

THE WAY OF A SERPENT

T. H. GILLESPIE

THE WAY OF A SERPENT



GREEN TREE BOA

From a colour photograph by Mrs. T. H. Gillespie

THE WAY OF A SERPENT

(A POPULAR ACCOUNT OF THE
HABITS OF SNAKES)

BY

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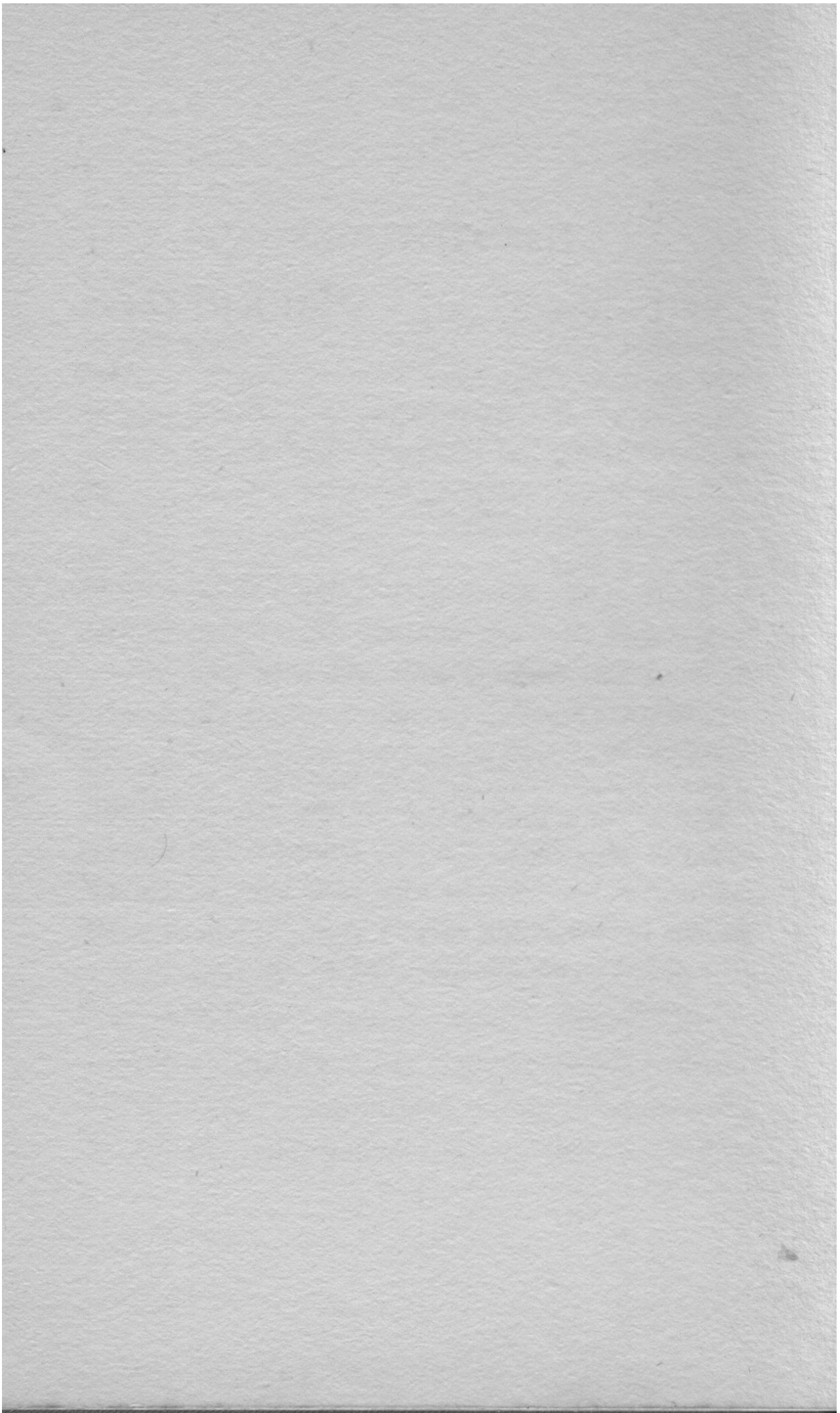
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THE WAY OF A SERPENT

CHAPTER I

INTRODUCTORY

THERE was a period when snakes were perhaps my dearest if not my only love among animals. I was often asked, in those days, why, when there are so many very attractive creatures in the world to choose from, I should fix my affection on "such horrid slimy things." Probably I would reply that at any rate they certainly were not slimy and that I thought them very much the reverse of horrid. Sometimes I might plead their beauty and—though perhaps with slightly less enthusiasm and assuredness—their usefulness. Perhaps I would point out that when the enemy of

mankind, in Miltonic phrase, set out to tempt our general mother and doubtless sought the most seductive form in which to present himself before her, he chose that of the serpent. Among all the reasons I may have offered to justify my preference there was one that did not occur to me (I doubt whether, at that time, I should have been very pleased with it if it had!), but it would have been quite a good one and as true as any other—that the snake is really among the most popular of animals! Instead of, I suppose, felicitating myself upon an eccentricity of taste (for it is many years ago!) I should have realized that I was merely expressing a most commonplace attitude!

Snakes popular? Whoever heard of such an idea! Well, perhaps “popular” may not be the just word, but their wide appeal seems proven by the fact that they find their public at least as large as that of any of the other attractions of the Zoological Park. Even such Zoo “stars” as the chimpanzees or the penguins fail to outrival them. On a

winter day, when visitors may be comparatively few, the greater number of them will be found in the Reptile House. On a day of summer crowds the same house will be crammed to its utmost capacity. Birds are supposed to be popular, and adjoining the Reptile House is the Tropical Bird House, of equal size and stocked with brightly coloured and lively birds, yet for one person seen in the Bird House there will be at least a dozen in the Reptile House. They will be found, moreover—most of them—in front of the cases containing snakes. Surely that makes manifest the fascination of the snake ! I do not for one moment suggest that there is the smallest tincture of affection or liking in this popular regard. It is, rather, the intriguing attraction of the unknown, the shuddering thrill of the frightful (mingled with some confidence in the stoutness of the plate glass between) that gathers the crowds towards the snakes. They have all the lure of a ghost story—when we do not believe too firmly in ghosts ; the excitement of a murder

case—when we have no connection with murderer or murdered.

Early man must have felt great dread of the creatures, often so apparently small and insignificant and feeble-looking, who possessed the terrible power to bring swift and painful death through one puncture of a tooth no larger than a thorn, and so the fear of the snake became one of the earliest and most widely spread of human traditions. Fear may inspire respect, and respect, when mystery unites with it, may grow to something greater and thus, among primitive peoples, the snake tended to become the symbol of supernatural power, sometimes of good, sometimes of evil. The snake might be god or devil; men might worship it or propitiate it or curse it, but one thing they never did—they never regarded it with negligence or indifference. The effect of this persists even among educated people of our own day and explains why most people feel a thrill or a shudder at the sight of a snake. One may, indeed, feel more than a thrill; there are some

people who have an innate, ineradicable horror of snakes just as some have of cats. I believe, however, that that is comparatively rare and that the average human attitude towards snakes is an acquired distaste, the result of tradition and of teaching. I have repeatedly tested young children by offering them a snake to hold and found comparatively few of them who showed any fear of it or any reluctance to take it in their hands when I had assured them that it would not hurt them. I have found, too, that as a rule it is the older children, who have been influenced by the opinion and attitude of their grown-up elders, who are the more inclined to hesitate in touching, or show any repugnance towards, a snake. I have found no more evidence among animals than I have among children, of any general instinctive fear of the snake, though it does seem to exist in a few cases. I have experimented with a large number of different animals by showing them living snakes and found the majority quite indifferent, while of the minority, some

were interested in the snakes shown to them and tried to take hold of them in paw or mouth or beak, and some showed unmistakable uneasiness and even terror. Of these last the distinction was one not so much of race as of individuals. I shall give some details of these results later.*

Notwithstanding all this, the general human fear or distrust of the snake is not an unreasoning or unreasonable one ; it is founded on a mixture of lack of knowledge and of common sense. A venomous snake of certain species is perhaps the most dangerous and justly-to-be-dreaded animal on earth, and it is no more than simple prudence to regard such a creature as a deadly enemy and to treat all snakes as one in this respect if one has not the knowledge to discriminate between them. That all snakes are "poisonous" is probably the most common as well as the most persistent of the many popular misconceptions regarding snakes. I could not tell how often, when I have been in the Reptile

* See Appendix, p. 205.

House and a keeper has been handling some quite harmless snake, I have heard the exclamation: "Oh, look, won't it sting him?" If one ventures to explain that the snake was not a venomous one and that no snake ever "stings," one receives, three times out of four, some such reply as: "Really? I thought all snakes would sting."

It is the multiplicity of similar remarks and questions I have heard that convinced me that the snake is still, of all the more important animal types, the one of which there is most misconception and least knowledge, and so, in spite of the number of books about snakes published in recent years, it seemed to me that there might be room for one more. It is not, this book, in any sense a technical treatise nor a systematic account of the snakes of the world. It merely sets out to supply, very simply, the kind of information which, as indicated by the remarks and questions referred to above, so many people seem to want.

CHAPTER II

OF SNAKES IN GENERAL

WHAT THEY HAVE AND WHAT THEY LACK

ONE of the first things that might strike one on seeing a snake for the first time is the fact that it has no legs—no sign of limbs projecting from the long smoothness of its body. If, however, we could look backwards over the ancestry of the modern snakes we should come to a time, millions of generations away, when the nearest approach to a snake had four legs ; we should find, in fact, that the ancestors of the snakes were something very like lizards. The outstanding change that took place in the evolution of the snake was the progressive lengthening of the body and the dwindling and ultimate disappearance of the legs.

It seems surprising that organs of such

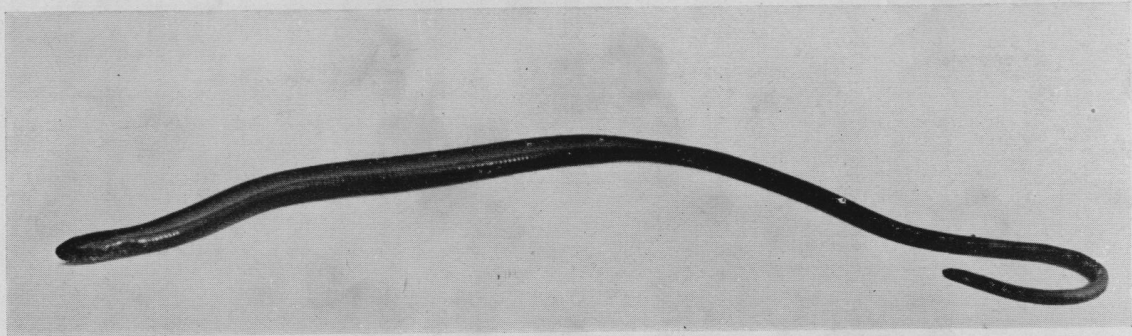
apparent usefulness to a land animal as its four limbs should be so lightly discarded after the long evolutionary process of developing them, but it is not the snakes alone who have done this. It is a reversion, a stepping backwards, towards the oldest ancestral method of progressing by lateral undulations of the body, and the same tendency to a lengthening of body and an accompanying diminution in the size of the limbs may be seen in every class of back-boned animals except the birds. Among mammals it occurs, for example, in the weasel tribe, where the body has become long and slender and the legs relatively very small, and who progress with a very distinct undulation of the body. Among batrachians it has proceeded to a degree paralleling that of the snakes, and it has also taken place to a similar degree among the fishes. It would appear, therefore, that legs, as mere implements of progression, are not of such supreme functional importance after all. They can evidently very well be dispensed with.

The absence of legs, however, is not alone

a sufficient distinction to identify the snake, even among reptiles, for there are lizards which have lengthened their bodies and reduced their legs till they are so diminutive as to be quite useless, and there are some which have lost their legs as completely as the snake has. One of the latter—very familiar in this country—is the slow-worm or blind-worm (which, one may remark in passing, is not in the least blind and can travel, when it wishes, at a fair speed, though not so quickly as a snake.)

If the snakes had got rid of every sign of legs the fact that they once possessed them might not have been so easily and clearly shown. Some of them, however, still retain internal vestiges of their former limbs, and in the pythons two tiny spurs or claws, which can be seen at the base of the tail are the external remains of a pair of hind legs.

Since the lack of legs is no guide, we must find some other way of knowing that a snake is a snake and of distinguishing snakes from



Photos]

[Mrs. T. H. Gillespie

*Above : Three-toed Skink ; a lizard which has a snake-like body and four rudimentary legs
Below : Slow-worm or Blind-worm ; a lizard which has lost its legs and acquired a snake-like form*

their nearest relatives, the lizards. We must do so by a combination of characters or loss of characters.

Happiness, it has been suggested, may be the greater in proportion as our possessions are less—on the reasoning, perhaps, that the less one has to worry about the happier one will be. One might imagine that the snakes had been searching for felicity in that direction, for they have dispensed with other parts or organs besides their legs—eyelids, for example, and most of their ears and one of their lungs.

Snakes have no eyelids, and their eyes are covered with circular transparent scales which form part of the epidermis or outer covering of the snake and are shed with it when the snake undergoes its periodical sloughing or change of "skin." Most lizards have moveable eyelids, and by their presence one can tell that a legless lizard is not a snake. There is one group of lizards called Geckos which have followed the example of the snakes in having no eyelids, their eyes being protected by the same kind of transparent round scale which, like

the snake's, is attached to the outer "skin" and is shed with it. These lizards are, however, not at all snake-like, having in most species short stout bodies and sturdy legs.

A snake cannot, of course, close its eyes even when it is asleep. It seems certain that snakes must sleep, since all animals do, but sleeping or waking, their eyes have the same open, unwinking state; perhaps they only sleep in darkness. There may be an advantage to the sleeping snake in the absence of eyelids, since it would probably be awakened by seeing anything moving near it, just as we should be awakened by hearing a sound while we are asleep. So the snake, though asleep, may receive, through his ever-open eyes, warning of the approach of an enemy. How clearly does a snake see with those unwinking eyes of his? It is certain that he perceives very quickly the slightest movement which any object near him may make, and he is sensitive to variations in light and shadow, but I doubt whether he has much capacity to distinguish detail or to

recognize, by sight alone, the precise nature of any object at which he may be looking or in which he may be interested. It is probable that he has to depend on another sense organ for that.

