ANIMALS IN THE WILD AND IN CAPTIVITY

E. G. BOULENGER

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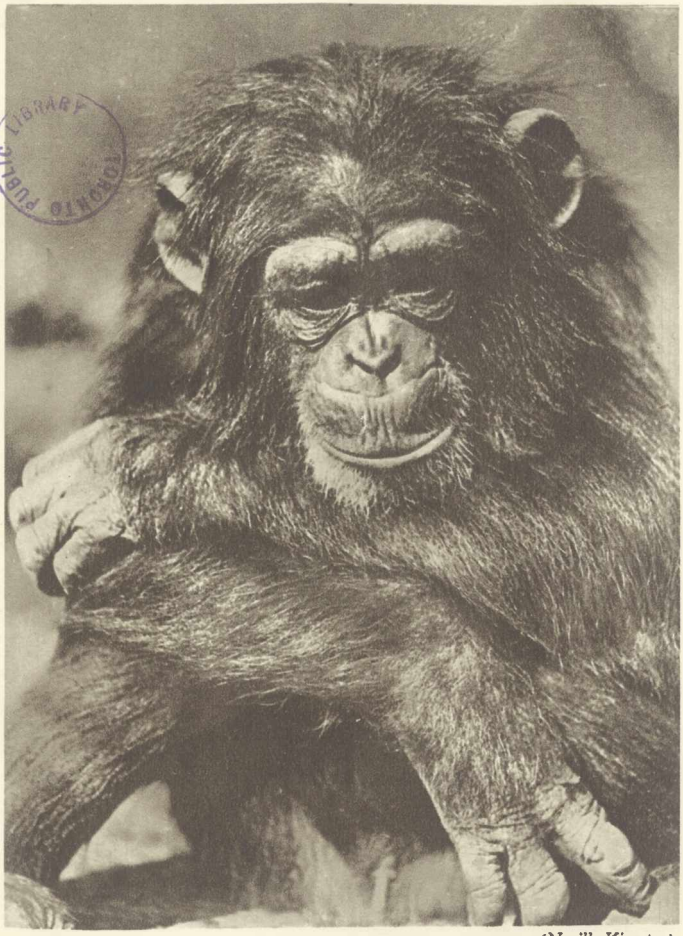

(*Neville Kingston*)

Young Chimpanzee

ANIMALS IN THE WILD AND IN CAPTIVITY

BY

E. G. BOULENGER

Director of the Zoological Society's Aquarium

WITH TWENTY-FOUR PHOTOGRAVURE PLATES

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ANIMALS IN THE WILD AND IN CAPTIVITY

OUR NEXT OF KIN

THE most popular inmates of the Zoological Gardens are the anthropoid apes, and the daily baths of health-giving ultra-violet rays they indulge in are as nothing compared with the limelight of publicity which they receive and enjoy. This, considering the close relationship which exists between our next of kin—the gorilla, the chimpanzee and the orang-utan—is not surprising. Not only do they resemble *Homo sapiens*—the flower of creation—in general appearance, but they do so also in size and structure of the brain. It may, in fact, come as a surprise, and even a shock to some, to learn that there is less difference between the brain of a chimpanzee or gorilla and the lowest living savage than there is between the brain of such a savage and the reader of this book.

The "Gorilla"—a native name for "wild man"—is an inhabitant of Tropical Africa, and stands in the minds of most people for a giant ape that beats its breast when aroused, attacks at night,

kidnaps native women, and generally terrorizes the jungle. Despite some three and a half centuries' acquaintanceship with the animal, the original and false reports still persist in countless natural history books. It is only quite recently that this most interesting of creatures has been estimated at its true value, and active measures are now being taken to conserve such specimens as the "sportsman" has failed to exterminate. As usual, the measures are a little too late, for the gorilla is fast becoming extinct. Ancient chronicles tell of hand-to-hand conflicts between armed knights and fiends living in trees and having the strength of ten men. These obviously point to some huge manlike ape, almost certainly the gorilla. Du Chaillu, the first man of any culture to bring the gorilla before the public, was at first unanimously acclaimed as a "Prince of Liars" and was a God-send to most of the comic journals in the latter part of the eighteenth century. Even when he produced concrete evidence (some of his gorilla skeletons may still be seen at the College of Surgeons), only a minority took him seriously. Du Chaillu was for many years the first and last authority on "*Troglodytes gorilla*", and his accounts, unaided by kinematography and taxidermy, originated most of the gorilla stories still current. From 1864 onwards the animal was consistently misrepresented as habitually walking erect and supporting him-

self upon a staff, building immense arboreal turrets and at times even resorting to human flesh as a variant to his menu.

The great difficulty of keeping a gorilla in confinement is largely responsible for our poverty of knowledge. The creature's shy and retiring temperament makes it hard to learn much of its mental process at first hand. Even in early youth it lacks the volatile " friend of all the world " disposition of the young chimpanzee. The London Zoo was the first menagerie to exhibit a gorilla, and the authorities have now definitely decided to abandon all future attempts at keeping the animal in a cage. The only gorillas that have thrived in captivity for any length of time are those that have been treated as civilized beings, kept in a house or flat, and given constant human companionship. The famous gorilla " John Daniel ", who for several years was on exhibition in the Zoological Gardens on summer afternoons, came into the possession of its owner, Miss Alyse Cunningham, when quite a baby, and was treated by her as one would a delicate child. John was taught to dress and wash himself and to behave properly at table.

For the latest authoritative knowledge of this ape in its native state the world is indebted to the late Carl Akeley, explorer and kinematographer, and to Dr. Dyce-Sharp of the West African Medical Service. The former's last great work was to assist the

Belgian authorities in establishing a gorilla sanctuary in the Congo, and it is in that region that Akeley's remains now lie. According to Akeley the full-size gorilla may stand close on six feet high and weigh over 360 pounds. The animal invariably progresses on all fours, using the knuckles for support, with the body sloped at an angle of about 45 degrees. Both males and females beat their breasts and produce a deep bark, but this trait, of which so much has been made by former natural history writers, is not necessarily a sign of rage. Travelling in small family parties, gorillas keep always to the densest cover, foraging by day and sleeping at night. The sleeping methods are unique and have only lately been brought to light by Dr. Sharp. Apparently the band of gorillas consists usually of a big male and a harem of several females of varying age. The same sleeping site—a tree—is seldom used twice. The tree selected, the " old man " sends his wives up aloft, where each makes a very good pretence at making a bed. My lord then establishes himself at the foot, sleeping with his back to the tree and his arms folded on his breast. With regard to the structure of the beds Dr. Sharp states, " All chimpanzees, both male and female, adult and young, sleep in trees at heights varying from thirty to fifty feet, where they make small untidy beds somewhat like a stork's nest. In the same area the gorillas also make beds

for themselves, but of a far more elaborate character. The male's bed may be as much as nine feet by six feet and is as like a spring mattress as possible considering that it has to be of raw forest material. To make it he selects with some care a suitable site where by stretching out his long arms he can encircle, bend down, and break young saplings of two to four inches in diameter. Across these he places stout branches brought from neighbouring trees and over the whole he stretches a thick layer of leaves and twigs so as to make a couch a foot to eighteen inches deep. At the same time he takes care to have at one side of the bed a stout tree against which he reclines in a recumbent position. I repeatedly tried the experiment of lying where the male had lain, and in every case I was able to see from his couch the beds of his several wives." This observer, who was for many years in Nigeria, made a rough census of the gorilla population in his own particular parish, an area of approximately sixty miles long by twenty miles broad. He estimated the actual number of adult gorillas at two hundred. It would appear that the gorilla is an indifferent tree climber, seldom going aloft save to rest and avoid danger, and this was noticeable in the case of John Daniel, on the occasions when he visited our Zoological Gardens. Indeed the heavy, sluggish-souled gorilla is by nature not much more arboreal than man. Whereas a chimpanzee

in captivity will soon acquire a taste for meat, the gorilla never touches birds or their eggs. Even nuts and fruits are passed over if succulent tree shoots are available. Great havoc has been worked amongst gorillas in the past not only by " sportsmen " but by native hunters. During the latter part of 1928 a large collection of gorilla skulls was brought to London, and it was noticeable that in many cases the back of the brain case had been blown clean away. It appears that occasionally the native hunter upon sighting the gorilla will approach with his gun held straight before him. The gorilla will catch hold of the barrel and place it in his mouth with a view to biting. The hunter makes the next move and wins the trick ; not always, however, for what passes for a gun with native hunters is not quite up to Bisley standards. The barrel occasionally takes the form of a length of gas piping and the gorilla's immense teeth close upon this and the gun blows back, reversing the programme, greatly to the gorilla's advantage. The power of the jaw of the animal is tremendous, but the huge canine teeth are usually only employed in fighting with other males. Akeley has immortalized the gorilla in the form of museum groups and films, and such records are better than any number of unfortunate individuals pining away in travelling menageries. It is to be hoped that the fine work of conservation which Akeley was prevented from completing by

(F. W. Bond)

Chimpanzees at Tea

(F. W. Bond)

Young Gorilla

his sudden death may be taken up by others and the world spared one more relic of Africa's fast-vanishing wild life.

No Zoo animal enjoys more universal popularity than the chimpanzee. Leaving on one side his claims to kinship with ourselves, he is a public playmate attractive alike in physique and psychology. His make-up is grotesquely human, without being, as in the case of the gorilla, somewhat repellent. The large and mobile face, immense and finely-modelled ears, and restless hands and feet are usually of a wholesome flesh tint, framed in a setting of glossy black hair. His mental qualities combine to form a joyous, resilient nature in marked contrast to the brooding and phlegmatic characters of the other manlike apes. Indeed, the "chimp's" society charms have led to his undoing. Animal dealers, convinced that a chimp in a zoo is worth ten in a jungle, have done much to reduce the supply, until to-day it is quite inadequate to cope with the demand. "Monkey gland" treatment has not tended to make the chimp's lot an easy one nor to reduce his market value. The chimp's honest desire to behave like a human being is obviously of invaluable use to the trainer. Unfortunately, he only retains his natural docility until the age of seven or eight, at which period he shows a tendency to get out of hand and realizes his enormous physical strength. A chance movement may result

in throwing the keeper to the ground or in some other way opening the animal's eyes to the fact that force offers distinct advantages to its possessor when tempted to mutiny. Once this occurs it is not safe to give the beast full liberty, his active brain being apt to urge his powerful limbs to commit all kinds of outrages upon society. Of recent years large numbers of chimpanzees have been kept, not only in public menageries and such institutions as the Cuban Experimental Ape Farm, but also by private individuals, with the result that the chimpanzee's mental equipment is fast being assessed at its true worth, though the full extent of its limitations and possibilities are not yet ascertained. The creature's anxiety to please and be pleased renders it an ideal subject for educational experiments. It is tolerably hardy, and acclimatization in this country has resulted in one specimen, " Micky ", surviving our treacherous weather for close on thirty years. Mickey was thrown in as a sort of make-weight with a lot of four chimpanzees purchased for the London Zoo in 1898. He was not expected to live long, yet he evaded the pneumonia and other germs that carried off his cage-mates and survived to be the " Father of the Zoo ". With his declining years crippled by rheumatism he was somewhat cantankerous, but would turn a smiling face to his friends. He was amiable enough when quite young, but as he grew older would indulge,

on the slightest provocation, in frenzied war dances. This chimpanzee had a special dislike for policemen, and the entry of a member of the Force into the Ape House was a signal for an outburst of fury. This anathema for the police was due to the fact that on a certain Bank Holiday the policeman stationed in his House to control the crowds amused himself by shaking his truncheon at and otherwise mocking his poor relation. The incident took place when Micky was only about five years old, but to the day of his death in 1926 the insult was neither forgotten nor forgiven.

Up to the age of seven a chimpanzee is an ideal pet, cleanly in its habits, intensely affectionate and always, in vulgar parlance, " full of beans ". Incidents could be cited without end. Being highly imitative, this ape quickly acquires all kinds of human ways, taking readily to clothes, appreciating human beds and domestic utensils and enjoying such pastimes as roller-skating and cycling. He will quickly turn any such accomplishment to his own ends. The chimpanzee's brain is complex enough to possess an attribute known to only one other creature, namely man; and this is self-consciousness. A young and only partially-trained specimen but recently arrived from the Congo, and with no social knowledge, once attended a luncheon party given by the writer. He sat at table for over an hour, used a knife and fork, drank out of a

glass, and behaved with perfect decorum. At the end of the meal he aroused a storm of laughter by his vociferous appreciation of a large bowl of cherries. The laughter spoilt the party for the ape, who, suddenly realizing that he was making an exhibition of himself, pushed aside his favourite dish and covered his face with his hands in an agony of shame and mortification. The chimpanzee easily tops the list of manlike apes when subjected to the box test, a test of intelligence which consists in suspending some favourite fruit out of reach while a number of boxes lie scattered around. It very soon dawns upon his intelligence that to reach the dainty all that he has to do is to pile the boxes one upon another, with a cautious eye to stability of balance.

The chimpanzee is, as they say in the "Situations Wanted" columns, "good with animals". In private ownership he can be trusted with a mixed assemblage of dogs, cats and children, and at the Zoo has been given small monkeys and wallabies as pets to play with and patronize. Many menagerie keepers will tell one that the chimpanzee is cowardly, but this seeming cowardice is really proof of his higher intelligence. As an example one may quote the incident of a young chimpanzee that once lived in the Belle Vue Gardens at Manchester and was occasionally taken for outings in the country. When first introduced to a herd of

cows he was terrified. Familiarity, however, soon bred contempt, and when he realized that the comparatively brainless herbivores stood in fear of him, he developed a cowboy's enthusiasm for rounding them up.

The home of the chimpanzee is tropical West Africa. Unlike the gorilla, with his jealously-guarded harem, the chimpanzee is believed to remain faithful to his single wife, and shows his innate love of society by going about in noisy bands of twenty to forty individuals of all ages and sizes. He makes a sketchy stick platform bed some forty feet above ground. He lives abundantly and very wastefully upon fruits of all descriptions, and greets the dawn and sunset with those vociferous shouting cries which are familiar to Zoo visitors. The single young is carried pick-a-back, not at the breast as in the case of the gorilla, or at the hip as in the orang.

The orang-utan differs from the chimpanzee when grown-up in being silent as well as strong. In the juvenile state, however, although never boisterous he is playful and humorous. The head of the orang-utan is longer than that of the other apes, while the face is a distinct bluish tint. The ridges over the eyes are not so prominent as in the case of the chimpanzee or the gorilla, and the ears are smaller. There are two distinct races of orang-utans, the Bornean and the Sumatran, the former

developing when approaching maturity two enormous fleshy developments of the cheeks which are absent in the latter. Orangs are more arboreal than any of the other apes. They seldom set foot on the ground, and spend the greater part of their lives seated on large roof-like platforms of sticks which they erect high up in the trees. Often they construct a second platform above the main structure, which does duty as a roof.

Many of the juvenile orangs have established themselves at the Zoo as firm favourites with the general public. Sandy, who was for many years a recognized Zoo buffoon, had a host of friends. Although not the intellectual equal of some of the chimpanzees, he nevertheless endeared himself by performing antics with the evident object of provoking laughter. He was a born actor, and it was essential to his happiness and well-being to have an appreciative audience. Sandy lived in a cage next door to that of the mandrill, and on Bank Holidays and other busy days, when bored by the generosity of his many admirers and his appetite satisfied, he would throw the gifts which he accepted from would-be benefactors into the neighbouring cage inhabited by the morose mandrill. On Boxing Day children would bring their paper caps from the previous evening's crackers. Unlike the inmates of the Monkey House, who regard such caps in the light of mere empty paper bags, Sandy well

understood their use and caused great hilarity by wearing various types of headgear. On one occasion he appropriated an umbrella, which he opened and sat underneath for some time. The merriment was of course great when, tired of using his prize in the orthodox manner, he suddenly thrust his head through a rent in the material.

The future of the apes, especially that of the chimpanzee, invites speculation. If only they could be given power of speech ! With brains little inferior to those of savages, and exteriors far more likeable, the possibilities would be endless.

"CALENDAR MARKS"

MARK TWAIN has told us through the mouth of one of his immortal characters that "one blue bottle makes a summer". If he had confined himself to bare scientific fact—which, happily, he did not—he would have said "the common blow fly (*Calliphora erythrocephala*) is inseparable from the warmer weather which occurs periodically in the countries it infests". So inseparable is it that a chance specimen awakened from hibernation by the office gas stove at once distracts the City man's thoughts from files and ledgers to happy days by wood and river-bank.

The blue bottle is not alone in his glory. Those who seldom see the country know which way the seasons fly by the animal and vegetable merchandise displayed in the shops. Man, of course, has done his best to turn the calendar upside-down, for he has succeeded—at a price—in producing roses and carnations all the year round, and strawberries when the snow is upon the ground. The animals to be reviewed here are so conservative in their ways that despite all outside influence their arrivals and departures vary little from one year to another, and they are in fact regarded by those who know

them as " calendar marks ". Though a great many mammals and birds are given to annual migrations, few can be relied upon to favour a certain date, their movements being hastened or delayed by the exigencies of climate. The quail is one of the exceptions, and its punctuality is its undoing. So regular is it in its flight westwards in the late spring that the most elaborate preparations are made to intercept it. The little island of Capri, the centre of the quail harvest, is literally surrounded with nets spread between poles and into the nets the birds, tired with their long flight, fall in countless thousands. In fact, the annual visit of the quails has been compared to a swarm of locusts. It is, however, amongst the lower animals that we find the most remarkable seasonal movements. The march of the West Indian Land Crabs reads like a romance. The naturalist Herpst tells us that these crabs are so numerous when they creep out of their holes that the ground seems to be in motion. On a certain island which is so full of them that it is called Crab Island, they take up their abode on the hills, not less than one mile nor more than three miles from the coast. On a specified day in May they march in great hosts towards the sea, in which they bathe and lay their eggs. Nothing can hinder them from making straight towards their goal, for they surmount every obstacle that comes in their way, be it hedges, houses, churches, hills

or cliffs. On their nuptial march they would rather clamber up any obstruction at the peril of their lives than make a circuit. In the night they will creep in at a window of a bungalow and climb over the beds. If a crab has the misfortune to tumble down and damage its limbs it is immediately eaten up by a confrère. The fields at this period are so covered with these crustaceans that there is no setting foot to ground without treading upon them. The din produced by these creatures when migrating has been compared to that of a cavalry regiment in action and as a spectacle their march surpasses even that of the redoubtable driver ants, before whom all animals beat a precipitous retreat. It is interesting to note that the male crabs precede the females by a couple of days. The eggs are laid in the sea, and are washed ashore; on hatching, every available tree root for miles round is densely covered with infant crabs.

Equally remarkable are the sudden appearances in vast numbers of the North American grasshopper known as the " Seventeen-Year Cicada ", its grubs spending exactly seventeen years underground, and making their way to the surface by the million simultaneously.

Very interesting research work has been conducted in recent years on the influence of the moon upon such well-known shell fish as oysters and scallops. Although the conclusions arrived at seem to need

further verification, it has been definitely ascertained that these molluscs are in the main stimulated by a full moon, especially in the summer, when the full moon causes the largest spring tides. Something of the kind has long been a popular " fisherman's story ", and it is interesting to note that the ancient writers speculated on the same theme. Pliny tells us that generally speaking oysters increase in size with the increase of the moon, and Anniceris states, in speaking of the conditions of oysters after full moon, that " now that the moon is in truth waning, the oyster, like other things, is lean and void of juice ! " The somewhat vague phrase " other things " would seem to imply a very general susceptibility on the part of Nature to lunar influences. It has recently been ascertained that a Suez Canal sea-urchin breeds at each full moon. A long series of experiments conducted at the Marine Biological Association's Laboratory at Plymouth go to show that the scallop is subject to a physiological rhythm, causing the development of the large orange mass—the gonad—to coincide with the full moon. As in the case of the oyster, it has been pointed out that exceptionally high and low tides may well bring to the molluscs a more than usually stimulating food supply. It is believed, however, that the moonlight itself may be in some degree responsible, though this requires further proof before acceptance as established fact. To ascertain how much, if any,

influence the moonlight exerted, the oysters and scallops were kept in cages at varying depths and some so constructed that all moonshine could be excluded. Similar experiments have been performed with a genus of tropical worm known as the *Palolo*. The creature swarms off the coast of the Samoa Islands in the southern Pacific, but is visible on the surface only on two nights in the year—in October, the day before and the day on which the moon is in the last quarter. More abundant on the second than the first day of their appearance, these worms swarm to such an extent that the water is discoloured over a large area. Their numbers have been described at these times as so inconceivably great that the sea seems to consist of nothing else. The palolo worms appear with the dawn and their number is at its height soon after sunrise. Two or three hours later they have all vanished. The natives calculate their appearance to a nicety and reap a rich harvest, the worms being regarded by them as a great delicacy.

INFANT WELFARE

THE cradle and perambulator are very ancient institutions, and were, in fact, in use long before any animal developed the necessary vocal chords with which to sing a lullaby. The hip carriage is probably the most natural baby carriage for any biped of anthropoid stock, and many human tribes support their offspring for a short time on the hip, the youngster instinctively clinging to its mother with hand or foot. In a few monkeys the young are carried jockey-fashion across the loins of the parent. The habit of conveying the young about upon the back or in a pouch is in vogue with quite a number of mammals. Bears, racoons and the like often give their offspring a lift, whilst the kangaroo infants as soon as born, and when in an entirely helpless state, measuring not more than an inch in length, are transferred to the maternal pouch, in which they suckle. Juvenile kangaroos may cling to their mothers' apron-strings until they are almost grown up, and visitors to the Zoo are often entertained by the mother's violent attempts to frustrate her ponderous year-old offspring from having recourse to her pouch. In most arboreal marsupials the young are transferred from the pocket to the

parental back as soon as they are strong enough to take the air. Semi-aquatic creatures such as the hippopotamus and the capybara often give their young a ride in mid-stream, and the former animal may sometimes be observed doing so at the Zoo, the calf rising mysteriously from the depths. The female whale and polar bear are both known to carry their babies whilst swimming, tucked snugly under the flipper or the forearm. The case of the little Australian tree-opossum, who carries seven or more offspring on her back, each infant keeping its position by twisting its long prehensile tail round that of its parent, should excite the admiration of every pram-pushing ratepayer.

Avian cradles may range from a ten-foot platform of twigs, as built by the osprey, to the fairy-like structures of finely-interwoven fibres suspended from slender branches, as constructed by the hang-nests. A barren ledge several thousand feet above the sea-level, or a mere hollow in the sun-baked desert, may form the nursery of some baby bird. The most perfect cradles as judged by human standards appear, however, in the world of the frogs and toads, where the "pram pocket" takes many curious forms. A classic example is the aquatic "pipa" toad of the swampy forest districts of Central America, of which specimens have been exhibited in the Zoo Aquarium. In this case the female carries the eggs on her back until

hatched, each egg being pressed by the male into the spongy skin of his spouse, where the infant toads pass through a complete metamorphosis, the tadpoles never being called upon to swim a stroke. When ready to emerge, each tiny toad breaks through a very thin film of skin covering his walking cradle and tumbles out into the daylight, a fully-formed, self-helpful replica of his parents. A tree-frog inhabiting Brazil protects its family by building basin-shaped cradles in the shallow waters on the borders of ponds. The mud is scooped out to a depth of several inches and with this material an almost circular wall is built which emerges just above the surface of the water. In the construction of the enclosure the working-frog uses her fully-webbed hands in the manner of a trowel in order to smooth the floor and inside walls. The eggs and tadpoles are thus protected from the attacks of aquatic insects and fishes. Other South American tree-frogs deposit their eggs on the branches of trees overhanging ponds in nests of froth, and the larvæ at a certain stage of their development drop into the water below, where they complete their metamorphosis. In a Brazilian frog the tadpoles are carried about on the back of the mother, adhering by large sucker-like lips, and are thus conveyed from pond to pond, where they are subjected to a periodical bath.

In the African Lung-fish the cradle in which the

eggs and young are protected consists of an excavation, about a foot in depth, in the mud on the banks of the river, filled with water and surrounded by long reeds. By keeping the water well aerated by violent lashings of the tail, the parents protect the eggs not only from enemies, but also from the danger of death from want of oxygen. The so-called Elephant-fish of Central Africa lays over a thousand eggs in a floating nest of grass smaller than but similar to that which served as a cradle to the infant Moses. Many fish deposit their eggs in a floating foam formed of a secretion enclosing bubbles of air. Some fish parents make simple cradles out of scallop shells, while quite a number protect the eggs as soon as they have been laid by taking them up into the mouth, where they remain until they hatch. In a South American catfish the eggs become attached to the mother's abdomen, each egg being set in a little cup connected with the skin. Other fresh-water catfish, with obviously no æsthetic sense, convert old tins and boots thrown into the water into cradles for the reception of their offspring.

Among invertebrates the spiders take the most elaborate precautions to ensure that no harm shall come to baby " when the wind blows ". The eggs, laid in silken cocoons, may be hung from a leaf near the web, enclosed in a diving-bell, as in the case of certain aquatic species, or attached in a ball of artificial silk to the maternal abdomen.

The average human father of to-day gives his offspring a better chance than he had himself, and is often joyfully inflated with quite mediocre results. He does his best to be a stolidly respectable blend of nurse and schoolmaster in the intervals of making a living. He is often proud to wheel a pram round the park, to rock the cradle, or even wash the baby. In the enjoyment—or otherwise—of these virtues he may think himself unique, but a walk round the Zoo may convince him that he is not by any means alone. In Regent's Park the perfect—and imperfect—father is seen on every side. The father who kills himself in attempting work that should be done by his wife, the father who alternately makes and mars the home circle, and the father who makes himself scarce as soon as his progeny appear.

It is disappointing to find that the average mammal is a bad example of perfect fatherhood. The monkey, as a rule, finds his family a thorough nuisance. He detests the rising generation swarming up his tail, pushing its little fingers into his eyes, or swinging from his ears. Often his resentment is so great that the Zoo authorities find it advisable to effect a temporary divorce as soon as the family arrives. The marmoset, a tiny monkey-like creature from Tropical America, is an exception, for he takes sole charge of the baby, handing it over to the mother only at feeding times. In its

quite early days, as soon as the meal is over the mother returns the infant to her husband, who nurses it in his flank. As the baby grows older, he holds on higher and higher up, until eventually he takes up a position across the paternal shoulders. When the baby is two months old, the father tires of his nursing duties and gently but firmly pushes his offspring away, refusing to relieve the mother.

Male elephants, deer, cattle and antelopes, that live in herds for mutual protection, are usually in close proximity to their young, but the mother alone takes an active interest in the baby's welfare. In some mammals the fatherly instinct may undergo such a reaction that it can only find expression in murder, and for this reason many mammalian mothers hide themselves in nun-like seclusion until the youngsters can fend for themselves. Were it otherwise, the father would demolish the family. The Zoo polar bear has been known to devour his offspring as soon as they were born, and it is charitable to suppose that its reason in doing so was to hide them from possible intruders. It is more likely, however, that his conduct was due simply to greed and temper. In the wild the mother polar bear toils into the snowfields until she feels secure from all and sundry, especially her loving spouse. There she digs for herself a " fug hole " ten to twenty feet deep, where her babies are

(F. W. Bond)

A Baby Pigmy Hippo being Bottle-Fed

PLATE III

brought into the world and nursed until they can shuffle in her footsteps.

Fatherhood possibly appears in its most picturesque form in the Zoo aviaries. The feathered father is always perfectly "turned out", and frequently takes upon himself the major portion of the nursing duties. The cock hornbill incarcerates his mate in a hollow tree, plasters up the entrance hole when she is safely ensconced, and then devotes himself to supplying her with suitable food until she has got the eggs off her mind and the ensuing family is decently fledged and able to pick up a living for itself. The average bird father takes a fair share of the nest-building. The male brush turkeys of the Far East live a communal life and combine to form enormous hillocks fifteen feet in diameter and seven feet high, which serve for the incubation of the eggs. The same site is used year after year, further material being added to compensate for the ravages of wind and rain. The fathers, having completed their building jobs, quietly disappear for a merry time in the woods.

Among mammals the lions and the wolves take pride of place as indefatigable hunters who will trek for days on end in order to support their wives and families; but they are picturesque exceptions. Among birds it is quite the rule for the male to take more than a fair share of the

family's upkeep. A tom-tit has been observed to make two hundred journeys in a sixteen-hour day, each journey necessitating a flight of many hundred yards. Certain young birds are quite unable to digest raw food and must be given matter that has been subjected to the peptonizing fluids of the parental interior, and cock cormorants, pelicans and flamingoes allow the fledgelings to all but crawl down their gullets and so take their meals of half-digested fish or crustaceans.

Notwithstanding the universal popularity of the parrot, very little is known of its private life, as it can seldom be persuaded to breed in captivity. Not long ago, however, a pair at the Zoo brought up a family. Both parents sat on the eggs, the father sitting during the day, the mother by night, and they successfully reared a son and heir. The ridiculous-looking youngster, quite naked at birth, with an enormous beak, was fed on regurgitated food. The cock bird deposited his half-digested meal into the beak of his consort, who swallowed it, and after a short interval handed it over to the baby.

Even incubation is generally a matter of co-partnership, except among game birds, when the heavy work is invariably left to the female. A delightful instance of the bird that rocks the cradle is offered by the penguins, birds that make an irresistible appeal owing to their grotesquely

human appearance. The single egg is always held between the parental instep, and either mother or father simply let their lower half sag so that the egg is completely protected from the freezing temperature of its antarctic home. Mother when feeling cramped or hungry brays loudly for her husband, who obediently hurries to the scene and with the dexterity of a juggler catches the egg on his instep, as his wife twitches it over from hers. When the young penguin appears he is still nursed—egg fashion—by his devoted father until he is fat and strong enough to rest on the ice floes without taking cold.

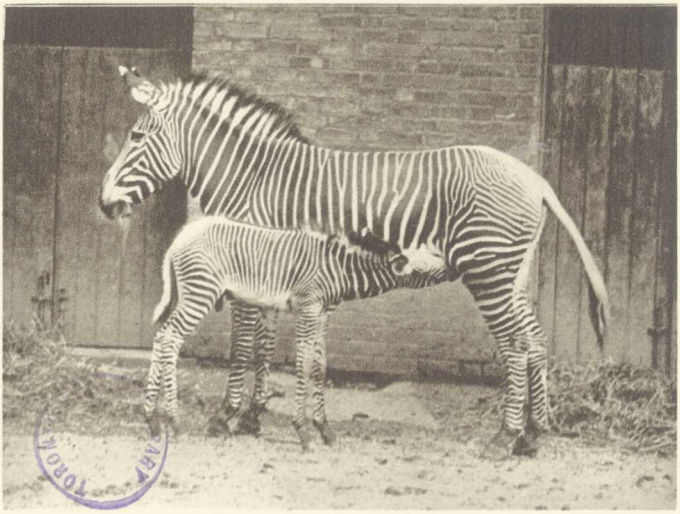
No male reptile lives up to the modern understanding of the term " father ". The mother, however, sometimes shows great solicitude for her offspring. Certain snakes, for instance, subject their eggs to a form of incubation by coiling round them until they are hatched, and guard their progeny until they are able to look after themselves.

The amphibians—the frogs, toads and salamanders—provide numerous instances of genuine paternal affection, and in some cases the eggs are taken over from the female. The Alytes Toad carries the eggs, laid in a rosary-like string, about on his own person tied around his hind limbs. Thus heavily burdened, he spends the day in the safety of a subterranean retreat, stealing forth at night to bathe the eggs in the nearest pond, where

he takes a hip bath. At the end of three weeks, the youngsters emerge in the form of tadpoles, escape into the water, and grow up like ordinary frogs and toads. Still more remarkable is the case of the little Darwin's Frog from Chile, which has a relatively large pouch under the throat and communicating with the mouth. During the mating season this sac acts as a species of bellows or bagpipe, enabling the lovesick frog to warble sweet nothings to his lady. When the eggs are laid, however, he drops romantic chirpings for more practical affairs. The sac that once enabled him to voice his love now becomes a safe deposit, and he swallows the eggs, not allowing them, however, to travel further down than the pouch. The eggs hatch into tadpoles, which grow apace, and to accommodate these the pouch becomes so extended that it almost covers the creature's under-surface, resembling an immensely inflated waistcoat. Here live the tadpoles until they emerge as perfect frogs.

