sir, very respectfully yours,

RALPH CARR.

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