It is the more necessary for the snake to be awakened by seeing movement while he is asleep, since to a great extent he has lost—if he ever had it—the sense which warns most sleeping land animals of approaching danger, that of hearing. A snake has no real ears ; it has no external opening or mark of ears, and though there are beneath the skin rudiments of the internal ear structure, it is doubtful whether the snake can hear any sound with them—whether, that is to say, it can detect vibrations of air, though it may, perhaps, by means of them, become conscious of vibrations carried by the ground. Though he may be deaf in the sense of having no ears, the snake is nevertheless not shut out of the world of sounds ; on the contrary he responds, when awake, to very slight sounds. There is evidence to support the view

that he hears (if one may use the word in this sense) through his tongue. The snake's tongue is very different from even a lizard's tongue and from that of any other animal. It looks like two black, shiny threads, each tapering to the finest of points, lying close together for most of their length and separating towards the tips into a forked shape. This tongue is exceedingly sensitive—so sensitive that the snake can detect by it the faintest of vibrations, even those produced by quite small sounds. If you watch a snake when it is alert and moving, you will notice that its tongue is constantly flickering in and out of its mouth. Speak or cough or make any sound and immediately the tongue of the snake will flicker out just as, if you made the same sound in the presence of a wolf or an antelope, its ears would turn towards you. In a healthy snake the tongue is never stuck straight out or held motionless, but is always in movement.

It is even more clear that the tongue serves the snake as an organ of touch. A

snake which is moving along its course will test every object it encounters with its tongue, which flickers (no other word so well describes the movement) over the object, barely touching it but clearly conveying to the snake some appreciation of what the object is. It is beyond doubt, therefore, that the tongue is one of the snake's most essential sense organs.

A structure so important and so delicate might be liable to injury, especially when the snake is swallowing large or rough prey, and a sheath is provided in the bottom of the snake's mouth into which the tongue is withdrawn for protection. It is said that a snake will not survive a serious injury to its tongue, and it may be true, though I have never exposed a snake to the risk of a test.

So much for what the tongue of a snake may do for its owner. Let us see what it cannot do. It cannot, most emphatically, injure anything. I have already referred to the widespread idea that snakes "sting," and associated with it is the belief that the tongue is the "sting"—a belief which originated

doubtless in the rapid movement and tapering sharpness of the forked tip of the tongue. The dangerous minority among snakes have, as their weapons, a kind of specialised tooth or fang with which they bite their victim. The word "sting" is not appropriate to either the weapon or the manner of using it.

Another old belief which crops up regularly is that snakes lick their prey over with their tongues to wet it with saliva and facilitate the act of swallowing it. The body of the prey may, indeed, become covered with saliva as the snake swallows it, but it should be sufficient only to look at the tongue to realise how impossible it is that there could be such a result from licking by it. This belief is based on the snake's natural tendency to flicker the tongue over the prey in order to ascertain that everything is as the snake believes it to be, and perhaps to make sure that it is really dead—a condition that snakes which kill their prey before feeding almost always wait for.

Sight, hearing and touch I have mentioned.

What of the remaining senses of taste and smell. The first we may dismiss very summarily ; I feel sure that no snake has any appreciable sense of taste. I believe, however, that at least some species have a sense of smell. I have seen a python move its nose with some signs of excitement over the spot on the floor of its cage where a rabbit had been sitting, when nothing but scent could have informed the snake of its former presence there. It is possible, therefore, that some snakes may become aware of the presence of prey, and even be guided towards it, by scent, but I do not think that it is by any means a universal property among them and it seems probable that many or most species depend on sight in their hunting, supplemented by their extreme sensitiveness to movement and vibration.

Snakes are a silent race. They have no voice and the only sound they can make is a loud hiss, pronounced by inflating the lung to its capacity and expelling the air forcibly through the glottis or entrance to the windpipe.

It is intended as a warning to intruders and is a device common to nearly all reptiles.

Snakes, like all other reptiles, are "cold-blooded," as it is termed, in distinction from mammals and birds, which are called "warm-blooded." The mechanism for the circulation and re-oxygenation of the blood of the reptile is not adapted for maintaining a fixed body temperature irrespective of its surroundings, as is the case in the more highly evolved bird or mammal. The practical effect of this is that whereas the members of the last two classes are to a great extent independent of climatic conditions and external heat and cold, the reptile depends on the temperature of the air or water surrounding it, or the ground on which it lies, for the heat necessary for the carrying on of its vital processes. The body temperature of a dog, for example, or a crow, will be the same whether the thermometer be standing at thirty-five degrees or at eighty-five, and they will be equally active and lively, though probably they might tend to be more lively at the

lower temperature than the higher. A snake at the higher of those two temperatures would be, under normal stimulus, as lively and active as the dog, but at the lower one it would be apparently almost lifeless and would continue so until a rise in the temperature of its surroundings raised it to active life again. The reason is clear, therefore, why snakes flourish best in the tropics and sub-tropics. When they are natives of temperate regions, such as Europe, they escape the difficulty of the low winter temperature by hibernation—"going to sleep" as it is often termed—for the winter.

Although snakes like and require a considerable degree of warmth, they are not such lovers of the sun as lizards are. They will bask in the sun if that is the only way, as it usually is in this country, in which they can find the warmth they want, but if they can be sufficiently warm in a "shade temperature," they usually prefer it. Snakes are, indeed, less able than lizards to tolerate too high a temperature.

HOW THEY MOVE

One might imagine that a snake, which has no feet or hands or claws, would be a rather helpless kind of creature. It is most amazingly the reverse! It has no feet but yet it is all feet, and can travel at great speed. Some snakes can cover the ground as quickly as a rabbit can run—for a short distance at any rate. The common grass snake can travel as quickly as a frog can leap and catch the frog by sheer speed. The snake has no fins nor any specialized device for swimming, yet it can swim as quickly as a fish and indeed catch the fish by out-swimming it. They have no hands or paws to grasp with, yet some snakes can dart upwards through the trees more swiftly than a monkey can climb. They have no claws yet can grasp and hold their prey as securely as a cat can do. How does the snake do all this? Chiefly he does it by means of his wonderfully flexible backbone. There are an immense number of separate bones in

a snake's backbone—more than three hundred in some—united to each other on a ball-and-socket principle that permits each bone or joint considerable movement on its neighbour, so that a snake is able to bend its body into a very close and tight curve. A python of, say, eight feet long, for example, can coil round one's finger and contract so tightly as to make the finger numb. Nearly every vertebra or joint in a snake's back has attached to it a pair of ribs and each pair of ribs is connected at the tips to either end of one of the broad scales which clothe the underside of the snake. The scales overlap each other so that they slip easily over anything in front, but grip with their loose back edges against any roughness of the surface on which the snake is lying. It is largely by means of these scales and the grip they afford that a snake is able to move forward. If a snake is placed on a perfectly smooth surface, such as a polished table, it can only wriggle along in a very slow and awkward fashion ; it cannot progress unless

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there is sufficient roughness for the scales to grip.*

A snake moves forward in two ways. The ribs are connected to their respective vertebræ by joints which allow considerable play, and are controlled by muscles. If the snake is not in a hurry he glides along slowly and smoothly by drawing forward the points of some of his ribs alternately, first on one side, then on the other; in a sense he walks on the tips of his ribs as if he had a couple of hundred or so pairs of feet. The progression of a snake cannot be fitly described as creeping or crawling; such words do far less than justice to the easy smoothness of its advance; it seems just to flow along. It was a very old observer who first noted "the way of a serpent upon a rock," and anyone who watches a healthy python in majestic progress, its skin, velvety and irridescent, just veiling the ripple of the powerful muscles as

* Snakes, or some of them at any rate, can get a certain purchase on a smooth surface by drawing upwards their under scales, so making the belly slightly concave and holding by "suction."

they contract and slacken, will realise the wonder he expressed. It is one of the most beautiful and graceful movements in animal life. When a snake is travelling in this way its whole body follows the same line. There is no cutting of corners or dragging of part of the body sideways ; if, for example, after travelling so far in one direction, the snake turns off at a right angle, the whole length of it will continue in the same angular track.

If the snake is in a hurry, however,—if he is pursuing prey or fleeing from danger,—he travels in a different manner. He travels by drawing up his body in curves, getting a grip of the ground with the tail end and throwing the greater part of the body forward in a straight line, then, gripping the ground with the fore part, the after part is again drawn up in curves and the movements repeated. In this way a snake travels at great speed. If the snake should be travelling through grass or undergrowth, the stems of it will give him even better hold for propelling himself forward than would bare earth, and he

swims in similar fashion by the resistance of the water, through which he "bends" his way. Always the curves in which the snake propels himself are from side to side; a snake never travels by up and down curves (unless it be when passing over some obstacle). A common idea is that a snake may spring at an enemy or leap at its prey. It never does so. It throws the fore part of its body forward in attacking, but the greater part of its length always remains firmly on the ground; to do otherwise would be for it to lose control of its aim in lunging and its power of recovery. Rarely more than a third of a snake's length is moved from the ground when it attacks.

THEIR COAT AND HOW THEY CHANGE IT

The skin of a snake is covered entirely with scales. The scales of the back and sides are usually more or less leaf-shaped, smooth and polished in some species, such as the great pythons, or roughish in others, and in some species, such as the common grass snake,

with a ridge or keel down the centre. They overlap and are arranged in symmetrical rows. The scales of the head may be small like those of the body, and irregular, as in some of the vipers, or large and symmetrical as in, for example, cobras, pythons, or, again, the common grass snake. The under part, as already mentioned, is usually covered with long scales which reach from side to side, though some snakes of burrowing habit have small scales underneath, as also have most of the sea snakes.

Snakes as a whole are not very gay in regard to colour. Sober tones are most in fashion among them, ranging from ashy grey to green or olive, relieved in most cases by spots or stripes of yellow, brown or black. Some species favour dark green or dark blue or black as their predominant colour. Some, especially the tree snakes, are uniform bright green. Beauty of colour and pattern are, however, by no means uncommon among snakes ; it would be difficult to find anything to surpass a common boa, for example, in

beautiful arrangement and blending of tint and tone, or a green tree boa or a coral snake in brilliance.

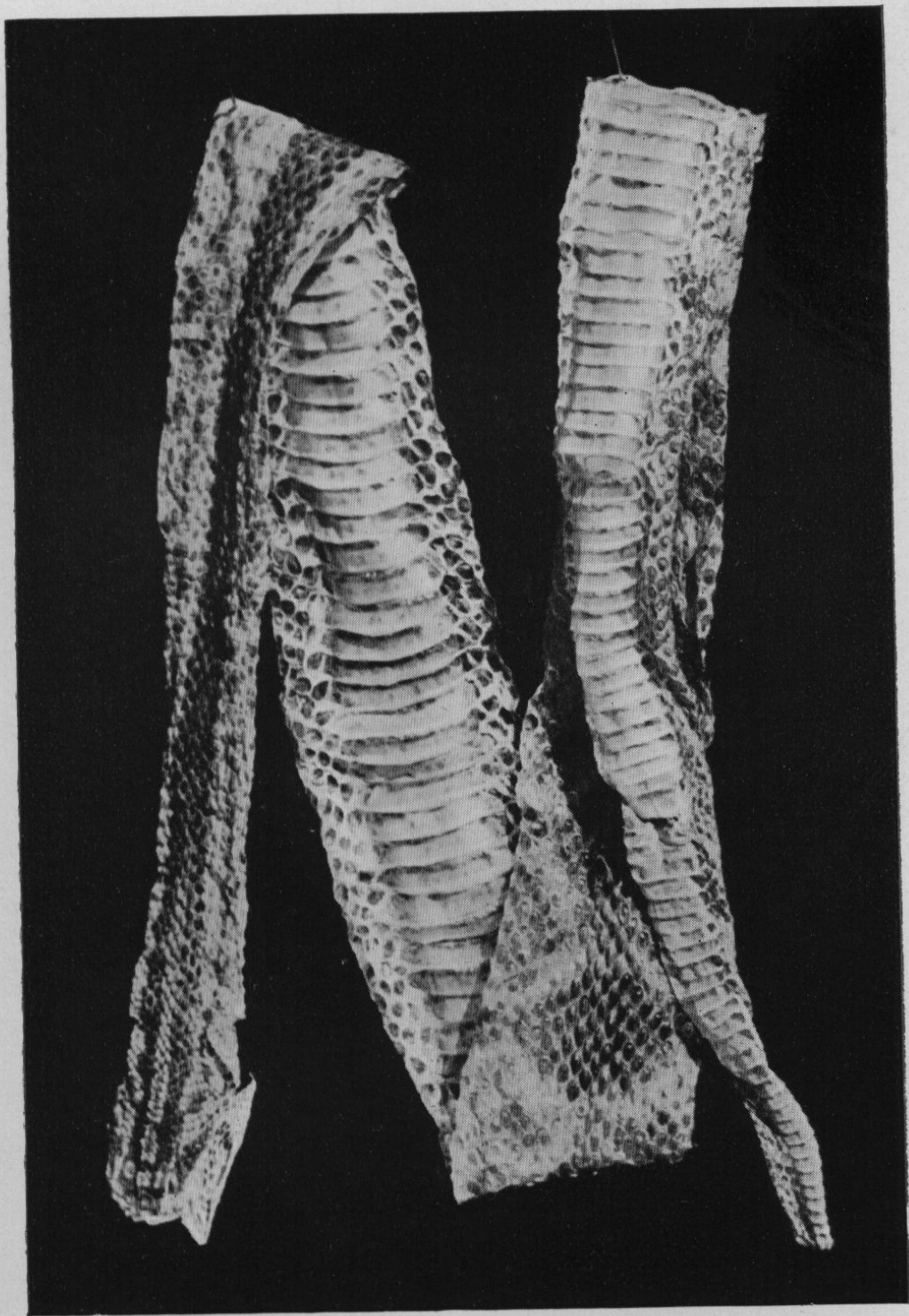
It is probably superfluous to mention the absurdity of the once common idea that a snake is "slimy." The skin of a snake is quite dry. It may feel cold to the touch if the snake has been in a cold place, but if a snake be handled when it is warm enough to be active, its skin has a pleasantly cool feeling like that of a piece of ivory.