The male giant Japanese Salamander, a creature possibly lower in the scale of life than any frog, carefully guards a mass of 500 eggs and walks over and through them to ensure aeration.

In most fish the father, having once assured the continuance of the race, goes his way and leaves the rest to chance—in other words, the laws of Nature. He takes no personal interest in his family



(F. W. Bond)

Grévy's Zebra and Foal

(Neville Kingston)

Young Timber Wolf, Fox Cub and Kitten at the Zoo

PLATE IV

and does not attempt to exercise any form of control. There are, however, a number of delightful exceptions, finny fathers who not only build the home but undertake its entire management. The common stickleback is a classic example. Like the sparrow, it rises to every occasion, and makes a brave show against the heaviest odds. The male stickleback, having made up his mind to marry, sets about the building of a home. This he accomplishes by gathering scraps of wood and twig, biting them into suitable lengths and welding them into a globular structure on the stream or pond bed. He binds the whole together with a sticky secretion and rams the stouter beams into position with his snout, using it as a pile driver. The home once built, he decides on courtship, fighting many a gory battle prior to winning his bride. The lady of his choice is led—if refractory, dragged—into the birdlike nest, over which he mounts guard whilst the eggs are being laid. A polygamist by nature, he encumbers himself with anything from four to eight brides, and having tasted sufficiently the joys of matrimony, expels them from the home and settles down to work. The eggs are not only to be guarded from such foes as scorpions, beetles and newts, but also from the mother sticklebacks. The nest having two entrances—which also act as exits—father is hard pressed to guard both doorways. When the eggs are hatched the house-

holder watches every movement of the fry that hover over and around him like a small subaqueous cloud. There comes a day when the young are large enough to fend for themselves. Slowly the father loses interest in them and they in him and, his life work accomplished, he dies. We have cited the case of the stickleback at some length since he is a native fish that can be kept in a tank in a living-room with the minimum of trouble. Indeed he will love, fight, build his home and guard his family within the confines of a biscuit tin. But there are other fish which display just as much family instinct and, adapting themselves to the dictates of environment, produce nests quite as wonderful as the stickleback castles in the village pond. The bowfin of North America, for instance, clears an area several square yards in extent in the thickest part of a reed bed. Here he induces his bride to lay the eggs, which he guards until hatched. Again, many male tropical fresh-water fish, notably the paradise fish of China, build fairylike rafts of sticky rainbow-hued bubbles, in the midst of which the eggs are laid. The father blows a slimy secretion on the surface of the water, expelled from his mouth until it froths up into a glistening mass. The eggs having been laid, he protects them from his cannibalistic wife. The fish father of the first grade may often be seen in the Zoo Aquarium in the person of the blue cichlid perches of Central

America. This male parent not only works at all hours to help his mate hollow out a basin-shaped nest in the sand covering the tank floor, but, having seen the eggs well and truly laid, watches over them with a care that is pathetic in its complete abnegation of personal comfort. When the newly-hatched young stray from the nest father cichlid surrounds the truants, inhales them into his capacious mouth, swims back to the nest with his burden and expels his offspring with affectionate violence back into the nursery from which they strayed.

Finally, the pipefish of our shores may be quoted as an admirable example of what a father may rise to when he tries. Father pipefish takes over the family, carrying the eggs about in a kangaroo-like pouch formed by two flaps of skin on his undersurfaces. On hatching, the infant pipefish follow their father in a little shoal and when tired twist their tails round any portion of his anatomy that may offer comfortable anchorage. The male sea horse—merely a compressed form of a pipefish—undertakes the care of the children in a similar fashion.

Spider fathers are perhaps the most unfortunate of all types, being devoured by their wives immediately after the marriage ceremony.

Fatherhood and all it implies is a sufficiently vexed question as regards our own species, but

with us it is at least standardized, and the standard becomes higher and higher every year. Fatherhood in the animal world, however, would appear to be a jumble of contradictions. Why should a mere fish work itself to a faded ruin in looking after its young, whilst polar bears or dogs, with brains approaching nearer to that of Man, calmly stroll off the moment the family arrives? Nature—as represented by the Zoo—puts these and a hundred other questions to us every day, questions that are none the less fascinating because we have not yet found the answer.

In many animals neither father nor mother is equal to the task of nursing, and in captivity young lions, giraffes, hippos and many others may be reared on the bottle. Sometimes goats and domestic cows make efficient foster parents, whilst lion cubs, young wolves, jackals, etc., sometimes take to a judiciously selected collie or retriever bitch. Of course the birth-rate of domestic animals has been turned completely upside-down by Man's intervention. Thus, a Berkshire sow can produce fourteen young, against the wild boar's three or four. Again, dogs produce larger litters than wolves; whilst the domestic hen's normal egg-laying capacity can be so raised by special food and artificial sunlight that the bird is literally converted into a mere automatic machine.

Many birds, finches, all the ducks and water

fowl, the pheasants and the turkeys, lay freely and hatch and rear their young in Regent's Park. Frequently the services of diverse matronly hens are requisitioned to hatch out valuable eggs that might otherwise perish by neglect, and these case-hardened birds cheerfully undertake to help to bring into the world freaks of beak and feathering that might occasion a nervous breakdown to less experienced foster parents.

The average man looks upon all animals other than the domestic varieties as self-taught, explaining what they know by the convenient but overworked and misused term "instinct". The idea of a monkey, a tiger, or even a sea-gull undergoing a course of education other than that of bitter experience appeals to most of us as ludicrous. Whilst it is true that most animals, like most men, begin their education in earnest when they leave the parental roof and face the world on their own, a certain amount of knowledge is instilled into the average young animal by its parents. Young herbivores such as goats, deer, antelopes and the like take to grazing quite naturally as soon as the maternal milk supply is exhausted. But where the food is of an animal nature and the prey liable to raise objections to becoming the meal of another creature, instructions by those experienced in the best ways and means of procuring the dinner are necessary. Most cats, for instance, encourage the

hunting instincts of their offspring, a baby tiger developing its powers to pounce and strike upon the tip of its mother's restless tail. Kittens are weaned very gradually. They obtain plenty of practice at a very tender age, and from stalking insects, wind-blown straws and their own shadows proceed to worry small animals purposely crippled by the parent.

Walking, climbing, and swimming are faculties latent in most young animals, but are only perfected after painful experiment. Young monkeys climb their way to the top of the tree by slow degrees, first making tentative efforts on mother's or father's pendant tail. A juvenile monkey is under constant supervision, his monitors being fond and attentive without being weakly indulgent. In fact, many simian parents are distinctly Spartan where the education of the child is concerned. A Zoo Japanese ape carefully scrutinized all food offered to the youngster. Any morsels not meeting with her approval she ate herself, considering this the best method of putting them out of harm's way. Like the children of its relations in a higher scale of life, the baby monkey, true to his age, resented bitterly the indignity of being put to bed. He would play in the outdoor enclosure, apparently deaf to mother's repeated summons to retire. At last the parental patience reached strain limit. A sudden rush, and the infant would be hauled shrieking

and struggling into a large kennel that served as a night nursery. The redoubled yells, accompanied by rhythmic thumpings, that issued from this compartment testified to the fact that the views of the Japanese ape concurred with those of the early Victorians on the subject of corporal punishment.

Baby elephants are forced to walk beneath the maternal stomach for a year or more, and the rhinoceros is known to steer her calf through the bush with her horn. Young mouflons, chamois and other rock-haunting herbivores gain their first experiences of mountaineering by climbing about on their parents' backs.

Many aquatic and amphibious animals, such as beavers, otters, sea lions, etc., have to take swimming lessons. They do not always relish their first ducking, and have sometimes to be pushed forcibly into the element that means their livelihood. In the sea lion the baby's head is so disproportionate to the rest of its body that it would drag him to the bottom if allowed in the water too soon. A sea lion born in the Regent's Park menagerie a few years ago was prevented by its mother from entering the water for the first month. At the end of that period she literally dragged her offspring into the water with her flippers and proceeded to swim underneath it. On the baby showing signs of distress the mother immediately supported her

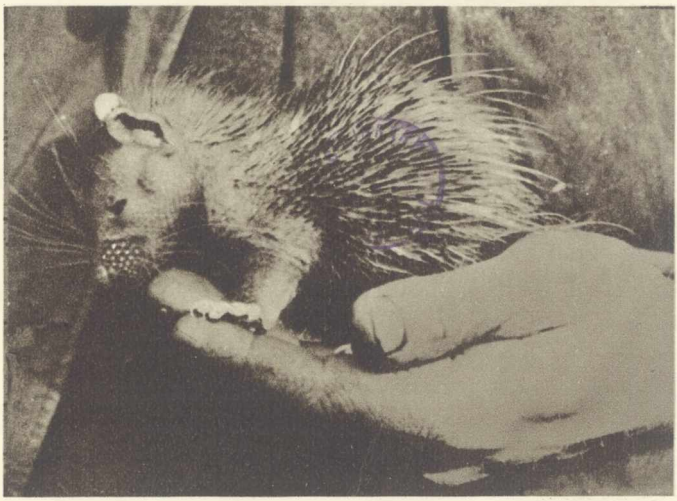
reluctant pupil on her back and made for the shore.

The faculty of avian flight which we all envy does not come so easily as many suppose. The reptilian ancestry of birds is strikingly apparent in chicks of all kinds. Many birds scramble about with feet and wings for quite a long time, and one, the Hoatzin, actually climbs trees when young in a manner highly suggestive of an arboreal lizard. Most young birds have to be coaxed out of the nest. Sparrows and finches display in their bills a tempting fly or luscious caterpillar. Some, like the storks, push the fledgeling over the side of the nest and quickly fly beneath it, catching the baby on the back when it has experienced a ten-foot drop. Ducks and swans often give their young a "trial spin" by carrying them on their backs, and many birds of prey induce their offspring to try their luck by letting specially-desirable scraps of food fall through the air within an easy jump of the nest.

Education can scarcely be said to enter into the lives of young fish as it does into those of the higher vertebrates. Among fish, however, a few parents impress upon their progeny the fact that the nest means safety, and that once beyond its boundaries anything may happen, the father stickleback keeping his brood within bounds by vigorous proddings with his snout.

(Neville Kingston)

Lion and Tiger Cubs at Play



(Neville Kingston)

Baby Long-tailed Porcupine

The lasting effects which the wrong food may have upon a human child are generally recognized. Here and there in far-separated groups of animals occur a certain number of cases that may cause some of us to imagine that animals have little to learn in the matter of dietetics. Many, however, learn what to eat by experiment, and the mortality caused by wrong feeding is known to be enormous. Food that tastes or smells unpleasant is not usually given a second trial, but it is quite a fallacy to assume that animals instinctively know a poisonous from a non-poisonous plant. At least, experiment justifies no such belief.

Birds are almost without exception models of home dietists. Those hatched naked and helpless are, so to speak, " fed by hand ", either on fresh or pre-digested food, in fact " peptonized " food straight from the parental crop. Birds that can walk and swim from the first are generally led to suitable feeding-grounds, where they are patiently taught to scratch and delve, with effectual results.

The feeding of infants possibly reaches its highest perfection among the lowly insects. Wasps, flies, bees and beetles of all kinds make elaborate provision for their young, ensuring abundance of the right food, whether honey or living animals, at the right time. Certain termites even allocate to their young a nursery far superior to any other apartment in the nest. Most appealing perhaps to

the human imagination is the case of the bee larva, a mere commoner at birth, but which, being provided with the mysterious compound " royal jelly ", attains in due course to the dignity and splendour of a highly-efficient crowned head, and the sociologist can but reflect that if only a similar food could be invented and adapted to human requirements, the difficult problem of child culture and education might be in a fair way to reaching a satisfactory solution.

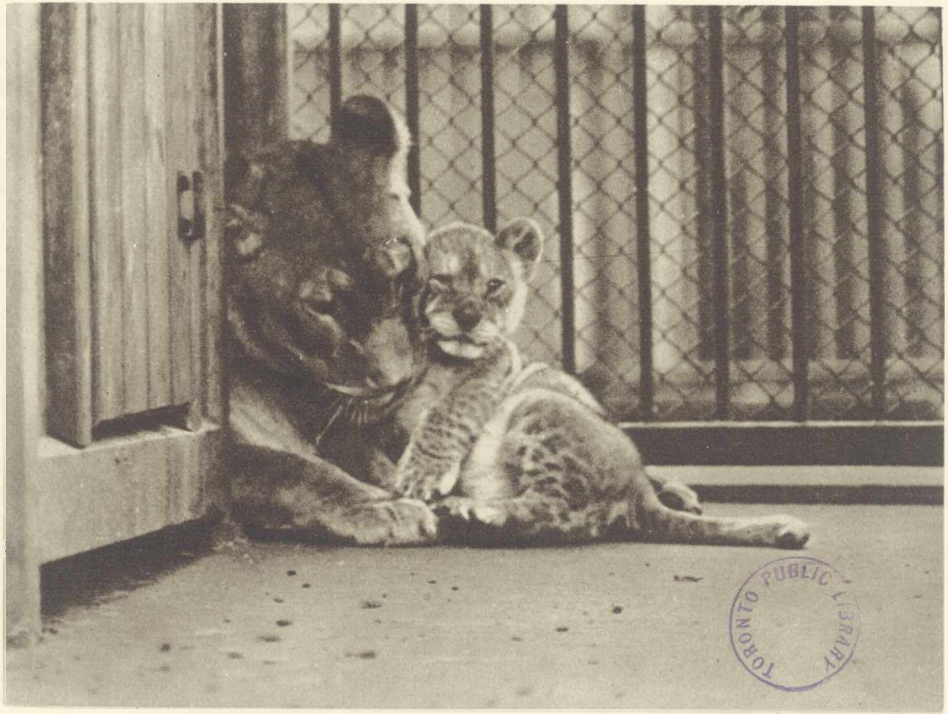
BABY CLOTHES

In common with our simian ancestors, many human infants come into the world with a more or less complete hairy covering, only the soles of the hands and feet and the inner surfaces of the limbs being bare, a fact that suggests clues to the probable appearance of our remote forbears. Baby elephants at birth are likewise covered with thick long hair recalling their mammoth-like ancestor.

It is now established that both mammals and birds had their first beginnings in a common reptilian ancestry, a fact often borne out by their colouration. The principal theme of reptilian colouration is, as we all know, a "spot" pattern, and one obviously best suited to a tesselated covering of scales. When the spots merge together the effect produced is that of stripes. In a large number of warm-blooded animals—lions, ostriches, emus, etc.—the young are spotted in a very reptilian fashion, the babies finding their spotted suits a much-needed "camouflage" for putting hawks and other predacious "infant-snatchers" off the scent of the helpless young things hiding close to the ground. With advancing years and stature and consequent independence, the spots are less neces-

sary and so are gradually discarded. In some animals they are retained throughout life, and when this is the case the reason may often be found in the wearer's own predatory habits involving a necessity for concealing its presence from the unsuspecting quarry.

Lion cubs and the young of all wild pigs and tapirs are spotted, the spots frequently merging to form stripes. The young of the caracal are never spotted, and it is interesting to note that the mother is said to be far more ferocious in defence of her offspring than any other type of cat known. The spotted skin of young animals is a natural pattern only retained in the adult where it is found useful. Generally speaking, animals compelled by nature to fend for themselves shortly after birth enter the world clothed with tolerable decency. This applies especially to most animals and birds born in the open. The young antelope or wild ox must be prepared to stagger in the wake of the ever-shifting herd at a moment's notice. So too with the feathered plainsmen. Young ostriches, pheasants, and the like can toddle about almost as soon as they have chipped the shell, and are amply protected from beak to ankles in close-fitting walking suits of baby down. The young brush turkey is even provided with flight feathers upon hatching and can flutter safely out of reach of the many carnivores inhabiting the bush. The sheltered



(*Neville Kingston*)

Lioness and Cub

PLATE VI

life, however, demands no such hurrying of baby into " shorts ". Nearly all the perching birds, and a large percentage of burrowing mammals, come into the world not only blind but naked, and take a considerable time to become properly clothed. The young penguin, though it quickly attains to adult stature, clings to its nursery suit for the best part of a year. Exposed as it is from the day it is hatched to the bitter cold of the Antarctic, its tender young body requires special protection. A king penguin that hatched out at the London Zoo a few years ago speedily soared to the parental height of two feet six inches—or thereabouts. It retained, however, its shaggy baby suit for many months and in this stage looked as though draped in the borrowed " plumes " of a Shetland pony. This coat was shed by inches from the ankles upwards. At first dubbed " Fluffy " by its keepers, it was presently called after a famous airman, appearing as it did in a short thick woolly " British warm ", and gleaming white tight-fitting trousers. At a still later stage it appeared in a massive fur cape and was known as " Aunty ". Its most comic aspect was assumed a few weeks prior to the time when it completely discarded its baby clothes, when its head alone retained a gollywog covering of long brown hair.

Some highly-specialized baby suits such as the flight feathers of the brush turkey or the protective

quills of the hedgehog or porcupine are protected whilst within the egg or parent to prevent damage to either mother or child. The flight feathers of the brush turkey would inevitably suffer in breaking through the shell were it not for the special provision made to forestall any such disaster. To obviate damage each barb is encased in a gelatinous capsule which splits and peels off almost as soon as the bird is hatched. The spines of spiny-skinned mammals are soft and blunt at birth, the spears gaining sharpness and durability only after a few days' exposure to the air.

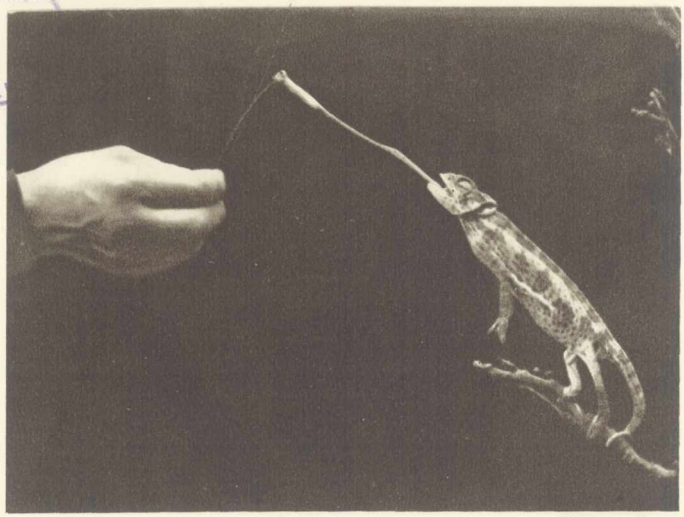
It is a curious fact that the young of most reptiles are sometimes differently and often very much more brilliantly marked than their parents, and it has been suggested that the "loudness" of their juvenile attire helps in attracting the prey. A strange difference in colour occurs in an African grass snake, which when young is whitish with broad black transverse bars. With age the black background changes to white whilst the markings become black. Thus in the new-born snake the colour pattern is precisely the reverse of that of its parent. An Asiatic tree viper is bright green when young, a protective colour which turns dark brown with age. Certain baby pit-vipers are born with about an inch of the tip of their tails coloured bright yellow. Captive specimens have been observed on food being introduced into their cage

to twist and wriggle their tails, which then resemble small worms, and this performance, it has been seriously suggested, is enacted in order to attract the small frogs upon which they exist. After a few months the yellow colour of the tip of the caudal appendage becomes very faint, and in a year or two disappears altogether.

It might well be assumed that the lower the status of the animal the more simple its dress. Actually the baby clothes become more and more complex as we descend the animal scale. Certain fish, frogs and nearly all invertebrates from the moment they emerge from the egg embark upon series of quick changes. In certain frogs the baby offspring when in the tadpole stage is much larger than the mother. A case in point is that of the Paradoxical frog of Brazil, in which the bulk of the larval form is equal to that of both parents. This tadpole was known to the old writers, who described it as an animal which began life as a frog but eventually turned into a fish.

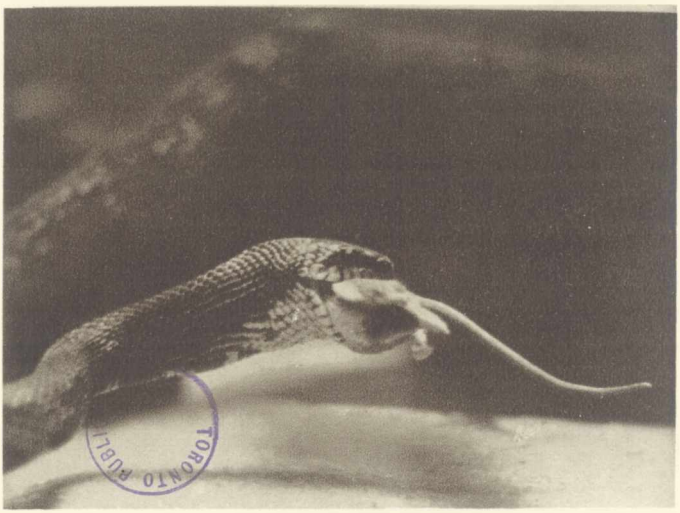
The tendency of the young of totally different types of crustaceans to resemble a common ancestor is very remarkable. Thus the edible crab wears much the same extravagant baby suit as the various swimming crabs, crayfish and lobsters. In all crustaceans certain grotesque modifications are apparent in the nursery garments, such as long spines and other projections which ensure the infant's balance.

To the uninitiated the adult form would scarcely be credited with even a fifth-cousin relationship to its offspring. Few except professed zoologists appreciate the fact that the familiar barnacle is related to the lobsters and crabs. It has, however, in recent years been established that the newly-born barnacle is an independent free-swimming animal with three pairs of legs resembling the young of other crustaceans. On approaching maturity the barnacle becomes tired of a life of adventure and attaches itself by the head to a rock, harbour wall, or ship, and acquires the impregnable armour which denotes that it has reached the age of discretion.



(F. W. Bond)

Chameleon Feeding



(*Neville Kingston*)

Black Pilot Snake engulfing Rat

PLATE VII

THE DINNER HOUR

DINNER is one of those important functions that is enjoyed by all animals from the highest to the lowest. Man differs, however, from other animals in taking an interest not only in his own fare, but in that of his less fortunate relations, and this is especially the case when the latter are subjected to captivity for his entertainment and education, as is the case with the inhabitants of the London Zoo.

In this review of the wild animals' dinner table, we shall first consider the table service. Food must be conveyed to the mouth. The microscopic animalcules surround their nutriment in the simplest table manner, causing their gelatinous bodies to float over, under and around the coveted particles, whilst at the other end of the scale we find the " ultra-civilized " Man who cannot dine without the assistance of several waiters, twenty-four square yards of tablecloth, fifteen plates, a dozen glasses and any number of knives, forks and spoons. Between these two extremes the animal world presents every conceivable—and inconceivable—method of " assimilation "—or, in common parlance, eating. The most cultured of the Zoo boarders, the apes, make use of their fingers and

toes at meal-times, although a number have been taught to eat from a plate, use a fork and behave at table in a manner associated with "the best people". A chimpanzee tea-party takes place every afternoon during the summer months on the Fellows' Lawn. A number of "Chimps" sit down to table, and, provided one is prepared to overlook such slight lapses as the alleviation of occasional irritation and a quite natural inclination to pick up fruit or bread and butter with a foot, their table manners may be described as well up to the average of the frequenters of any West End restaurant. Throughout the greater part of the world fingers, and fingers alone, are used by human beings at meal-times. Monkeys are wonderfully adept with their fingers, and their ways of feeding are invariably reflected in their hands. Such arboreal fruit-eaters as chimpanzees, macaques, and mangabeys, have very human hands. Rock-dwelling monkeys, like the patas and the baboons, have hands no less pliant but of a stubbier build to resist rough ground. The marmosets, the lemurs, etc., have the fingers greatly attenuated and at the same time thickly padded. These animals live by robbing birds' nests, picking seeds from fruit, and dragging insects from their retreats. The nocturnal aye-aye of Madagascar carries matters a stage further, its fingers being so enormously prolonged that they appear to be mere skin and bone. In the Zoo they

seem strangely out of place where food is supplied unearned. But in the wild the aye-aye must work hard for a living, delving into bark crevices two or three inches deep in search of the grubs and beetles that form its menu.

Finger-nails are an invaluable asset to the table service and the Zoo can show a surprising array of finger cutlery. The bear's claws can tear the bark from a tree or ravage a beehive, whilst the ant-eaters will demolish a heap of earth six feet high in as many minutes. The sloth, a creature no bigger than a terrier, uses his claws—which are so large that they can only be employed for climbing—not as table implements but to convey himself to the table. The lion's claws, which require constant sharpening, for which purpose logs are provided by the Zoo authorities, are merely an enlarged edition of the fireside cat's, and may be seen in action throughout the day in Regent's Park. In America the telegraph poles in puma-inhabited areas are protected with sheet iron to prevent the animals from using them as whetstones ; whilst in districts inhabited by bears, poles are similarly protected, but for a different reason. The wind which sets the wires humming suggests to the bears a possible bees' nest, which in its turn denotes honey. Much hard thinking is the result, until the bear is convinced by sad experience that there is " nothing doing ".

Where teeth and claws are unavailing to cope with a meal, the tongue is frequently knife, spoon and fork all in one. Many animals not in the least resembling each other in general make-up have long whip-like tongues with which they rifle ants' and other insects' nests. The kinkajou, an arboreal mammal allied to the racoons, has a similar "lick-up" tongue which is employed, however, rather for sipping honey and extracting the grubs from the cone than for capturing active insects. The giraffe's tongue may be seen in action any day, and has before now plucked counterfeit leaves and blossoms from lady visitors' hats. The tongues of butterflies and hawk-moths are made for sipping at long range. They are coiled like watch springs and can reach and rifle a flower three inches distant whilst the insect is travelling by air at a high velocity. The human tongue plays an important part in rolling the chewed food into shape ready for swallowing, and a parrot's is even more manipulative. With it the bird manœuvres a nut into position and brings it between the powerful mandibles at just the right angle. The head of a woodpecker may be only two inches long, yet the tongue attains three times that length. The bird knocks on the tree bark till ear-wig or weevil hurry forth in alarm. Then out rushes the lashing tongue, and the gardener is relieved of one more enemy. Still more remarkable is the tongue of the chameleon, which

is an organ adapted for the purpose of catching the insects upon which the creature lives. It has a club-shaped, sticky end which is thrown out at meal-times to a length exceeding that of the reptile itself. The unpopular snail has a tongue twice its wearer's entire length and furnished with thousands of teeth which rasp away the lettuce leaf with disastrous efficiency. The tongue of cat or lion works in much the same manner, the capilli being so large and coarse that they rasp away the flesh from a bone just as the snail's more complex " tongue teeth " demolish the garden produce.

The fore part of the Zoo's *Guide* gives a list of feeding hours, and these hours are instituted in deference to the requirements of the public. But the visitor must not flatter himself that the animals care a single nutshell whether he sees them or not. Beasts are very adaptable, however, and many of the more " showy " feeders can be persuaded to take their meals in public hours. In the wild an animal feeds when it can. Vegetarians such as sheep and oxen feed and sleep in shifts all round the clock. But hunters of all kinds, from lions to egg-robbing monkeys, have to rely upon darkness to make good hunting possible. If the Zoo inmates were given free choice in the matter it would be probably found that the majority would vote for a late dinner. Many of the monkeys, the kangaroos, the bears and ruminants would, however, volun-

tarily elect to feed in daylight. The vegetarians would also be on the side of the daylight dinner, for a vegetable cannot run for its life and is as easily attacked by day as by night.

Man is undoubtedly the most omnivorous animal known to science. The Englishman may pin his faith to beef, the Oriental to rice. Certain inhabitants of South America regard centipedes as a delicacy, whilst human flesh is still popular in a few forgotten corners of the earth. The inmates of the Zoo, representing as they do the fauna of the world, are fanatics by comparison, and with few exceptions rigidly keep to the food they have been accustomed to. There are exceptions, however, for it must be admitted that a few show very depraved tastes. Fallow deer have occasionally met painful deaths as the result of eating waste paper, and one that died just before the War was found to have sixteen pounds of newspaper and paper bags in its stomach. The mistaken belief in an ostrich's capacity to digest *anything* it swallows is unfortunately firmly rooted, and as a result many a Zoo bird has been cut off in its prime and subsequently cut up by the Zoo coroner—"Victim of an ignorant public." A West African ostrich which died a few years ago after a Bank Holiday was found on post-mortem examination to contain: two handkerchiefs, three gloves, a kodak film spool, three feet of thick string, a long pencil, part of a celluloid

comb, a bicycle tyre valve, two three-inch nails, and a long clock-winding key, a glove fastener, a piece of wood five inches long, part of a rolled-gold necklace, two collar studs, a penny, four half-pennies, two farthings and a Belgian franc piece. This treasure trove has been mounted and is now on exhibition in the Museum of the School of Tropical Medicine.

The mere act of swallowing can scarcely be regarded as a source of high æsthetic joy, yet it never fails to attract attention when it is carried to extremes. The human sword-swallower, for instance, often commands audiences denied to more deserving exhibitions. It is hard to say why this abuse of the œsophagus should enjoy such universal interest, though the blame may possibly be laid at the feet of the prophet Jonah. One might reasonably suppose that the Jonah question could be calmly discussed after such an extended lapse of time, yet when the writer some time ago penned a few innocent speculations on the pros and cons of the matter, he sat for days afterwards knee-deep in letters. Some of these were in accordance with his views, and were congratulatory, but indignation prevailed, and it was only too evident that the very slightest doubts cast on the prophet's release from his incarceration were resented.

As we descend the animal scale the sensitiveness to local inconvenience becomes less and less evi-

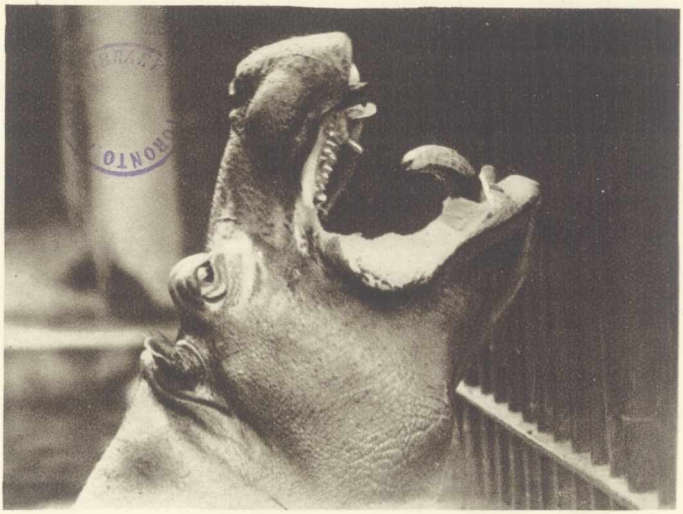
dent. Many diving birds occasionally meet a sudden death by attempting to swallow fish wider than the utmost limits of their sorely-tried food pipes.

The average fish is of a very low mental level and dinner-table tragedies are everyday occurrences in the world beneath the waves or village pond. Fish are amazingly indiscriminate in the choice of their food if sufficiently hungry, and are frequently choked when attempting to swallow their larger brethren. The miracle of the tithe money found in the fish as recounted in the New Testament need not strain our credulity. A large cod caught on board a Dogger Bank trawler had made a meal off 37 hermit crabs, 40 clams, cockles and similar shell fish, a ten-inch lobster, 20 worms, 43 small flat fish, a mass of refuse, and a stone weighing three pounds. Coins and jewellery have on occasions been discovered in cod fish, whilst full-sized whelk shells are too frequent to arouse comment on board the trawler. Such gourmands as pike and angler fish often come to grief in feeding not wisely but too well, especially the angler whose abundant incurved teeth render the rejection of a too bulky mouthful impossible once it has been seized.