Mention of the skin leads one to that interesting periodical process in a snake's routine, sloughing, often referred to as "changing its skin." It is not the real skin but only the outer covering of it, the epidermis, that is changed. This outer covering is thin, horny and transparent. Once formed it is incapable of further growth, and the frequency of changing it is related to the rate of growth of the snake, that is to say, as the snake grows too large for the thin inelastic sheath which contains it, it finds it necessary to grow a new one of more

accommodating size and discard the old. A baby snake will shed or cast its "skin" for the first time when it is about a week old (if, that is to say, it is thriving and healthy), and during its first years, when growth is rapid, sloughing takes place at fairly frequent intervals, the spacing between becoming longer as the snake grows older and its rate of growth declines. An adult snake, in good health and well fed, will cast its "skin" three or four times a year. Ill health will upset the regularity of the casting.

The operation of sloughing is a serious one for the snake and affects it much more than analogous changes of covering in mammals or birds or even in lizards; the only corresponding process that has, to my knowledge, a similar effect on the well-being of its subject is the moulting of penguins. When the snake is about to change its "skin" it becomes dull and listless and ceases to feed. Its skin loses its velvety "bloom," looks harsh and dry, and the colours fade to a rusty, dirty-looking drabness. Even the

scales covering the eyes lose their transparency and the eyes look as if they had turned to blueish chalk. The snake not only seems ill, it is ill. This state may continue for a week to ten days or a fortnight, and covers the period of growth of the new epidermis, which is being rushed forward to take the place of the old one. Then, if one keeps the snake under observation, it will be noticed one day that it seems much more lively; its eyes will be clear again and its skin will seem to have regained its colour. If one knew no more of the matter than one had seen up to that stage, a natural conclusion would be that the snake had completed its casting, in spite of the absence of any product of the operation which, perhaps, one might guess that the snake had swallowed, as a toad does on a similar occasion. It has not done so, though the worst part of the business is over so far as the snake's feelings are concerned. The return of colour to the skin is due to a secretion whose purpose seems to be to separate the old epidermis from the new and



Photo]

[Mrs. T. H. Gillespie

THE CAST "SKIN" OF A RATTLESNAKE

The cast is complete and unbroken; it shows the scales which covered the eyes and something of the colour and pattern of the snake

which has moistened the old and restored its transparency. In a few more days the snake will begin a restless wandering, continually rubbing its nose against rocks or stones on the ground. It is trying to turn back the edge of the old epidermis on its jaws. In a little while it will succeed in doing so and then, once a start has been made, it will gradually crawl out of its old skin. The cast "skin" will be found turned inside out and very soft and moist and fragile, but if the snake be in perfect health the cast will be in one piece, complete in every smallest detail, even the "watch-glass" scales which covered the eyes being in their places. If the cast is not complete, but comes off broken and in patches, it is usually a sign that the snake is not in the best of health, and if parts of the old cuticle remain attached and do not rub off, the omens for that snake's future well-being are not too favourable.

THE VARIETY OF SNAKES

The word "snake" covers a very great variety and contrast of size and habit, more perhaps than one finds in any other group of animals. In size they range from tiny creatures no larger than an earthworm up to the huge pythons of thirty feet or, as some claim, even more. Some of the smallest snakes resemble the earthworm not only in their size (or lack of it!) but to some extent in appearance and in living entirely underground. They have small smooth scales, resembling polished metal, tiny eyes almost hidden in the scales, and a very small mouth, and are otherwise adapted for a burrowing life. Most snakes can climb trees if compelled to it, though many, in the ordinary case, never do so. Some snakes, however, live entirely in trees, many of them very long and slender and coloured a lovely leaf green so that they are all but invisible among the leaves. Some snakes there are which live

entirely in the sea and there are some which spend the major part of their lives in fresh water. The majority of snakes live on the ground, seldom ascending trees, and entering water only at intervals, though all are expert swimmers.

The majority of snakes are creatures of the daylight, but some are active and feed at night. Many of the nocturnal species have great power of expansion of the pupils of their eyes, which contract in the daylight to a narrow vertical (or sometimes horizontal) slit, like those of a cat.

Many snakes are of great benefit to man as destroyers of noxious animals, chiefly small rodents, who are themselves inveterate destroyers of grain and crops, and the snake is particularly well fitted for this work since no mouse or rat or marmot can take refuge in any hole where a snake large enough to devour it cannot easily follow. Even some of the most dreaded venomous snakes, the Common Cobra, for example, though they make take a heavy toll of the lives of men

and of domestic animals, might claim to set against that the immense number of food-destroying, plague-carrying rats they exterminate. Many rodent-eating snakes are quite harmless to anything except their prey and ought to be always protected for the good they do.

Snakes are found in most of the large land areas of the world, island as well as continent, almost to the limit of the temperate zones. It is, however, in the tropical and subtropical regions that they are most numerous ; they reach there their greatest size, and as regards venomous species, their greatest potency. There are, it may be mentioned, no snakes in Ireland, a deficiency for which some praise or blame St. Patrick, but which may be attributed to the arrival of the snakes (in an evolutionary sense) having occurred too late for them to reach the " green island " before its separation from the continental land area. In this loss Ireland has the companionship of New Zealand.

CHAPTER III

HOW SNAKES FEED

DO SNAKES "FASCINATE" THEIR PREY?

THERE is probably no aspect of the snake's life story that contains more material for amazement than its manner of feeding, and the novice in ophidian matters finds his faith in the initiate who instructs him sadly strained when they arrive at this stage—when, for example, he is shown a grass snake with a neck no thicker than a pencil and is told that it will swallow a good-sized frog, or that a young python, with a head no broader than a shilling, will easily swallow a full-grown rat. If he be a polite novice, he is silent and unbelieving and a little hurt that one should hold him quite so gullible! If he be less polite he will be correspondingly less shy in expressing the view that "seeing's believing!"

Among the many actions that a snake has found himself able to perform in spite of the lack of feet or hands or claws, one rather important one is not included ; a snake cannot cut up or tear up his dinner. Not only has he no claws to tear it with but his teeth are not of a kind with which he could bite off portions of his prey ; they have no cutting edges or broad masticating tops, but are in shape rather like a thorn, sharp, slender, and slightly curved backwards. Their sole purpose seems to be to grasp and hold the prey when the snake catches it and swallows it. The consequence of this is that the snake is compelled to swallow his prey whole. That would not be a matter of any difficulty to the snake, or of any interest to us, if he dined on relatively small things ; a thrush quite easily swallows a worm, or a lizard a beetle, and no one thinks anything about it. The curious thing about snakes is that they are not disposed to live on food so small or so easily swallowed as that ; they have, for some reason not easy to discover, established the habit

of taking prey which, in relation to the particular snake concerned, seems enormous, and they swallow, as one mouthful, enough food to suffice for a week or sometimes for many weeks. A grass snake, whose head is only half an inch wide, and whose neck is no thicker than one's little finger, swallows a full-grown frog ; a snake with a neck about as thick as the handle of a tennis racket will swallow a large rabbit, and a large python whose neck may be no larger than a man's wrist will make a meal of a goat or a pig or even a small deer. Evidently, then, the act of swallowing can be no ordinary one since it seems to infer that operation which we learnt from Euclid was impossible, of making the less contain the greater. How does it happen ?

The explanation lies in the difference between the structure of the snake's head and jaws and that of other backboned animals. The jaws of all snakes are very loosely connected together. The lower jaw is really two jaws held together at what one may, for

convenience, call the "chin," by an elastic ligament instead of joined bone. The lower jaws are connected to the skull by similar elastic ligaments, which are capable of stretching to an astonishing degree. The two parts of the lower jaw can therefore be separated very widely from each other, and both from the skull and upper jaws, so that the whole orifice of the mouth might be compared to the opening of a bag held closed by a strong rubber band which can be stretched to pass over a large object. Let us suppose that a python of, say, nine feet long, whose neck would be ordinarily about as thick as a cricket bat handle, has killed a rabbit and is about to swallow it—quite an easy matter for a snake of that size. First it will look for the rabbit's head, and when it has found it, it will open its jaws and take hold of the rabbit's snout firmly. Then one side of the upper jaws will be pushed forward a little and take a fresh hold with its array of sharp recurved teeth; next the lower jaw on the same side will reach a little forward

and close its teeth into the rabbit's nose so much farther up. The jaws on the other side will then repeat the movements, and so, first top, then bottom, then one side, then the other, the jaws will advance and the head of the rabbit will gradually be pulled into the snake's mouth, or, it might seem more accurate to say, the snake's mouth will gradually be pulled over the rabbit's head. All this time, with each alternate movement forward of the snake's head, the ligaments which tie the bones of the snake's mouth together have been stretching till the lower jaws look like nothing but a tight elastic band stretched round the prey, and the further pulling of it inwards seems to depend on the alternate action of the two sides of the upper jaw. The snake's throat has also begun to stretch as the head of the rabbit enters it, and once that stage has been reached the muscular action of the throat begins to help to draw the body of the prey inwards and the swallowing proceeds more quickly. It is at best a slow, and as it seems

to the human onlooker, a most laborious and even painful task. Every few minutes the snake will pause, in its struggle to engulf the prey, to rest and breathe. That may suggest a question, how can the snake breathe when its mouth and throat are stretched so tightly over a mass of flesh and fur which seems absolutely to choke it? If one looks at a snake feeding one may notice, between the snake's lower jaw and the body of the prey, something that looks like a fleshy tube, the end of which is continually opening and closing. This is the glottis or entrance to the windpipe, which the snake has the power to draw forward beyond the obstruction in its mouth and so to breathe while swallowing is proceeding. By degrees the jaws advance until the whole body of the rabbit has passed between them and is now distending enormously the skin of the throat, which may be stretched so much that the scales, which normally are in contact with each other, become separated and look like rows of little islands in a sea of skin. So the prey passes



Photo]

[*Mrs. T. H. Gillespie*

A small Boa which has just swallowed a pigeon. The distension caused by the meal is very obvious.

onwards to the stomach, where its presence is manifest in a very prominent bulge. The snake now yawns once or twice and the head and jaws, which perhaps one thought must have been dislocated and distorted beyond remedy for all time, return to their normal position and appearance, with no sign remaining of the extraordinary distension they had endured.

The time taken by a snake to swallow a meal, and the effort it may be put to, will depend, of course, upon the nature and relative size of the prey. A grass snake may catch and swallow a frog in less than five minutes, the slimy skin of the frog making it easy to swallow. Furry or feathered prey, unless very small in proportion to the size of the snake's head, takes longer. I once timed an eight foot long python who was swallowing a pigeon, and found that from the moment when the snake seized it till the last of the tail feathers disappeared from sight, fifty-five minutes passed.

It is, I think, almost certain that a snake

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can have no sense of taste and it does not seem likely that it can have any pleasure in feeding, apart from the fact that it is satisfying an impulse, for the whole process conveys an air of struggle and strain suggestive rather of pain than of pleasure. It may be for that reason, perhaps, that snakes feed comparatively seldom, at least they seem to be under no temptation to over-eating! Some kinds of snake feed more frequently than others, but a week between meals is a very good average. Feeding, like all other vital processes of a snake, is affected by temperature, and a snake when very warm will digest its meal and become hungry again more quickly, and will be more active in seeking prey. Snakes also feed more frequently at certain seasons than at others. Sometimes a snake will lose flesh and become thin and feeble if it should be unable to obtain food at a normal interval, yet at another time the same snake may be able to fast for a period which seems prodigious. I remember an Anaconda, about nine or ten

feet long, which came to the Zoological Park at Edinburgh in June, 1916. Soon after its arrival it was offered food, but showed no interest in it. It was tried at intervals but steadily refused to feed, and as it was not apparently losing condition, no resort was made to artificial feeding (which is sometimes necessary to save the life of a captive snake). It was not until July, 1917, that that snake took its first meal! Once it had begun to feed it continued to do so at intervals of about a fortnight. The astonishing thing is that at the end of that fast of at least fourteen months (for it was a month on its way from Trinidad to Edinburgh) the snake was in almost as good condition as it was at the beginning.

Snakes feed almost entirely on other animals. No snake, so far as we know, ever takes fruit or vegetable food. A number of species will swallow eggs, and there is one snake—a native of South Africa—which feeds entirely on eggs, but with that exception snakes take nothing but prey which they have

caught themselves, that is to say, living prey—mammals, birds, reptiles, batrachians, fish, and even, in the case of some smaller species and perhaps of very young snakes, insects and earthworms. The tendency is for each species or related group of snakes to restrict itself to a limited range of prey. Thus those which feed on warm-blooded prey—mammals and birds—are not prone to include cold-blooded animals in their dietary, and those which feed on aquatic animals are not much inclined to take warm-blooded prey. The water snakes, snakes such as the common grass snake, for example, feed chiefly on fish and frogs, and I do not think a grass snake, in a wild state, would ever take warm-blooded animals unless, perhaps, it were very young hairless mice or unfledged birds. Some snakes confine themselves to lizards as their diet, and there are some cannibal species which feed on other snakes, either exclusively or by preference. These are not hard and fast rules, however, and we find a number of species, which will take either fur, feather or

scales. Moreover, individuals sometimes break away from the tradition of their respective species (or what we have believed to be their tradition), and extend the scope of their larder.