The champion swallowers of the animal world are localized in the ocean depth. The body walls of these fishes are capable of an expansion quite unknown among the more abundant fishes of comparatively shallow waters. Thus, one form from one

(*F. W. Bond*)

The Dinner Hour Approaches



(*F. W. Bond*)

The Hippo Asks for More

PLATE VIII

of the 9,000 feet "holes" in the Atlantic floor can engulf fishes three times its own length and ten times its weight. A deep-sea angler is capable of even greater excess, its gigantic victims being clearly visible through the enormously stretched body wall. The living fish, indeed, appears as a mere annex to its meal. Digestion in this, as in many other fishes, is a slow process, and the fish swallowed may retain sufficient vitality to force its captor to the surface of the ocean, where victor and vanquished combine to test the swallowing capacity of some passing shark.

Large crocodiles may occasionally swallow whole small deer, and even human beings, though such feats may be regarded as rare occurrences. At a meeting of the Zoological Society held some years ago, Mr. C. F. M. Swynnerton, the Game Warden of Tanganyika Territory, exhibited the contents of the stomach of a large East African crocodile, which had been recently shot. This gruesome exhibition revealed the fact that this crocodile was a man-eater. Apart from antelope hoofs, tortoise shells, porcupine quills, it was found to contain a large number of metal bangles, which are worn as bracelets and anklets by the native women, beads, and a long thread of metal cord. The thread of cord solved the mystery of the disappearance of a native boy who was known to frequent the neighbourhood of the river bank in

order to collect wood, the cord being similar to the type he used for tying his bundles together. Two small pieces of elephant tusk were also found in this crocodile, but no explanation is offered as to how they came into the reptile's possession. If the full facts were known they would no doubt bring to light another human tragedy.

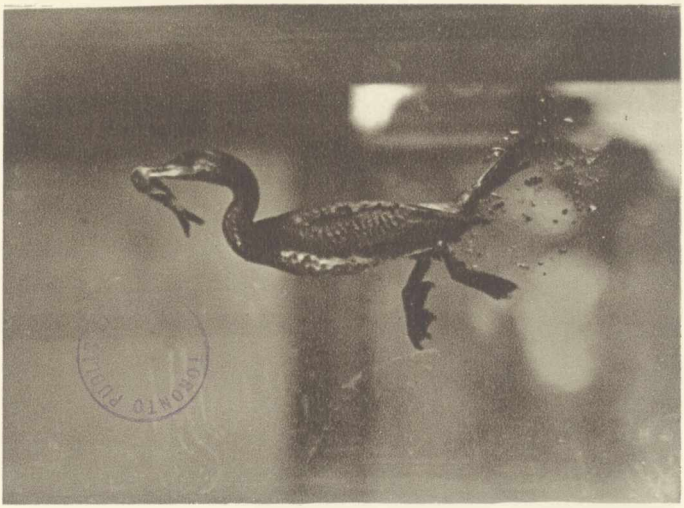
The Zoo, however, taken as a whole is very conservative in its diet, and the catering entailed is a serious matter. Here is a typical menu for a year: Fodder, 400 tons; Grain, 10 tons; Fish, 50 tons; Horses, 450 tons; Goats, 250 tons; Bananas, 200,000; Oranges, 20,000; Apples, 7 tons; Lettuce, 20,000; Other Vegetables, 200 tons; Eggs, 25,000; Bread, 15 tons. In addition to these items much good money is spent on such oddments as Mellin's Food, Cod Liver Oil, Rock Salt, Honey, Sugar, Earth Worms, Meal Worms, Dried Flies, Live Flies—and Worse. "Feed the brute" is a trite saying, but unless the brute is fed on the right food and in the right way disaster is ensured. The flesh-eating animals are easily the most expensive to feed if the "flesh" takes the form of fish; thus a sea lion eats forty pounds of fish a day—if given less it dies. The Zoo walruses have never cost the Society less than £500 per annum each. The famous walrus known as "Old Bill" or "Andy" could only be kept going on chunks of fresh cod soaked in cod-liver oil, or freshly-imported blubber. In the

short intervals between meals—average ten a day—Andy sucked the hands of visitors and bleated for company the moment he was left alone. His love of society, grotesquely human appearance and ponderously clownish deportment, made him easily the most popular inmate of the Zoo during his all too fleeting stay. Most of the Zoo fish-eaters eat their fish whole, and the operation is always worth watching, for the sea lion can bite the shoulder from a cod whilst travelling at twenty miles an hour. Even more adept at a " quick lunch " are the diving birds. The darters augment their swimming powers with a spring trigger arrangement of the neck muscles, enabling them to catch by sudden lunges fish that escape the fastest aquatic mammal. When all is said, however, the penguin takes easily first place as the most efficient of the higher vertebrates as an under-water fisherman. Ashore its best efforts at progression are suggestive of Charlie Chaplin in more than usually impossible footwear, but once afloat it darts through the water. The wings, so helpless on land, enable it to overtake the swiftest fishes. Like the rest of us, however, the penguin likes to enjoy the best possible meal at the least possible expenditure. Ashore a king penguin, eighteen inches high, will suck down three herrings, each a quarter of its own length, in a few minutes. In pre-war days the Zoo kept seals and penguins in the same enclosure. All went well until one day at

feeding time a sea lion and a penguin met at opposite ends of a herring, and the sea lion won, taking both at a single bolt. Penguin so pleased his palate that he tried several more—but without herring accompaniment, and as a result penguins and sea lions are now kept in separate enclosures for the comfort of all concerned. It is noteworthy that the highly-intelligent sea-lion is amongst the greediest animals in the Zoo. A specimen that escaped from a continental aquarium some years ago visited each tank in turn and completely wiped out the supply of fish. Confronted when fully satiated with a three-foot cod, he merely bit tasty snacks from its sides.

A lion is far cheaper to keep than a sea-lion, though less attractive as a pet, devouring about seven pounds of horse-flesh a day at a cost of under a shilling. Lions may impress one for a moment by their size and the apparent ferocity with which they attack their food, but, after all, the fiercest specimen in the Zoo is only a tabby cat seen through a magnifying glass and heard through an amplifier.

Among the greediest of the Zoo inhabitants are the racoons. "Fat Peter", for many years a favourite with the crowds, died recently of over-eating. This animal grew so abnormally fat that he actually experienced difficulty in walking. He was an intelligent little creature, but had prostituted his mental powers to inventing means of attracting the attention of the public and begging for food, one



(*Neville Kingston*)

Cormorant Catching Fish under Water

(*F. W. Bond*)

Komodo Dragon Swallowing a Chicken

PLATE IX

of his tricks consisting of sitting up and beating a tattoo with his front paws on that portion of his anatomy for which he had so peculiar an affection. Peter was still comparatively young when he died, and his too generous friends are partly to blame for his premature death.

Cannibalism is not very frequent among flesh-eating animals. The fare of certain snakes, however, consists solely of their own kind. Among the recent additions to the Zoological Society's Reptile collection is a seven-foot-long specimen of the South American non-poisonous snake known as the cribo, a species which feeds entirely on other snakes, poisonous as well as harmless. The cribo is the arch-enemy of the justly-dreaded fer-de-lance and rattlesnake, from the poison of which it is immune, and is capable of overpowering and swallowing specimens as large as itself. As a result of its cannibalistic tendency it receives Government protection in the State of Sao Paulo, where the fer-de-lance is specially abundant. The large king cobra or hamadryad is another cannibal serpent. Many years ago a hamadryad deposited at the Zoo by a dealer along with a number of common cobras was placed in the same cage by an ignorant keeper. The snake was hungry after a long fast, and devoured a number of its companions before its identity was discovered. The meal was an expensive one, costing the Zoological Society approximately £20.

Serpents not infrequently swallow their cage-mate in the event of both taking a fancy to the same pigeon or rabbit, the larger specimen swallowing the smaller quite mechanically and without any malice aforethought. Some years ago two large four-feet long king snakes seized hold of a bird at opposite ends, and when their snouts met in the middle of the prey the snake with the larger gape proceeded to swallow its companion. The occurrence was brought to the notice of the keeper when barely three inches of the victim's tail protruded from the larger occupant of the cage, who with great difficulty was forced to disgorge. The most remarkable point in connection with this ophidian "Grand Guignol" lies in the fact that the snake which had been almost wholly swallowed, so far from being dead, was so little put out by its experience that immediately on its release it soothed its ruffled spirits by devouring a couple of rats in the quiet of a separate compartment. Snakes have little sense of taste, and this was demonstrated in the old Reptile House, when a large python attempted to swallow its blanket. After getting about two yards of blanket down its throat, it discovered its mistake and gave up the unsavoury meal. In the *Proceedings of the Zoological Society* is an account of the swallowing of a nine-foot-long boa-constrictor by an eleven-foot-long companion. "The snake, following on its remarkable swallowing feat, had no longer the power

of curling itself round as boas usually do, but remained extended nearly its full length in a straight line, and appeared to be three times its normal size in circumference. It was painful to see the distended skin, which had separated the scales all over the middle of the body. The snake not only digested its companion, but within a month regained its appetite as well as its normal size." Snakes are capable of doing without food for very long periods, the record being held by a boa that lived some years ago in the Jardin des Plantes in Paris, and which fasted for over four years. The amazing plasticity of skull in snakes is seen at its maximum in the egg-eating snake of South Africa. Between meals the head measures little more than three-quarters of an inch across, yet it can surround a hen's egg—a much more remarkable feat than the swallowing of a pig or deer on the part of a python. The unyielding egg is taken entire and remains whole until it reaches the entrance to the gullet. The distorted head then falls into its trim formation and certain enamel tooth-like processes of the under-surface of the vertebræ come into play. They crush the egg-shell, powerful muscles force the yolk into the snake's interior, and the shell, cracked in a hundred places but held together by its membraneous lining, is presently expelled.

The sensational feats we have thus hastily reviewed may sometimes, but not always, be regarded

as the expressions of mere gluttony. Like the sword-swallowers' feats, they are performed simply to make a living in a feverishly competitive world. Life is a chancy business and a creature that makes an impolite mouthful does so simply because the next meal is more than problematical. For every deer a python swallows it is more than likely that fifty others evade the giant reptile. The animal with a big swallow is usually of sluggish habit and unable to chase its prey, though one must except such creatures as the giant sharks and whales. In all cases, however, digestion is slow, and, whereas creatures with small intakes must feed all round the clock in order to keep going, the "swallower", having once taken every course in one gigantic mouthful, can sink to rest and enjoy a long period of dignified repose.

The animals that will eat insects present the Zoo authorities with some of its most difficult problems. Ant-eaters and ant-bears are easily fed in certain foreign and colonial zoos. The Johannesburg Zoo, for instance, sends out a motor-car twice weekly to collect living white ants from the adjacent veldt. At Regent's Park mince-meat and raw eggs are found to prove a fairly satisfactory substitute. Wherever live insects are not to be had easily the egg may generally be relied upon to fill the breach. This, of course, does not apply to such confirmed insect-eaters as the chameleons and praying mantis,

for such connoisseurs will only be content with the genuine article, and "rush orders" executed by motors have frequently been necessary to meet their demands.

The Zoo's assemblage of vegetarians, which includes the largest-known land animals, provide, with few exceptions, very little fun at feeding time. A diet of flesh food implies pursuit, and a night spent in hunting makes for rapid movement, vigorous attack, and a generally restless temperament. Not so with the vegetarians. In the main they take life as they find it, living at ease so long as green stuff or its equivalent is within sight. The elephant provides a notable exception—at the Zoo. His insatiable appetite ever expressing his needs through the medium of his trunk brings him into frequent, but always friendly, collisions with the public. He will, whilst filled with the kindest sentiments towards mankind, quite mechanically rifle a picnic basket or upset the gardener's barrow. Every fully-grown elephant is allowed over 200 pounds of hay, corn and roots per day, but it is questionable whether an elephant has ever been filled to capacity. The exploits of escaped circus elephants and their ceaseless search for another mouthful might fill a volume. The star of the late P. T. Barnum's famous circus once wandered through the streets of Chicago, visiting thirty fruit stalls, twelve bakeries, and as many grocers' shops before it was eventually

captured—in a brewery with its trunk stealthily negotiating the bung of one of the largest casks.

Nuts often round off the human dinner. To a few animals nuts are the only things that matter, constituting the entire meal. The Zoo's most interesting nut-eater is all too rarely seen, yet it is one of the commonest animals and is only rare in this country by reason of the difficulties associated with its transport. The animal in question, the coconut-crab, is undoubtedly the world's champion nut-cracker. It swarms up the nut palms of Christmas and other South Pacific islands and deliberately hews off the nuts. If they crack in falling, the crab —an enormously-enlarged edition of our common hermit, dines at his leisure off the exposed kernel. But more frequently he is obliged to rely upon nuts that have fallen intact and these he attacks at the eye-holes, gradually forcing an entry large enough to admit the intrusion of one of his pincered walking legs, and so, after several hours of labour enjoys a hard-earned meal. It may come as a surprise to some to learn that very few of the monkeys enjoy nuts if they can obtain fruit or sweets. Such being the case, why do visitors insist upon providing nuts, and nuts only? The nuts which the simian inhabitants of the Zoo receive are often returned to their would-be benefactors with more despatch than courtesy. A few cheap bananas,

raisins or oranges are not only more appreciated but ensure the donor more fun for his money.

Most animals are " dry feeders " and do not drink with their meals. A few, however, are unable to feed without at the same time taking in a certain quantity of liquid. This especially applies to those that habitually feed under water. Animals that live entirely in the water, such as fish, cannot be said to have any need of moisture, but it is different with the seal and other aquatic creatures that frequently catch and swallow fish " on the fin ". The otter can suck down a fish four feet below the surface, straining off the water and also the scales through its closely interlocking teeth. The flamingo is unique amongst birds in possessing a highly-specialized beak, its lower mandible being deeply notched, allowing mud and water to pour out through the space when the upper bill is closed upon the lower. This is very necessary, for the flamingo feeds by plunging its head into the mud and cramming its mouth with a species of snail which swarms in its native lake bed. At the Zoo water fleas and a special mixture of meal and animal matter take the place of the tropical mud snails. An even more startling instance of this strainer is to be seen in the moustache of the walrus. This facial ornament almost amounts to a *cheval de frise* of spines, which prevents the Arctic mud joining the clams and marine worms in the walrus's

interior. Finally, the crocodile may be quoted as Nature's most successful under-water feeder, its throat being closed up by a special valve which allows it to hew in pieces a large carcass deep under water without the slightest danger of choking.

The Zoo visitor might well spend a pleasurable afternoon in merely noting the varied ways in which animals drink. The chimpanzees' tea party, where you see these apes drinking from cups and apparently enjoying the convenience, stands alone, for most monkeys assume the all-fours when assuaging their thirst, and it is most noteworthy how instinctively the civilized Man urged by thirst and unprovided with any utensil will drink in the normal monkey fashion. One famous orang, "Jacob", took to sipping water from the tip of a straw which he dipped in a trough some two feet from his cage. Most mammals lower the head half towards the water, the giraffe straddling its forelegs in an extraordinarily grotesque manner. The frog, far more susceptible to drought than any mammal, takes in water in great quantities through its skin and may fairly claim to be a champion "soaker". Many of the Zoo's inmates drink very seldom, and a number of rodents are content with the moisture contained in cabbage, lettuce, etc.

Every full meal should be followed by a period of rest. Civilized man may bolt his food whilst thinking of other matters, and hurry off to work

and worry and a lifelong aftermath of indigestion. The Zoo eats, drinks and rests. Most animals yield to the natural reaction to the exertion of assimilation and give their digestion an interval, however brief, in which to do its work. The lion lies prone, the wolf coils himself into a snug ball, and the bird puts its head beneath its wing, and shuts the world with all its troubles from its sight and mind.

Cleanliness after feeding is not entirely a human monopoly, for before composing themselves for an after-dinner nap many creatures carefully remove all signs of the late repast from their persons. Most of the carnivores enjoy an elaborate wash and brush up, and even monkeys suck their fingers, though no doubt with less thought to cleanliness than of enjoying the last lingering taste of sugar-cane or banana. Many animals that habitually live in foul surroundings give the greatest attention to the matter of finger bowls. Certain rodents that are almost synonymous with filth of every kind are meticulous in their personal sanitation, and leave the loathliest banquets in faultless dinner dresses, unsullied by a single spot.

"IF WINTER COMES"

THE steady flow of visitors to the Zoo during the winter months testifies to the fact that the public are at last realizing that the so-called "Pageant of Nature" is not merely a six-months' performance, but a non-stop entertainment, providing something for all tastes all the year round. An English woodland may, during severe winter weather, appear very dead indeed to the casual observer. The silence is almost oppressive, but those with eyes to see are aware that the snow-carpeted country is full of stealthy life on the look-out for the human intruder.

The Regent's Park Menagerie, representing as it does the fauna of all countries, is fully as active when the temperature is below freezing-point as it is when it registers 80° in the shade. One animal's winter is another's summer, and the Zoo authorities do their best by means of artificial sunlight to persuade their more conservative and delicate charges that our treacherous climate simply does not exist. It is not, however, with the exotics that we are principally concerned. Rather would we draw the reader's attention to those Spartan hearts that if not positively revelling in the cold, suffer

little inconvenience from snow and frost. Every year sees an increase in the number of animals that have become acclimatized. The monkeys, including the manlike apes, are fast becoming quite familiar with our quickly-changing climate. In the old days, nearly all the Zoo animals were kept shut up in warm houses during the winter months, the conditions of housing being determined almost solely by considerations of temperature. Investigations carried out in the Gardens a few years ago went to show that the majority of the boarders, even those emanating from tropical climes, do not live so long when kept in heated houses at a uniform temperature as those exposed to fresh air and a varying temperature. Consequently, the animals are now given access to their outdoor enclosures during the coldest weather, and are invigorated by sunlight baths on their return indoors. This free access to the outer air during very severe weather often leads to somewhat entertaining situations. For instance, " Sandy ", a famous orang-utan from Sumatra—a country seldom enjoying a temperature lower than 85° in the shade—took so kindly to the snow that he made snowballs, not first-class, but still snowballs, and pelted visitors with them, to his own and the public's amusement. Whilst the snowball trick was largely the outcome of " Sandy's " instinct to throw things, the ape had also profited by watching the keepers at

their pre-breakfast snowball match. " Sandy " made and threw snowballs not because he was angry, but just " pour le sport ". The sacred ape of the highlands of Japan heartily appreciates frost and snow, as does the sacred langur of the Himalayas, who is equally familiar with wintry conditions ; but some others, meeting " solid water " for the first time, are tempted to make some unsettling experiments. Generally a monkey swallows a piece of ice once—and once only. The adjutant stork has been inured into a similar indiscretion, resulting in a sad, if temporary, loss of his natural dignity. Animals, even those used to facing the cold for several months in the year, are frequently caught napping. A severe winter some years ago provided many tragedy-comedies. An otter, for instance, fascinated by a live roach swimming beneath the ice, stayed out so long, seeking a way to reach the titbit, that his tail became frozen to the surface—a misadventure which would probably have caused him his life in any place but the Zoo. During frosty weather, the Egyptian flamingoes are kept indoors, not for the reason that they require warmth, but owing to the fact that on one occasion the foolish birds remained standing in the frozen water of their pond, and consequently suffered considerably in their belated efforts to extricate themselves from the ice which had formed round their long slender legs.

Ice means high adventure for such creatures as are unused to a winter of "the good old-fashioned sort". One has only to watch a heron's tentative efforts at walking upon ice to realize the futility of skating upon stilts. The attempts of such large-footed birds as cormorants and pelicans are scarcely less ludicrous. With the seals and sea-lions, it is another matter. So active are these beasts that they give the ice little time to set, and their efforts to land upon the existing "floes", soon resolve the entire expanse into a jungle of glassy fragments that tinkle musically as the animals swirl around their pond, in the never-ceasing look-out for a keeper with a dinner.

Animals that are supposed by the untravelled to live in perpetual winter may provide surprises, for very few of them behave according to the popular natural history books. We all know that the Arctic fox, mountain hare, ermine stoat, ptarmigan, etc., are brown in summer to harmonize with heathered moor and moss-grown boulder, and that in winter they are all dead white to blend with the snow. Winter and summer, however, are very elastic terms. The Arctic fox, for instance, knowing no better, keeps rigidly to the winter habits he has acquired from his ancestors. Winter in the Arctic finally breaks up about May, or even June, and consequently, it is a by no means uncommon sight at the Zoo to see an Arctic fox

still clinging to his coat of immaculate white well into the summer. When the change comes, it is dramatic, but untidy. For some weeks, the fox presents a piebald appearance, which, in the wild, blends to perfection with the background of crags and grass tufts slowly making their way through the shrinking mantle of departing winter.

It would surprise many visitors to the Menagerie to see the way in which certain birds and beasts dally in the hardest weather, apparently quite immune to the cold. They would probably hate the severe weather as much as we do, were they not dressed so appropriately. A seal, for instance, carries anything from two to five inches of solid fat in winter-time, and even the penguin may have an adipose layer covering its more salient parts to a depth of more than an inch. The birds' leathery-looking feet are literally swathed in fat, down to the very roots of their " toe-nails ". Wolves, deer, foxes, squirrels, beavers, bears, and a host of animals that keep active in hard frosts, wear splendid overcoats, which often, thanks to the abundant grease they contain, display a bloom like that seen on a ripe hot-house grape. The Bactrian camel of Northern India and Manchuria, and the yak and takin from similarly cold quarters, are loaded with fur robes, whilst the musk ox of the Alaskan barrens is so fortified against the wintry blasts that at a distance it is

difficult to tell which end of the animal is which. The Zoo is full of surprises in really severe weather. The ostriches and the rheas paddle about the crisp snow—or the more frequent slush—with the same zest for life that they display in midsummer. The polar bear, instead of melting into his background of dazzling white, is a complete blot on the landscape, looking distinctly sooty, a condition that is not entirely the fault of the London chimneys, but is rather due to the fact that the animal simply hates cold, and refuses to enter its bath when the temperature falls below 45°. These bears, emanating from the coldest regions, are, curiously enough, happiest during a heat wave, when, unlike many of the tropical inhabitants of the Menagerie, they suffer no inconvenience, but on the contrary enjoy life in the full glare of the sun. It may be truthfully said that the appearance of ice invariably gives the Zoo polar bears cold feet. They are afraid the ice may let them down. Very gingerly they shuffle round the pool, backs pointing towards the ice, and at intervals test the surface with their enormous hind feet. Usually the ice gives way, and they hurriedly retire to await a thaw. Zoo elephants are kept indoors during severe weather, but those at the Boston Zoo are annually engaged by the corporation to drag snow-ploughs through the great drifts blocking the public thoroughfares.

Many animals can not only stand, but actually enjoy, the hardest weather. Certain Arctic creatures living amidst the snow may feel at their best when the thermometer registers 30° of frost. But more in sympathy with our own sentiments are those hardy souls that make the best of an English winter because they must. Zoo squirrels are as much in evidence in January as in August, and may be observed searching everywhere for their hidden stores, which are often forgotten as soon as accumulated.

Happiest, perhaps, are those creatures who, unable to travel South, have to put up with our winter, and sleep until the frost has gone for good.

In the animal world as mirrored by the Zoo, every degree of hibernation is participated in. There is the animal that wraps itself in a death-like slumber, as well as the beast that awakens with the first hint of sunlight and enjoys life whilst the sunlight lasts—although it may be for only a few hours.

Cold days certainly force many creatures to take the easiest way and sleep till better times shall dawn. Those unable to sleep are often driven to desperate straits for food. The Canadian moose fearlessly enters farm-yards to steal forage, whilst in Northern Europe wild boars are sometimes driven by severe frost and snow to plunder chicken

(*Neville Kingston*)

Himalayan Bear tasting the Ice

(*Neville Kingston*)

King Penguins on the Ice

PLATE X

runs. Other animals, such as the field mice, hamsters, rats and squirrels, lay up huge stores of food on which they batten when foraging is impossible. Many, like the marmots and hedgehogs, eat to excess in the autumn, accumulating great reserves of fat, and when thus fortified go to sleep, defying the elements to do their worse. The hedgehog hibernates in the truest sense of the term, and so profound is his slumber that he can be submerged for twenty minutes under water without waking. During hibernation the animal's circulation is slowed down to an extraordinary degree, the heart only just functioning. The hedgehog's heart, as a matter of fact, has such a tenacious hold on life that it can beat for hours after the animal's brain and spinal column have been destroyed. The mother polar bear, cut off from all supplies, is believed to live with her young from November to April buried deep in a snowy " fug hole ". No bird is known to actually hibernate, although it is not so long ago that even naturalists confidently believed that swallows slumbered through the winter at the bottom of ponds. Doubtless many would be happier if they could do so, each winter making enormous depredations amongst their numbers.

Hibernation in some form or other is the rule with all reptiles and amphibians inhabiting temperate countries. The blood of these creatures is

never more than a degree or two above the prevailing outside temperature and when that falls below 40° activities cease, and the animal becomes more or less completely dormant. How much cold a reptile or amphibian can survive is uncertain, but frogs have been known to live even after ice spicules have formed in their blood. The power of some fish to withstand cold is also amazing, carp having been brought to market in solid blocks of ice and appeared none the worse on liberation. At the Zoo the cold-blooded animals are kept at a uniform temperature throughout the year.

Large numbers of insects hibernate, but are soon tempted forth by a genial day, even in mid-winter. At such times their arch-foe the bat, who may have slept head downwards for several weeks, likewise awakens and goes in search of the all too early blue-bottle. It is to be noted that such habitual burrowers as the mole and the worm do not hibernate. The colder it gets the deeper they delve into the ground.

Most of our native snails seal up the mouths of their shells with a viscid secretion that hardens into a mica-like sheet, the edible snail reinforcing this anti-frost measure with a layer of carbonate of lime. Several such doors may be formed one behind the other, each pierced with a miniature breathing hole. The snail may go to bed for a

long time, not only in cold weather but during a prolonged heat wave, which may likewise entail a food shortage. Desert and other tropical snails invariably do this, and in captivity will retire from the world when the season comes, although food may still be within reach. One such desert snail, after a nap of almost two years, escaped from its moorings (gummed to a card) in a case in the Natural History Museum.

STRATEGY

In the animal world we see the ceaseless activities and machinations of the human brain reduced to comparatively simple forms. The fundamental ideas which may lead to the birth or death of a nation have their counterparts in the brains of wild animals. Strategy, if well conceived and executed, ensures for its originator, whether civilized man or uncivilized beast of the woods or fields, a tolerably long life and a well-filled stomach.

Many of the tricks which the Zoo boarders are up to in order to obtain a particular delicacy for which they have conceived a fondness, demonstrate a linking of cause with effect, and are not merely the outcome of chance. The elephant, though not the fount of wisdom our early primers would have us believe, is intelligent enough to realize that the human beings before him at the Zoo enjoy throwing eatables his way, which as a result of bad marksmanship fall alike out of his reach and theirs in the passage which separates his paddock from that of the public corridor. He therefore kneels upon his huge wrists, arches his back, stretches his trunk to its last fibre and blows the piece of bun or whatnot back to the visitor. The new elephant alternately sucks and blows at

a titbit until he discovers his limit of suction. Anything over three inches from his trunk must be blown back.

Not only food but the " cup which cheers " may inspire a monkey's brain to work at very high pressure. Some time ago a small capuchin was given brandy as a cure for colic. He liked it—very much. When the brandy was not forthcoming he took the most natural course and abandoned himself to paroxysms of infantile rage, screaming and beating the walls of his compartment and refusing to be comforted. Slowly he realized that where violence failed gentler methods might prevail. He clasped his " tummy ", rolled his eyes heavenwards, and moaned theatrically. . . .

Birds frequently have resource to strategy in pursuit of the next meal. To take but a few examples, the kiwi, one of the most attractive of birds, habitually taps on the ground with its long bill to induce the coy, retiring worm to break cover. The gentle but rapid tapping of the tip of the kiwi's padded beak is supposed to suggest to the simple worm the first welcome drops of a reviving downpour, and the creature instinctively makes for the surface. Similarly, the woodpecker hammers with his pickaxe beak at the tree stem till insects come to the entrance of their burrows to see what all the noise is about. The British angler fish and the South American mata-mata turtle

dangle filaments of skin before the passing throng and any small creatures mistaking such wisps of skin for dainty worms discover their error too late. The angler spends its whole life luring other fishes to its jaws by means of fin rays situated on the head and which act as living rods and bait lines. A small fish is attracted by the flap of skin resembling a worm and seizes it. The rod is instantly lowered so that it overhangs the cavernous mouth into which the victim disappears for ever with the inrush of water. In the mata-mata terrapin the bait, in the form of a number of long movable appendages, is situated on the chin, constituting a veritable " whisker trap ". The method by means of which a small electric cat-fish of the Nile obtains a living is clever—if not clean. The creature having given shocks to larger fish eats the partially digested food which the shock has made the victim bring up. Strategic likewise is the method by which the insectivorous archer-fish of Eastern Asia obtains its meals. Having stalked a fly or other insect reposing upon a twig or hovering over the water it fills its mouth with water, raises its head above the surface, pursing up its lips, and shoots out several drops with sufficient force to bring it down. The accuracy of the fish's marksmanship is stated to be so good that it rarely fails to hit its target at a distance of three feet.

Many have observed the octopus deliberately

kill small fish and use them as bait, placing them outside the ogre's lair within easy reach of the crabs that form the animal's staple menu. The octopus also exhibits a very high degree of intelligence when placing a stone between the gaping valves of an oyster in order to prevent them from closing. This latter strategy appears almost too remarkable to be true, but it has been, on frequent occasions, corroborated by scientific observers.

Perhaps the simplest form of strategy as applied to the preservation of life is the simple act of standing still. A stag or grouse on the move is clearly visible, but when movement is arrested suddenly, the former's antlers melt into the tree branches and the latter becomes one with the dappled hill-side. Such animals are just fortunate in the camouflage clothing that Nature has provided them with. A few others highly conspicuous and realizing the possible danger they are courting, will, when the necessity arises, feign death most cunningly. " Playing possum " is an ancient adage and pays tribute to the opossum's marvellous power of keeping quiet and simulating death under the most trying circumstances. The animal is extraordinarily tenacious of life, and has need to be, since it is in great demand for its fur. If wounded by a bullet whilst tree climbing it will fall to the ground and lie motionless, while a squirrel under similar circumstances will run for cover so long

as its strength permits. After having most of its bones broken by a dog, the opossum will lie quiet until all is clear and contrive to crawl away to some retreat. Such feats require either iron nerve or unconsciousness caused by sheer terror, for the slightest movement means sudden and possibly painful execution. The conspicuously adorned hog-nosed snake of North America is particularly clever at shamming death. It is not provided with a poison apparatus with which it can defend itself, but nevertheless it raises a hood and makes a display of striking of which a cobra might well be proud. If its aggressive attitude proves of no avail in frightening its enemy, it plays its trump card. It dies. It dies so completely that the " corpse " will hang over one's fingers as limp as a piece of soaked string. Throw the body on the ground and it looks " deader " than ever. But let us wait, remaining perfectly still, and the reptile will be observed after a minute or two to return stealthily to life and make a dash for well-earned liberty. Freshly-caught specimens of the European fire-bellied toad are likewise given to feigning death. Having gone through various ridiculous antics in order to intimidate the aggressor, they suddenly bend their spines, turn up their heads and hinder parts of their bodies and limbs and remain perfectly motionless in this position until the supposed danger has passed. A large number of frogs

and toads give off glandular secretions which effectually discourage enemies, whilst the widely distributed bombardier beetle ejaculates drops of a highly-volatile fluid which on exposure to the air explode, often in the face of the pursuer.

Incredible as it may seem, the alleged strategy of the ostrich is still given some credence. Under no circumstances does the bird hide its head in the sand under an impression that by so doing it renders itself invisible. The ostrich has, however, been known to hide its head when wounded, and if so, probably does this in an attempt to protect its most vulnerable part—its skull, which is very thin.