Dietetic conservatism is among snakes the mark not only of the species but also of the individual. A snake which has been in the habit of feeding on one type of prey may quite likely refuse to feed, even to the point of starvation and death, upon another type which is counted among the orthodox regimen of its species. Thus grass snakes which had always fed upon frogs may refuse to look at minnows, though others of the species take minnows readily, and *vice versa*. A python I once owned, which at one time fed with equal keenness on rats, rabbits or pigeons, had been restricted for a year or two to rabbits only ; after that it refused absolutely to contemplate dining on rat or pigeon. I have known other pythons which had been fed on pigeons and refused with equal emphasis to consider the question of feeding

on a rabbit. Yet both bird and mammal are equally among the food favoured by their race. The Anaconda, whose long fast was described above, furnished another example of ophidian exclusiveness in diet. I mentioned that it did not take its first meal until after it had been in the Zoological Park for over a year, though it had been offered food at frequent regular intervals. I did not explain at that point, however, that the food offered to it had been rabbits, pigeons and fowls. All of these had been consistently ignored. It happened (at the time when the snake first fed) that a large white Aylesbury duck chanced to be on hand, and accordingly it was offered to the Anaconda, and was immediately constricted and swallowed. My only immediate thought was that the snake was at last coming on to feeding. In a fortnight the anaconda was again offered a rabbit—and ignored it. When this refusal was again repeated, though the snake was obviously on the look-out for food, I suddenly thought what the true reason for its refusal

might be, and gave instructions for a duck to be offered to it. The duck was immediately seized and it became clear, after further experiment, that that snake would have duck and nothing but duck. Even a goose which was tried on him was refused. Rabbit, fowl, goose, would have been equally good for him, but duck or nothing was his creed! A snake, therefore, is far from that attitude of mind which prompts a human being to exclaim: "What, boiled mutton again? That's the second time this week we've had boiled mutton!"

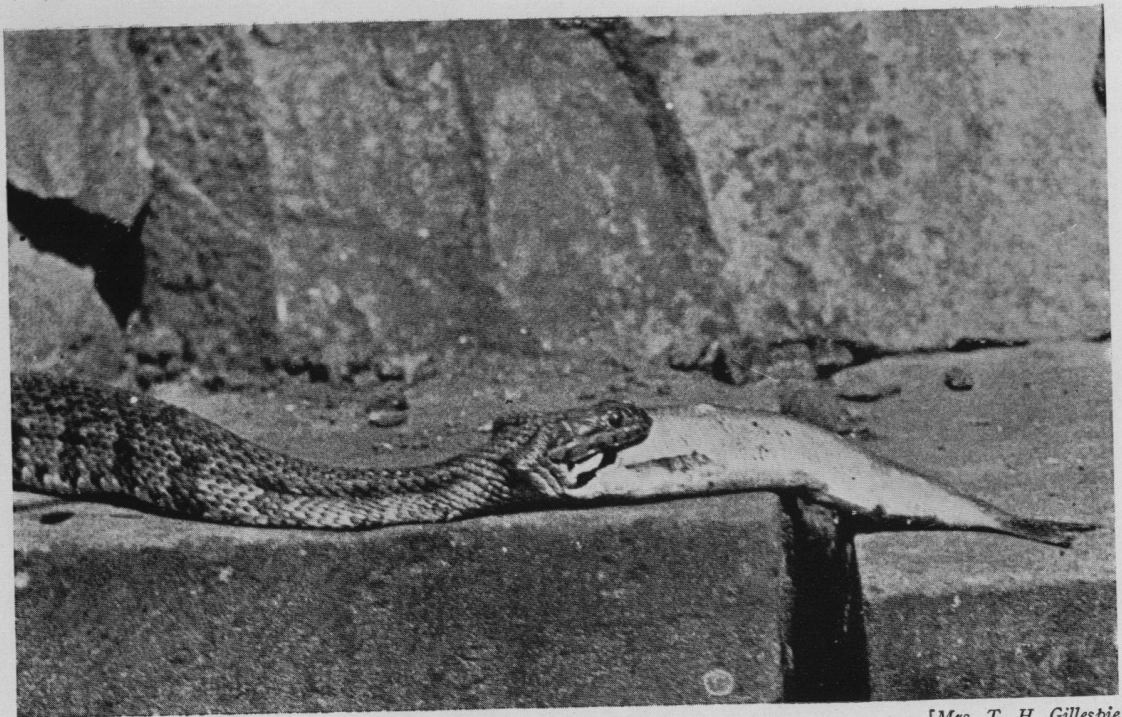
The reason why snakes, as a rule, will take only prey which is living and which they have seen moving, a tendency which they share with frogs and toads and other batrachians and many lizards, is not by any means clear. I can only suggest that it is because, while their eyes are sensitive to light and shadow and movement, they may not be able to define detail, and it may be that the snake awaits movement to indicate the edible nature of the food which, apart from

movement, it might be unable to recognize, (although, in making that suggestion one must not forget that some snakes recognize the edible nature of eggs, which do not move). While that may be the unfailing rule among wild snakes, it is possible in most cases, if not all, to teach captive snakes to take freshly killed dead prey. It has been the custom for many years, in the London Zoo, to feed the snakes on dead food, and the same rule is followed in the Edinburgh Zoo. The experience we have had in training snakes to take dead food has offered some interesting and surprising observations, and at the same time has strengthened the fear I always feel of using the words "always" and "never" in connection with the behaviour of animals. One usually begins their tuition by placing the dead animal in front of the snake and moving it jerkily by means of a string or stick. If the snake be in the mood to feed it will show a more or less lively interest in the moving body, probably following it if it is moved far; after a satisfactory inspection

it will ultimately seize and swallow it, showing that it is not the "livingness" of the prey but the movement that acted as the necessary stimulus. Some snakes will very quickly come to take dead food offered to them in this way ; others may be slow to do so, and many attempts may be necessary before they are finally persuaded. Very few fail in the end to adapt themselves to this method, and there is not a single snake in the Reptile House of the Edinburgh Zoo which does not take dead food. Once snakes have become accustomed to having their food provided for them already dead they may utterly refuse afterwards to kill for themselves. We had a cobra which went further than that, for after having become habituated to taking dead rats, it dashed off in apparent terror at the sight of a living rat !

Snakes which have been taught, in captivity, to take dead food, may sometimes allow themselves to be tempted to depart still further from the strict orthodoxy of their type or species. Some little time before this

chapter was written the keeper in the Reptile House had been making some experiments in the use of fresh herrings as a food for reptiles. He really began by using herrings for the crocodiles, which, he found, took them readily enough. Then a Rhinoceros Iguana arrived but failed to bring an appetite with him. He was offered all manner of foods—fruits and vegetables of every available kind, raw meat, mice, frogs—but he fed only very spasmodically and capriciously and not nearly sufficiently to keep up his condition. One day the keeper placed half a small herring in front of him, and was a little surprised when he took it. The surprise was greater when next day he again swallowed a meal of herring. From that time he began to show a better appetite and was soon feeding regularly. Whether it was simply a coincidence that the offer of herring coincided with a reviving inclination to feed or whether there is, as the keeper believes, something of special appeal in the herring, I am unable to say, but it is certain that the lizard began to feed



Photo]

A WATER SNAKE SWALLOWING A HERRING

[*Mrs. T. H. Gillespie*

well from that time and improved in condition. The keeper was encouraged to continue his exploitation of the herring, and found not only a large number of lizards who take it but also some snakes as well. The snakes are chiefly water snakes which feed on live fish in a natural state so that their taking herring is not very surprising. My reason for introducing the affair here is that I suggested to him to try some of the other snakes with the fish, particularly boas and pythons. I had not the least expectation that any python would look at any fish, for they feed on mammals and birds and do not, so far as I am aware, ever take cold-blooded prey, though some of their cousins the boas may do so. Most of the pythons supported me in my scepticism, but to my extreme surprise one python has consented to take the fish. It is a small Seba's Python, above five feet long, and it was in rather poor condition though feeding fairly well. I thought its first herring meal might have been what one might call an accident, due to a misunderstanding on the

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part of the snake and that it would not repeat it, but it took a second herring some five days later and is now feeding regularly on them.* From the time it reached the Park until this change in its diet, it had been sloughing badly, the old "skin" coming off in small patches, but its first sloughing after the herring diet began was perfect, the cast coming off complete—a sign of definite improvement in its health. This seemed to me a very interesting and unusual change in a snake's general habit as well as a marked testimonial to the food value of the fish.

One quality, perhaps a negative one, that snakes may claim is the fact that they are seldom or never bloodthirsty. They hunt and kill under the stimulus of hunger, but if they are not hungry they are usually quite indifferent to the presence of their prey. Captive snakes have shown this tolerance times without number, and it is extremely probable that they would behave in the same

* That was a year ago. The snake subsequently died—but not of the herring!

way in the wild, though in the latter circumstances the contiguity of snake and prey might not be so close. I have seen a pigeon perch upon the coiled body of a python and preen its feathers, and a rabbit squat in the middle of the snake's coils and sit up and wash its face, both in complete ignorance of the nature of their neighbour, who, not being in the mood to feed, was as harmless to them as the stick or the stone they seemed to assume it to be.

Some snakes, the majority, perhaps, capture their prey by lying in wait for it at a spot where it is likely to pass, as, for example, near a watering place or a feeding ground. Others quest about and, when they have discovered something edible, pursue it. The grass snake is a good example of the latter; when such a snake discovers a frog which leaps away, the snake dashes after it and captures it by sheer speed. In any case, if the prey has eluded the lunge of the waiting snake, the latter will probably pursue it. Many snakes stalk their prey, moving rapidly but very silently towards it. In that case the

snake, watching the prey intently, moves its head gently forward, then keeping the head motionless, draws up the coils of its body, the neck taking an S-shaped curve. If the prey continues unconscious of the snake's presence, there is another advance of the head, followed by a similar drawing up of the coils, the neck always taking the S-form which is essential for the snake's striking. When the snake has come within striking distance of the prey it will remain for a moment, tense and rigid, until it feels certain that it is near enough and that the prey will not move, then, more quickly than one's eye can follow, there is a swift lunge forward of the head with open jaws, and the backward-pointing teeth take firm hold of the victim. There is tremendous force in the blow of a snake's head when it strikes; I have had my hand feeling numb and painful for a couple of days after being bitten by a quite small python, the pain being due, not to the comparatively negligible pricking or tearing of the teeth, but to the impact of the snake's jaws. A snake (except

those of the cobra group) almost always draws its neck into the S-shaped curves before striking and will seldom bite without doing so.

After the prey has been captured comes the question of overpowering and killing it. Snakes deal with that problem in one or other of three ways—by poisoning the victim, by constriction, or by simply swallowing it. The venomous snakes have least trouble; they have only to wait till the poison injected by the bite has done its work. I shall speak of their methods in detail in a later chapter.

The constricting snakes, the instant they have grasped their prey with their teeth, throw two or three coils of the fore part of their bodies round it and, by contracting the muscles, squeeze it to death. This is the method not only of the "great constrictors"—the boas and pythons—but of many smaller snakes. The death of the prey is caused sometimes by its neck being dislocated when the snake strikes its head (which may partially stun it), when it must be almost

instantaneous, or by the pressure on its heart and lungs. The statement frequently made that the pressure of the snake's coils is so great that "every bone in the body" of the victim is broken, or that it is "crushed to pulp," is sheer nonsense. I am afraid before such pressure as that could be applied the delicate bones of the snake would suffer first. The victim's neck may be, indeed very frequently is, dislocated, or on occasion some ribs may give way, but it can be only very rarely that the stronger bones are broken. It is suggested that the reason for this "crushing" of the bones to "pulp" is to reduce the body of the prey to a shapeless and pliable mass that will be more easily swallowed. The alleged reason is as unnecessary as the suggestion is unsound; the amazing elasticity of the snake's jaws and throat enable it to deal with such relatively minor obstructions as the skeleton of its victims, and the constricting power, great as it is, is not quite equal to turning a chicken, say, into a sausage! The power of these

snakes is nevertheless very great, as one may realize if one should ever feel it. I have had a little python of not more than seven feet long coil round my arm and contract so tightly that in a few minutes my hand was numb and my arm felt "as if it was not there!"

In addition to the true constricting snakes there are many snakes which may be called partial constrictors because, though they are scarcely able to kill prey by that method, they do put a coil or two round their victim to prevent it struggling or escaping and to hold it while they are swallowing it. Such snakes are usually among the smaller members of the order. Then there are the snakes which have no means, and make no attempt, to kill their prey except by the comparatively slow method of swallowing it and so probably suffocating it. One could not find a better example of this kind of snake than the common Grass-snake and its fellows. As soon as a Grass-snake has seized a frog in its jaws—the frog is seized usually by the hind leg, since it has been caught by pursuit,

and not by the head as a snake that lay in wait for prey would have done—it begins by the independent action of its exceedingly mobile jaws, to work its mouth along the body of the frog, without ever slackening its hold or giving the frog a chance to break away, till it comes to the head, when it very quickly pulls its jaws over the body of the frog. Sometimes a Grass snake will not wait to turn the frog round but will begin to swallow the hind leg it has seized and then a prolonged contest may begin, as the snake tries to work both hind legs into its jaws and the frog struggles to evade it. After the frog has been swallowed it lives for some little time in the body of the snake before it is killed either by suffocation or by the action of the snake's digestive process. I have known a frog which had been swallowed by a snake be disgorged more than five minutes afterwards, not only alive but so little affected by its experience that it immediately swallowed a worm placed in front of it! Many people who have kept snakes could

doubtless match this incident. As a rule the snakes which feed in this way prey upon cold-blooded animals—frogs, newts, fish and sometimes lizards—and the tendency is, though it can scarcely be called a rule, that the snakes which feed on mammals and birds kill their prey, either by poison or by constriction, before swallowing it. I believe that of all the animals which prey on others the snake must not be accounted among the least merciful or most blood-thirsty.

Some snakes there are which feed on their brother snakes. One of the outstanding cannibals among them is, without much doubt, the Hamadryad or King Cobra, which has the distinction of being probably the most deadly of venomous snakes; it feeds largely upon snakes and will often take no other prey. There are other cannibals which feed on snakes as well as other prey. The most interesting of them, I think, is the King Snake of North America. It is not a very large snake and it is not venomous, but it does not hesitate to attack a rattlesnake as large as,

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or even much larger than, itself. It is a constrictor and feeds on small rodents and lizards as well as on snakes, but it seems to prefer snakes to other prey. Unlike almost all other snakes, which do not attack animals so large that they can never hope to swallow them, the King Snake will throw itself with ferocity upon another snake twice its size. In an instant its whole length is twisted in a spiral round the body of its victim and tightened till the latter ceases to struggle or to live. It makes no difference that the victim may be a deadly rattlesnake, for the King Snake is immune to the venom, and the only effect of the biting of the struggling viper is to cause a further tightening of the suffocating band around it.