The grotesque horned lizards of Arizona, whose heads are surmounted by enormous spines, make little use of their prickly weapons either for offensive or defensive purposes, relying on confounding their enemies by squirting very fine jets of blood with great force from the corner of their eyes—tears of blood, shed as a result of the cardinal emotion—terror.

Strategy may be applied in aggression quite as well as defence, and many animals employ it for both purposes.

Strategy often reaches a very high-water-mark in the insect world, using the term insect in the generous manner of the unscientific. Every spider web may be regarded as a stratagem, a cunning device to overcome obstacles and defy the laws

of Nature. Sometimes it takes a very simple form, a single thread which prevents the spider from falling. It may enable him to climb from floor to ceiling, or assist him to land if marooned upon a floating leaf. The strategic rope when multiplied to form a web may cover three feet or more. Such webs are built by the bird-eating spiders of the tropics, and so strong are they that other spiders content with mere insect food stretch their smaller nets amid the meshes, tolerated by and enjoying the protection of the humming-bird-devouring giant. The web may be employed merely to line a tunnel, whilst in the famous and widely-distributed trap-door spider the tunnel is capped with a lid that the spider closes when danger threatens and keeps closed by bracing his legs against the walls, clinging tenaciously to the inside of the lid.

The necessity for obtaining food to make a living is one of the greatest incentives to the strategic instinct. Few animals develop this instinct to such elaboration as the leaf-cutting or parasol ants of South America. The leaf-cutters were known for centuries by their habit of cutting semicircular sections from the leaves of trees and carrying them to their burrows. It is, however, only within comparatively recent times that the reason for this has been elucidated. The leaf is obviously more than just the parasol, and as a matter of fact the ant is a highly-scientific market gardener. The leaf frag-

ments are stacked up in a warm, moist atmosphere, and as decay gradually sets in certain fungi make their appearance which form the main food supply of the colony. The creatures are frequently exhibited in the Zoo Insect House, where they may be observed running nimbly to the rose bush planted in a corner of their cage, mounting a leaf, cutting a fragment off, and with it held parasol-wise regaining the ground. They then proceed to an adjacent burrow where ant and leaf vanish, not without a struggle, in the doorway.

Sometimes an animal will conceive a fondness for some particular toy and go to any length to get it. A Zoo polar bear many years ago derived enjoyment from appropriating the umbrellas from his visitors. The bear learned that a soft-hearted public would often push a bun which had fallen just outside its cage within reach of its paws, using an umbrella for the purpose. The bear did a lot of hard thinking, and eventually baited what amounted to an umbrella trap with edible fragments which he himself pushed just over the edge of his enclosure. The trap having been set, he proceeded to register signals of distress. Frequently a Good Samaritan would appear armed with an umbrella, and attempt to push the titbit towards the animal to the great joy of certain knowledgeable onlookers, many of whom had themselves in their time been deprived of their " brollies ".

PIONEERS OF FLIGHT

During the last third of a century Man has succeeded in securing his right to the air-ways—hitherto enjoyed only by bats, birds, insects and extinct giant reptiles. The cost of his victory is common knowledge. No Man-made machine has, however, yet eclipsed Nature's best efforts at actual flight, provided we are prepared to make due allowance for proportion. A bird the size of the biggest aeroplane would have no difficulty in crossing the Atlantic and back whilst the press photographers were bringing their "guns" into action. A stag beetle of equal size would make the 350-miles-per-hour record look like the first efforts of a babe. It is comforting, therefore, to reflect that so-called lower animals like ourselves achieve flight only by slow and painful efforts fraught with many mishaps by the way. In the present chapter we are concerned only with Nature's first tentative efforts at flight, i.e. the parachute, a form of progress that relies upon the buoyancy of the air to counteract gravitation. Parachuting is of interest from the evolutionary point of view, since it constituted a prelude to flight proper. If we look through the newspaper files of the 'eighties and

'nineties we shall find a number of instances of pioneers who met their death by "planing", the mere launching of themselves from a hill-top and relying upon their apparatus for support—a primitive method of aerial transport which has been recently revived in the sport of "gliding". The animals that have presumably aspired to flight but have been checked at the parachute stage are few, and in this country are chiefly known by stuffed carcasses and waxed effigies in museums.

All the planing mammals of to-day achieve semi-flight by expanding a membrane that runs from the elbow to the knee, and one's own armpit is but a feeble remnant of this apparatus. It follows that such creatures cannot fly, but simply plane on the air currents when the membrane is expanded. By bringing the knee nearer to the elbow or vice versa the flaps of skin are expanded or contracted and the flight is thus to a certain extent controlled.

The "flying" squirrel, abundant throughout North America, is a notable parachutist, and has been the subject of some interesting experiments. It lends itself well to handling and will indeed feed from the hand twenty minutes after capture. One of these little beasts and its litter of young were recently experimented on in America by Mr. A. Brooker-Klugh, and passed a number of tests. The mother would "take off" from the top of a

thirty-foot tree and sail to the trunk of another tree forty yards away. The baby " flying " squirrels, when weaned, grew so tame and confiding that they allowed some startling liberties to be taken with them. They were first tossed a few feet into the air, when they at once spread their side draperies and planed down in safety. The exercise was continued day by day and the distance steadily increased. At the end of a month the little creatures would cheerfully consent to being hurled into the air with the full arm force of a hefty man, the squirrels sailing aloft until gravitation began to assert itself, when they turned in the air and planed leisurely down. The " flying " squirrel of America, like all other " flying " mammals, moves chiefly at night and often tumbles into farm-house living rooms, where it cheerfully allows itself to be fed and handled until the next evening, when it climbs to some convenient window sash and " takes off " for the wild once more.

The parachuting mammal nearest akin to Man is the Cobego or " flying " lemur of the Malay Peninsula, the largest-known " flying " mammal, approximately the build of a domestic cat. It has, however, none of the " flying " squirrel's dash or initiative, moving always in a downward direction and never " taking off " in the striking manner of the rodent. It lives on fruits, insects, and birds' eggs, and spends the day hanging head downwards from

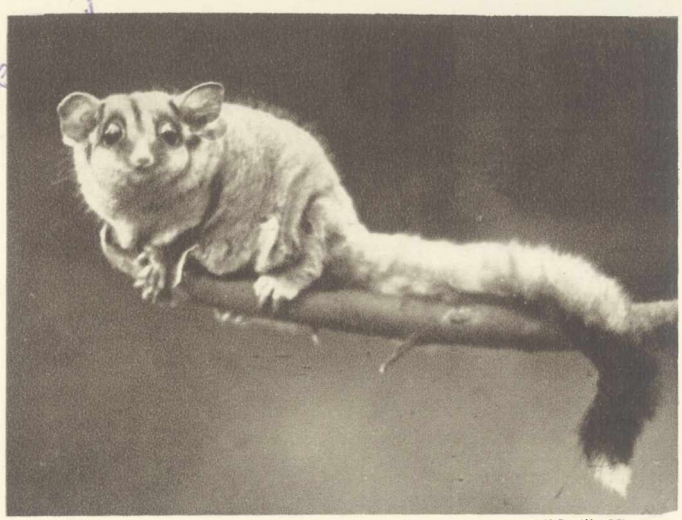
the branches of trees in a bat-like manner. Phalangers, pouched animals allied to the opposums, have developed a similar means of locomotion.

Amongst amphibians and reptiles are some expert parachutists, and they deserve special attention inasmuch as they demonstrate the infinite number of ways in which planing may be accomplished. In the "flying" frogs of Borneo, for instance, the webs between the toes are so enormously exaggerated that they form planes large enough to prolong the creature's leaps by many yards. In a certain lizard inhabiting the Far East planing is accomplished by an enormous expansion of the ribs. These little "dragons", as they are called, carry folds of skin which are red or orange in colour, and at a distance they resemble enormous butterflies. A so-called parachuting tree snake inhabits tropical Asia, and is noteworthy for its flying leaps. A certain well-known naturalist has observed these serpents to descend slowly from trees over twenty feet in height. He ascertained that the under-parts of the reptiles during these descents are drawn inwards, becoming concave, like pieces of bamboo longitudinally dissected.

A few fish have their breast fins developed into wings and they are able to sustain themselves in the air for considerable periods, when they may cover distances of over 400 feet. The common "flying" fish which occasionally makes an appear-

ance off our south-western coast attains a length of two feet, the wings extending from below the head to the base of the tail. A controversy has raged for years on the point whether these fish actually fly or whether the " wings " merely act as gliding planes. Those who uphold the former opinion point out that if the wings remain motionless there would not be sufficient resistance to the air to enable the fish to sustain themselves in flight for more than a few seconds. All observers are, however, agreed that the initial factor enabling them to leave the water lies in the amazing velocity which they attain when swimming on the surface, the so-called flight being a continuation of their natatory locomotion. The " wings " of the " flying " gurnard are likewise very large. The creature is, however, bulky and heavy, lacking the stream-line formation of the true " flying " fish, and as a result is a very inferior aviator. A small fresh-water " flying " fish or butterfly fish of the rivers of West Africa is able to jump high out of the water, and by reason of its very broad breast fins to sustain itself in the air for several seconds. The first of these fish to be discovered was actually caught by the German explorer Buchholz in a butterfly net.

A few spiders are able to parachute by means of large expansions of the skin on each side of their abdomens, after taking formidable leaps into the



(*Neville Kingston*)

Phalanger, showing edges of Flying Membrane

(*Neville Kingston*)

Escaped Demoiselle Crane flying over Primrose Hill

PLATE XI

air. The young of several different species of spiders parachute by clinging to self-spun threads which, catching the breeze, waft them through the air. When several such threads become entangled a "mop" is formed which may be large enough to carry a number of the baby spiders many miles. When desiring to alight the passengers lower themselves earthwards by single threads and leave the abandoned plane to take its course unguided and unloaded.

THE WILD LIFE OF LONDON

LONDON, like every other human colony, has established itself and grown at the expense of the native wild life. For every beast and bird that lives on sufferance among us a thousand have been banished never to return. Creatures that once figured largely in the Londoner's larder or contributed to his amusement now linger only—when they exist at all—as carefully-guarded exhibits in our public parks. It is hard to realize nowadays that the kite, the rarest of chance visitors, was once one of the sights of London. In Henry VIII's reign the flocks of kites acted as scavengers, and enjoyed as public pets the petting and popularity now accorded to the pigeon. Heron was once so plentiful that the London 'prentices publicly protested against being called upon to dine off the bird more than four days a week. Even so late as the year 1828 coursing matches were held in Regent's Park, and hawking was the accepted Sunday afternoon amusement on the Hampstead Heights.

Wherever vegetation is allowed to grow one may expect to find a wealth of animal life sheltering amongst it. The famous site at Aldwych, where now stands Australia House, was a remarkable case in

point. For some years whilst the site stood vacant it was a riot of willow herb and spear-bloom thistles. Over 200 species of wild flowers were enumerated, and as may be imagined they attracted a host of insects. Peacock, painted lady and red admiral butterflies hovered above the blooms unaffected by the traffic that roared on every side of their sanctuary. London is never likely to enjoy again such a spontaneous scrap of *rus in urbe,* but must keep her birds and butterflies in the more convenient arcadia of the public parks and gardens, many of which are the survivals of communistic lands, the joint properties of the surrounding villages. During the past thirty years much has been done to coax back creatures strongly tempted to fly before the rising tide of brick and mortar. Lakes with secluded islands have enticed many wild fowl to nest and multiply, whilst enclosed shrubberies have ensured the safety of rabbits, hedgehogs and small deer. Regent's Park is particularly rich in bird life, and the lake dwellers include swans, moorhens, wild geese, wild duck, widgeon, tufted duck, pintail and teal. The beautiful shimmering kingfishers, so frequently sought after in Victorian times for ladies' bonnets, are not infrequently to be observed hovering over the water or perched on willow trees overhanging the lake on the look-out for prey. The normally perching birds make an even more imposing list, and include nightingales, linnets, goldfinch,

yellow-hammers, hedge-sparrows, skylarks, starlings, blackbirds, song-thrush and missel-thrush, fly-catchers, willow-harbourers, robins, red wings, blue tits, great tits, long-tailed tits, swifts, swallows, cuckoos and brown owls.

Thanks to that pioneer of our fishery laws, Frank Buckland, London parks are tolerably well supplied with fish, and the waters of the Serpentine can boast of harbouring some large carp which enter into active competition with the ducks for the bread and buns offered by the public. London is not so rich in wild mammals as it is in wild birds, for they need more space. The last otter that earned a living in the Regent's Canal was killed in 1863. Otters are still occasionally found on the Harrow line within the ten-mile radius, having come to grief on the live rail. The little grey American squirrel is, of course, a firmly-established favourite, though not popular with the birds, for he is an expert nest-robber. A few of these aliens were originally presented to the Zoo by the Duke of Bedford and established in the marmot enclosure. As they multiplied apace, the authorities decided to give the overflow a larger liberty, and to this end a rope was stretched from a tree in the enclosure to another tree in the ground outside. Very soon the bolder spirits tight-roped into the world beyond, and from that moment the American squirrels' conquest of London may be said to have commenced.

Greenwich Park is famous for its deer. In 1510 a sum of £13 6*s*. 8*d*. was paid to one Eustace Brown "for deer to enstock Greenwich Park", and ten years later £20 was paid for sixty deer from Rayleigh in Essex, by which it will be seen that the price of venison, as of most other commodities, has risen considerably. In the sixteenth century, when robbery was rife, troops of soldiers were specially detailed to protect the royal deer from poachers. To-day the deer, about 150 head, need no other protection than that afforded by a notice forbidding the public to feed them. Misguided generosity has caused many deaths amongst the flock, for fallow deer are inveterate scavengers, and seldom temper appetite with discretion. Richmond Park harbours an abundance of wild life, stoats and badgers being still found in this most beautiful of all London's pleasure grounds. The writer himself, whilst playing golf recently on the Sudbrook course, disturbed a hare with a misdirected drive into the rough.

The insects of London are even more numerous than its birds, and one enthusiastic entomologist recently enumerated over 200 species in a small back garden near the Borough. Many insects are linked inseparably with London, and the larvæ of the handsome leopard moth and the evil-smelling goat moth do a vast amount of damage to trees in the squares. Every year the little vapourer moth

obtrudes itself upon the visitor to Hyde Park, and in some seasons its larvæ hang from the trees in such masses as to be a public nuisance. The oak leaf moth is another common insect pest, and its handsome black and gold caterpillars may in summer be observed taking a leisurely stroll along the pavements bordering open spaces. The Flower Walk in Hyde Park is a veritable butterfly paradise on summer days, and towards dusk one may see humming-bird hawk moths, poplar hawk moths and privet hawk moths poised before the tobacco flowers and evening primroses. The large death's-head moth, by far the largest of the British moths and which bears on its flanks a pale marking resembling the human skull, was boxed some years ago by a boy in the playing-grounds of St. Paul's School in West Kensington.

LOADING THE LARDER

THE truism that every human activity has its parallel in the animal world is, of course, subject to many exceptions, but it undoubtedly holds good as regards that ever-present necessity—the stocking of the pantry. Its importance to ourselves is brought home to most of us at least three times a day. Whilst the bulk of the lower animals live very much from hand to mouth, there is to be found amongst many widely-separated families and classes the beginnings of housewifery. There are many thrifty birds that lay by something of what they have at the moment for the near or distant future when food may be scarce.

The larder in its simplest and most useful form consists of fat which is carried about by its prospective consumer. Many hibernating creatures eat prodigiously throughout the warmer months that they may face the cold fortified by a living overcoat of solid fat. Fat, of course, may be a good standby against privation in any weather, a camel's hump being as good an insurance policy against starvation in the scorching desert as the polar bear's load of adiposity in the snow-bound wastes of the Arctic regions. The coconut crab accumulates a mass of

fat beneath its tail, a secret store much in demand by the South Sea natives, since it yields a quart or more of admirable oil.

A tenet of the monkey world is "snatch before your neighbour", and it often happens that a monkey fills his face with far more food than he can comfortably swallow. However, only in the cheeks is it at all safe, and even there it may be stolen by some prying paw. This habit has led to some amusing incidents at the Zoo. Recently a large baboon snatched a guinea-piece from a visitor's watch-chain. In vain the keeper endeavoured to retrieve it, but the baboon pouched it, and the manner in which it was produced at intervals for exhibition was suggestive of a dawning æsthetic sense. In time his interest flagged and the coin appeared at rarer intervals. Its ultimate fate, however, remains one of the Zoo's many unsolved mysteries.

The little brown squirrels of North America, commonly known as gophers, have amazingly-developed cheek pouches in which the food may be stored for many hours. They may be crammed so tightly that the little animals are quite unable to control the mass for mastication by means of their face muscles. They therefore, when hungry, use their paws to squeeze the food from the side chambers of their cheeks into the centre of the mouth, where the grain comes into contact with powerful grinders.

Instinct to put by for a rainy day is deeply rooted in that most rapacious carnivore, the glutton, which has extended its instinct for thrift to filling its burrow with such useless oddments as spent cartridges, articles of clothing and kitchen utensils. As regards mammals, however, thrift undoubtedly finds its fullest expression amongst the members of the rodent family. Some of these have developed it to a high degree and display far more foresight than many a human. The squirrel's immense stores have become legendary. Like most of its tribe, it is much addicted to preserving nuts, often constructing a dozen or more warehouses, in the ground, in old walls, hollow trees, etc. Squirrels are very fond of fungi, and many kinds are hung out to dry in the forks of tree branches. Unfortunately the grey squirrel likes to vary a vegetarian regime with eggs and birds, which latter it hangs up by the neck in much the same way as it suspends the fungi.

Almost as efficient a quartermaster is the little hampster of the Hungarian plains, which stores vast quantities of wheat, rye, barley, peas and indeed seeds of all kinds, being careful to hull the seeds first, and storing each variety in separate chambers. One hundred and twenty-eight pounds of grain has been taken from a single burrow, and when it is recalled that within a five-mile radius of Gotha in Germany 80,000 hampsters were killed in a single

year, the extent of the depredations may be well imagined. If cornered, the hampster has been observed to blow the contents of its cheek pouches into the face of the pursuing party.

Many of the crow family are conservators of food, the raven, for instance, having a well-developed throat pouch. Besides the ability of holding in its memory quite a number of well-hidden stores, the secret of which the bird keeps strictly to himself, he has, in addition to this instinct of commendable thrift, a miserly strain which often prompts him to jumble in with food-stuffs many inedible matters.

With the first weeks of May there comes to our shores one of the most remarkable " larderers " in the whole chapter of natural history. The red-backed shrike, or butcher bird, although little larger than a sparrow, kills all kinds of creatures with its sharp hook beak, impaling them upon thorns at a convenient distance from its nest. On these gruesome remains it regales itself and in due season its brood of half a dozen youngsters. Large beetles are the chief items, but the menu may include frogs, lizards, mice, blue tits and even pheasant chicks. This form of larder is quite unique, and makes the octopus's store of some twenty crabs amongst its ample folds a very tame affair by comparison.

Dr. W. E. Ritter, Professor of Zoology at the University of California, has published recently the

results of several years' labour on the acorn-storing woodpecker of California. The Californian woodpecker, like most of its numerous tribe, sits upright on the side of a tree—reminding one of the hardy souls who repair our telegraph wires—and ceaselessly taps the bark. Most woodpeckers tap with a sound not unlike that of a machine-gun, detecting and extracting the many insects tunnelling or hiding beneath the tree's outer crust. Not so, however, the acorn-storer, who is a vegetarian. He has his favourite kind of acorn and his favourite trees, and he inserts the one into deliberately-drilled holes or ready-made fissures of the other. Whole woods may be found with the tree-trunks literally peppered with acorns which fit neatly in the holes or tuck snugly in the deep furrows of the bark. When times are hard, the bird reappears at one of these acorn stores and takes his fill. Like another harvester—the grey squirrel—he has a poor memory and makes many foolish mistakes. He will make a *cache* in the side of a house and cram it with food that falls through on the other side, or at great cost of labour store nuts too hard to open. Still, his thrifty instinct has caused him to flourish where others must decamp when winter comes, and he is consequently five times as numerous as any of his insectivorous relatives sharing the same woodlands. It may be mentioned that the English nut-catcher, a tolerably common resident, though living chiefly on insects

during the summer, in the autumn lives largely on cob-nuts. These it wedges neatly in a bark fissure, and then, clinging to the tree-trunk, delivers sledge-hammer blows with his beak, pivoting from the hips like the expert golfer, so as to obtain the full weight of the body behind the blows.

Between the birds and the insects there is a vast gulf in the world of animal economy. No fish or reptile to the writer's knowledge has the slightest instinct to save for the lean years, or to provide to any great extent for the upkeep of its family. Amongst the insects, however, we see on every hand extraordinary instances of providence and fore-sight. The ants and bees and the sacred scarab beetle are classic examples. In particular, the honey ants of Mexico attract attention by their extra-ordinary method of conserving food. Many insects store honey, grain, etc., in cells or burrows, but in the honey ants we find certain workers with pecu-liarly distensible abdomens, which may be so crammed with honey that they become globular in shape. The horny plates which normally enclose the hinder region become forced apart until they are mere isolated scales upon the vast mass of sweetstuff that dominates all the rest of the insect. These living honey-jars are herded in special chambers where they congregate upside down upon the roof. A tired worker in need of refreshment signifies such with its antennæ, and the nearest

honey-pot obligingly squeezes a honey ration into its hungry jaws.

Many ants herd the green fly for its "milk", or farm certain insects for their sticky secretions. Wasps of the "digger breed" cram their burrows with paralysed caterpillars, spiders and other creatures, so that their own grubs, on emergence from the eggs, shall find a choice selection of "infant food" ready to hand. A digger wasp from the Eastern United States paralyses and carries off such massive creatures as the clumsy cicada, a grasshopper with a body bigger than an acorn. Each grasshopper is placed in a separate cell about two inches in diameter, several such cells opening out at the end of a burrow, which may be as much as two feet deep. The egg is cunningly deposited on the grasshopper's under-surface, where the wasp grub, at first somewhat helpless, will have little difficulty in tunnelling between the soft abdominal plates and so reaching the victim's choicest portions.

FROCKS AND FRILLS

Dress occupies an important part of our lives, and we are therefore inclined to regard the wherewithal to cover the body as a matter that taxes no other animal save civilized man. It is wrong, however, to suppose that wild animals are spared the clothing problem. An animal's clothes grow on the body of the wearer and the trouble saved in changing them voluntarily is often counterbalanced by loss of health and sudden exposures to climatic changes which the owner of a wardrobe can anticipate and counteract. Human clothes, after all, are the outcome of either mere vanity or climatic dictation. Eskimo fashions never alter, whilst on the Equator anything—or nothing—may be worn. The intelligent savage goes about his day's work in comfort and a loin cloth, merely oiling his skin to protect it from the sun's rays and the night chills; the foolish negro attires himself in the cast-off remnants of Western civilization.

Only in the spring does one see a shabby animal. Thus the camel from Tibet and the Arctic fox from Baffin's Land must doff their heavy winter clothes for lighter garments when the sun begins to shine. At such times they look like burst rag bags, and at

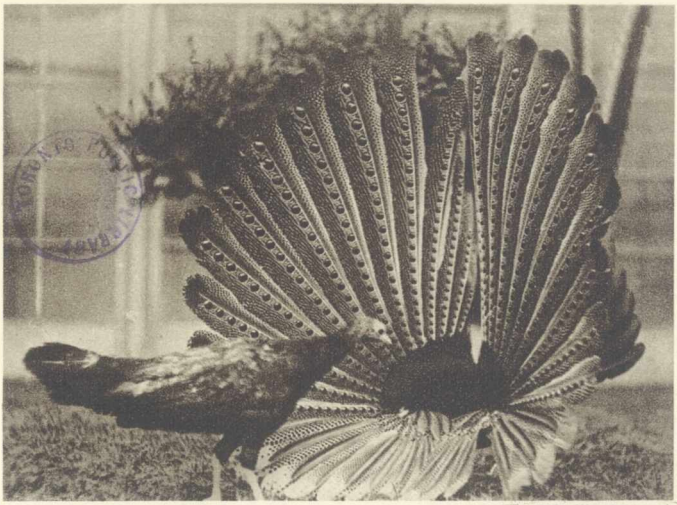
the Zoo the sparrows and rats rely largely on their cast-off apparel for nesting material. The reader may reasonably protest that as animals' clothes grow on them they involve no actual outlay. It is true enough that the animal world is spared the blessing of currency and the reception of dressmakers' and tailors' bills, but it should be borne in mind that in most animals considerable care must be expended on the outer face if the inner is to enjoy life and health for long. If the clothes of animals are not just right they are all wrong. Unless the mammalian hairs or avian feathers are set correctly they will not throw off the rain as Nature intended. Moreover the badly-dressed animal means an inefficient animal, and for that Nature has but one remedy—death without reprieve.

No man looks his best whilst in the act of dressing, and the "half-way stage" presents an animal at a similar disadvantage. Mammals and birds not only look extremely unkempt in such a condition, but suffer greatly in health and spirits. The moult is a function which is much dreaded by the Zoo authorities. At this period many birds find themselves so "poorly" that only the utmost skill and care pulls them round and enables them to look as though nothing had happened. Reptiles are possibly the greatest sufferers. Snakes in good health may cast a skin in one piece, but if a little below par the old clothes hang about them for

weeks. At the Zoo they may be helped off by a soft-handed keeper. Lizards, usually alert and virile, seem to care less about their looks and may be observed scampering about with last season's fashions clinging to their persons in ribbons—the new suitings gleaming through the rents.

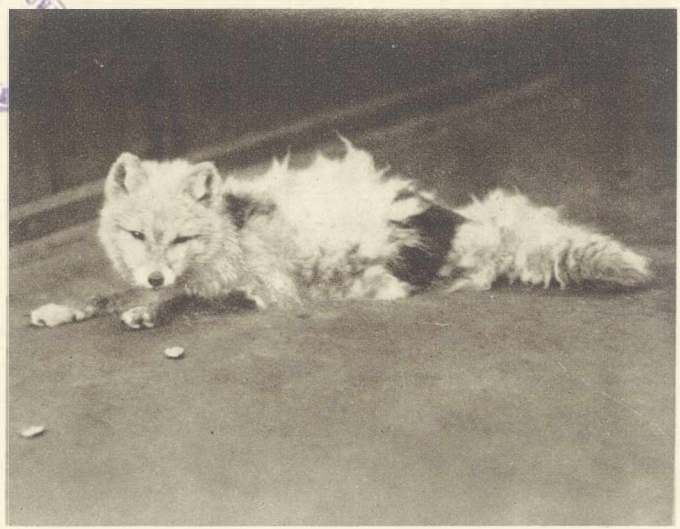
These reptiles certainly appear to enjoy all the advantages of a dramatic contrast, but it is not improbable that there is some purpose behind their semi-undress, and that their ragged clothing harmonizes with certain bark peelings and spiders' snares that render the ragged lizard almost invisible to prey and foe.

Crustaceans—the crabs, lobsters, etc.—wear jointed armour which as everybody knows is often so hard that it can only be cracked with a hammer. What must it be like to shed? The older and bigger the crab or lobster the more difficult a change of clothes becomes. A lobster six years old may go for eighteen months before needing a change of armour, but as a youngster he crawled out of his plastic baby suits with ease at weekly and later monthly intervals. As the lobster grows older each change of suit means a life and death struggle involving many hours of combat with his outer garments that may leave him so exhausted that he is eaten alive by mere prawns who attack his vital parts before his new shell has hardened upon him.



(Neville Kingston)

Cock Argus Pheasant displaying to the Hen



(Neville Kingston)

Arctic Fox changing its Coat in the Summer

PLATE XII

This brings us to the previously-mentioned loss of health involved by change of clothing. In birds the new feathers are pushed up through the skin as the old fall out, and as there is considerable displacement of the under down, a certain exposure of the naked skin is consequently involved. A rise in temperature plus a liability to chill naturally puts a bird off its feed, and it is much more likely to catch cold when changing clothes than when completely dressed.

Mammals are also frequently indisposed when donning their new coats. At the Zoo accidents may be forestalled at the critical periods by a nourishing diet, artificial sunlight, and ample shelter, but in the wild the death-roll entailed by a mere change of clothes must be enormous.

Clothing, as mentioned at the beginning of this chapter, indicates very largely the character and mode of life of the wearer. Like every human community, the Zoo has its eccentrics. Many creatures, for instance, wear suits of black and white more daring than any conceived by the most advanced modernists. The porcupine and the skunk are notable examples. The average beast of prey is only too anxious to keep at quill's length of the porcupine, and so far as is yet known the skunk's only enemy is disease. The skunk's dress shrieks for attention, crying "Beware!" to all and sundry, a warning which

is never ignored twice. The dazzling burnet moth with its indigo and crimson wings is very indigestible. Birds have learnt to recognize the pattern as a warning sign and even fledgelings are seldom seen to meddle with this moth. The daring colours of the Arizona heloderm lizard are displayed in an equally brazen fashion, the lizard lying at full length in the open, its vivid black and pink or orange markings making it more than conspicuous against the desert sand. Here the garish garb—as in the case of the skunk—is intended to intimidate.

Dressing up to match surroundings is to be seen on every hand in the animal world ; the stripes of zebra and tiger blend with the shadowing of long grass, whilst the blotches of the giraffe and leopard perform a similar service for their wearers amongst dense foliage. Indeed, some of the more striking animal costumes serve for self-effacement —what might be called almost " aggressive modesty ".

As amongst humans, many wild animals make their way in the world purely by their appearances being mistaken for what they are not. Thus a certain self-effacing Madagascar mouse so closely resembles a native shrew with a bellicose reputation that few care to meddle with it. Certain harmless snakes are attired in costumes which are almost exact replicas of those of poisonous species, and they naturally

derive benefit from the imposition. Thus, the markings of the highly-venomous coral snake of Mexico, which consist of red and yellow rings on a black background, are exactly similar to those of a quite harmless serpent inhabiting the same regions. The head of each is black with a yellow band across the sides. Similarly, many saw flies and a few moths so resemble wasps and hornets both in shape and colouration that they escape enemies that would otherwise devour them.

The "camouflage" dress takes an infinity of forms, many fish and crustaceans changing colour involuntarily to match surroundings. Flat-fishes, for instance, always assume a pattern which harmonizes exactly with that of their surroundings. Some years ago some entertaining experiments were conducted at the Plymouth Laboratory in order to ascertain to what lengths the fish would go in their attempts to render themselves inconspicuous. They were placed on various "jazz" backgrounds, and all responded, almost instantly assuming the fantastic patterns of the backgrounds chosen for them. The spider crab, less fortunate, is obliged to clothe itself with weeds which take root and grow on its shell. He may even heap stones upon his back, a process taking many hours, portions of his attire tumbling off as fast as they are placed in position. After moulting, the cloak of weeds has, of course, to be replaced,

and the crab as soon as the new shell has hardened works hard at replacing his covering, sometimes for days on end, until he is once more undistinguishable from his surroundings.

Sufficient has been said to show that dress plays quite as important a part in the life of a wild animal as it does in that of a human being. The human is indeed still largely reliant on wild animals, not only for the wherewithal to clothe himself, but also for many of those subtle indulgences and compliances which are vaguely included under the convenient title of " the dictates of fashion ".

THE ABYSSAL DEPTHS

CONSIDERING the millions of years during which the sea has been in existence, systematic exploration of its marvels is a thing of mushroom growth—an activity of yesterday. Since the times of Aristotle, and possibly before, the fish and other inhabitants of the sea excited man's curiosity—but only so far as the surface waters were concerned. Up to the late Middle Ages, many parts of the sea were regarded as bottomless. Even when such a state of affairs was realized as impossible, the ocean depth was a matter for the wildest conjecture. The first systematic attempt to plumb these mysteries was made by the Challenger Expedition some fifty years ago. Since that time expeditions, more and more efficiently equipped, have recurred with increasing frequency, so that to-day the public is given many tantalizing glimpses of a world bizarre and mysterious beyond the dreams of the most imaginative, a world that would have been condemned scientifically by the biologists of a century ago.