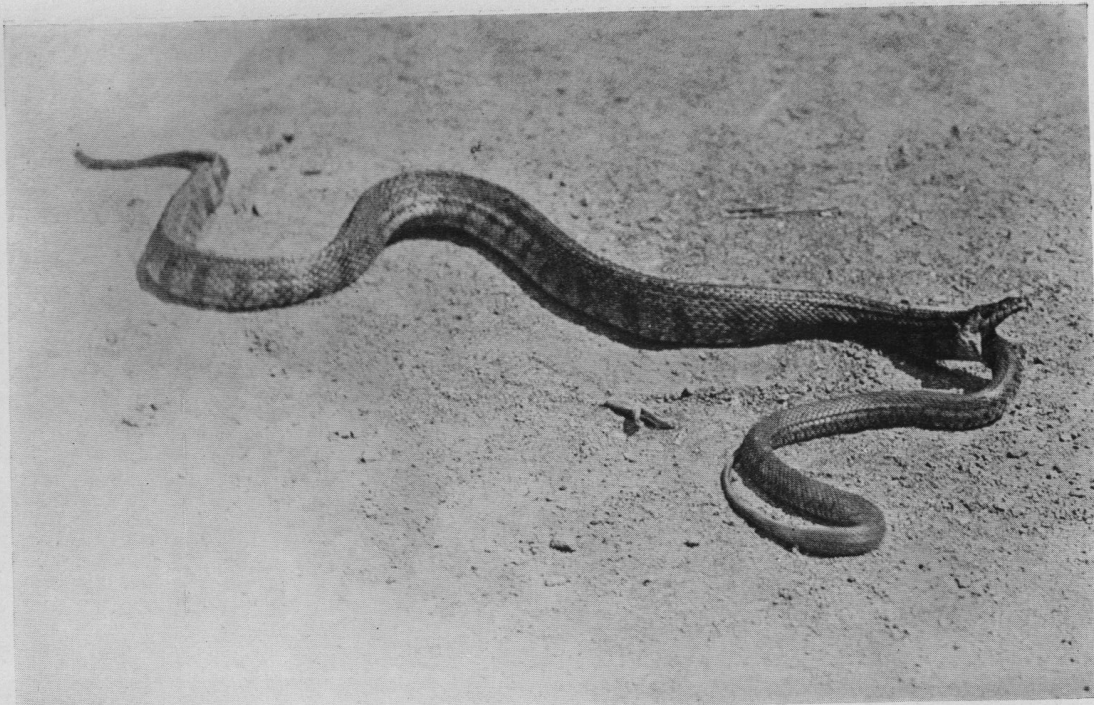
In addition to what one might term genuine or intentional cannibalism, it sometimes happens—in captivity at any rate, if not in the wild—that one snake may swallow another accidentally. Snakes are not very intelligent, and their feeding is very much of a mechanical affair, so that when several are living together

in comparatively small space an awkward mistake may occur at feeding time. The following is an often-told account of such an accident. In a case in the Reptile House of a certain Zoo were two boas, one about eleven feet and the other about nine feet long. One night, to feed them, the keeper put in two pigeons, one for each, and duly went away. Next morning when he looked into the case he discovered that, where the night before he had left two snakes and two pigeons, there was now only one snake to be seen! Where had the other snake gone? A second glance at the very bloated and exceedingly uncomfortable-looking snake that remained gave the clue. Each snake had seized a pigeon and the larger, having swallowed its own first, had then turned and demanded a second helping by grabbing the unswallowed portion of its neighbour's dinner. Each snake had gone on swallowing till their jaws met in the middle of the pigeon and then, the larger snake, having worked his jaws over those of his companion, had gone on swallowing

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till he had engulfed not only his companion's dinner but his companion with it! It must, one supposes, have had a very unpleasant after-dinner feeling for a week or two, but in a few weeks the huge meal was digested and the snake recovered from the effects of it. I have quite frequently had the beginnings of similar accidents with my own snakes and have many a time had to free the head and a quarter of the body of one snake from the jaws and throat of another. That the tragedy was never completed was due solely to the fact that I never left the snakes for long unwatched as long as food was in the case. The partially swallowed snakes never seemed perturbed by their experience and were usually prompt to seize another frog or mouse, or whatever it may have been that they were feeding on, as soon as it was offered.

Once, in a Zoo, a python striking at a rabbit, missed the prey and caught its teeth in a blanket which served as a covering for it or for its floor. The snake did not realize



Photo]

ACCIDENTAL CANNIBALISM

[*Mrs. T. H. Gillespie*

It not infrequently happens that two snakes seize the same prey and that one of them is swallowed by the other along with the prey

its mistake and, the trigger of the feeding impulses having been pulled and the machinery set in motion, the snake set about and in due time accomplished the task of swallowing the blanket. This meal proved too much, though, even for the digestion of a snake, and after a little the blanket was disgorged. By the way, it is sometimes stated that once a snake has started to swallow anything it cannot free its mouth from the object in it owing to the length and backward set of its teeth, but must go on swallowing. That is not true. A snake can, and sometimes will, abandon a meal after it has drawn half of it into its mouth, and eject it, and quite frequently a snake that has fed but is not feeling too fit will disgorge its meal.

The instances mentioned of one boa swallowing another not much smaller than itself, and other similar instances in which boas or pythons were concerned, were accidental, and intentional cannibalism is not a vice of which the snakes of this family are expected to be guilty. I have, however,

known one case which seemed to me deliberate cannibalism on the part of a python. It happened in the Edinburgh Zoo a year or two ago. There were living in a case two snakes, one a Seba's Python, about ten feet long, and the other a Common Boa, some nine feet long. One morning the keeper, on looking into the case, saw no boa but only the python—enormously distended. No food had been put into the case the night before and there was nothing that could serve as an excuse for the larger snake to plead a mistake, so one was forced to conclude that being in the mood to feed and finding nothing else available, it had deliberately swallowed its cage-mate. Justice, however, did not sleep on that occasion, and the offender paid the penalty of his "crime" by dying, as a direct consequence of it, a week later.

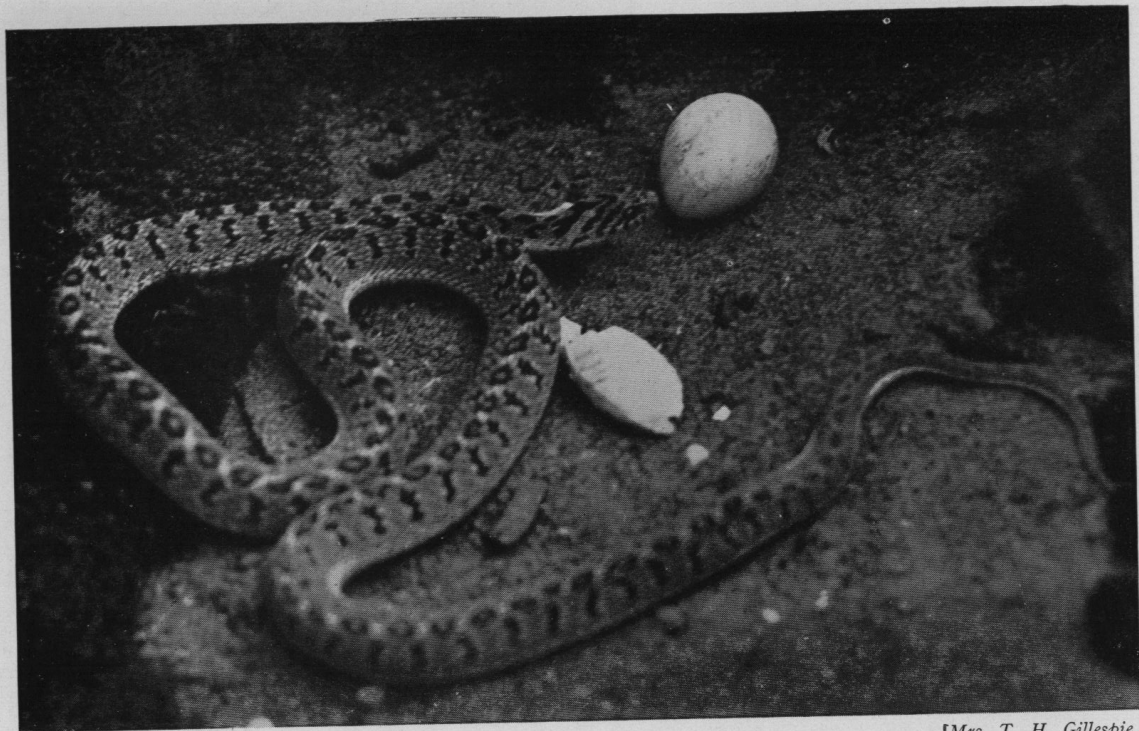
I mentioned on an earlier page that there is one snake which feeds entirely on eggs. It is a native of South Africa and is a very interesting little snake. It seldom grows to more than about two and a half feet long and

has a neck scarcely thicker than an ordinary pencil, yet it can swallow an egg of breakfast-table size without breaking the shell. Since an egg cannot try to run away or struggle to escape, this snake needs not the usual complement of sharp recurved teeth for holding prey, and has indeed few teeth in its mouth, but it has instead a very neat and effective arrangement to deal with its specialised diet and method of feeding. It has in its throat several long tooth-like bones, extensions of the first joints of its backbone. When this snake is about to feed and has found a suitable egg, it works its mouth over the egg, which passes into the throat and distends it in the same way and in about the same proportion as a football would distend a silk stocking. The huge swelling moves slowly on, then stops; the snake makes one or two jerky muscular movements of its neck, and suddenly the swelling subsides. What has happened is that the egg had reached the "teeth" in the snake's throat and a contraction of the muscles, pressing the egg

against them, had caused them to cut through the shell, which of course had collapsed under the pressure and allowed its contents to run down the snake's throat into its stomach. Usually, a few minutes after, the snake opens its jaws and ejects the empty shell neatly rolled up. Some individuals do not eject the shell, but swallow and digest it also.

DO SNAKES FASCINATE THEIR PREY ?

One of the oldest beliefs concerning snakes is that they possess the power to " fascinate " other animals and either to render them incapable of movement or retreat, or even to cause them gradually to approach the snake and come within striking distance of it. The power lay in the eye of the snake ; it was its " magnetic glare " that paralyzed or hypnotized the victim. In antiquity the power was so great that even man might not resist its influence and it reached its climax in the mythical Medusa whose " snaky tresses," if looked at, turned men to stone.



Photo]

AN EGG-EATING SNAKE

[Mrs. T. H. Gillespie

The rolled-up shell of an egg has been disgorge by the snake and is lying near its body while it is about to swallow another egg

The Gorgon was a very extreme case, however, and in the main the power was supposed to be exercised only on the creatures on which the snake desired to prey. Birds were particularly its object, in fact the influence of the snake over the bird has become a common metaphor. So we have the poets writing with indignation of "the bird that shrieks and flutters in the gazing serpent's thrall," or "the bird whose pinions quake but cannot fly the gazing snake," the idea being that the bird was the conscious and unwilling victim of an influence which controlled its movements and brought it within each of the waiting hungry snake.

Is there any foundation whatever for such an ancient and widespread belief? It is, in part, undoubtedly due to the impression left on the observer by the fixed unchanging appearance of the snake's lidless eye, which conveys a strong suggestion of the weird and uncanny. If an animal were seen behaving in the presence of a snake as if it were in some way attracted to it, one can

easily realize how the fact might be hastily and uncritically attributed to the influence of the staring eye. So far as this "hypnotic stare" of the snake is concerned, we may dismiss the matter at once as being mere superstition with no sound basis, but there is more to it than that. Many intelligent and educated observers have recorded that they have seen birds behaving as if attracted by some unknown cause towards a snake and fluttering and hopping towards its head. There can be little doubt that the organ of "fascination" is not the snake's eye but its tongue. A snake lying coiled and motionless is not likely to be recognized as a living creature by small mammals or birds. Times without number mice or rats or rabbits have been seen to settle themselves within the coils of captive snakes in whose cages they had been placed to serve as food, and, in utter unawareness of the dangerous possibilities of their neighbour, washed their faces and groomed their coats, while in the same conditions pigeons have perched on the snake's

head and composedly preened their feathers. In such a case the snake, being indisposed to feed, has shown indifference to the presence of rodent or bird and has not displaced it. While, however, the snake might be motionless, its tongue is likely to be active, flickering in and out of its mouth, and to a small bird or other insect-loving creature, the suggestion of a moving insect may be irresistible. The late Dr. Arthur Stradling, an enthusiastic snake-lover and student of snakes, in articles I remember reading years ago, gave many instances to prove this. One I remember was of a fowl which had been placed in the cage of a boa and which persistently pecked at the snake's tongue as it went in and out. He also mentioned the case of a frog which was attracted to the tongue of a snake and attempted to snap it up, evidently mistaking it for a worm or an insect. It is probable, then, that in that sense snakes may now and then attract small mammals, birds, lizards, or even frogs, towards them, and so the ancient observers who first founded the tradition may

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be justified as to the fact though not as to the cause. The fascination is due, not to any mysterious power in the snake, but to the hunger or curiosity of the small creature. It is an additional example of the value to a snake of its tongue, but it is used, we may suppose, without any deliberate intention on the part of the snake.

CHAPTER IV

THE GREAT CONSTRICTORS

THERE is little doubt, I think, that the most popular snakes are the large snakes, for the reason, perhaps, that the greater the snake, the greater is the thrill it produces. I, at any rate, am not disposed to question the general choice. My own favourites have always been the great constricting snakes—the boas and pythons. They seem to me to be the most beautiful in form, the most graceful in movement, and far from the least interesting in habit, while their comparatively sensational size is not without its appeal.

We get some of our early ideas of the size of these snakes from those books of our boyhood which describe the swallowing by a gigantic snake of, it may be, a donkey or a bull or a

buffalo. My own interest in snakes was, I believe, first stimulated by that treasure of my childhood, the "Swiss Family Robinson," in which, as they will remember who may have shared my joy in it, is described with due pathos the devouring of the family's faithful donkey by a great constricting snake! It is, to an eight-year-old, an enthralling story. I remember even now my speculation and my efforts to picture the actual size of the snake concerned. I had, at that time, never seen a snake, but I knew something of the swallowing capacity of other animals—I knew, for example, how a duck could swallow a half-grown frog or a thrush a good big worm, and working from such ascertained data I arrived, by the rule of simple proportion, at a noble snake of perhaps eight or so feet in diameter and a proportionate length of it might be a hundred feet! It was a sad disillusionment to learn later that no snake that lives ever approached half that length or a tenth of that thickness, unless, indeed, there be a "great sea serpent"! Moreover, while

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it may be just possible for a very large python to swallow a not too large donkey, it is, I think, quite certain that none ever swallowed a buffalo. Goat, pig or small deer are the gauge of the larger prey of these snakes, and there are only four species that could concern themselves with anything so large.

The great constricting snakes are all members of the family of the Boas, which is divided into two sub-families, the Boas proper and the Pythons. Both sub-families share their more interesting characters, and the distinction between them is mainly anatomical. Most of the pythons have large horny plates or shields on their lips and the front of their heads, in which are a number of curious pits, whose function, if they have one, as seems probable, is not definitely known. The true boas tend to have their heads covered with small scales, but some of them have plates with pits on their jaws resembling those of the pythons. Though this family contains the largest known living snakes, it also includes some quite small species.

One of the largest of living snakes—it may have a very good claim to be regarded as the greatest of all—is the Anaconda or Water Boa of Central and tropical South America. The other three species which are its only possible rivals in size are an African snake, the Seba's Python, and two Eastern species, the Indian Python or Rock Python and the Reticulated Python, the former of which ranges over India, Ceylon, the Malay Peninsula and some of the East Indian Islands, while the latter is confined to Burmah and the Peninsula and islands to the south. All of these four snakes grow to a very large size, and it might be a somewhat rash venture to say definitely which of them is the largest. Snakes, even after they have attained an average full growth, probably continue to grow, though it may be very slowly, as long as they live, and if a snake happens to be located in some happy place where food is plentiful and nothing hostile disturbs it, there seems to be no reason why it should not continue to live for a very long time, and

continue to add steadily if slowly to its size during all of a long life. One cannot, therefore, say with any assurance that some of the tales travellers tell of snakes surpassing all authentic records are impossible, even though one may suspect exaggeration and suspend belief. So, when one hears tell of anacondas of forty, or it be more, feet long, one may discreetly refuse to deny the possibility but at the same time wisely reflect that no body or skin of such a monster has ever been submitted in evidence. It is, to say the least, doubtful whether an anaconda exceeding twenty-five feet long has ever been found. Dr. Ditmars, of the New York Zoological Park, one of the leading authorities on snakes, considers that the anaconda may rank only third among the world's largest snakes, and he gives seventeen feet as an average length for what might be called a large example. The anaconda, as its alternative popular name suggests, is a lover of water, living in the vicinity of lake or river, and spending much time lying in the water. It may lie in

wait for prey, either coiled in the water with its eyes and nostrils above the surface, or it may suspend itself from a branch of a tree in such a position that it can strike at any animal passing beneath. I should judge from its behaviour in captivity that it prefers to wait in the water. It is perhaps in keeping with this fondness for water that the anaconda, though it feeds largely on mammals and birds, includes in its dietary small crocodiles and large lizards. In captivity, at any rate, it seems to prefer feathered prey. It is not so beautifully coloured as the three big pythons, its prevailing colour being a rather unpleasant shade of yellowy green with a series of black spots running in a zig-zag down the back and smaller spots with whitish centres on the sides.

The *longest* snake of which there is trustworthy record measured about thirty-two feet long. It was a Reticulated Python, and pythons of that species of a length of twenty-five to twenty-eight feet or so are not very rare. It is probable, in view of the number of very

large individuals that are known, that this python is really the longest of all snakes. While, however, it may be the longest, it is not necessarily the largest or the heaviest, for it is, as compared with the other two pythons and the Anaconda, a somewhat more slender snake, so that an individual of one of the other species might, though somewhat shorter, be heavier and stronger than a Reticulated Python which had the advantage of two or three feet in length. The Reticulated Python is, according to my eyes, the most beautiful of the "big four." Its ground colour is a mingling of rich shades of brown, from purplish to old gold, with a series of diamond-shaped blackish markings forming a kind of net-like pattern (from which it takes its name) along the back. When in good health a lovely iridescent sheen distinguishes this splendid snake, which seems well entitled to the name "Regal Python" by which it is sometimes called.

The Indian Python does not grow to so great a length, at least none so great has

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been recorded. It does, however, grow to at least twenty feet or so long, and it is a heavily built snake—thick in proportion to its length.

Perhaps I ought to give some indication of the relation of girth to length in these snakes. An Indian Python which had reached a length of about fifteen feet would have a circumference, at the thickest part of its body, provided it had no distention due to food, of about sixteen or seventeen inches. A Reticulated Python of the same length would, in similar condition, have a girth of only about fourteen to fifteen inches.

The African Seba's Python is very similar to the Indian in proportion and in size, though if there is any difference in average size the African would seem to be if anything the smaller.

It has probably been noted by this time—perhaps with surprise and some mystification—that though I have had so much to say about the greatest of all snakes, I have

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never even mentioned yet—at least in this connection—that snake which has figured so often in story as the incarnation of all that is monstrous in snakes—the Boa Constrictor ! Is it not the Boa Constrictor who has earned so great a fame as the unembarrassed swallower of donkeys and bulls and buffalos ? Why then has it been so inexplicably ignored in a discussion of ophidian greatness ? The reason is just that, compared with the others, it is not a very large snake. It probably seldom grows much beyond twelve or thirteen feet in length,* and it never dreamed, in its hungriest moments, of swallowing a donkey ; rabbits are of a size much more to its choice and nearer to its capacity ; it perhaps prefers birds and will also take large lizards. It has its compensations, though, and if it may not impress us by its size, it cannot fail to do so by its beauty. It is a lovely snake. Its ground colour is a reddish-brown, darkening to a deep brownish-crimson towards the tail,

* There is, at the moment of writing, in the Edinburgh Zoo, a Boa Constrictor fifteen feet long ; it is the largest I have ever seen.

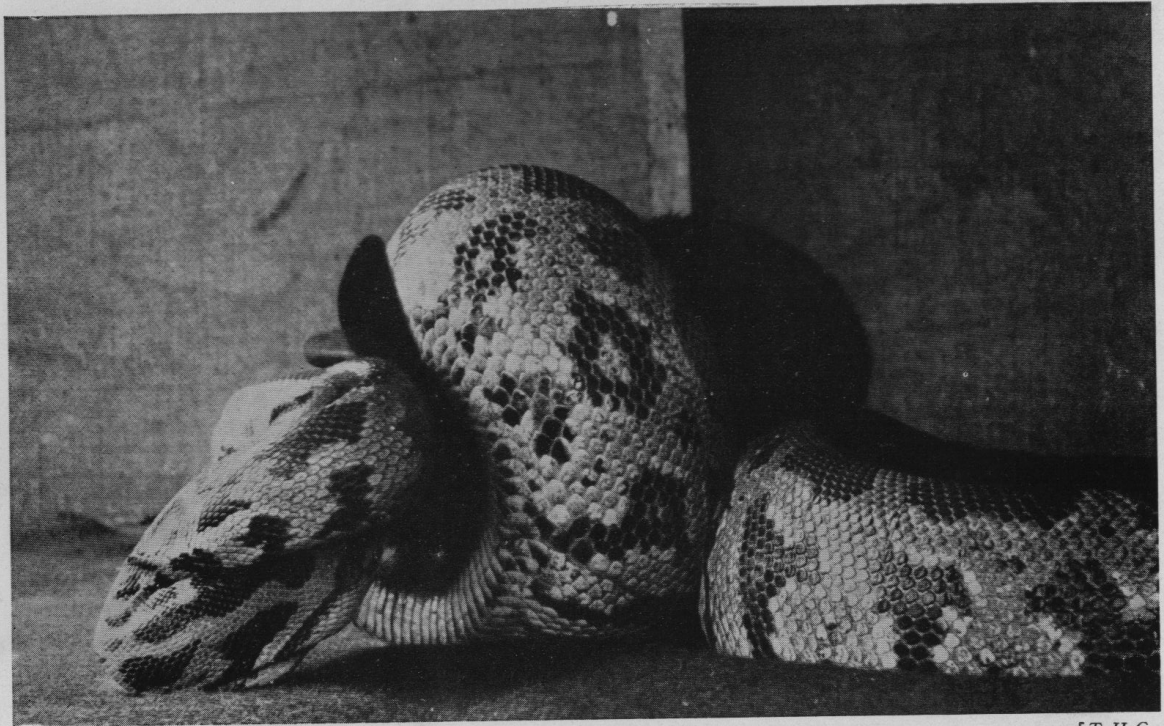
while down the back the colour is broken by a row of large saddle-shaped blotches of lighter brown or grey-pink. It is, however, impossible to describe in words the beautiful colouring and lovely soft velvety sheen of a healthy Common Boa. This snake, by the way, is one of those comparatively rare examples of an animal which is known popularly by its scientific name.

Most of the large snakes, when taken young, are easily tamed, to the point, at any rate, of allowing themselves to be handled freely without attempting to bite. Whether they, or any snake, is capable of recognizing its owner and of showing any response to him, or even of distinguishing one human being from another, I should not care to decide. I am afraid the answer to the question must depend a good deal on personal bias. Some people have been convinced that a snake can develop a quite definite recognition of and attachment to the person who regularly feeds and handles it, the Common Boa having been specially mentioned in that

regard. Certainly this Boa is generally quick to become tame and gentle when handled, if it was not too old when captured. All I will say definitely on the point is that I cannot persuade myself that any of my own snakes, though many of them were quite tame, ever showed the least affection for me! Perhaps I ought to add that I never expected them to do so!

Like the Anaconda, the Reticulated Python sometimes lies in water to wait for prey to approach; the Indian and African Pythons generally hunt on dry land. Sometimes they, and the Common Boa too, will lie coiled on a branch of a tree; it may be that those which do so are individuals who prefer feathered prey or it might be monkeys or squirrels they had in view. Sometimes, in certain books, one sees snakes pictured as waiting for prey having a coil or two of their tails round a branch and hanging straight down with heads near the ground. I cannot imagine any snake ever behaving like that! When one of these snakes is really hungry it will

go in search of prey and stalk it in a manner that the most subtle cat could not hope to excel—advancing its head in the direction of the prey so slowly and silently that the chance of the movement being noticed is slight, then holding the head rigid while the body flows along the track of its own coils and so drawing up towards the prey until the snake is near enough to strike. In most cases the constrictor seizes its victim by the head and its coils are thrown round the shoulders and body and death comes quickly in the manner already described in the preceding chapter. Sometimes, but I think not often, the snake may make a bad shot, and fail to throw its coils neatly round its victim, whose death may then not be so speedy, but I do not think such bungling happens often. Usually the constrictor kills its prey as quickly, and I think with as little fear or pain to the latter, as a man could do. However quickly or slowly death may come, the constrictor always knows when its prey dies and whether it is not yet dead, and it never relaxes its



Photo

AN INDIAN PYTHON CONSTRICTING A RABBIT

[T.H.G.]

(The snake remained so rigidly still that a time exposure of two minutes was able to be given)

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coils till then. As soon as it is dead the snake loosens its coils and searches for the nose of its prey in order to begin to swallow it. If it should have any difficulty in working its mouth over the head of the prey the coils will again be brought into action and used to hold the body firmly and to turn it into a suitable position to facilitate the operation.

Are the huge constrictors, of approaching twenty feet or more long, dangerous to man? The question is often asked and it is not one to which an unqualified answer can be given. As compared with the more important venomous snakes, one might say that they are not very dangerous because though a large boa or python can give a quite serious and very painful bite, such a bite alone would be no more, usually, than a matter of passing discomfort, provided proper precaution was taken in dressing the wound. The question of real danger would only arise if such a snake were willing and able to bring its coils into action. It is certain that if a fifteen foot

python, to say nothing of still larger individuals, were to get its coils round a man's body it could give him a very unpleasant time. If his arms were caught in the coils he would be quite unable to help himself in the slightest, and if the coils got below his arms he might well have his ribs squeezed inwards and be killed by the compression of his heart and lungs. It is astonishing how helpless one can be with a large snake coiled round one! I remember some years ago being placed in a rather ludicrous position by a python. It was suffering from canker, a disease of the mouth to which snakes are susceptible, and I went one day to attend to its mouth. There was no keeper about at the time and as the snake was not a large one, being only about eight feet long, I did not trouble to find anyone to help me. I took hold of it with my left hand, grasping it, of course, by the neck close behind the head, so that it could not turn and bite my hand, and holding its jaws apart with the forefinger and thumb of that hand, I was dusting an antiseptic powder

on the mouth with my right hand and rather carelessly neglected to observe what the tail of the snake was doing till the tail suddenly flung forward and coiled round my right wrist. I could not free my wrist—the more I tried to shake them off the more tightly the coils of the snake were drawn, and I dared not loosen the grip of my other hand on its neck as I did not want to risk a bite from an unhealthy mouth. I had to wait in this manacled state for a considerable time till someone came along who could screw up courage enough to take hold of the end of the snake's tail and uncoil it! By that time my right hand was quite numbed by the pressure of the coils on my wrist and arm.

Many tales are told of huge snakes attacking human beings and some of them seem to have the support of credible authority behind them. In spite of that I cannot help still having my doubts, for it seems to me that the argument *a priori* is all against it. Of course, if such a snake be interfered with,

or had cause to apprehend interference or danger, it will most naturally and excusably defend itself, and it does so by drawing its body into coils and striking savagely at the intruder, but the tendency of a snake in such circumstances is, immediately it has bitten, to draw back its head and be ready to strike again instantly. It is like the action of a swordsman, who, having lunged, instantly recovers in readiness for the next thrust. A constrictor does not, in such defensive attack, use its coils unless it is actually seized by an enemy and is engaged in a rough-and-tumble struggle. I think for all these reasons that any man, meeting a large python, need not expect aggressive action on the part of the snake or any action save retreat, unless he be himself the aggressor. Even then he would probably get off at the expense of a bad bite. The bite of a large python is serious enough, for the long teeth, slightly curved and pointing backwards, make a nasty lacerated wound, and the force of the blow is equal to that of a boxer's fist.