The public generally is now acquainted with a few of the deep-sea fish. Many have been admirably modelled and the American Museum of Natural History has even produced " tableaux

vivants " of its forms, the phosphorescent lights exuded by such fish being cunningly reproduced by hidden electric bulbs. The weird and fantastic creatures termed " deep-sea " fish are obtainable only by the dredge. The fastnesses to which they have repaired are so profound that no fragments of their forms ever come ashore, even after the most violent storm. They mostly haunt depths varying from 1,000 to 5,000 fathoms. Ninety-nine per cent. of the fish we know to-day seldom penetrate lower than 100 fathoms, and all food fishes popular in this country are caught in waters seldom exceeding half that depth. Nearly all the known families of fish, however, have representatives that have penetrated into deepest seas, no doubt in search of quiet and safety. But there are others, inhabitants of a world the presence of which our scientists first began to suspect from the strange growths appearing on submarine cables.

In describing the ocean depths, it is customary to make the flesh of one's readers creep. Adjective is piled upon adjective with a fine disregard for veracity or even common sense. The true facts as at present known, however, far outweigh in interest the usual insistence upon the horror of the deep. In defiance of tradition, therefore, it must be admitted that the inhabitants of the abyss are monsters in form rather than in size, the largest deep-sea fish known scarcely exceeding four feet in

length. Like many cave-dwelling animals, they have paid for their retirement by the loss of many privileges. Sometimes the eyesight is reduced almost to vanishing point ; in other instances it is enormously developed. In both cases, the fish may be furnished with elaborate tactile organs—prolonged fin rays, and filaments that may act as fingers wherewith to probe the darkness or as balancing poles. With the banishment from sunlight also comes an inevitable loss of colour. At a thousand fathoms red and yellow usually fade to brown and a dingy orange, and, as the wearers plumb still greater depths in a ceaseless search for food and escape from foes, to a livid white. But there are exceptions, for certain deep-sea creatures, notably the prawns, are of a flaming scarlet, suggestive of a visit to the kitchen pot.

The average depth of the seas is 12,000 feet, with a shifting oozy bed formed of countless millions of tiny shoals of vacant homes of dead animalculæ such as form our chalk cliffs. Judging by the harvest of the scientific trawlers at this depth, the animals are largely cosmopolitan, wandering from one hemisphere to the other. More segregated are the animals haunting the isolated pits five miles deep—vast submarine wells wherein the chalk sediment gives place to a reddish clay. At such a depth the inky well of water must be lit from time to time, if not continuously, with a weird assemblage of

living lights. The myriads upon myriads of dimly glowing microscopic animals slowly drop above the ooze, the milky way torn and scattered suddenly and silently by fishy meteors leaping from nowhere into the field of vision and vanishing with only a trail of greenish light to show where they have been. Again the darkness closes on that awful atmosphere, but a few degrees above freezing-point, and the blackness shrouds once more a swarm of stealthy forms at ceaseless warfare with one another. The majority of deep-sea animals are luminous. One squid living in water over a mile deep is a veritable firework display. It has twenty-two globular phosphorescent organs dispersed over its body. Two show a ruby-red light, two a sky-blue light, one an ultramarine light, whilst the others are white. Another deep-sea squid stores its light in the form of two masses of pasty substance situated near its ink sac, and when irritated these are squeezed out through holes, filling the surrounding water with clouds of greenish light. Yet a third squid has over 400 light organs covering the entire surface of its body. Such squids travel in vast shoals and light up the sea for many yards around on their annual migrations from the depth to inshore waters for the purpose of depositing their eggs.

Deep down the stalwart sea-lilies glow with a pallid luminosity, and amongst their slowly swaying stems crawl more brittle stars and worms. Still

more in evidence are the light-giving shrimps that stand poised above the ooze, bestriding its treacherous surface on limbs attenuated so that the creature suggests a deep-sea daddy-long-legs. On being suddenly attacked by a fish the prawns leap backwards, covering their retreat with a mass of luminous smoke rings puffed out from near the gill chamber in two parallel series.

But it is the fish lit spasmodically with countless living lights that give the true nightmare touch to this aquatic underworld. The deeper the water, the wilder the finny forms that creep and swim. The gay and brilliant fishes of the sun-warmed tropical shoals are often sufficiently startling, but the most grotesque pales to insignificance beside their congenitors who have left the light for good. The last rays vanish at 1,200 feet or more, and at this depth and deeper still the fantastic shapes hold carnival. All round there must exist fish with some particular feature, fins, mouth or eye, exaggerated almost beyond recognition. It is a crazy world of " over-specialization ", which Mr. H. G. Wells depicted in his *First Man in the Moon*. Whilst some of the forms that are content to swim for their dinners still retain some resemblance to the surface fish, others that have taken the line of least resistance rest upon the oozy bed, and with eyes set upwards in a vacant stare await what chance shall bring them. Such are the angler fishes. The common

angler is fairly well known, and its habits have been described in another chapter. It is a fish some four feet long with a vast head bearing fin rays which are literally bait rods and lines. The tallest of the rods dangles a flap of skin sufficiently suggestive of a meal to deceive most comers. But when the angler retreats to the abyss such a lure is useless, and he adopts the obvious course. Most fish are attracted by a light, and so the skin flaps give place to a bulb that burns with a steady glow whenever the angler is hungry. Sometimes the bulb is surmounted by a crown of waving tentacles that feel the nature of the quarry dallying with the bulb, which may suggest some phosphorescent small crustacean. As soon as the angler registers a bite, the rod bends over towards the landing net—the vast mouth ranged with row upon row of teeth. In some forms the teeth are placed externally, and each tooth, bearing a hooked tip, is worked by independent muscles. Or, again, the angler may bear a trailing beard three times his own length, which explores the hunting-ground below whilst his lure scours the waters above. In any case, once he bites, the sea-devil—as the angler is sometimes called—gives a convulsive jerk and the catch is relegated to the stomach. As in some other deep-sea fishes dependent on not too frequent meals, the angler has a very slow digestion and a very elastic interior which may accommodate a fish three times

his own length and five times his weight, the skin stretching until it is a mere film through which the catch is clearly visible. In some cases the angler is without a lure, Nature adjusting the balance by giving him enormous hypersensitive nostrils, stereoscopic eyes and teeth that are literally grappling irons. The rod itself is subject to a bewildering series of adaptations to particular requirements. Often it bears one or more hinges or is prolonged into a writhing whip four times as long as its possessor. As for the teeth, they may be half as long as the fish's head and capable of lying flat or standing erect. With such an equipment the oceanic angler may be deemed invincible. His greed, however, is often his undoing. One species common throughout the depths of the Atlantic frequently engulfs fish several times his own weight, and by the internal struggles of its victim is carried helpless to the surface, where a shark appropriates the captor and the captive. Most remarkable of all the strange features presented by certain angler fish is the helplessness of the male. Usually he is but a fiftieth of the bulk enjoyed by his monstrous spouse, sometimes greatly less. Often no doubt he falls a victim to her lures—and jaws—but when his star is in the ascendant he conducts successfully a most extraordinary wooing. Seizing his partner by any portion of her person which precludes her adding him to the daily fare, he becomes literally one with her.

His tongue and lips at first, and later the whole anterior portion of his head, become grafted to his spouse's head, breast or pelagic fin. He has even been known to become attached to the living bait. Once married the male becomes a mere cypher, for his blood-stream merges with that of his bulky wife. The viscera are reduced to mere vestiges to leave four-fifths of his body free to house the only organs vital to his rôle—the organs of generation.

The permanent smile is a leading feature of many deep-sea fishes. One, for instance, a degenerate form of eel, has a mouth occupying three-fifths of the entire fish. At the other extreme, we have another that to compensate for her " rosebud " pout has in the lower jaw a set of teeth that when the mouth is closed slope backwards over the head, giving the appearance of a multi-horned rhinoceros. The outstanding feature of all these abyssal forms, however, is the light which they all burn in one shape or another. In some the lights are carried ranged in rows along the fish's sides, veritable deep sea liners ; others bear the light on the end of a huge proboscis which travels in front of the fish, stirring up the ooze and disclosing all kinds of dainties which are inhaled by the mouth following some way behind. Often the light organs are placed on the top of the head, and the fish, its eye set close to the light, quickly drags the animals attracted by its beacon to a sudden end. A few fish have their

entire head illuminated, whilst a small shark has the whole of its under-surface converted into a vast electric lamp, which throws the sea floor immediately below the creature into high relief.

The imagination boggles at the fearsome sights that doubtless await disclosure in the thousand pits and gullies of the ocean bed. The vast areas of perpetual night must be streaked with the milky way and teeming invertebrates that drift and scatter as the creatures composing them feed upon the still more numerous plants. Anon, these ghostly clouds of life are broken by swift-moving constellations, the headlights of shoals of small fishes. These in their turn are burst and scattered by the still more swiftly-moving meteors, the lanterns of the solitary hunters—the tigers of the deep. Below, glimmering through the ooze, shine the treacherous lures of the anglers, incapable of swift pursuit and content to play a waiting game. Every year fresh data for a complete picture of the ocean depths is offered by the scientific expeditions of the world, and some day, no doubt, self-closing nets will drag the mysteries of even the unexplored five-thousand-fathom-deep pits that lie in the Pacific Ocean.

Although many of the deep-sea animals are becoming tolerably well known to the public, thanks to the admirable series of models at the Natural History Museum at South Kensington, few of them

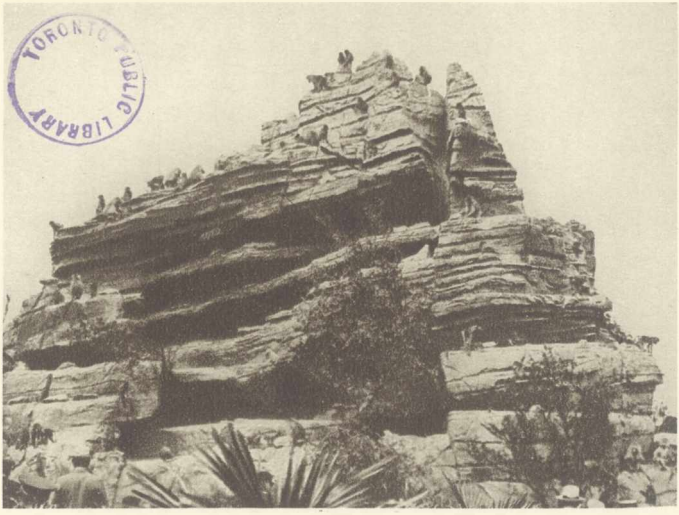
are likely to become household words. None have popular names, and the cognomens of most of them excel the fish in length, representing some of the name-makers' finest efforts.

ZOO ESCAPES

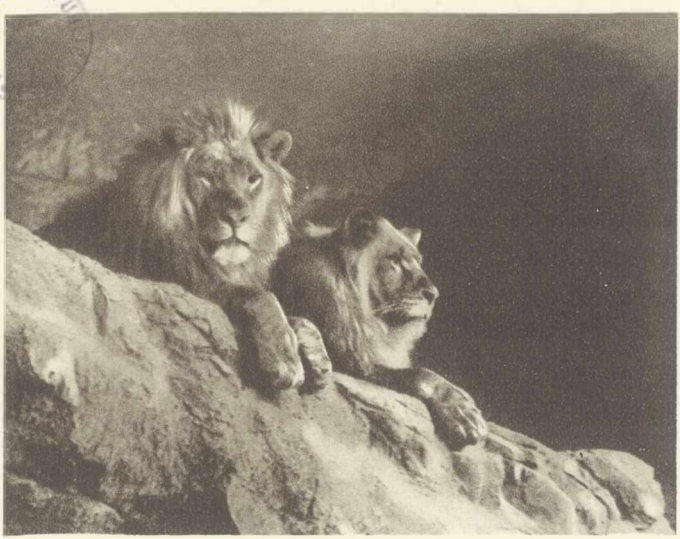
MANY of the most thrilling pages in human history are concerned with the subject of " Escape ", and the matter is often scarcely less exciting when a cleverly-executed escape from captivity is achieved by one of the so-called lower animals. Most of us indeed date our first acquaintanceship with animal escapes from our nursery days or school epoch. The writer can recall many an insurrection on the part of white mice, lizards or silk worms, resulting in those blameless creatures intruding themselves upon the family at the most untimely moment, or breaking the tedium of school hours.

The escapes of larger animals—apart from market day alarums—provide excitement reserved almost exclusively for the staffs of zoological collections. Usually they prove to be more humorous than tragic, though, of course, a certain section of the Press never fails to present them in the most lurid colours. Recently a certain evening paper displayed the headline " Exciting Scene in Zoo Lion House ". The expectant reader once embarked upon the small print following found that the scene was caused not by a sortie on the part of the king of beasts, but merely by the arrest of a pickpocket.

An attempt to escape on the part of a Zoo boarder by no means implies that the animal is unhappy. Generally it is the result of sheer wanderlust and the truant after enjoying a short period of freedom returns of its own accord to the assured comfort of its official quarters. Apes and monkeys easily head the list of escapes and quite a score of these animals annually do their best to create a " brighter London ". Usually they escape from private ownership or from some live-stock emporium, but in all cases the *modus operandi* is very similar. The escaped monkey, having once broken bounds, gravitates upwards—to the roofs—where it remains, often for days, accepting all bribes—if sufficiently tasty—but firmly refusing to descend. Sometimes pursuers are held at a distance with a heavy fire of tiles or other missiles. A small capuchin that got away from its cage in the Regent's Park menagerie made for the genial warmth of the stoke-hole beneath the Zoological Society's Offices and resisted attempts at arrest by pelting the staff with lumps of coal and kitchen "brights". Endless stories, indeed, might be told of many similar simian escapes. The Zoo's own classic example is afforded by the late " Jacob ", the gigantic orang-utan who left his house unexpectedly on a foggy winter's night some years ago. The escape of a manlike ape is rather to be welcomed than otherwise, since the manner of its



Monkey Hill at Carl Hagenbeck's Animal Park, Stellingen, near Hamburg



Lion and Lioness at Stellingen

PLATE XIII

achievement often casts a fascinating sidelight on the creature's almost incalculable mental powers. In this instance, escape was prompted more by the orang-utan's workmanlike delight in overcoming mechanical difficulties than a mere craving to make a clumsy dash for liberty. Jacob gained possession of an iron bar left just outside his cage by a thoughtless workman, and utilized it as a lever to prise apart the meshes of a steel net covering the top of his cage. Similar netting had kept lions and tigers within bounds, but it soon yielded to the persuasion of the wily Jacob and his trusty mace. But, out of the cage was only half the problem. Jacob contemplated the not too tempting world without and then rolled his glistening orbs around him for a weapon that should prove a match for the plate glass. His mace he had dropped to the cage floor as soon as he had made an opening in the steel net large enough to permit the passage of his ponderous person. This was a false step, as he should have kept it. But, like a good general, he lost no time in idle lamentation, and turned his attention to the quickest way of overcoming the momentary check. He found a stout ally in a large potted geranium. Holding the plant as a knight might hold his battle axe, he successfully applied the pot end to the plate glass. Affectionately cuddling the pot, Jacob left his home and repaired at once to a tree standing just outside the ruined

window. There, some thirty feet above the ground, he built himself a platform of cunningly interwoven branches as he had doubtless done many a time in his native Sumatran jungle. By this time the Zoo staff was aroused, and a cordon of keepers surrounded the tree, there to wait for morning light. Dawn found a somewhat chilly Jacob, still cuddling the flower pot and prepared to see things through. The first hint of a fire hose joining the party, however, caused him to alter his plans and he returned to his cage (with flower pot), never again to risk the rigours of a climate so unlike that of the Dutch East Indies he had left.

Moritz, elder half of a once famous music-hall turn, Max and Moritz, was a chimpanzee that lived when " resting " in the Hagenbeck Zoo at Hamburg. Moritz could ride a bicycle and was allowed to exercise " on his own " in the grounds before the gardens opened to the public. On one occasion he cycled through a service gate and out into the world beyond, where he raided such fruit stalls as lay in his path. He eventually returned laden with loot and doing his best to look as though he had never left the gardens.

Next to the apes and monkeys, the bears perhaps show the greatest ingenuity in breaking bounds. The late " Sam ", the famous polar bear, once gained access to the grounds, the door of his cage having being left open by a careless keeper.

Sam, when several hundred yards away from his abode, headed for home as a result of a chance meeting with a panicky workman laden with a number of long planks, who suddenly found himself confronted with the white bear looming like some gigantic ghost in the morning mist. The terrified workman dropped the planks, which met the ground with a noise like a thunder-clap, and made for the nearest emergency exit. The most heroic stand could not have been more efficacious, for Sam turned tail and never stopped running until safely back in his official quarters. Some time ago a specimen of the rare spectacled bear from Peru—a strange beast with Harold Lloyd spectacle frames of yellow fur around its eyes, was shipped to Regent's Park, but escaped *en route*. The bear when in mid-ocean chewed through the stout wooden bars of its travelling cage and took to the rigging. A heavy sea flung it overboard, and despite the prompt launching of a life-boat the unfortunate animal was drowned.

That wonderful water-dog, the sea-lion, is high up in the list of resourceful and persevering animals. The Zoo sea-lions have never attempted to leave their quarters, but many stories are told of the adventures of those frequenting the variety stage. "Hooky", a member of the famous Woodward troupe of sea-lions, once bolted through the stage door of a seaside music-hall and spent a joyous six

hours raiding various fish shops and stalls. He was eventually attracted to the beach by a strong smell of brine blowing shorewards. Here, however, he met with a most unexpected setback—not from any human intervention, but from the sea itself. An inshore gale was piling the shore high with vast banks of wreckage and drift wood. Hooky after scores of attempts to regain his own love—the open sea—turned back to the safety of the stage, where a tub took the place of a rock and the clash of brass drowned the thunder of the waves. It frequently happens that performing sea-lions are given an annual rest for several months at some convenient public aquarium. Sooner or later, however, they gain access to other tanks, with disastrous results. A few aquarium inmates can at times develop a lust for adventure, raiding adjacent tanks or indulging in other orgies. An eel at Regent's Park made scores of midnight journeys, always visiting a tank of sea anemones some thirty yards distant from its official abode. The authorities at last got so tired of finding him every morning ensconced in this subaqueous bower that they decided to let him have his way, and from that time his desire to wander ceased. An aquarium keeper's life is sometimes disturbed by a lobster climbing into an octopus tank, and vice versa—a duel to the death and the loss of a good show beast being the inevitable result. At Brighton

some twenty years ago an octopus left its cage, climbed through a ventilator and landed on a lady's hat in the public corridor.

There are some escapes that baffle all attempts at explanation. Only a short time ago an Australian flying phalanger, a species of opossum capable of making parachute-like glides, was captured on a chimney-stack in Brook Street. How the somewhat rare creature came to find itself in the metropolis remains a mystery. The animal registered its disapproval of its removal from a snug chimney-pot by severely biting his captor on the hand. It was taken eventually to the Great Marlborough Street Police Station, where the officials, having no record of its antecedents, removed the prisoner to the Zoo, where it remained pending investigations.

A badger that made its way from the Zoo to the area of a hostelry in Little Harcourt Street, off Marylebone Road, caused a sensation in the middle of the night by drawing to its immediate vicinity all the cats of the neighbourhood. The yowling of the cats attracted the police, who quickly replaced this unofficial cordon and remained on guard over the " animal unknown " until a couple of keepers appeared with nets and collected it in a sack. It must be admitted that this badger, a large male, was what might be described as a " hard case ", for it was caught on the Yorkshire moors after having walked through a pack of hounds and injuring

several of them. The only kangaroo that ever left the Zoo unofficially travelled so fast that a motor-car had difficulty in following it. It was eventually captured in a back garden off Baker Street.

Birds frequently escape, not only from the Zoo but from private aviaries, and it is strange how few are lost for ever. Not so surprising, perhaps, when we consider the deeply-seated homing instinct of most birds. All kinds, ranging from parrots to cranes, have escaped from the Regent's Park Menagerie, but after a few days of hand-to-mouth existence in the surrounding trees have returned to the ensured food and safety of captivity. Quite recently a Stanley crane bolted whilst having its flight feathers clipped, and lived at large for weeks, yet never venturing far beyond the South Entrance to the Gardens. Liberal bribes of food failed to coax it back while largesse was being showered upon it by chance strollers. As long as the food rolled in and the sun smiled, the crane preened and strutted before admiring crowds. The first cold days of autumn, however, found the high-stepping bird clamouring—with a sort of donkey bray—to return to the source from which it flew. Less happy was the escape of a certain ostrich that used to carry visitors in a Dutch zoo many years ago. On one occasion the rider got more than his money's worth—the equivalent of a sixpence. The bird, as soon as the visitor had

mounted, eluded its keeper, dashed through a service gate and out on to a typical Dutch road. Anyone who has ever been to Holland will know what that means—a ten-mile stretch without a bend or side-turning. The terrified "fare" clung to the bird and hoped for the best. Eventually the ostrich and its rider collapsed together, miles from home, in the square of a far-distant market-town.

One of the most ludicrous escapes that has come within the writer's experience in recent years was that of a big tree-frog that an artist was commissioned to paint for the *Proceedings* of the Zoological Society. The specimen was valuable and, in order that full justice might be done to it, was posed on a sheet of glass, since confinement in a case would have involved confusing reflections for the man behind the brush. Whenever the frog left its pedestal—which it did at regular two-minute intervals, it had to be brought back. It once made its way by six-foot leaps to the ceiling, and was chased by means of a step-ladder. At the end of an hour it was completely missing. A feverish search ensued and just as all those involved were giving up in despair the treasured creature was discovered comfortably adhering by means of its sucker-clad toes to the back of the collar of the artist.

The sinuous form of the average reptile, of course, lends itself well to squeezing through cracks and

fissures that would be unnegotiable to most other kinds of animals. For instance, a harmless snake that had come to the Zoo in a crate of bananas squeezed out of a case believed to be snake-proof and was missing for over a year. It was eventually found in an adjoining cage inhabited by a number of asp vipers, and when discovered was in the act of being swallowed by the cannibalistic inhabitants. More alarming was a case which occurred in 1918, when a seven-foot python removed itself from the public gaze. It presently appeared festooning an ornamental column on the roof of the Reptile House. A chance visitor mistook it for part of the decorative scheme until a sudden movement on the part of the ornament caused him to doubt the veracity of his eyesight. Having a clear conscience, however, as to the temperate nature of his last meal, and being convinced by further demonstrations on the part of the scroll work, he communicated his discovery to the head keeper. That functionary, however, being case-hardened to the too often inane remarks of the laity, openly expressed his suspicions of the communicant's veracity, until closer investigation cleared up the matter and the python was returned after a chase to its official domicile.

Though exhibits have been known to absent themselves for long periods, it is seldom that they disappear for good. This was well shown some time ago when a creature at first mistaken for a giant

worm came to light during the unpotting of a large palm in the old Reptile House. Upon being brought before the Curator, the " worm " was recognized as a specimen of that curious limbless amphibian known as a coecilian, hailing from India, Africa and Tropical America. The specimen in question had been reported missing for over two and a half years.

Possibly one of the most lurid escapes on record concerns a dash for liberty on the part of a dozen giant South American cockroaches. These were purchased from the Zoo by an enthusiastic entomologist, who inadvertently loosened the cover of their travelling jar in a crowded carriage on the Underground during the rush hours. A lion let loose could hardly have caused a greater consternation. By the time the train arrived at a station the last of the monstrous insects had disappeared—and so had the entomologist.

BEDTIME

SLEEP—" tired Nature's sweet restorer "—comes normally to all the higher animals at some time or other during the twenty-four hours. In emergency sleep may be postponed for short periods, but it must be given its due eventually if life is to continue. The number of hours of sleep depends upon the individual. Six hours for a man, eight for a woman, and ten for a fool is an old saying, but the actual hours of sleep required by any individual must depend upon the manner of spending the waking hours. In every large city a comparatively large percentage of the population is obliged to keep going whilst all alleged " honest folk " are between the sheets. The police, scavengers, road-menders, transport workers, journalists, the followers of the gentle art of housebreaking, and others must keep awake throughout many of the hours of darkness. The Zoo has its parallels to most of these human activities, and even those cheerful if mistaken folk who can only enjoy life between 10 p.m. and dawn have their counterparts in the Regent's Park menagerie. A part of the Zoo with which the public is unfamiliar may be aptly described as the weirdest and gayest night club that has escaped a visit from Scotland

Yard, for when the turnstiles have clicked behind the last visitor and the staff door slams good-night to all save the night watchman, a thousand odd exhibits that the public seldom sees steal forth to hold high carnival. Then do heaps of straw and sleeping quarters of all kinds yield up their starry-eyed tenants. Goblin forms patter over floors and branches that are uninhabited during the daytime. Cages that yield no entertainment for the least impatient visitor become inhabited by joyous throngs. The slow loris, the aye-aye monkey, the jerboa, the beaver, the porcupine, the echidna, the phalanger, the bat, the ant-eater, the armadillo, amongst the mammals, the kiwi, the frogmouth and the owl amongst the birds, are only a few of the distinguished members of this zoological night club, and a large portion of the keepers' work consists in preparing for the animals that insist upon a midnight orgie. Besides the legitimate night-walkers there is a stealthy nocturnal population of rats, mice and cockroaches that play a ceaseless game of hide-and-seek with an army of cats "on the strength".

But let us inspect the majority of the Zoo boarders —those that entertain the public during the day-time and enjoy a well-earned rest as soon as their visitors have departed home. Only by taking a walk round the gardens at night are we able to realize the many ways of going to bed. Man can

sleep on a mattress, in a hammock, or even on the ground, but to do so he must always assume a more or less horizontal position. Not so with the majority of animals, although monkeys, bears and kangaroos sometimes sleep on their backs. A monkey will often sleep in a sitting posture, leaning against a tree or wall; it may also court the drowsy goddess hunched in a heap with the face resting on the knees, in which attitude it may well convince the most wooden-headed anti-evolutionist. Bats may be seen reposing during the public hours suspended by their hind-legs, whilst the equally arboreal sloth relies upon all four feet to ensure its safety, and swings horizontally as though reclining in an invisible hammock. The great majority of mammals prefer the "curl-up" pose. This applies to such widely different creatures as lions, wolves, mice, rabbits and antelopes. The nose is generally snuggled tightly between the hind limbs, and the tail, when long and bushy, is curved over the head, or, as in the case of the giant ant-eater, squirrel or fox, is wrapped almost completely round the body. Birds evade a draught by putting the head under one wing—a measure also adopted in order to exclude the light and analogous to our own habit of hiding beneath the eiderdown. It is to be noted that the more secure an animal's hiding-place, the more elaborate and lavish its notions of a bed. Burrowing creatures, such as badgers and rats, hole and cave

dwellers like squirrels and raccoons, and even the large cats, have luxurious standards. They gather such litter as they can find, and by turning round and round in it fashion the whole into a very snug retreat. When young are present the bedding is specially elaborate, many animals plucking the fur from their own breasts to ensure the comfort of their babies. The " eiderdown " trade relies upon the robbing of the eider duck's nest, which consists of masses of rich fluff torn by the mother bird from her bosom.

Many birds take great pains to ensure snug sleeping quarters, although their notions of a warm bed do not always conform to our standards. Most birds of prey lay their eggs on a sort of mattress composed of twigs, fish bones, and manure. The sleeping position of the normal large adult bird is standing on one leg, with the head tucked beneath the wing, and in this attitude many feathered folk sleep so soundly that only violence can awaken them. When asleep, pheasants and pigeons, over-confident of their immunity from attack, are quite oblivious to any amount of noise arising from the ground, and fall frequently victims to the poacher's air-gun. That remarkable inhabitant of the Zoo's bird house, the Australian frogmouth, sleeps so soundly by day that he can be lifted from his perch and removed to another cage before he realizes that he has moved house. Very different is the sleep

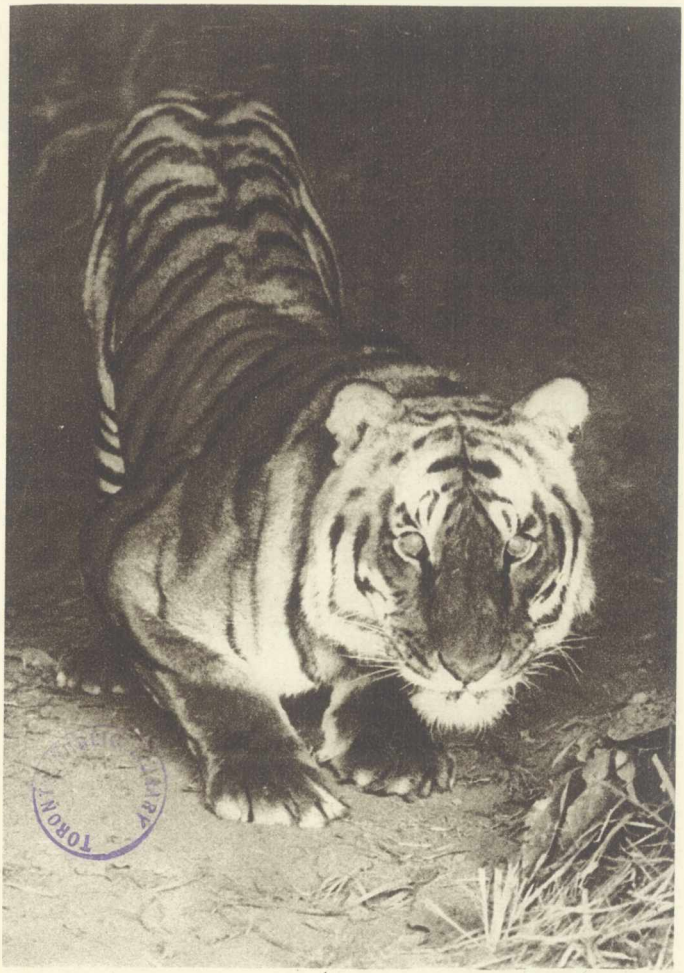
of creatures used to taking their rest in open or exposed country. The incident of the famous geese that saved Rome may be accepted as something more than a mere legend, for the goose's ear-bones, and indeed the whole surface of its skull, are extraordinarily sensitive to vibrations. Such responsiveness to the quivering air waves must be of enormous value to creatures liable to attack from any quarter in a landscape that leaves them within full sight of a hungry foe. Even though sentinels may be placed to act as alarm clocks, as in the case of many gregarious plain-dwellers, from ducks and cranes to deer and sea-lions, each individual sleeper sleeps with " one eye open ", as the saying goes, and quite a number of mammals have acquired the avian trick of sleeping in a standing position. The domestic horse in the security of its stable largely sleeps erect, clinging to the ways of his wild forbears, who might expect a call from such night visitors as wolves or lions, and would pay for the luxury of a sprawl with their lives. The elephant's huge bulk might be expected to withstand calmly anything less deadly than a high-velocity bullet. Yet even at the Zoo he permits himself to lie at ease for rarely more than a couple of hours at a stretch. An hour on the left side, then an hour on the right, and the rest of the time is spent in a ceaseless rocking or shuffling—two paces to the front, then two paces to the rear, like some vast pendulum.

Hibernation—that state of torpor in which many creatures pass the winter—is not to be confused with true sleep, for it represents a mere slowing down of the general circulation accompanied by a state of coma, and is in no way analogous to the ordinary slumber that daily claims its due.

It has been repeatedly asserted that fish never sleep, a statement which anyone privileged to have visited the Zoo Aquarium at night is in a position to refute. Some fish certainly never appear to rest, but the majority, as soon as it gets dark, sink to the bottom of their tanks and fall asleep in an upright position. The wrasses not only seek the floor, but lie flat on their sides, a habit which certain other somnolent individuals adopt during the daytime, and which prompts tiresome if well-meaning visitors to inform the keeper that " a fish is dead ".