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Apart from self defence, there remains the question whether a very large constrictor might regard a man from the aspect of a possible dinner. It would be a dietetic novelty and, as I have mentioned before, snakes are extremely conservative in regard to their food. A snake which was large enough to be within measurable hope of swallowing a man must have lived for many years on food which was not human, and at that stage would be likely to hold that feeling with which many a staunch Conservative supports his political faith—he is too old to change. Add to that the fact that the constrictors, at least so far as one can judge from their behaviour in captivity, never interfere with any other animal that does not interfere with them unless they are hungry and desire to feed, and the extreme unlikeliness of such a snake attacking a man becomes very strong. It might, however, happen that if a man had interfered with the snake and for some reason—perhaps through its teeth becoming entangled in his clothes or perhaps because

he had himself taken hold of the snake—it was held in contact with him and threw its coils round him, then the impulses and “machinery” of feeding might be set in motion, and having his body in its coils, it might proceed to constrict and kill and, if it were a large enough snake, to swallow him. It is possible, but, I venture to think, extremely improbable. The case of a child, however, would be quite different. I have often noticed that carnivorous animals seem to regard the human adult and the human child as quite distinct and different creatures, showing fear or respect or sometimes affection for the adult, and a hungry-looking desire to stalk and doubtless to devour the child, and I should not deny the possibility or even likelihood that a python might not always draw the line between a child and its usual food mammal. I am inclined to think it quite reasonable to accept some of the stories of native children having been swallowed by large pythons, as based on fact. Some of the smaller members of the boa family

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are much more inclined to be savage than the larger ones, and might be really dangerous but that their comparatively small size forbids.

Like many families in this world, that of the boas includes dramatic contrasts in the fortune and importance of its members. While in that family we find the largest and most powerful of snakes, we find also some of the smallest and most humble. Beside the magnificence of the Regal Python, with its possible thirty feet of strength and grace and beautiful colouring, we find, as poor relations, the insignificant little Sand Boas, some of which can hardly attain much more than eighteen inches. These little snakes spend most of their lives buried in sand; they have small flattish heads scarcely distinguishable from their necks, smooth small scales, short stumpy tails, and are yellowish brown in colour matching the sand among which their lives are spent. They are hardy in captivity and are good for handing to anyone who may wish to handle a snake in

perfect safety, for under no conceivable circumstances will they ever try to bite. A glance at many of the shoes which ladies are wearing at the moment shows that the sand boa is not without his uses.

CHAPTER V

POISONOUS SNAKES

HOWEVER impressive in their beauty and formidable in their strength the great constricting snakes may be, they can scarcely grip one's imagination or thrill one quite so much as do the poisonous snakes with their sinister power.

The poisonous snakes of the world may be most conveniently regarded as falling into three groups—groups whose members are connected not so much by closeness of general relationship as by identity of function and of the specialisation related to it. They are all alike in so far as they kill by a venom which is secreted by certain glands situated in the head, and which is injected into the victim by means of teeth specially shaped for the purpose. The distinction between the

snakes of the three groups lies in the difference in the form and arrangement of the teeth and the method of using them.

Snakes of the group to be considered first are known as "Back-fanged Snakes" (*Opisthoglypha*). In this group the teeth in the front of the snake's jaws are small and harmless, but towards the back of the jaws are a pair, or, in some species, several pairs, of larger teeth. These are the specialized fangs or venom-conducting teeth. They have a groove or channel running down them, the purpose of which is to conduct the venom into the flesh of the victim when the snake bites. The venom glands, in snakes of this type, are placed in the jaws immediately above the teeth. When such a snake attacks, it bites, but at the first only the small front teeth, which are innocent of venom, enter the flesh. In order to bring the poison-conducting teeth into action, the snake must keep its hold and work the jaws forward by the alternating action of the two sides of its jaws until the longer back fangs have entered the

victim's flesh, when the snake grips hard with its jaws and the venom, squeezed out of the glands, flows down the grooves in the teeth into the wound. It is obviously a rather slow process as compared with the action of the other groups of poisonous snakes which I shall describe later, and unless the snake is able to retain its hold for the necessary time, it cannot inflict a dangerous bite.

The snakes included in this group are very numerous. Many of them were at one time regarded as harmless, and it is only comparatively recently that the potential deadliness of their bite has been proved. The failure to recognize it earlier may be attributed to the relatively small size of their fangs, which are, in so many of them, too short to penetrate through human clothing or thick fur or feathers and enter the flesh beneath, and also to the appreciable interval of time the snake requires between its first biting and the coming into operation of the venom-conducting teeth. If, therefore, the snake were shaken off or pulled away before it had time

to work its jaws forward, a bite was a quite insignificant affair and the biting snake was credited with an innocence or innocuousness that it did not in reality deserve. When, however, the snake has opportunity to bring its bite to the final stage, its venom kills the prey as quickly as in the other types of poisonous snake.

It is easy to see that such snakes are not, as a rule, likely to be at all dangerous to man because, apart from the fact that a large proportion of them are of very small size, even the largest can seldom have the chance to complete its bite but would be flung or pulled away at the first moment of its biting. It is beyond doubt, now, however, that if the venom of some of the larger species of snakes of this group should enter a man's body it will kill him unless steps are taken very quickly to save him. The classical example is that of a keeper in a collection of snakes in South Africa who, handling a "Boomslang" (Tree Snake), was bitten on his bare forearm. He believed then that the snake was non-

poisonous—as it had hitherto been regarded—and ridiculed the idea of having the wound treated, but in a little while symptoms of poisoning by snake venom showed themselves. The condition of the man became rapidly worse and he was removed to hospital in a state of complete collapse. He remained on the verge of death for nearly a week and his final recovery was slow. Mr. Fitz-simons, Director of the Port Elizabeth Museum, where the accident occurred, gives a very complete account of the whole affair in his book, “The Snakes of South Africa.” The essence of the matter was that, as the man did not consider the snake a venomous one, he did not trouble to snatch it away or shake it off quickly—in which case the bite would doubtless have been as harmless as at that moment he thought it would be—and so allowed the snake to hold on firmly and work its jaws forward till the fangs at the back of the jaws could penetrate the flesh of the arm. Mr. Fitz-simons subsequently made many tests with snakes of this species and found

that its venom would kill birds just as rapidly as that of the South African cobras. Thus was established the deadly power of a snake that until that time (1907) everyone had believed to be quite harmless. This snake is among the larger members of this group and reaches a length of five feet or more. The great majority of them are not only small but are gentle and not much disposed to bite when they are handled. They feed largely on cold-blooded prey, lizards, frogs, and, in some cases, fish, though some of them will kill small rodents and birds. Some are said to eat small birds' eggs. Some of them live entirely in water and feed on fish.

Now we come to the second kind of poisoning method and mechanism. In the snakes which fall into this group there has been a considerable advance and improvement in their weapons as compared with the first group. The poison-conducting fangs are no longer at the back of the jaws; they have, as it were, been moved forward to a position at the front of the jaws. These snakes are

on that account known as "Front-fanged" Snakes (*Proteroglypha*). The fangs themselves have also undergone a highly important improvement for, instead of having merely a groove down the surface to guide the poison into the wound they had made, the grooves, in the course of their evolution, have had their edges united so that they form internal channels down the tooth through which the venom can be forced rapidly by pressure on the gland, and from it emerges, without the loss of the smallest drop, through a small opening near the point of the fang, sunk in the victim's flesh. The great improvement in method is obvious, for while, in a snake of the back-fanged group, it is necessary for the snake to get the full length of its jaws to grip and, as it were, chew the wound to enable the venom to run down the grooved teeth and enter the victim's tissues, all that the snake with fangs in front has to do is to bite with only the front of its jaws, the venom being injected to the bottom of the wound, as if by a hypodermic syringe, almost in the

moment of biting. They do, to bite effectively, require to *bite*—that is to say, to grip the victim firmly with upper and lower jaws, but a very rapid bite is sufficient as compared with the slow chewing bite of the back-fanged snakes.

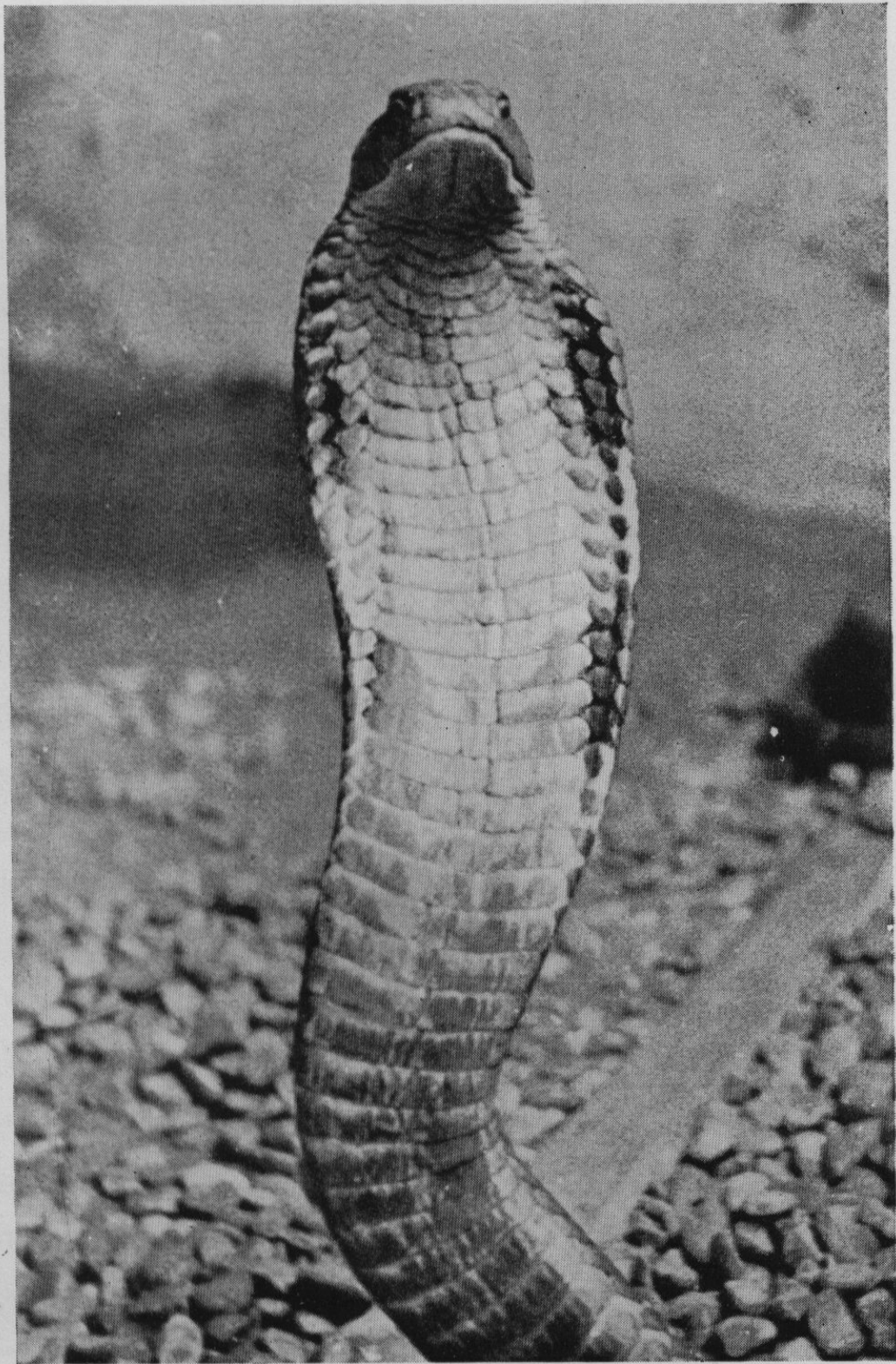
The expression “ front-fanged ” is sufficient to distinguish the snakes of this second group from those of the first, but it is, as we shall see, not enough to distinguish them from the third group, whose fangs are also in the front of their jaws, and to make the latter distinction clear it would be necessary to call the second group “ front-fixed-fanged.” The fangs of all the snakes of both these first and second groups are fixed rigidly erect in their jaws and are relatively small, those of even the largest scarcely reaching half-an-inch in length. The fact of their rigid attachment alone would account for the shortness of the fangs, since longer teeth would interfere with the closing of the jaws or would project beyond them. The shortness of the fangs must greatly limit their effectiveness since they may be scarcely

long enough to reach the skin through the fur of a thick-coated animal. Nevertheless, in spite of such limitation, some of the most notable and most deadly snakes in the world belong to this group. Chief among them are the cobras. The cobras are, for the most part, active nervous snakes which, from their highly strung temperament and quickness to defend themselves against real or imagined danger, have gained a reputation, not altogether deserved it may be, for viciousness. The best known of them, in a popular sense, is the Spectacled Cobra, also known as *Cobra-de-capello* or Hooded Cobra, which is one of the commonest and most dreaded snakes of India and Ceylon. It has a very spectacular means of adding an awe-inspiring appearance to its power of dealing death. Several pairs of ribs nearest the head are greatly lengthened and by raising them the snake expands its neck, flattened and widened, into a kind of hood shape. On the back of the neck are some curious markings which, when the hood is expanded, suggest a pair of eyes

with spectacles round them. Whenever the cobra is alarmed it rears up its head and the fore part of its body, expands its hood, and waits threateningly for the next move of the enemy or for an opening to attack. It follows every movement of its "enemy" with its eyes and with readjustment of its pose and balance in order to be ready to lunge and bite.

The length of a large Spectacled Cobra is about six feet. Far more human beings are killed by this snake, probably, than by any other species. That is due to its being a fairly common snake which lives in a country where a dense human population is accustomed to go bare-footed and bare-legged, and to its nervous irritability and promptness to bite before looking for a way of retreat. On a bare limb its comparatively short fangs are able fully to penetrate, while they are likely to be defeated by boots or leggings or clothing.

It will occur to anyone who sees an alert cobra that the snakes of this type adopt a pose of aggression or of defence different from that of other snakes. As a rule all



Photo]

KING COBRA

[*Mrs. T. H. Gillespie*

other snakes, when they think themselves threatened by an enemy, just as when they attack prey, coil their bodies compactly and hold their necks in horizontal, never vertical, curves, and when they bite they thrust forwards and slightly upwards. The cobras, on the contrary, when they are alarmed, raise the fore part of their bodies almost vertically upwards, holding the head forward in a sharp bend, and they strike forwards and downwards in a fashion similar to the blow of a man with a pick-axe.