One extraordinary instance of indifference to rest is provided by the porpoise, it having been ascertained that this animal never actually passes into that complete state of inertia we associate with " sleep ". A few captive porpoises have been kept in good health for the greater part of a year, but never have these animals been caught napping. A specimen that lived some years ago in the Brighton Aquarium became quite tame, taking fish from the hand. He swam about 10,000 miles in the course of his four months' sojourn in the aquarium, but though closely watched by night as well as by day

for several months, he was never detected in any act more suggestive of somnolence than a nightly slowing down from his customary six to three and half knots.



[Photo by F. W. Champion, India Forest Service (author of "With a Tiger in Camera Land").]

The Tiger takes a Midnight Prowl

PLATE XIV

UNNATURAL HISTORY

NOTHING is harder to kill than a false rumour—provided it appeals sufficiently to the imagination. Even when the truth is proclaimed, a large proportion of the populace—not necessarily confined to the least educated—cling fervently to the false story in preference to the true. Natural history "fairy tales" are still given credence even in these days of Nature films, lectures, museums and other forms of "higher education".

The nurse is often responsible for such tales. The precious knowledge is instilled into the young and plastic mind and lingers for a lifetime unless ousted by scientific study. The late Sir Ray Lankester recounted how as a small child he spent all his weekly coppers on salt, with which he sought to capture sparrows. Unlike most children, however, the scientist-to-be did not tire of the business after a short time, and argued that his lack of success was due probably to the comparatively small amount of salt employed. He consequently conceived the luminous idea of an attack on a grand scale on the colony of ducks that inhabited a small creek adjoining the St. James's Park lake. "If", he argued (at the age of six), "there is any truth in the story

recounted by my elders, the ducks with their tails covered with salt are certain to be mine." Money that might have been expended on mere sweets or toys was invested in pound after pound of kitchen salt that was hurled with the full strength of a chubby arm over the ducks attracted to within reach by offers of bread. That ended young Lankester's dutiful acceptance of the wisdom of his elders. From thence on he took for his motto that of the Royal Society, "*Nullius in Verba*".

No class of animals has been and still is the victim of such persistent fallacies as that of the Reptiles. Their glistening scales and sinuous movements lend themselves to extravagant rumours. Only by actual contact can one persuade the average person that a reptile is never "slimy"—slime being the monopoly of most frogs, salamanders and fishes. Again, the man who would blush to be accused of an ignorance of the classics is quite confident that all snakes possess the hypnotic eye and that all are poisonous. Years of experiments in a number of zoos and laboratories have utterly disproved these cherished beliefs. In the days when captive snakes were always fed on living food, rats and mice were to be observed in the reptile houses of most zoos cheerfully sporting over, or enjoying a meal on the back of, an exhibit capable of killing every visitor in the house. In dealing with a snake of any kind, the accepted method is to cut it into pieces with

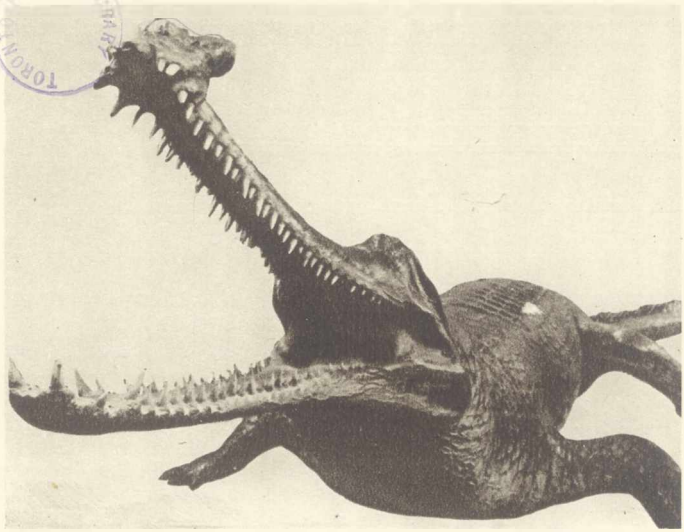
a spade or chopper. In spite of our educationists' best efforts, not one person in a thousand can distinguish our common British grass snake from the poisonous adder, though both species, in spite of much needless slaughter, are abundant throughout the major portion of these islands. Equally diehard is the belief that a snake stings with its forked tongue, an organ used only as a man uses his stick. Amusement was caused to the author by a country parson who some years ago wrote to him requesting the loan of a harmless snake in order that he might show his congregation " the creature responsible for original sin ". This holy man had at any rate no fear of a snake—provided it was harmless—but was well aware of its effect upon his congregation. In remote country districts the less enlightened still suspect that the toad carries a jewel in its head, and that a newt has a habit of spitting fire, whilst many comparatively intelligent persons believe that a frog or toad can live for an indefinite period walled up in solid rock. Experience has proved that about fifteen months is the limit of a frog or toad's fasting capacity. These incarcerated amphibians found their way into the chamber in the rock through a fissure when quite small, immediately after having transformed from the tadpole stage, and survived as a result of being visited by insects that penetrated through the same entrance. It has often been affirmed that the adder swallows

her young on the approach of danger. The phenomenon may be explained by the fact that, when disturbed, the young escape into the herbage with such speed that the spectator, who is the victim of an optical illusion, imagines that they have taken refuge down the throat of their mother. On the female being opened she is found to contain fully developed and active young, who are, however, but part of a brood about to be expelled. Many years ago the *Field* newspaper offered a reward to anyone producing conclusive evidence that a viper swallowed her young. The reward, however, was never claimed. Frogs and small fish are in remote districts believed to appear occasionally in vast numbers out of the sky as accompaniments of an unusually heavy rainfall. This variant of raining " cats and dogs " is, however, not quite so unjustified as far more popular beliefs, as small fish have been known to be sucked up in tornadoes and deposited—" as from the sky "—at a considerable distance from their home waters. Small frogs and toads may be called forth by sudden rain and appear amongst the dancing drops as though from the heavens rather than from subterranean retreats.

Some popular names pay tribute to ancient superstitions which no longer enjoy credence even amongst the least sophisticated. The common goose barnacle was a few hundred years ago believed to grow on water-side trees. The thin,

(Neville Kingston)

The Slow Loris, which in its native land is believed to be the possessor of the "evil eye"



(Clarke & Hyde)

The Gharial, a lurker in Indian Rivers

PLATE XV

flat shells were supposed to open to release small birds which later developed into the well-known barnacle goose, a common winter visitor to our western coasts. The story of the goose's fish origin was probably encouraged in order that the bird might be eaten on fast days and thus supplement the meagre Lenten fare.

THE EYE, NOSE AND EAR

The commonplaces of life—the everyday facts, accepted without question as a matter of course—are often replete with romance. Amongst them are the all-important faculties of sight, smell and hearing. Eyes have been described as the windows of the human soul, and this is partly true when applied to some of the lower animals. The eye anticipated the camera, which compared to it is a cumbrous heap of mechanism. It must be admitted, however, that the camera has grown to its present condition in a century, whilst the best eyes have been millions of years in the making. The first eyes were merely organs more or less sensitive to light and are illustrated in certain of those minute creatures that are only just animals and still have much in common with plants. It is very doubtful whether such lowly inhabitants of the ocean as sea anemones or star-fishes see as we understand the term, though they are compensated for these shortcomings by having other senses more highly developed. In the molluscs, however, the eye is well established as a clearly-defined organ with a cornea, a lens, a

retina and an optic nerve, and is, in fact, in some cases, remarkably like our own.

The ways in which eyes are "worn" are various. In the bivalves such as the scallop, the "eyes", a hundred or more, are ranged in two rows along the sides of the animal's body. Some zoologists regard these as merely modified tentacles and consider the true eyes to be represented by certain small but well-developed organs in the gills. Some of the higher molluscs—the whelks and pond snails—carry the eyes at the base of the horns, or poised at the tips of the horns, as in certain snails. The eye-tipped horn of the snail may be compared to the finger of a glove pulled inwards. At threat of attack or collision with a hard surface, it is instinctively drawn inwards and out of harm. The most highly-specialized molluscs, the octopods and cuttlefish, have two eyes only, set one on either side of the head, and they may be of enormous development. The eye of the giant squid of the Newfoundland Banks is a foot across, or one-twentieth the length of the animal's body, whilst the average man's eye is less than one-seventieth of his height. In the higher invertebrates and all vertebrates of modern times the eyes are found in pairs only. Sometimes they are situated at the side of the head, sometimes in front. Frequently they are set near the top, and not infrequently they are balanced upon stalks. In most

flat-fish and other fish that lie buried in sand the eyes are raised above the rest of the head, and many crabs have the eyes mounted on stalks one and a half inches long. A recently-discovered sea fish has eye-stalks nearly half the length of its body, whilst those of some deep-sea cuttlefish are almost as long. The reason for the optical development of the cuttlefish is probably the fact that the creature, being furnished with numerous light organs, would be hampered by the glare of its own headlights if its eyes were set close to the body. But being, as they are, set on long movable stalks outside the " dazzle area ", they quickly pick out creatures attracted by the phosphorescent lure, enabling the sucker-clad tentacles to seize the prey. It is worth noting that most of the lower vertebrates have eyes that work independently, and the advantages are obvious. The chameleon is apparently the highest creature in the scale of life to enjoy this independent action, but many sand-burrowing fish, notably the blennies, gobies, weevers and angler fishes have the eyes raised to a noticeable extent. In the common star-gazer of the Mediterranean, entitled the heavenward-looking fish by the ancients, the eyes protrude to a remarkable extent. Their owner does not rely wholly upon chance fishes and other prey passing overhead for its sustenance, being provided with a waving filament which acts as a lure.

The eye set upon the top of the skull is usually an indication of aquatic life. It is a feature common to crocodiles and aquatic frogs and toads, and not a few mammals. Especially is it noticeable in the otter and hippopotamus, the eyes in the former being so placed as to command a clear view of the water above when skating over the stream bed in pursuit of a fast-moving fish. The hippo, like the crocodile and frog, is able to bask on the surface of the water and at the same time keep a sharp look-out for approaching trouble. One creature at least has solved the problem of seeing above and below water simultaneously. This is the so-called four-eyed fish of Tropical America, which has two distinct pupils to each bulging eye, the upper pupil being specially adapted for vision above water. The fish generally swims on the surface, and so commands a clear view of two worlds simultaneously. Actually the eye is but one lens and retina, but the iris is divided so as to present two pupils, the one above the other.

The eye, as we have seen, is by no means always proportionate to the size of the wearer. Though enormous in the giant squid, it is very small in the largest-known mammals, such as the whale and the elephant, and is little bigger in the largest-known snakes and crocodiles. In many comparatively small nocturnal animals it reaches a huge size.

The homology of the eye and the camera is very

apparent when we examine the diaphragm which contracts or expands to admit a greater or less amount of light as required. In most reptiles and all birds this takes the form of a number of bony plates which produce a contrivance known as the " sclerotic ring ". Such a mechanism is reproduced by the ordinary camera, the bony plates being represented by flat pieces of metal. A bird's powers of sight might be accurately gauged by the size of the diaphragm. In the eagle owl, for instance, the ring is one and a half inches across and about one inch high—a huge size when we consider that the entire skull is no bigger than a tennis ball. The extinct fish-lizard Ichthyosaurus had a ring to each eye that measured fifteen inches across.

The elevated position of the eyes as seen in aquatic creatures is exactly reversed in animals hunting their prey from the air. In most of the birds of prey the eye is protected from distracting top-light by a roof of bone that, coupled with a heavy eyelash, effectually directs the gaze downwards. Many creatures habitually exposed to fierce sunlight have eyelashes greatly developed, and this is seen in the giraffe, ostrich, the hornbill, the secretary bird, etc. Sometimes in addition to the normal eyelid there is an additional transparent one which may be drawn right over the eye. This is very apparent in the crocodiles and alligators, which can look out upon the world of waters from behind

a protective window. In the little mud-skipper, described in another chapter, and some other fishes there is a very noticeable pit below and behind the eye and into this the organ is rolled for lubrication, giving the animal an appearance of winking.

Most animals take care of their eyes by washing and brushing them, certain rodents having special and peculiar brushes on the upper surfaces of their fore-feet. These are able to clear the eyes of the sand acquired during their subterranean tunnelling.

Insects' eyes are worthy of special notice, since they are amongst the most beautiful and complex of living structures. Often they fairly monopolize the head. Under the microscope they have the appearance of a vast honeycomb, each cell representing a cornea capable of receiving separate images. The dragon-fly has 20,000 such eyes arranged in two masses, whilst some of the hawk moths have as many as 30,000. Some night flies have, in addition to the two large eye clusters usual in insects, auxiliary eyes in the front of the head.

It was suggested at the beginning of this chapter that the eye was an indicator of character amongst animals, no less than with our own species. Unfortunately, however, the index may not always be correct, and many blameless creatures have acquired bad names and in the past suffered

much unmerited persecution solely on account of their eyes. The cat and owl in this country are noteworthy examples; but why the goat with its sinister-looking horizontal pupil should have escaped condemnation is a mystery. In the past, however, most nocturnal animals were deemed capable of any malpractice and linked inseparably with witches and demons. As a result they were held in general abhorrence by all God-fearing and respectable citizens. Perhaps no animal has gained such a reputation on the strength of its eyes as the slow loris of the Malay Peninsula. It has influenced every phase of public and private life and from the earliest times every form of crime has been laid at the door of this diminutive and harmless wanderer of the forest tree-tops. Its eyes are used in the manufacture of a variety of medicines, in which connection the eyes of many of our native animals, both wild and domestic, were similarly in demand little more than a century ago.

Certain animals have elected to live in perpetual darkness and as a result have almost completely and in some cases completely lost the power of sight. The sightless eyes have shrunk from disuse or at the best lingered as mere vestiges. This applies to many typical cave beetles and crustaceans in which there remains no vestige of a cornea. Many fish, and the newt-like amphibian, the pro-

(*Neville Kingston*)

Long-eared Foxes

(*Neville Kingston*)

Orang-Utan

PLATE XVI

teus, which live in complete darkness are blind, though, contrary to what one might expect, a proportion of the inhabitants of the deep seas have functional eyes, the result no doubt of the phosphorescent illumination which must be present always in varying quantities. Though certain zoologists support the theory that blind fishes and insects have acquired their blindness rather from selection than by disuse, the latter theory appears to be more worthy of support. Most of the totally blind fishes live in the subterranean waters of Kentucky, Virginia. One is a native of the Congo. The caverns of Kentucky are abundantly supplied with waterways, lakes, rivers and even waterfalls, and in these abound a species of fish which is flesh-coloured and has its sightless eyes embedded beneath the skin. It is exceedingly sensitive to touch and sound, but if no noise is made may easily be taken by the hand when it feeds, as it usually does, at the surface of the water. Most of the blind animals are compensated by having their other senses very highly developed. Thus the blind fish from the Thysville cave in the lower Congo, the only fresh-water blind fish in the Old World, has its entire surface covered with hypersensitive tactile organs. Indeed, the bulk of blind fishes can probably call to one another by sounds produced by the vibration of their air-bladders, the waves thus created being picked up by the network of

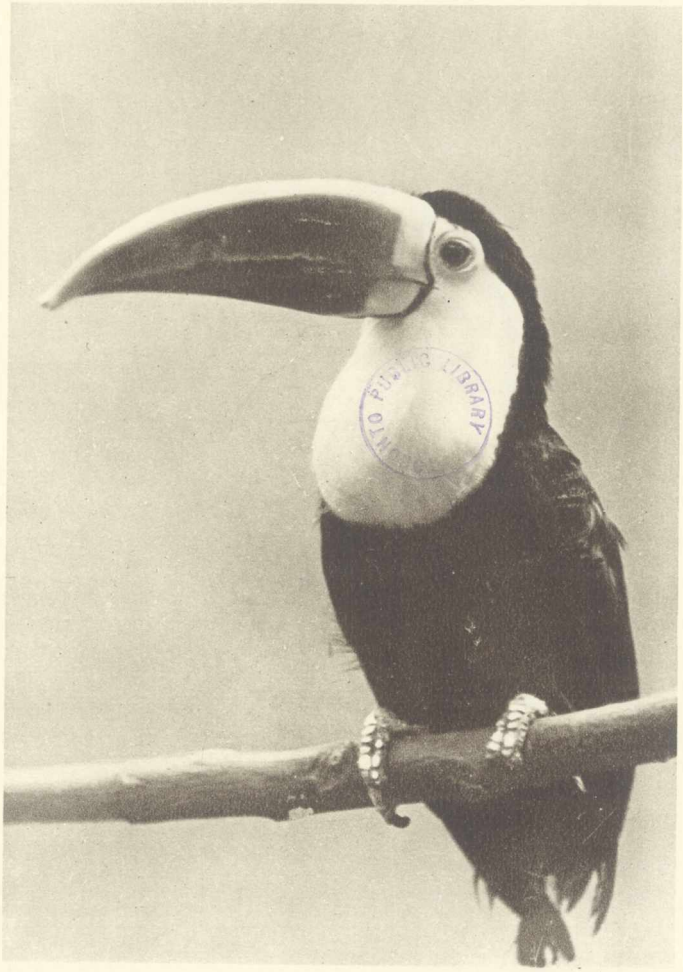
receivers covering every portion of their skin. It is interesting to note that when in the infantile state many cave fishes and the blind newt *Proteus* have fairly well-developed eyes, the organs of sight becoming increasingly atrophied as the fish approaches maturity.

We have already mentioned the fact that animals in which the optic apparatus is lacking or deformed are compensated by other senses such as those of the nose and ear. The faculty of smelling, it must be confessed, is one of the neglected senses as regards the human race, but what Man lacks himself he sets great store by in the lower animals. Every huntsman is careful to get to windward of his quarry, knowing that the majority of animals live or preserve their lives largely by a highly-developed sense of smell. The olfactory nerve communicates with a well-defined lobe of the frontal brain, and records at once every odour. Dogs have been bred for their sense of smell from the earliest times, not that this sense, even in the most astute bloodhounds, is always infallible. There was an instance not long ago of a housebreaker who—it appeared later—had smeared his boots with creosote. The robbery had been prefaced by a murder, and bloodhounds were put on the criminal's track. The dogs lead the law a weary dance for many miles, and finally brought

them to a yard filled with drums of the coal-tar preservative. The creosote had proved an effective "red herring". An animal's sense of smell may usually be pretty accurately gauged by the development of its nose. A big nose generally indicates a keen sense of smell. Pigs more than dogs are popular as truffle hunters and are in great demand for this work in Picardy, where the educated porker is rewarded at judicious intervals for his labour with fragments of the treasured fungus. Elephants have a very keen sense of smell. Their forerunners probably had but a short trunk like that of a tapir, but the nose increased with use. Many, however, whilst growing to huge proportions, never carried their trunks beyond the modest tapir stage of development. About the time that the mammoth came into being trunks were immensely popular, not only with giant hogs and rhinoceros-like animals, but even with sheep and camels. The power of a trunk as seen in the elephant is enormous, and with it the animal can lift half a ton with ease or hurl a man twenty yards. Though immensely strong, a trunk has its own peculiar dangers, and its care is a matter of constant vigilance and anxiety to the owner. If threatened by a tiger it is always curled up over the forehead. Still more to be dreaded by the elephant is the common mouse, whose "holing instinct" may lead him to seek refuge in one or other of the large nostrils.

The star-nosed mole with its snout surrounded by a coronet of delicate papillæ, and the ant-eater with its large sensitive nostrils placed at the end of a nose quite as long proportionately as the elephant's, have very keen senses of smell. The most finely-tuned olfactory apparatus is to be found amongst the deer. On dissection we find in the nose cavity two bones, each the size and shape of an almond, of honeycomb-like structure and richly supplied with blood vessels and nerves, and it is this wonderful apparatus that makes stalking the fine art that it is and gives the deer a long start of the swiftest pursuer.

Many are the changes rung upon the nose to meet special requirements. In aquatic mammals such as the otter, seal and hippo the nostrils are placed like the eyes on the upper surface of the head, whilst in desert animals they are surrounded by dust-straining hairs. The saiga antelope is exposed to constant dust storms which would choke the average nose. Dust, however, leaves the saiga unmoved, for its nasal apparatus is enlarged to an enormous extent with the nostrils pointing downwards. This grotesque nose, which suggests to the ribald mind a " second best " emergence from a prize fight, can be wrinkled up at will and the nasal passage so completely closed that scarcely a particle of sand finds its way to the upper regions or the throat. The " nose decorative " is in great



(*Neville Kingston*)

The Large-billed Toucan

PLATE XVII

evidence amongst many of the higher vertebrates. The white and blue nosed guenon monkeys are striking examples, and the bibulous tints of the baboons never fail to appeal to the risibility of Zoo visitors. The nose of the proboscis monkey is a thing to marvel at. Beginning as a mere button, it grows and grows (if on a male countenance) until it completely eclipses the familiar organ of Mr. Punch. It is said of the male of this little-known simian that it protects its precious nose with one hand when travelling at any speed through the tree-tops.

The animals of several species of seal have enormously-developed nasal organs, those of the sea-elephant and hardy seal being notable examples. The former can inflate its nose with air until it almost equals the rest of the head in size.

Birds, always more ornamental than the earth-bound mammals, have produced some wonderful examples of *le nez decoratif*. The bills of many toucans and hornbills rival the prettiest butterfly wings, and our own puffin can under the influence of the gentle passion display an enlarged bill that is saved from being grotesque by a pattern of stripes at once arresting and harmonious. Still more remarkable is the case of the pelican, for in the mating season the male beak is surmounted by a crest of horn four inches high, which is shed when courtship is over.

The sense of smell is so inseparably linked with the nose that it is difficult to associate it with any other organs. Insects, however, are without noses in the human sense, yet possess a very keen appreciation of odours. It is now generally recognized that they smell entirely by means of their antennæ, delicate feelers without which their world of odours, pleasant and otherwise, would remain closed.

The precise order in which the various senses came into being must be for all time a matter of conjecture, but it is fairly certain that the sense of touch was enjoyed by a large number of widely-different creatures—plant as well as animal—long before what is loosely described as hearing. The sense of touch was in fact evolved countless ages before even the simplest form of ear—a structure enjoyed only by the vertebrates—was created. It is quite possible even amongst our own species to enjoy sound after the hearing apparatus is partially or even totally destroyed ; thus Beethoven conceived some of his greatest masterpieces long after he became deaf. Even amongst insects which are without ears there is a very fair appreciation of rhythm. This is obvious when we consider the day- and night-long concerts of grasshoppers and crickets, it being only reasonable to suppose that no creature would put up an eight-hour non-

stop instrumental effort unless confident of some sort of audience. The vibrations are picked up in the insect world by an apparatus that when first conceived foreshadowed one of the greatest forces of our complex life to-day—the wireless—and the reception is believed to be achieved by most insects through the antennæ, which are at once aerial and receiving sets. Recently it has been ascertained that the groups of hairs upon the limbs of crabs and lobsters are furnished with nerves connected with the main nervous system and so-called brain, and experiments have proved that without these hairs the creatures are oblivious to the activities of an under-water buzzer, but that with them they readily respond to the stimulus. The crawfish may even have an insect-like appreciation of music, being provided with a species of stridulatory apparatus that when in action is capable of imitating some of the deeper notes of a double bass.

Our own highly-refined ears are scarcely consistent with our capacity for enjoying sounds, since the actual sounding-board or outer ear is of medium size and of simple workmanship. Through disuse many of the surrounding muscles have ceased to function at all, and as a result the whole head must be turned to gather sounds not projected directly upon the tympanum.

In animals where quick reception is a life and death matter the ears are of large size and highly

mobile. The deer, sheep, cattle, kangaroo, rhinoceros, pig, hare and rabbit are but a few cases that at once suggest themselves. The elephant may hold the record as regards " acreage ", but the largest ears, relatively speaking, belong to the little galago that haunts the great African forests. The immense and very delicate ears of this half-monkey have the unique peculiarity that they are collapsible and can be folded up at their owner's will. In detecting sounds the ear may be augmented by strange fleshy outgrowths, as in the bat. Spallanzoni found that temporarily blinded bats when liberated in a room traversed by a complex meshwork of cotton threads never once collided with the threads though flying at a rate of some twenty miles an hour.

There is great uniformity in the ears of semi-aquatic mammals. Thus in the sea-lion, the otter and the hippopotamus, the organ is reduced to a minimum. In the seals, dugongs and whales there is no external ear at all, the presence of the seat of hearing being represented by a tiny orifice.

The avian ear is seldom detected by a noticeable external feature, although it is readily apparent in bare-headed birds such as ostriches and ground hornbills. Usually it is covered by the feathers, and is relatively uniform in size and structure throughout the class. The night-flying owls are exceptions, since their ears are of immense size and covered

by feathery flaps which can be slightly raised. With these the bird is able to appreciate the slightest sounds.

The ears of birds and some reptiles have much in common. Snakes are, however, without external ears of any kind whatever, their internal auditory bones and nerves being in a state of degeneracy. Experiments at the Zoo have failed to arouse the slightest interest amongst serpents in any kind of music, and the droning pipe play of the professional charmer is merely a piece of showmanship which impresses the audience whilst leaving the reptile angry but unappreciative. So far as a snake can be said to hear at all it hears with its tongue, which is remarkably sensitive to the slightest vibration, quite apart from its more general use as a feeler.

Controversy rages over the question—"Can fishes actually hear?" All the bony fishes have certainly a very well-defined structure known as the auditory apparatus, but just how far this is a receiving set and not a species of spirit level enabling the fish to keep its correct balance is still a debatable point. The writer's experience is that fish do not respond readily to vibrations, only reacting to violent shocks, the ear being concerned merely with a sense of equilibrium and direction, which is one of its functions in ourselves. In some aquaria an attendant blows a whistle at feeding

time and the exhibits immediately evince the liveliest expectation. The real cause of the sudden liveliness, however, is the food pail which, hidden from the public, is clearly visible to the fish gazing upwards at the service gallery above.

STOCKING THE ZOO

The capture of wild animals alive for purposes of scientific study or public exhibition has ever been a theme beloved of the sensationalist, and has usually in the past been associated with a good deal of cruelty. Indeed, the wholesale destruction of " mother " animals in order that their offspring might safely be taken alive has fortunately led to drastic legislation. Only this and farming can save much of the world's wild life from extinction. A vast number of wild animals are farmed on a wholesale scale for food or clothing, and the list, which includes alligators, Arctic foxes, wolves, ostriches, etc., grows every day. A considerable number of beasts, however, are still outside the range of cultivation, and this necessitates capture in their native deserts, prairies, or jungles. The taking of adult apes, which is usually achieved by means of pitfalls, is to be deprecated. A few years ago an enormous number of full-grown orangs were shipped to Europe from Sumatra, but they are likely to become scarcer every year since the tightening of restrictions by the Dutch authorities at the instance of our Zoological Society. The Zoo has long ago forsworn the exhibition of gorillas owing to their

temperamental unsuitability for exhibition and the cruelty involved in their capture. Monkeys lower in the scale can, however, be captured in bulk without bloodshed or producing a shock to the system. The hundred-odd Zoo baboons, for instance, have become quite acclimatized and occasionally bring up their families on the Monkey Hill. Their captors constructed scores of huts with trap-doors camouflaged with bushes, and these were baited with various delicacies dear to the simian heart. The baboons, once inside, were retained by the sudden dropping of the doors. The animals were then lured into cases and after a long journey by camel, steamer and lorry eventually found themselves in their present quarters in Regent's Park.

The elephant possibly heads the list of animals that are dangerous to capture, whether taken in pitfalls, run down by relays of tame elephants, or rounded up by the wholesale method of the stockade. The elephant drive has been immortalized by Kipling and magnificently filmed in " Chang ". A special department of the Indian Civil Service is devoted to the periodical capture of elephants for draught services, since captive elephants rarely breed even in their own country. An elephant stockade is really a gigantic edition of the " duck tunnel " still seen in Norfolk. Many weeks are spent on its formation, the whole being built of the strongest

timber and camouflaged with leafy boughs. Meantime scouts have located the herd and soon hundreds of men are employed night and day for weeks together in a vast surrounding movement. The beaters, moving behind screens of brushwood, slowly and insidiously drive the herd, consisting of possibly a hundred elephants, towards the entrance of the stockade. Torches, drums and lung power give the final push that sends the herd, a roaring torrent of panic-stricken monsters, into the tunnel, and as the last crosses the threshold a gigantic hidden portcullis falls with a crash behind it. It is impossible to give any adequate idea of the uproar and mellay that ensues when some days later skilled mahouts mounted upon trained elephants enter the enclosure and the work of roping the wild animals begins. If all goes well a few months of good food and disciplinary treatment will convert the wild animals into tame ones. But a hundred possibilities of disaster attend the business before the happy ending is arrived at. There is always a chance of the herd bolting back and breaking through the line of beaters, and a certain number of human lives are annually added to the heavy price which must be paid for the successful drives.

Hippo and rhino can only be taken when young, and the same applies to the larger carnivores, which when taken adult seldom thrive or become tame-

able. The capture of birds presents little difficulty, whether with traps, bird lime, nets, or other devices. The majority become very tame and live to a ripe old age under captive conditions. The large flightless species—ostriches, kiwis and cassowaries, are usually run down by hunters mounted on swift horses and lassooed or taken with a bola—a rope having a ball at each end which when thrown with skill twines itself round the bird's legs and brings it to the ground. Bolas have been found with the remains of prehistoric man—an interesting sidelight on the great antiquity of a weapon still popular in many parts of the world. Modern equipment, ranging from aeroplanes to wireless, has made the task of capturing wild animals an easier one than it was in ancient days, yet one is tempted to question whether the general principles employed have altered much. The Romans must have been expert animal collectors, as thousands of large carnivora were taken alive annually to be slaughtered in the arenas. Many of the Emperors allowed leopards to wander at liberty in their palaces, and Heliogabalus, we are told, made a dramatic entry into Rome in a chariot drawn by four tigers. The exact manner in which these and other creatures were caught and tamed none can say, but it is certain that they did not enjoy the treatment which to-day is practised by all civilized collectors.

The taking of reptiles alive demands a good deal of subtlety. Lizards, for example, have a way of leaving their tails behind them when seized by these appendages, and many, in common with most snakes, can move with lightning rapidity, making successful pursuit no easy matter. Many kinds of terrapins and the common alligator are farmed on a large scale, but the bigger snakes, especially the largest constrictors, must be taken in the wild. The giant twenty-five-feet-long pythons and anacondas are usually trapped by tethering carcasses of small deer where the snake is sure to find them. The reptile, having eaten, is gorged and helpless, and so easily falls to the efforts of a gang of natives, who under the collector's guidance pounce upon and box the snake before it can make any effective efforts at resistance.

Acquiring specimens for the Aquarium is a comparatively simple matter, the majority being captured in seine nets and submerged traps. Many fish can travel long distances, indeed indefinitely, provided the water in the travelling tank is thoroughly aerated and kept at the right temperature and gravity. Some, however, travel better than others. The Zoo sea-horses must be rushed to Regent's Park, and for some years past these very attractive exhibits have been brought to the Aquarium part of the way from their home in the southern Bay of Biscay by aeroplane in small

tanks aerated by means of a hand-pump. Many of the under-water Zoo's most popular inmates lie in waters too fraught with rocks to permit the use of nets. The strange flat lobsters from Madeira, which, unlike their less sophisticated northern cousins, refuse to enter lobster-pots, are taken by hand by native divers who descend into several fathoms of crystal-clear water in order to effect their capture.

FISH OUT OF WATER

It may come as a surprise to many to learn that to be a fish out of water—a phrase so frequently used to express a state of acute discomfort—is no truism. The majority of fish certainly suffer when out of the watery element, but there are a few that are by no means incommoded by finding themselves on "terra firma", and actually spend a considerable part of their lives ashore. A most entertaining member of the select community of piscine landlubbers is a member of the goby family popularly known as the mud-skipper, an inhabitant of river mouths of tropical Africa and the Far East. Not only does the creature enjoy promenading on the banks of the mud flats, but it actually climbs into the branches of trees. Mud-skippers, of which specimens have been exhibited in the Zoological Society's Aquarium, will feed in the water, but much prefer to take their meals on land. The creature will lie prone upon the bank and patiently wait for a fly or small crustacean. As soon as one appears within range the fish gives a sudden leap into the air and a catch is bagged. The mud-skipper is a champion long jumper, and when pursuing or pursued is able at a single leap to cover distances far exceeding its own length, the feat

being performed with the aid of its very muscular tail, which is bent forwards and then suddenly straightened out with lightning rapidity. When merely walking about the fish employs its broad breast-fins, which are developed into legs, being bent at an angle like an elbow-joint. The creature—a veritable beachcomber—has been described when startled to hop, skip or jump inland among the trees or on to the water, like a flat stone set skimming by a schoolboy when playing at ducks and drakes. The mud-skipper is a grotesque-looking animal, its huge bulging, goggle eyes, which can be turned in every direction like those of the chameleon, being situated quite close together on the top of the head. Whilst one eye is watching for the approach of a fly, the other is carefully on the look-out for an approaching enemy. The creature's tail is richly supplied with blood-vessels, and plays an important part as an organ of respiration. Professor Hickson, who has investigated the functions of the mud-skipper's tail, states: "It would seem at first sight a very extraordinary thing that a fish should have become so modified by a change of habit as to have transferred the chief part of its respiratory functions from its gills to its tail. It is a well-known and generally recognized fact, however, that in the frogs, toads, newts and salamanders, the skin plays an important part as an organ of respiration, and it is quite possible that the thin skin between the fin rays of

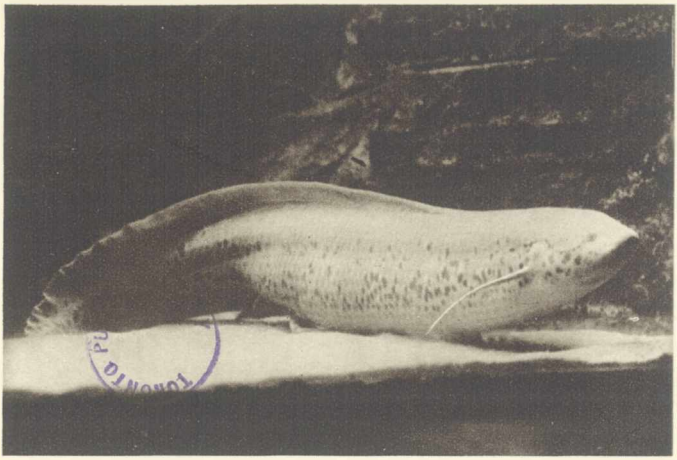
many fishes also acts as an accessory to the gills. If this is proved to be the case, we must look upon the tail of the mud-skipper as an example of an organ discharging a function which is performed in a lesser degree by the tails of many, if not all, fishes."

The climbing perch of the estuaries and rivers of India, Ceylon and the Malay Archipelago is also addicted to walking about on land, and has been found at considerable distances from the water. To the Malays it is known by the name of "*undi-colli*", which signifies "tree-climber", and they assert that it habitually ascends coconut palms in order to drink the milk. There is good reason to doubt some of the native accounts of the fish's scansorial powers, but the fact remains that a European has observed it in a cavity at a height of seven feet in the stem of a palm-tree. The climbing perch, unlike the mud-skipper, although not much inconvenienced by finding itself "high and dry", prefers a watery element, and it is only during the dry season, when the rivers and lakes it habitually frequents dry up, that it is found on land. Then it drags itself along by means of its breast fins and gill plates, which are armed with strong spines and act as climbing irons. The apparatus which enables this fish to exist out of water takes the form of a peculiar organ on each side of the head in which water can be retained for considerable periods. The climbing perch in the Zoo Aquarium, although given every opportunity for

leaving their watery environment, have never made any attempt to do so.

Closely allied to the climbing perch is the snake-headed fish of Southern Asia, which, during the dry season, when there is danger of the water disappearing from the ponds it inhabits, buries itself in the mud.

Perhaps the most remarkable of living fish is the eel-shaped lung-fish of tropical Africa and South America—so-called from the fact that the air bladder is converted into a functional lung. The fish is thus endowed with a dual means of respiration, breathing by the aid of gills when in the water, but falling back upon the lung-like air bladder during the dry season. Lung-fish are the connecting links between the true fishes and the amphibians, and are survivors from a time when the world was populated by animals all of which have been extinct for millions of years. And yet to-day these remarkable creatures may be seen alive in the Zoo Aquarium. In the dry season the swamps and rivers in which the lung-fish live dry up, and when this condition occurs the fish digs into the still damp mud to a depth of about a foot and there coils up in a cocoon lined with hardened mucus secreted by the skin. The fish remains enclosed in a dry state until the next rainy season, when it is liberated and takes once more to an active existence under water. The aperture to the cocoon is closed by a perforated lid, the margins of which are pushed inwards for insertion between the lips of the fish, the



(*Neville Kingston*)

African Lung Fish

(*W. S. Berridge*)

Entrance to Cocoon of African Lung Fish

PLATE XVIII

air passing from the outside through these perforations directly into the mouth of the animal. In this position, breathing air by means of lungs, it remains for about half the year. The lung-fish during its incarceration is, of course, unable to take any food, and receives nutriment solely by the absorption of the fat stored up about its various organs. As soon as it leaves its prison chamber it becomes intent on reproducing its own kind, and sets about the building of an elaborate nest on the edge of a swamp, in which the eggs are deposited. On hatching, the young lung-fish, furnished with long external gills like those of newt larvæ, is provided with a sucking disc situated on the side of the head just below the mouth, and by means of this organ is able to attach itself to the sides of the nursery in which it is confined. The lung-fish exhibited in the Zoo Aquarium were received in the dry state in sun-baked blocks from Africa or South America, and were released from their temporary prisons by being soaked in warm water for some hours. Some few years ago the address labels on a barrel containing specimens of lung-fish shipped from a West African port to a private aquarium in Northamptonshire were found to be missing on their arrival in Liverpool. The barrels with the fish were therefore returned to the port of embarkation, where they were re-addressed. Eventually the fish arrived in Northamptonshire, none the worse for their protracted journey.

THE SPEED LIMIT

THE subjects of speed and the "speed limit" are forced upon our attention nowadays with somewhat wearisome persistence. Whilst the Press is stentoriously acclaiming the last hero that drove a car or 'plane at anything from 200 to 350 miles per hour, experts are busy devising mechanisms which shall reduce the record to the efforts of a mere toddler. It is therefore with some relief that one turns from the advance of the petrol-driven engine to the more leisurely speeding-up of Nature. Before the advent of steam she held the world's record for fast travel, and some of her greatest triumphs, though now made to look pitiful by the god of the machine, may still excite admiration. Amongst the swiftest animals—both of mushroom growth—are the greyhound and the horse. In the prehistoric past the ancestors of the latter were comparatively small, forest-haunting animals with three toes on each foot. By constant contact with the hard ground of open plains, however, they have reduced the toes to a single digit. It is not improbable that the modern greyhound, which is able to exceed the speed of sixty miles per hour, will follow in the horse's footsteps, and there are those

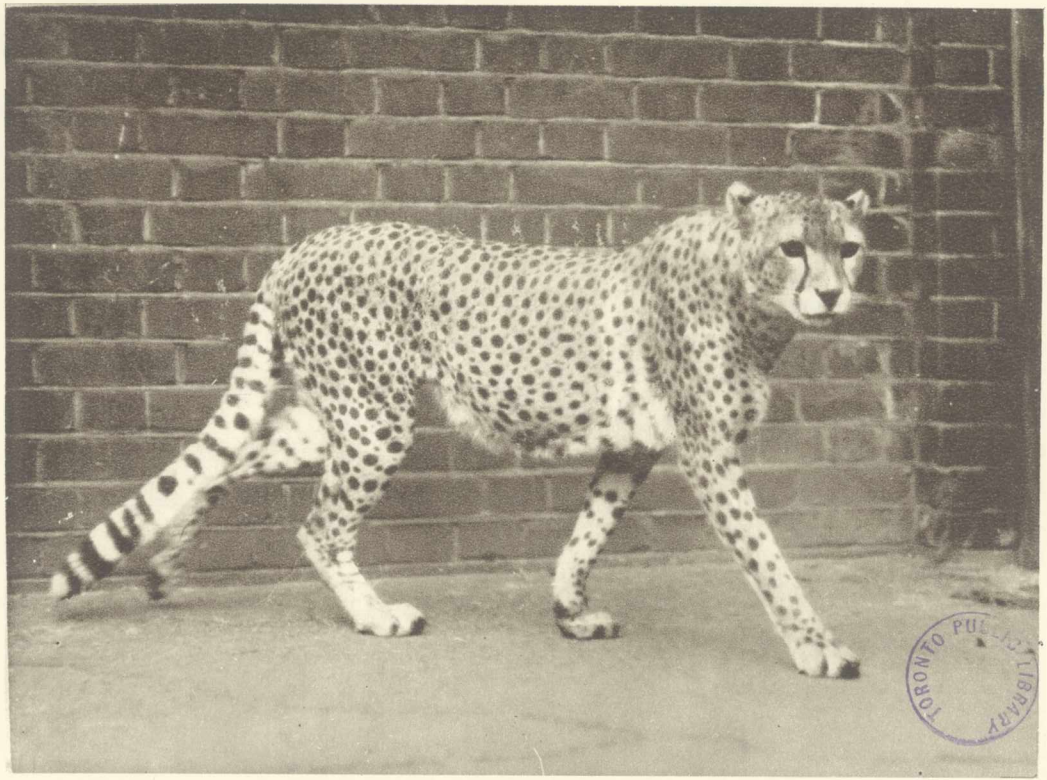
who contend that the racing dogs of the future will be animals with at the most three toes, using the middle one only for really swift progression. In the case of the racehorse and the greyhound, Nature's speeding-up has been greatly accelerated by man. Unaided by artificialities she has, however, produced some types which, like the stag, gazelle and ostrich, can tax the powers of both for a short distance. More wonderful is the panic speed of a hotly-pursued jerboa, which has been timed in South Africa to cover short distances at a speed of 40 miles per hour. Amongst the cat tribe, the cheetah, the caracal and the serval have for countless centuries been trained by natives to break speed records. All the fastest animals are very lightly built and are to be admired for their graceful form. A neat and compact symmetry of structure is essential, since speed depends chiefly upon offering the least resistance to the air. If a full-sized hippo could be magically endowed with the lightness of an antelope, it would still lose the race by reason of its shape.

The carrier pigeon has made a name as one of the speediest birds, and its pace can be estimated with a certain amount of certainty. The swallow, if it could be timed, would doubtless exceed a pigeon's speed—for short distances. If, however, we take endurance into account the lapwing claims the championship. Marked lapwings liberated at

Ullswater in Cumberland in May, 1926, were shot in Canada. Mr. H. F. Witherby has estimated that these birds travelled with the wind at quite 100 miles per hour, and that they therefore made a trans-Atlantic flight in little over twenty-four hours.

Even the slow-going world of the molluscs has its speed fiends, though to be sure their records are only impressive when the creatures' very sedentary natures are taken into account. The fastest snail known is one that answers to the scientific name of haliotis—the maker of the beautiful ear-shell which is found in the Channel Islands. This four-inches long snail travels at the dizzy speed of six yards a minute, or well over a quarter of a mile per hour. Let us picture, however, one increased to the dimensions of a tank, and some boastful car owners may look to their laurels. The octopus, most active of all the molluscs, can by "breathing heavily" travel backwards at the rate of nine feet per aspiration. On its annual migratory swims it may take forty breaths per minute, and exceed a speed of four miles per hour.

The clocking of winged insects is an almost impossible task. There is no question, however, that relatively some of the hawk moths, dragonflies and beetles easily out-fly the fastest 'plane, and one may roughly estimate their headlong



(Neville Kingston)

Cheetah, showing great length of stride

PLATE XIX

speed by the force with which they not infrequently crash. Many of the large tropical beetles have been known to meet lamp glasses, to their mutual undoing, and the common European cockchafer has been found on more than one occasion impaled upon barbed wire.

AQUARIUM LIFE

ALTHOUGH perfected in recent years, an aquarium is by no means an institution of modern growth. The ancient Romans spent enormous sums in the construction of canals from their villas to the sea-shore in order to lead fresh salt-water to the ponds and aquaria which existed in connection with their homes. No expense was spared to make these as attractive as possible, and in fact at one time an aquarium was an adjunct of every Roman nobleman's banqueting hall. Even before the time of the ancient Romans the Chinese and Japanese were in the habit of keeping ornamental fish for their edification and entertainment.

The Zoological Society's Aquarium, the largest and best equipped in the world, is situated underneath the Mappin Terraces, its rocky roof thus forming a playground for mountain sheep. It is over 400 feet in length and is divided into three large halls—a Fresh-water Hall, a Marine Hall, and a Tropical Hall. The tanks, over 100 in number, are illuminated by daylight or artificial sunlight lamps. They vary in size according to the boarders they are required to accommodate. Thus, young sharks, rays and turtles are made at home in tanks contain-

ing over 5,000 gallons of water ; whilst such midgets as the quarter-inch-long transparent Ghost Fish are kept in tanks with a thousandth part of that capacity.

Water, especially sea-water, unless continually aerated becomes stagnant in a very short time, and the Aquarium water is therefore kept in constant circulation. The sea-water is obtained from the Bay of Biscay, and is brought to the London Docks in the ballast tanks of large vessels. There the water is transferred to the barges that feed the large liners with drinking-water, and is brought up the Regent's Canal into the Zoo Gardens, where through long hoses it is pumped into the reservoirs excavated in the basement of the Aquarium. To obtain the necessary oxygenation and purification the water is pumped from the underground reservoir, which has 180,000-gallon capacity, to a much smaller reservoir situated inside the peak of one of the Mappin Terrace mountains. From this high-level storage tank it falls under pressure into the show aquaria, the overflow from these passing through sand filters before returning to the underground reservoir.

The capture of such wild animals as lions, tigers, bears, etc., brings to mind the picture of strong, silent men in white ducks, burning skies and streams of toiling natives. The capture of specimens for the Aquarium, however, often involves an output of quite as much daring and possibly even greater in-

genuity and endurance. Many of the fish now living in peace and plenty in the Tropical Hall were captured in the mosquito-infested tributaries of the Amazon, alive with giant anaconda snakes, razor-toothed barracudas, and electric eels. Even such ordinary fish as we are familiar with on the fishmonger's slab require very special attention, tanks, and machinery to ensure their arrival in good condition at the Regent's Park under-water zoo. Of course, the aeration and agitation of the water must be kept up in the travelling tanks from the time the fish are caught to the time they arrive at their new home. Such fish as dogfish, skate, cod, whiting, mullet, conger and most flat-fish are fairly good travellers ; but others, especially the pelagic forms, are not. Herrings, for instance, shed their scales and die off if taken out of the water for only a few seconds, and they therefore have to be captured and transferred to their travelling tanks under water.

The daily routine work of the Director of a large public aquarium, if sometimes uninspiring, is relieved by adventures, entertaining and otherwise. Let us take a typical morning. The keepers having vacuum-cleaned several acres of sea and river floor with suction pipes, a complete survey is made of every tank. A post-mortem examination is held on any dead specimens, whilst sick animals are isolated or treated as the case may be. Here a pike has taken to fighting his tank-mates, and a bunch of bachelor

fish are interfering with the nesting of a happily-married couple. These tanks must be rearranged. In Nature every time the clock ticks a fish engulfs ten of its fellows, a whelk settles down to kill an oyster, and a lobster tears its nearest and dearest limb from limb. The sea as it is might indeed satisfy the morbid lusts of a Nero. Such scenes of carnage are, however, not encouraged in the Aquarium. The tank survey finished, it is now time to deal with the correspondence. Ten gross of ideal fish food is offered at an absurd price; a lady's goldfish has just died—Why? A gentleman from the U.S.A. has invented an engine that will run a big aquarium at the rate of only five dollars a day. About this time the telephone rings. A lady is speaking, "My goldfish have just died. I keep them in a glass bowl, and give them ants' eggs regularly. I change the water every day, sometimes twice a day, and yet they all die." The chief engineer brings for inspection a scrap of iron piping, new last year, which is now hopelessly corroded. A keeper enters to say that one of the tanks has sprung a leak. Lunch-time comes within sight, but is forestalled by the visit of an influential Fellow of the Zoological Society, who wishes to know if there is a job in the Aquarium for a young nephew, a keen fisherman, who is at present unfortunately unemployed. The patience of the Aquarium staff is often tried severely. The best-tempered keeper grows tired of giving a suitable

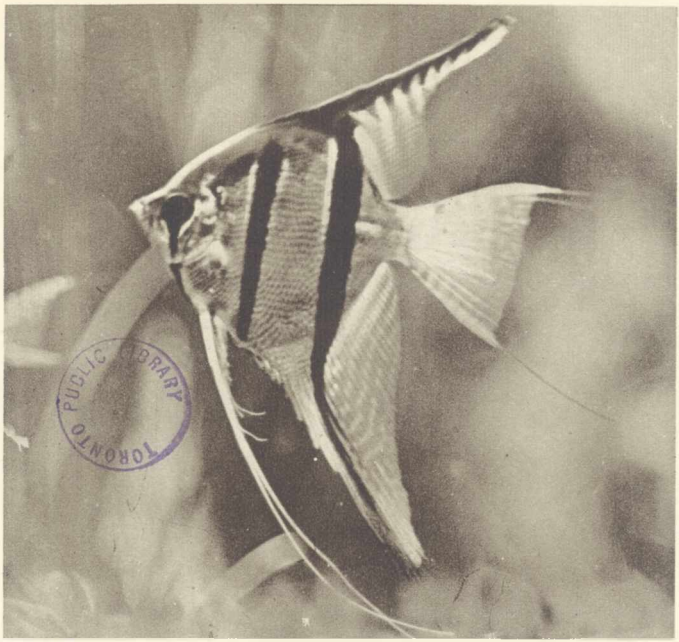
reply to " Where are the kippers kept ? " Again, the type of person who delights in scribbling his quite uninteresting name on any permanent structure is unhappily not yet dead. A scratch with a diamond ring on a one-and-a-quarter-inch-thick sheet of glass may cause a tank to burst. The larger the sheet of glass the less it can stand such tomfooleries. A burst may mean 5,000 gallons of water and two tons of gravel and a collection of assorted sea monsters being swept out through the Emergency Exit.

Considerable care must be exercised by keepers in handling Aquarium exhibits. Fish are not all they look, many hiding poisonous spines amongst their shining scales, whilst others can give a very good imitation of the American " chair ". One Zoo keeper not long ago went sick as the result of receiving 400 volts from an electric eel. Even the edible crab can be a source of danger. At a continental aquarium a boy set about cleaning out a tank single-handed. His task was to collect all the crabs from their rocky " kennels" and transfer them to a reserve tank. All went well until a large specimen gripped his fingers and pressing its legs against the walls of its " kennel " held him as in a vice. At this juncture a feed-pipe commenced to run. Slowly the tank filled, and the water had nearly reached his waist before his cries for help brought assistance.

Some of the most primitive inhabitants of the Aquarium are also the most beautiful as well as

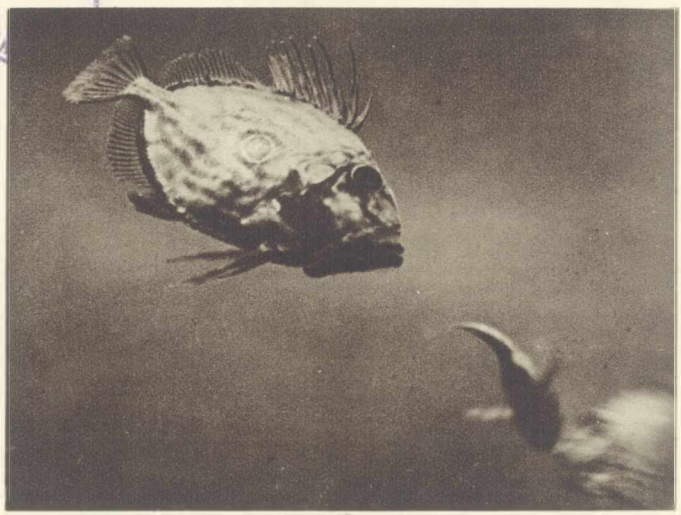
the most interesting, and no tank attracts greater attention than the one inhabited by those counterparts of terrestrial floors—the anemones and sea worms. The anemone has a cylindrical body with one end attached to some solid base, such as a rock, and the upper end with its brightly-tinted tentacles exposed to the world at large. When an anemone is hungry it expands and spreads out these tentacles, waving them about in the surrounding water until it finds a meal. They are voracious creatures, and will enjoy suitable animals several times their own size. In the event of suffering from indigestion as a result of a too substantial fare, they are able to make a clean sweep of everything by turning inside out, a faculty which the dyspeptic human might be inclined to envy. The name worm suggests something repellent, yet many of the marine specimens in the Aquarium are amongst the most æsthetic of the exhibits. Some are content merely to hide themselves in the sandy walls; others mix the sand with carbonate of lime, which they obtain from the seawater, converting the resulting mixture into serviceable dwellings. In some cases long tubes are formed of sand saturated with a glutinous secretion, and from these protrude tufts which are often gorgeously coloured, the tubes with the gill plumes fully extended resembling long-stalked delicate flowers. The resplendent peacock tube worm of our shores, which is adorned with long green and purple fila-

ments, erects sandy turrets of such strength and purpose as to form wave-resisting reefs on certain parts of our coast. Another sea worm, a native of the West Indies, exhibited at the time of writing in the Aquarium, in one of the tropical tanks, resembles a yellow crocus growing on a rock, the stem being formed of a tubular shell into which the whole " flower " is withdrawn. Such a marine bloom was transported across the Atlantic in a bath and eventually reached Regent's Park still clinging to a small piece of rock that had been taken from its original home. Amongst the most entertaining inhabitants of the Aquarium are the hermit crabs, which spend the greater part of their lives in one long struggle to cope with the housing problem. Hermit crabs are not covered with armour as are most crustaceans, but have naked bodies, and to remedy this defect they live in empty shells. The creatures are perpetually house-hunting, for after every moult, when they increase in size, their quarters become too cramped and they are consequently forced to go in search of a new home. In the course of their inspection of suitable dwelling sites they come into conflict with the sitting tenants, and a fight to the death often ensues, the victor being rewarded not only by a home but a meal. With the possible exception of the hermit crabs, the most pugnacious members of the Aquarium family are the lobsters, which likewise spend their existence in perpetual strife.



(*Neville Kingston*)

Angel Fish



(*Neville Kingston*)

John Dory chasing small fish

PLATE XX

As a result, many a Zoo lobster is rendered limbless and unfit for exhibition. Those that have come off "second best" in such encounters are removed from the public gaze and placed in reserve tanks where they remain until their lost parts are regenerated. Lobsters are frequently sent to the Zoo packed in sawdust or damp seaweed. Now, if such animals immediately after a long journey were to be put direct into the tanks they would drown, their enfeebled bodies having become filled with air. In order to bring them round they are therefore on arrival laid out on their backs in shallow trays filled with just enough water to cover them partially, and in these they remain for several hours, bubbling out the air inhaled on the journey. When the gills become filled once more with water and the patients are able to turn over without assistance they are regarded as in a fit condition to be removed to the exhibition tanks.

Most of the fish in the Aquarium become very tame and are on the best of terms with their keepers, especially at feeding-times, when the majority can be persuaded to take food from the hand. The appearance of an attendant with a dish produces a joyful demonstration in the tanks of the carp, tench and gurnards. Even normally bad-tempered six-foot conger eels are prepared to ingratiate themselves with the Aquarium officials at meal-times, when they allow themselves to be raised bodily out of the water.

At feeding-time the tank containing the mournful-looking John Dories provides entertainment. The sides of the normally-uniform golden-brown fish become barred with dark brown and vivid blue as dinner-time approaches; and when the meal is actually introduced the great dorsal fin rises, forming an enormous crest. At the same time, the gigantic telescopic mouth is shot out several inches with lightning rapidity and the prey disappears for ever.

Amongst the more ornamental fish, none quite compares with those emanating from the coral reefs of the East Indies. The most spectacular of these fish in the Aquarium are certain specimens that are of a bright orange with light-blue bands. These fish are remarkable not merely for the beauty of their appearance, but for the fact that they spend almost their entire lives in the abdominal cavity of a sea anemone, and their capture is due to the diving feats of the natives, who bring up the anemones with their inhabitants from the sea floor to the surface.

Observations on the behaviour of aquatic animals during the day-time have been frequently described. Night, however, seals the observer's eye, and the aid of artificial light at once creates abnormal conditions. The moment light is introduced into surroundings which have been in darkness the populace is stirred to unnatural activity by a dim suggestion of

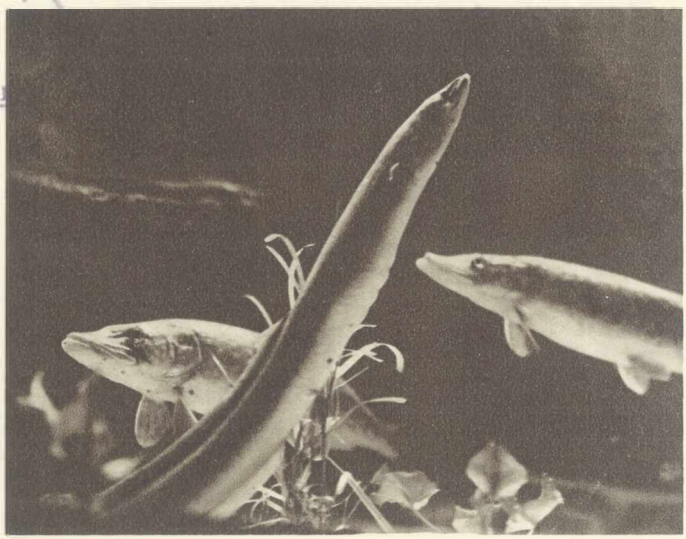
dawn. It is therefore only in an aquarium that it is possible to observe the various ways in which such animals spend the hours of darkness. The majority of the Zoo Aquarium inhabitants sleep, spending their nights in a state of suspended animation. A few of the vertebrates and all the invertebrates are, however, less active during the daytime than at night. The anemones display to their fullest in the dark, whilst similarly the tube-worms, which seldom protrude from their tubes during the period when the Aquarium is open to the public, are fully extended. During the daytime the visitor enjoys but a cursory view of the members of the cat-fish family; at night, however, they swim about actively, ready to snap up anything large enough to merit their attention. The lung-fish and the flat-fish are amongst other active nocturnal inhabitants of the under-water Zoo. During the daytime the flat-fish lie half or almost wholly buried in the sand, except at such times as they are offered food. At night, however, they are extremely active, shuffling about on the floor of their tanks or swimming close to the bottom.

The positions that fish assume when asleep vary considerably. Some rest on the floor of their tanks, either on their sides or in a horizontal position. Others slumber surrounded by water just above the floor or quite close to the surface. At dusk or as soon as the Aquarium lights have been extin-

guished, all the marine wrasses cease swimming about and turn over on their sides, resting on the bottom of their tanks. The common trout is amongst those that rest on the bottom in a horizontal position. Now anglers are aware that this fish will frequently take the fly at night, but Aquarium specimens sleep when it is dark, remaining awake only if specially hungry. It is therefore probable that the trout that takes the fly at night is the hungry individual that has kept awake owing to the abnormal activities of its insect prey. Some interesting observations have been made in the Zoo Aquarium on the behaviour of certain young fish that swim about in mass formation during the daytime. At night the shoals break up and the fish take to the bottom, every unit separating and facing a different point of the compass. As soon as disturbed, however, they awake and speedily join forces again on the surface.

(*Neville Kingston*)

Turtles in the Zoo Aquarium



(*Neville Kingston*)

Pike and Eel

PLATE XXI

THE WARDROBE

The philosophical naturalist must be tempted to ask himself from time to time if in the matter of dress we have progressed very much beyond the ideals of prehistoric man, for in spite of the fact that the human masquerade has been running for innumerable centuries, it is still reliant for its makeup upon the lower animals. We were forcibly reminded of this the other day when in conversation with a lady who is a rigid vegetarian and a fierce opponent of the exploitation of animals for any purpose. The Zoo, of course, was on her black list. Yet, in her own person she must have been responsible for many broken homes, carrying about as she did the nucleus of a very promising natural history museum. Rabbits and birds had gone to make and decorate her hat; a turtle and an oyster had contributed towards the adornment of her hair, ears and neck; a cat, a bear and several other animals garnished her principal outer garments; whilst a calf, a kid and a snake all met violent ends in providing her with gloves and boots. More oysters had helped to ornament her fingers, and an elephant's tusk accentuated her shapely wrists. In her hand she carried a lizard-skin bag.

It was a tragic day when climatic conditions or police regulations forced upon us what Bernard Shaw has called " compulsory fancy dress ". To-day over 300 different kinds of animals, ranging from colobus monkeys to duck-billed platypus, are slaughtered for clothes that Nature intended they should keep. I have before me an extract of the official figures of the London Fur Market, published by the Society for the Preservation of the Fauna of the Empire. In a single year the following skins were put up for sale by a single firm : Opossum, 360,000 ; wallaby, 330,000 ; marmot, 65,000 ; musquash, 46,000 ; wild cats, 35,000 ; fox, 40,000 ; flying squirrel, 21,000 ; marten, 13,000 ; gazelle, 10,000 ; beaver, 9,000 ; chinchilla, 7,000 ; ermine, 6,000 ; monkey, 2,000. Many of these animals being as a result on the verge of extinction, the trade has invented a sort of nightmare zoo, which to-day fills the gaps left by many creatures that have given up a losing fight against gun, trap and poison. In the tradesman's catalogue, but nowhere else, one meets such monsters as the electric monkey, tiger giraffe, and the flashy zebra. At one period the beaver was a standard of value, all other furs being judged by it. Rabbit has taken the place of the beaver, so that the time-worn conjurer's trick of producing rabbits from hats may be said to have been reversed by the scientific furrier.

It is pleasant to turn to the consideration of silk—

a commodity that still holds its own in spite of a host of synthetic substitutes, one of which is finely-spun glass. The story of silk reads like a page from the *Arabian Nights*, and can only be lightly touched upon here. The original discoverer was the wife of the third Emperor of China, who for her enterprise was deified in about 1700 B.C. For about 2,000 years the Chinese kept their secret to themselves, and even when their products were carried westward by the wandering Persians the true nature of the wonderful garments evaded detection for another ten centuries. Aristotle divined the source of supply, but many years after his death elapsed before any Western nation succeeded in producing silk themselves. Although the penalty for exporting silkworm eggs from the Far East was death, eventually certain monks successfully ran the gauntlet and brought not only the eggs but the food plant, in the form of the seeds of the mulberry tree. From thence onwards the industry rapidly spread over Greece and Syria, and so into Spain and Italy. The silkworm is no monopolist, as most caterpillars can produce silk within the meaning of the act, the silken threads of the spider's web and those of certain mussels having been turned to account, though scarcely on profitable lines.

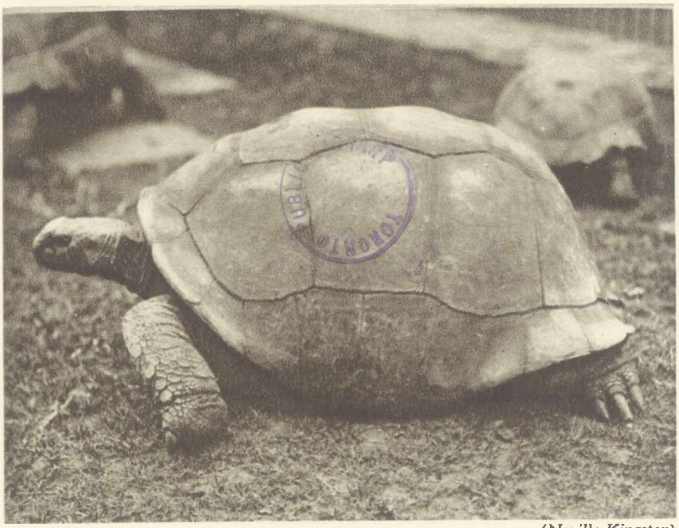
In the realms of adornment pure and simple, few animal products have not been utilised. For centuries one of the most popular dyes was obtained

from the sea snail. To-day there is a sudden demand for reptile skins of any and every kind—a fashion that has been going strong amongst savages since the dawn of Man. Fiji Island shell necklaces at one time had a great vogue in this country, but have in recent years given place to the wings of South American and Central African butterflies. Cuttle-fish eye-lenses are used for adornment in many parts of the world, whilst in South America there is to-day an ever-increasing demand for fire-flies—the insects being threaded upon wires and worn round the arms and necks of the native " belles " at all kinds of evening functions.

We may smile at the savage who smears himself with cochineal, thrusts porcupine quills through his nose, or distends his lips with oyster shells, but at heart we are very much the same. The only difference is that from our own " ultra-civilized " point of view we do things perhaps a little more gracefully.

(Neville Kingston)

Beaver, showing fur half wet and half dry



(Neville Kingston)

Century-old Tortoise

PLATE XXII

THE SPAN OF LIFE

THE average human centenarian though feeble of wit and muscle is a stalwart boaster, who trades upon his years at the expense of the gullible, and the exaggerated respect which we concede to the "oldest inhabitant" is often extended to the lower animals. The tendency to exaggerate finds full vent when the years of some notorious animal such as a Zoo favourite are in question. But the scientist out for truth at all costs ruthlessly tears the veil from such objects of worship. The Zoological Society has kept records of some twenty thousand different animals, and these have been carefully tabulated. The actual span of life of any animal in the wild no man can say, but one may safely surmise that in a large number of cases it is much shorter than that of the captive animal carefully dieted and protected from a host of natural enemies. Tropical animals are in some ways much easier to keep in this country than those emanating from more temperate climes. Creatures inhabiting comparatively cool localities change their coats automatically, and unless the English climate synchronizes with that of their native land they suffer as a result. This applies

to such creatures that retain their heavy coats during a too-premature English spring or cast them whilst winter lingers—as she often does, a couple of months later than expected. An animal's life span depends little upon size. Thus most parrots live longer than ostriches, and bats longer than tigers. In captivity lions will live for seventeen years, tigers twelve, leopards and wild dogs fourteen. The bear family takes life quietly, and so it is not surprising to find certain species living to over thirty. In zoological gardens the anthropoid apes seldom live more than five years. The notorious chimpanzee "Micky", who was a boarder in our Zoological Gardens from 1898 to 1925, was a notable exception. Micky was a two-year-old babe when he arrived at Regent's Park and was so weak and rickety that the question of his destruction arose. He was, however, spared, and survived some score or other more healthy-looking apes, living to be honoured as the father of the Zoo. The cat's nine lives do not carry it much beyond fifteen years, and some animals with still greater reputations show, comparatively speaking, an even poorer record. One might recount stories of the supposed longevity of elephants *ad infinitum*, but so far as is known definitely few survive the age of seventy. The Indian Government's elephant records show in fact that only one has been known to live more than thirty years after joining the

service. The fruit-bats quite upset the theory of size as a factor in ensuring long life, unless we consider them purely in regard to their own kind, when they are of course the giants of the race. The common Indian fruit-bat will live for seventeen years in captivity and if kept under more perfect conditions would doubtless live still longer, as to the writer's knowledge no Zoo has yet taken a bat very seriously. The bat's relatively great age gains in interest when we compare it with an animal such as the ox. When one contrasts the placid lives of oxen with the fussy expenditure of energy put forth by the average bat, the comparative long life of the bat and the shortness of the bovine life is truly surprising. Though cattle are many thousand times bulkier and heavier than a bat, their age limit is but twenty-five years.

There are numerous records of longevity amongst birds, and the length of life of the smallest species is much greater than is generally supposed. A nightingale has been recorded to have lived twenty-five years under captive conditions, a skylark twenty-four, a goldfinch twenty-three, a cardinal twenty-three, and a canary twenty. Amongst the larger birds there is a record of a parrot that lived to the age of a hundred and two, a swan to seventy, a raven to sixty-nine, an owl to sixty-eight, a pheasant to forty-five, a gull to forty-four, a crane to forty-three, a pelican to forty-one, and a dove to

forty. The raven has the reputation of being very long lived, and from time to time one is introduced to a specimen of rusty plume and evil eye who is reported as being anything over a century old, according to the imagination or conscience of its owner or biographer. Although the established record is sixty-nine years, the Tower of London supports half-a-dozen of these feathered retainers who are all supposed to be centenarians. According to the yeomen responsible for the birds' upkeep, only one raven has died in the Tower within living memory, and that was during the War, the specimen in question succumbing as a result of seeing a section of the new army change guard.

The age to which a fish may live can often be determined with some accuracy by an examination of the ear bones and the scales. On these are written the fish's past, much as a tree's life is recorded in its annual rings. Ear bones and scales often show well-marked winter rings—ridges of lime or semi-calcified material that by their number and placing give an indication of not only the age of the fish but the rate at which it grew in any given year. In discounting many extravagant stories of the past one must remember that these had their origin before the well-equipped biologist came into his own. The fisherman's tale, however, dies harder than most. Recently a pike caught at Teddington was found to have swallowed a Roman

coin much encrusted with gastric secretions. The fish was promptly dated as having hatched somewhere about 150 B.C.! The pike and carp share with the elephant, parrot, crocodile and tortoise a reputation for being almost immortal. In captivity, however, they seldom live for more than thirty years. The giant carp at Fontainebleau are supposed to be centuries old, but if apart from any other reasons we consider our forefathers' appetites for fresh-water fish, it is scarcely likely that many were allowed to reach the ages that have been ascribed to them. The records of other captive fish are interesting. The wells, the giant cat-fish of Central Europe, grows to a length of eight feet and a weight of over 300 pounds. Specimens six feet long on the Duke of Bedford's estate at Woburn were introduced when youngsters fifty-five years ago and one of these is flourishing in a tank in the Zoological Society's Aquarium. The sterlet of Europe has lived for forty years in Captain Vipan's private aquarium in Northamptonshire, whilst the bowfin, the long-nosed garfish of North America and the lung-fishes of Africa and Australia have all lived in aquaria for twenty years and over. Many are the stories told of ancient tortoises and alligators, animals which attain to almost their maximum size in fifteen years. Thus in the parts of Africa inhabited by giant tortoises, a native baby girl is always presented with an infant giant tortoise at

birth, and the animal is kept alive to be eaten on her wedding-day by a very extensive family party. Bearing in mind the early age at which these primitive people wed, it is obvious that the reptiles must attain a very considerable bulk in about a dozen years. Many of the giant tortoises exhibited in public menageries have been great travellers ere coming to a final anchorage in European or American zoos. They have often been passed from potentate to potentate, from ship's captain to ship's captain and from dealer to dealer, a decade or two being added to their age with each change of ownership. The giant tortoises, especially the tropical island forms, are, however, occasionally very long lived, the history of a few dating back nearly two centuries. Giant carp are frequently covered with a fungoid growth invariably attributed to great age by the credulous. Similarly the tortoise gathers a great deal of moss. Sun, wind and rain set their mark upon his house, which may acquire other signs of wear and tear by being brought into violent contact with trees and boulders by its clumsy and ponderous tenant. The larger crocodiles are estimated at anything from forty to fifty years and some of the giant boas and pythons are known to be over thirty years of age. " George ", the eleven-foot-long Zoo alligator, is constantly being honoured in the Press as a centenarian. As a matter of fact he is not even approaching middle

age, for he was purchased by the writer in 1912 when a comparative youngster of about seven or eight summers. Curiously enough, chameleons, though readily tamed, seldom survive for more than two years in captivity, even though given the range of a big garden in their own country. During the War it may be safely said that not a man of the B.E.F. in Palestine was without his mascot chameleon, and a war-time joke asserted that certain battalions had more chameleons than rifles. But, though supplied with abundant food, these reptiles never lived for more than a few months. In spite of the fact that toads seldom survive more than fifteen years in captivity, the notion that the animal is all but immortal will probably never be allowed to die.

The ages to which various invertebrates may live, though making less appeal to the average man than the records of beasts and birds, are of considerable interest and are often of great economic importance. All the shell-bearing mollusca carry their years written on their tenements in annual rings. The oyster is usually four years old when brought to market, but deep-sea oysters sometimes figure in the shops with fifteen or twenty well-marked ridges on their enormous shells. Many crustaceans do well in captivity, and the size and condition of their shells is a fair indication of their ages. The ten-pound lobster

whose shell is heavily encrusted with barnacles has likely enough seen fully twenty summers.

Many of our native insects spend several years as pupæ imprisoned in earthen cells and emerge at last to enjoy a few days in the sunshine before laying their eggs and departing this life.

(*D. Seth Smith*)

An Old Polly

PLATE XXIII

THE BALANCE OF NATURE

One hears a great deal nowadays about our vanishing wild life and the devastating march of civilization. The truth is that Man and the lower animals cannot live together in the state of bliss that the sentimentalist desires. If Man is to live certain animals must go. But so dependent are we upon the services and co-operation of both animal and plant life that we must fill the gaps made by the elimination of the undesirables with creatures largely of our own fashioning more suited to our needs. To give but one instance: the wolf, though no doubt part of the scheme of things, is incompatible with modern human life. He is therefore regarded as vermin and is being shot and trapped into extinction, whilst his more amenable representatives are bred and interbred to form that extraordinary collection of animal shapes which we lump together under the name of "dog". The production of the dog is a direct interference with natural laws on the part of Man. In a few hundred years he has evolved such assets as the sheep dog and the hunting dog, and in addition a host of creatures that should be described as freaks and which only justify their existence by providing various humans with a livelihood.

In the preservation of existing fauna Man has frequently interfered with Nature. Little over half a century ago the bison, one of the most prolific creatures in America, was hounded to the verge of extinction ; to-day the animal is increasing to such an extent that hundreds must be weeded out annually. The preservation of the European fauna is giving all genuine animal-lovers grounds for very real uneasiness. Time was when that most fascinating mammal the beaver raised his lodges in the Thames and its tributaries. At the beginning of the last century it flourished in France, but twenty years ago it was practically extinct in that country. Its extermination was excused on the grounds of preserving timber and water-ways. Greed, however, was the chief incentive. Happily, steps have recently been taken to reinstate this rodent in Europe and large colonies have been formed near Magdeburg on the Elbe, and in various localities in Norway, where the animals are very strictly protected. The largest of the Norwegian colonies numbers over 10,000 beavers.

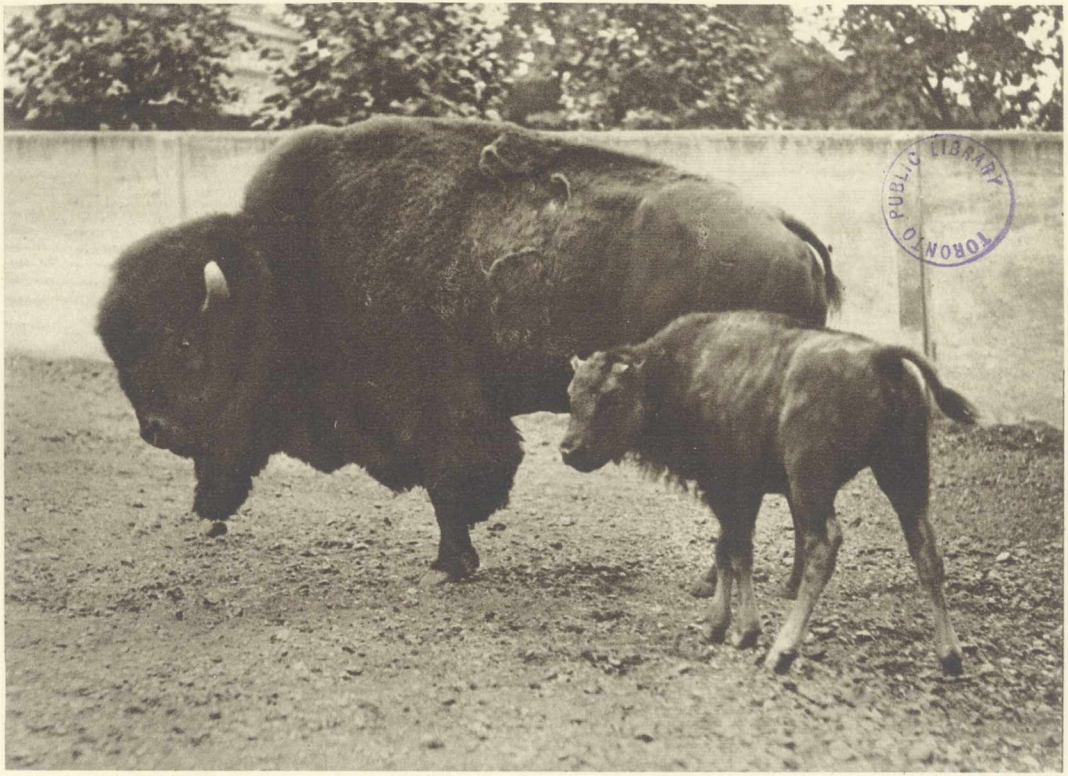
More undesirable than extinction is the reckless introduction of new species. Often these aliens are imported by accident. The rat and cockroach may be cited as glaring examples, since these two animals have since their introduction into Europe involved an outlay far greater than that of our National Debt. In Australia, the principal imported scourge is the

common rabbit, and immense is the wholesale damage inflicted in that continent by the animal regarded by holiday-makers in England as a charming incident of the country-side.

Of all the inhabitants of Madeira the most unpopular are the little Argentine ants, which were introduced into the Island in samples of sugar-cane some thirty years ago. These ants, which now swarm everywhere, attacking everything edible, have been responsible for the destruction of the fruit trees and coffee plantations which before their advent were a great source of profit to the inhabitants. Quite as expensive in its own way has been the advent of the Colorado beetle in the United States. The beetle, which has occasionally taken ship for Europe, has been the ruin of many trans-Atlantic potato-growers. In 1922 a plague of Colorado beetles covered a hundred square miles in the neighbourhood of Bordeaux, and was only stamped out by spraying with lead arsenic and the destruction of the crops. A less harmful introduction was that of the zebra mussel (*Dreissensia*). It vanished from our native fauna in prehistoric times, but was reinstated in 1820, attached by anchor threads to vessels plying to and from its native home in the Baltic. Its vividly-coloured shells now encrust every pile or boat stage from Greenwich to Oxford, and it has even been known to choke the supply pipes of the Metropolitan Water Board.

A fortunate case of accidental introduction is that of the elongate Portuguese oyster into France. Its introduction was due to a cargo of the bivalves shipped from Lisbon being wrecked at the mouth of the Garonne. The shipwrecked oysters survived and multiplied, and in the course of a few years gave rise to enormous banks similar to those that always existed at the mouth of the Tagus. As a result of this fortunate mishap the inhabitants of Arcachon—the seat of the largest oyster park in the world—benefit to the extent of over £50,000 per annum.

The goldfish, for which an enthusiast will pay almost any price the dealers have the nerve to demand, is now *the* fish of Madagascar. Some years ago a deputation from that island visited Europe and were so struck with the beautiful golden carp that they returned with a large consignment. The goldfish, meeting with few or no competitors, increased so rapidly that within a couple of years it had exterminated the only native edible fish inhabiting the island. To-day Madagascar abounds with goldfish that have reverted to the mud-coloured livery of their wild forbears. A happier experiment with fish was accomplished when tropical disease experts selected the little top minnow of the West Indies as the one creature capable of dealing with the larval mosquito. The top minnow is also known by the name of " millions " from its remark-



(*Neville Kingston*)

American Bison and Calf

PLATE XXIV

able and most opportune fecundity, and the Zoo has bred large numbers and exported them to mosquito-ridden areas upon representation from the Colonial Office.

The insect world has always been a happy hunting-ground for the experimenter, and only now are we beginning to realize the enormous influence which these diminutive animals exercise upon human destinies. Entomologists appointed by the British Empire Board have been busy during the past few years breeding numerous beneficial parasites. Ichneumon flies have been bred in this country to combat various crop-destroying grubs, and in California lady-birds are farmed on a large scale and shipped to all parts of the world where the green-fly has threatened to bring ruin to the orchards.

Recently a cricket plague threatened the crops of Barbados. The remedy was found in the introduction of a portly toad—*Bufo agua*—which, tracking the crickets to their lairs, where no chemicals could reach them, at once benefited the farmer, whilst adding to its own well-being.

The danger of interfering with Nature was never better exemplified than in the case of a certain guano company which drew its wealth from the birds inhabiting a certain island in the South Pacific. It was argued that if a colony of sea-lions which shared the fish with the birds were killed off the latter

would increase a hundredfold, having no competitors in the struggle for food. Accordingly, the sea-lions were slaughtered, and as a result the guano company —which up to that time had been a flourishing concern—" crashed ". Experts explained that the sea-lions had acted as " sheep dogs " and had brought the shoals within easy reach of the birds—an explanation which, however, came too late to save the shareholders.

A very little thoughtlessness may so upset the balance of Nature as to cost millions of money. Despite our Wild Birds Protection Act, large numbers of brown owls are shot by gamekeepers, with the result that more labour and expense is involved in eradicating the rats, a couple of dozen of which an owl will destroy for every pheasant chick it takes. Again, the water-wagtail is destroyed by the ignorant, although the bird is a devourer of water-snails which harbour the larvæ of a worm causing liver clot in sheep.

Far-reaching results have sometimes attended the chance introduction of various plants. An interesting case is that of the Canadian water weed (*Elodia*), introduced to this country about 1860. It quickly spread to such an extent as to render many small rivers, such as the Colne, unnavigable. Of late years the plant has been on the wane, since being of one sex only it is not easily rejuvenated. The introduction of the common bramble into New Zealand has

resulted in a growth of blackberry plants that defy fire, scythe and plough, and at one time threatened to starve the sheep by covering their all-essential grass lands. In certain parts of the island the remedy has been found to be as simple as it is obvious. The first consignment of goats rang the plant's death knell—the " poor man's cow " devoting itself with unfailing appetite to the eradication of the bramble. that soon gave way before its attack.

OTHER'S PEOPLE'S ZOOS

In speaking of " The Zoo " the average inhabitant of this country has in mind the famous collection in Regent's Park. At the same time it is well to remember that there are others, and that of the many hundred large public menageries scattered over the world most are good in their peculiar ways, and that each is probably the best possible zoo—for certain exhibits. An animal that does indifferently in Regent's Park may flourish in Berlin or Budapest—and vice versa. To the average tourist certain features of a foreign zoo appeal at once, the gardens being usually enlivened by various side-shows excluded from Regent's Park. In certain continental gardens many quaint features are introduced to collect money. In some of the Dutch zoos the elephants are made to contribute to the staff funds on very business-like lines, the animals having been taught to put the donations in a box and ring a bell by way of a receipt. At one of these I once saw this very popular performance meet with an unexpected check. The elephant—a small one—acquired a coin which lodged half-way up the unfortunate pachyderm's trunk. A violent step-dance accompanied by extraordinary gyrations of

the proboscis ensued and was only brought to a happy termination by the action of its keeper. That official applied massage and at the same time exhorted his charge to blow his nose, with the result that the coin eventually shot across the house with dramatic violence. The sea-lions' remarkable flair for catching fish thrown to them is well exploited in the Dresden Zoo, where the animals eagerly watch a slot machine which delivers a herring on receiving the necessary coin. The machine is so contrived, however, that before the sea-lion can eat his fish he must earn it by pulling on a string which raises the fish to the top of a pole whence it is flung into the air, and dexterously caught by the waiting "sea-dog" below. This very paying pastime naturally commends itself strongly to what is probably the most voracious mammal known, and the exhibit never fails to urge his admirers to invest money on his behalf in the strongest possible terms. At Dresden also a most ingenious device is employed to exercise the camels. A herd of these is kept in a miniature desert and they owe their excellent health and fine condition to ample exercise. Business houses hire the animals to parade the streets and advertise their wares, and thus the zoo funds, the exhibits, and local trade all benefit by a plan as simple as it is ingenious.

It is the experience of all zoo officials that solitary confinement is not conducive to good

health, and therefore whenever possible suitable society is found for the animals. In the event of the impossibility of exhibiting more than one member of the same species, an attempt is usually made to provide the captive animal with some congenial substitute. A chimpanzee will retain its spirits if given a rhesus monkey as a stable companion; and one zoo orang for years shared the same enclosure as a tree kangaroo, who accompanied the ape in all his excursions over the ceiling of the cage. In one of the German gardens I once saw a large ant-eater sharing its paddock with two Brazilian tapirs—creatures of placid temperament and hailing from the same habitat. The Antwerp Zoo enjoys the unique good fortune of having possessed two specimens of the rare okapi from the Congo forests—the only examples brought to Europe alive. The first specimen presented in 1919 died after a few weeks; but its successor "Sally", brought up by two friars in its native land, flourished and struck up a friendship with a giraffe.

It is now very generally recognized that animals are far more capable of becoming acclimatized than was formerly believed to be the case. Even in northern latitudes many animals from hot countries soon become attuned to altered conditions, and so has arisen the very popular terrace and moat principle first adopted by the late Carl Hagenbeck in his Zoo at Stellingen near Hamburg

—a system which in one form or another may now be seen throughout Europe and America. The Stellingen Zoo makes a great feature of groups, and every effort is exerted to show animals that share the same territory in a wild state under surroundings as natural as possible. In the foreground of one of the panoramas is a large pond stocked with hundreds of wading birds. Further back there is an open steppe populated by lions, zebras, elands, gnus, water-buck and ostriches, whilst in the background are a series of massive rocks over 100 feet high on which mountain goats and sheep display their agility. Although from a distance the various divisions have the effect of an undivided panorama, the visitor is enabled to view each section at close quarters from wide walks built at a low level.

One of Hagenbeck's first efforts was signalized by an amusing misadventure. The monkey-hill at Stellingen overlooks the main Hamburg-Berlin railway line. Unfortunately the authorities had somewhat under-estimated the baboons' leaping powers, and whilst being unpacked over a hundred of the intended exhibits escaped and boarded a passing Berlin express, invading the roofs and even the compartments with a democratic enthusiasm that the passengers by no means reciprocated. A description of the outraged dignity of the Berlin station-master on the arrival of the

schnellzug bedecked with a merry gang of baboons is best left to the imagination.

That bars and balustrades, whilst ensuring the safety of the visitor, do not always add to the attractiveness of an animal display, has been well appreciated by those in charge of the Dresden Zoo, where elephants are kept within bounds by a ditch with low incurved spikes such as those employed in India to restrict the activities of newly-captured elephants. Whilst on the subject of elephants it may be mentioned that Berlin possesses the largest specimen in Europe, an Indian bull some forty years of age. Though too dangerous to be used for carrying, it has been successfully mated in the menagerie, and the union is commemorated by a female calf now two years old and doing well. African elephants are much less frequently seen in captivity and so special interest attaches to those in the Antwerp Zoo. One of these is considered to be a new pygmy species, and is covered nearly all over with long hair. A large female African elephant is almost as fully draped, especially on the trunk and hind legs—a very unusual feature in these animals when once they are past their adolescence.

Stellingen is the only menagerie to have seen a giant elephant seal give birth to a calf, an animal measuring nearly four feet long at birth. Its sire, a docile animal allowing itself to be patted by

visitors, is nearly seventeen feet long, weighs about three tons, and costs over £1,000 a year to feed.

Zoo-keeping is full of surprises. Lions, for example, breed in these northern latitudes quite as well as in their native veldt. The Leipzig Zoo has long been famous for its lion "stud", and cubs born in the gardens have been exported to all parts—even to South Africa, a truly remarkable case of sending coals to Newcastle. A special feature at Leipzig is the River Pleisse, which runs through the grounds with sections divided off for sea-lions, polar bears, water birds, etc.

Reptiles are displayed in many ways, some of the German zoos even enlisting crocodiles as special turns. A fourteen-foot specimen of the estuarine crocodile in the Frankfurt Zoo is handled by its keeper and persuaded to exhibit the interior of its mouth for the public edification. The Berlin Zoo shows burrowing reptiles in special glass cases, with a scanty supply of burrowing material only in the division occupied by the creatures during exhibition hours. These reptiles are exhibited in turn like sentries on guard, one displaying its charms to the public whilst the other enjoys sleep and privacy.

THE IDEAL ZOO

In the Regent's Park Menagerie the stay-at-home visitor may see all kinds of animals that he would never otherwise see, living *as nearly as possible* in natural surroundings. The little phrase " as nearly as possible " is used in order to emphasize the fact that the ideal zoo—like all ideals—is unrealizable. Strenuous efforts, however, to grasp the ideal have been made in all progressive menageries. During twenty years of office the writer has lived to see the London Zoo practically remodelled throughout. The elephant, giraffe, camel and lion houses are the last remnants of the Victorian Zoo. Houses, paths and paddocks have changed places with almost kaleidoscopic rapidity as the authorities strived to please their exhibits and the public.

The dawn of the new Zoo may be said to date from the time when the wonderful adaptability of animals was appreciated by Sir Peter Mitchell. To-day monkeys, bears, and reptiles of all kinds are in the London gardens given an amount of access to the open air that would have been regarded as a death warrant thirty years ago. As a result of this and the installation of ultra-violet lamps generating artificial sunshine, improvement in the

general health of the boarders has been magical, and the work of the Zoo coroners greatly decreased. The sunlight lamps are so disposed that the effect produced resembles tropical sunshine, and the inmates spend most of their time on chosen spots in full view of the public. In the monkey house patches of the floor are electrically heated, whilst the cages are furnished with verandas comprising shelters fitted with clusters of bulbs manufactured of quartz glass for the transmission of the health-giving rays. The animals thus have the advantage of sunshine even during misty or rainy weather.

The ideal zoo will be a zoo reversed, the public walking about on caged pathways from whence they may see the animals enjoying life in fifty-acre paddocks. The zoo of the future will rely less on bars for the protection of its visitors than upon trenches artistically concealed from view, but still guaranteed to exceed the jumping powers of the fittest lion. So spacious will the ideal zoo be that field-glasses and telescopes will be possibly obtainable "on application to the attendant". Bears, racoons, otters and monkeys are effectively walled in by ditches at the London Zoo, whilst at Hagenbeck's Animal Park at Stellingen near Hamburg some of the lions and other large carnivora are similarly kept within bounds. Only a comparatively few unacclimatizable beasts—denizens of the hottest

tropics—need large indoor premises. Northern zoos are faced with difficulties unknown to such menageries as those of Pretoria, Calcutta or even Sydney, where in these naturally heated gardens the most delicate native forms are able to enjoy perfect liberty. In Sydney, for instance, those weird marsupial " Teddy bears ", the koalas, climb about the walks and trees as do the Canadian squirrels in Regent's Park. Space, of course, must always be a leading factor in the ideal zoo, and lack of accommodation alone prevents the London authorities from giving a very large assemblage of harmless and highly-ornamental birds complete liberty —a liberty that would not only be highly beneficial to the birds, but add materially to the public entertainment. In a zoo of 400 acres such as the Zoological Society is developing at Whipsnade, it will be possible to give the freest range to cranes, storks, guinea fowl, and a huge assemblage of water-fowl from mandarin ducks to pelicans.

Great as the strides made in aquaria have been during the last few years, the ambitious aquarist cannot but feel that he has still many worlds to conquer, for the largest and best aquaria are still far from being representative. Such magnificent swimmers and divers as otters, seals, sea-lions, walruses, porpoises and polar bears are still taboo as no adequate means have been devised to counteract the rapidity with which they foul the water;

but, " there is always a way ". Coypu, beavers and other aquatic or semi-aquatic rodents might also make attractive exhibits. The semi-aquatic mammal enters the water only to catch fish or occasionally for a romp. If, say, a few small pieces of fish were thrown into the bears', seals', sea-lions' and otters' tanks every ten minutes, visitors would have a chance to see the beauty of these animals under water. Having taken their snack, the creatures would return to dry land, also on view from a special service gallery above. A special section could be devoted to the legions of diving birds, enabling the public to watch penguins and darters in action at all hours, and that remarkable little water-fowl, the dipper, literally walking the tank floor.

No department of the Zoo—any zoo—has need of greater reform than that concerned with nocturnal animals. At present they are seldom if ever seen by the public, though often heard after closing hours. Probably fewer than a hundred of the Zoo's most constant visitors have seen the ardvaak, galago, jerboa, aye-aye, douroucoli, kiwi, or frogmouth. Occasionally these and many more may be seen coming to life on their perches or stealthily creeping from their sleeping quarters just as the keeper delivers the inexorable " All out " command. Even privileged scientists see little or nothing of them. The night-workers are shy and nervy to a degree, but they might be shown in the ideal zoo by

artificial moonlight, say for two hours a day. This would not upset their mode of life. Indeed, animals are very adaptable, as witness the zoo lions who sleep all night because they are fed in the daytime and the hours of darkness call for no reasonable wakefulness. The zoo of the future will possibly have a house devoted to those of its inmates that turn night into day. The visitor will enter a corridor lit by sufficient artificial moonlight to prevent him colliding with other sightseers. In this building the walls will be pierced at intervals with small circular windows set at a convenient height and likewise faintly illuminated by "spurious moonshine". Peering through these the visitor will behold an amazing series of creatures gathered from the plains and jungles of the tropic zone. In one spacious enclosure ant-bears will be seen rummaging in peat and earth for their ants, or their zoo substitutes—mincemeat and chopped egg. In a miniature desert those extraordinary wingless birds the kiwis will be seen probing the earth for worms and in the next a dozen jerboas—dormice on stilts—will cut the queerest capers. Further along the scenes will change to tangled masses of foliage in which weird semi-human shapes, such as those of the aye-aye and galago, will be observed gliding and scrambling in goblin fashion. In the full rays of an electric moon tree frogs will be seen and heard chorusing together, whilst bats as large as

sea-gulls will scramble and scuffle for food before the visitors' astonished gaze. Then there will be a special section for the owls, birds of the liveliest description, and not merely bundles of feathers glued to perches, as they appear to be in the daytime. One can well imagine the visitors' portion of the house being as noisy as the monkey or parrot houses. But the shy nocturnal exhibits will evince no alarm, for the public corridor will be sound-proof. This roughly sketched-in picture is, the author admits, still a dream, but he believes it to be quite within the limits of the up-to-date scientist.

Snakes are beautiful and interesting creatures, especially if exhibited in roomy surroundings, as they are in the Snake Parks at São Paulo in Brazil and Pietermaritzburg in South Africa. These Snake Parks consist of scores of domes some twelve feet in diameter by four feet in height, giving on to sun-warmed lawns surrounded by water-filled trenches which the snakes cannot cross. Some sort of an attempt has been made in our Zoo in the new Reptiliary near the Main Gate, but in more spacious quarters larger and more showy serpents could be shown.

One realizes how far short the best modern zoo falls from the ideal when considering the lot of many Arctic and Antarctic beasts. Whales and porpoises, for instance, seldom live long in captivity, since if kept in comparatively small tanks the

enormous amount of heat given off by the animals raises the water to an unendurable temperature. Certain Arctic animals, in fact, do not live long in captivity and the root cause of their troubles is shortage of ice. If many commercial enterprises can to-day make their own ice, there is no reason —except cost—to prevent the ideal zoo from having a gigantic refrigerating plant. As mentioned in a previous chapter, the one animal that is popularly supposed to suffer great discomfort from the present ice shortage, namely the polar bear, is strangely enough at one with those who fly from England in October for warmth.

The public enthusiasm for animal study grows with every generation, and the hard-won knowledge necessary to the successful keeping of animals increases annually as a host of workers apply themselves with tireless enthusiasm to the solving of Nature's manifold problems. One might speculate upon the future indefinitely, and the speculations might possibly not be altogether idle ones. A glance at the Zoo as it was in 1830 might enthuse the most cynical with some hope that the dreams of to-day may be the established facts of a not far distant morrow.

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