The Spectacled Cobra is far exceeded in size by that other member of its genus, the Hamadryad or King Cobra, which is, beyond almost any doubt, the largest and most deadly snake in the whole world. It may grow to as great a length as eighteen feet, one of that length having been living recently in the London Zoo. That is an enormous size for a venomous snake, and though it was doubtless an exceptional specimen, thirteen or fourteen feet may be regarded as a fair average for a full grown Hamadryad. It is

only necessary to picture to oneself a snake as long as a large python, with the increased range in attack that its length gains for it, together with the longer fangs and larger venom glands corresponding to its size, to realise how terrible such a snake must be. Even the elephant, it is said, is sometimes bitten by the King Cobra and falls a victim to its venom, though I should think such a happening must be extremely rare, to say the least. It is a less nervous but, on the contrary, far more bold and aggressive snake than its relatives, or, it may be, any other snake, as if it were conscious of its own power. It is said that it does not merely act on the defensive, but will go out of its way, through pure malevolence of temper, to attack a human being which, if it be true, is a most unsnake-like characteristic. It does not seem that all King Cobras possess this malevolent disposition, but of course all members of a species are not alike and perhaps the more reasonably-minded individuals may be exceptions from a rule. Some naturalists, with

field experience in India and Burmah, consider the King Cobra no more disposed to unprovoked attack than any other snake, and it has been suggested that the tradition of malice may have had its origin in females who were disturbed while guarding their eggs. The King Cobra is certainly above the general level of intelligence in snakes. It is a cannibal snake, feeding largely on other snakes. Many writers state that it feeds on nothing but snakes, but some individuals at any rate will also take small mammals and birds. This snake is supposed to owe its popular name, "King Cobra," to a habit of including its smaller relative the Spectacled Cobra in its dietary, but, according to Dr. Ditmars, the King Cobra is much more courageous when it has a harmless snake to deal with than when it is in the presence of a venomous snake, and in the latter case it tempers hunger with a marked discretion. It shows, according to this authority, remarkable quickness in recognizing the dangerous quality of a poisonous snake, even of a species not native in its own

country and one which it had never seen before, even distinguishing between a venomous snake and a harmless one of almost identical appearance, and it manifests a settled determination to avoid so dangerous a dinner.*

The King Cobra, when it rears up, flattens and expands its neck to some extent, but the width of the expansion or "hood" is not nearly so great as that of the Spectacled and some other smaller cobras. Its range extends over Burmah, Malaya, and some of the East Indian islands, and it is also found in India, but it is, fortunately perhaps, not a very common snake.

One ought not to pass from these two cobras without some reference to snake-charming, since the Spectacled Cobra is the snake most commonly used for the snake-charming displays of the East (though the Indian snake-charmer may have two or three Russell's vipers or even a small python or two in his basket to give "body" to the show). The "dancing" of the cobras is due

* Ditmars,—*"Reptiles of the World."*

entirely to their nervousness and to the pose they assume when on the defensive. If one stands in front of a case in the Reptile House containing an alarmed or uneasy cobra and moves one's hand from side to side, the snake, reared up, with expanded hood, will sway its head in corresponding movement. There is, of course, the showman's art in the matter. Weird slow music is played by the snake-charmer on his pipe, the snake basket is opened, and the cobra in it (or cobras, for there may be more than one), rearing up a third of its body, fixes its eyes on the musician in front of it and as he sways his body to the rhythm of his music, it sways from side to side in unison with him. Even a comparatively unobtrusive movement of hands or fingers may be enough to keep the excited snake in motion. The snake is not affected by the music as music, or under any kind of influence or "charm" exerted by the musician; the "dancing" cobra is just a frightened or angry cobra, watching its supposed enemy and on the alert to defend itself

in the manner natural to it. The more recently captured and more frightened and nervous or irritable the cobras may be, the better will be their "dancing." Indeed, when they have been for some time in captivity and have become more or less accustomed to the near presence of man, they become less easily irritated or alarmed, and "dance" with correspondingly less readiness and energy—in other words, they are beginning to have some realization that they are in no immediate danger and are less inclined for instant defence. The snake-charmer has therefore constantly to replace or renew his cobras.

That is, I believe, the essential substance of snake-charming. I do not believe that any snake is sufficiently intelligent, or at least sufficiently teachable, to be capable of learning to make any ordered movements, however simple, except those natural to it and prompted by its own instinctive behaviour, and I am still less able to accept the proposition that a snake could appreciate musical tone or rhythm—even, as is more than

doubtful, if it could hear it. At the same time, one cannot withhold recognition of the clever showmanship, and admiration for the nerve, of the Indian and Burmese snake-charmers. Sometimes the snakes may have their fangs removed, which, as I have mentioned on another page, while it does not make them harmless, may reduce their inclination to bite, and does reduce the effectiveness of a bite, but very often, and I believe, among the majority, the snakes are intact and in their full vigour. Probably most of those who handle cobras have been made immune to the venom by long continued inoculations with small but gradually increasing doses of the poison.

In Burmah certain snake-charmers use the King Cobra in their performances. I am indebted to Captain C. R. Douglas Gray for some very interesting notes about these people as well as for his kind permission to use the very dramatic photographs taken by him which are included among the illustrations of this book. These snake-charmers,

who come from Popa, an extinct volcanic crater in the Myingan district, say that they never keep a King Cobra for more than a year, but within that time of its capture each snake is returned to the jungle where it was originally taken, and in return for this consideration the snakes never bite them. (This tradition may not be unconnected with the need, mentioned above, to replace cobras which have become so used to captivity and to human presence that they are no longer inclined to resent it or, accordingly, to erect their bodies and "dance"). The snakes, as was demonstrated to Captain Gray, are not mutilated in any way and are in possession of their fangs. The girl who appears in the photographs told Captain Gray that once she was bitten on one of the fingers of her left hand and that she promptly chopped off the finger. (The mutilation can be seen in one of the photographs.) Captain Gray was able to purchase this Hamadryad, which is a fine specimen over thirteen feet long, and present



Photos]

[Captain C. Douglas Gray

A BURMESE GIRL SNAKE CHARMER WITH A KING COBRA

The Snake, which measures thirteen feet long and is in possession of its fangs,
is now in the Zoological Park at Edinburgh.

it to the Zoological Park at Edinburgh, where it is now on view. The girl was much attached to the snake, and her grief when the moment of parting came was pathetic. When one sees a girl handling a full-fanged King Cobra of that size, kissing its raised head and allowing it to play its tongue over her face, it is necessary to reason with oneself to be convinced that there is nothing more in it than self-confidence, nerve and a knowledge of snakes. One is almost tempted to believe in that bargain between the Hamadryads and the snake-charmers!

The Indian and Burmese snake-charmers and their cobras are what one might term "the cream of the profession." No others, in fact, approach them. Exhibitions of so-called snake-charming given by Europeans are rarely or never more than a mere handling of non-venomous snakes—usually pythons or boas—though I have seen smaller harmless snakes, even the common grass-snake, used—and depend for any show value they have on the popular belief that all snakes are

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venomous and that the person who handles them is in constant danger.

Another Indian snake which is responsible for much loss of human life is the Common Krait. It is a near relative of the cobras, but does not, like them, rear up or expand a hood. It differs from them, too, in disposition, for though it possesses venom of a potency equal to theirs, it is described as a quiet, inoffensive snake that is more inclined to hide than attack, and that will not bite unless one interferes with it. The high death-rate it causes is probably due to a predilection it shows for the vicinity of human communities and a strong inclination to seek cover in houses. It is probably for that reason that it is perhaps more dreaded by Europeans living in the East even than the cobras, for one may find a krait under a newspaper when one picks it up or under one's pillow or in one's boot, and the person who in such an event inadvertently touches or takes hold of the snake may be bitten on the hand, where the small fangs readily

penetrate. Mr. Grimsdick tells me, in this connection, of a friend of his in India who while living up-country was bitten on the finger by a Krait. He immediately pulled out his revolver and shot off the bitten finger, which, with little doubt, would be the means of saving his life since he was out of reach of doctors or anti-venom serum.

Some of the African cobras have added to the ordinary terrors of their bite the capacity to eject their venom to a distance and are sometimes termed "spitting cobras." The venom of a snake, to be fatal or even harmful, must enter the blood stream of the victim, either through a wound in the skin or by absorption through a permeable surface; it would seem, therefore, that such a habit as that of "squirting" poison, as these cobras do, can be no more than a waste of venom unless it happen to strike the eye of the creature against which it is aimed. The power is most developed in a South African snake, the Ringhals (a Boer name meaning "ring-neck") so called from a white collar

seen on the throat when the snake is erect. Like the other true cobras, the Ringhals rears up when disturbed, dilates its hood and opens its mouth a little ; then, with its fangs pointing at its enemy's eyes, which it seems to know to be the only point vulnerable to this form of attack, it sends out two thin sprays of venom to a distance of six feet or more, the force of the spray being added to by a sharp expulsion of air from the lung. If the jet of venom should happen to strike the eyes, it causes at least temporary blindness and so enables the snake to escape ; the blindness may be permanent if prompt treatment does not follow. It is obviously a means of defence against enemies and is not likely to be used in attacking prey.

The Egyptian Cobra bears also the name of "Asp." It has a reputation in history as one of the two alternative snakes credited with being the active instrument in the suicide of Cleopatra, its rival claimant to the "honour" being the Horned Viper.

Another African snake with a very sinister

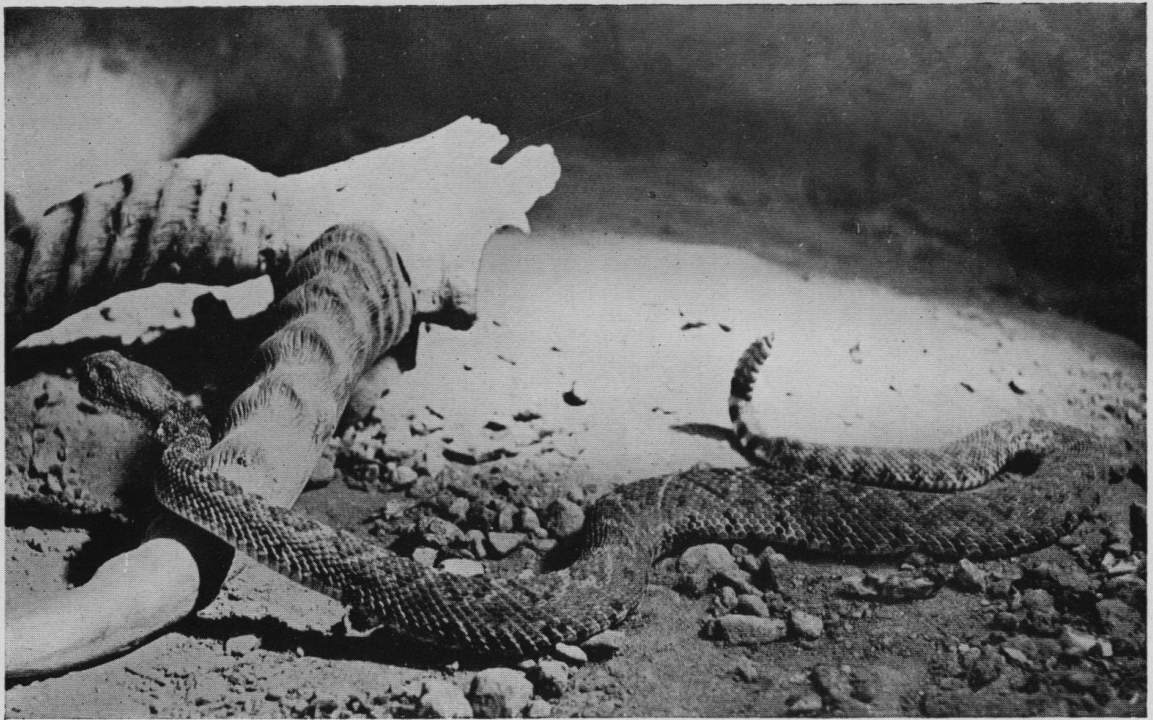
reputation is the Mamba, of which there are three or four species ; they are probably the most deadly and most dreaded of all the African snakes. A Mamba may grow to a length of twelve or thirteen feet, and it not only possesses relatively large fangs and powerful poison, but is said, like the King Cobra, to harbour such a malicious spirit that it will go out of its way to attack man when it meets him. It is a tree snake and has the unpleasant habit of lying on a branch above a forest path or runway and striking at the face or neck of a traveller passing beneath. There is a case on record of a native having been attacked in this fashion and having died within fifteen minutes of being bitten on the neck by a large Mamba. It was a Green Mamba which, some two or three years ago, was sold by a Continental dealer to an animal dealer in Glasgow under the belief that it was a harmless tree snake, and bit the man who was unpacking it. It is probable that the snake, being cold and out of condition through long travel, was not

in possession of its full powers, but, as it was, the man's life was in danger for some time and he was only saved by the prompt despatch from the London Zoo to Glasgow, by aeroplane, of a supply of anti-venine.

Also belonging to the front-fanged group of snakes are the Sea-Snakes (*Hydrophinæ*), of which there are some fifty species, living in tropical seas, chiefly in the Indian Ocean. Some of the largest of them may reach a length of about seven feet. Many of them are vividly and beautifully coloured. They feed on fish and are all highly venomous—among the most deadly of poisonous snakes. They, of course, breathe air, like any other snake, rising to the surface at intervals to do so. They have tails flattened vertically for swimming—an indication of their adaptation to an aquatic life—and many (though not all of them) have not the wide abdominal scales which characterize the land snakes, but are clothed all over with small round scales.

VIPERS

We come now to the third group of



Photo]

RATTLESNAKE

[Mrs. T. H. Gillespie

venomous snakes whose members have a much more elaborate and more highly specialized mechanism for injecting their poison into the bodies of their victims. This method is confined to one family of snakes called Vipers. They resemble the second group in so far as they have one pair of fangs at the front of the upper jaw. Their fangs are, however, much larger, in relation to the size of their owner, than those of the snakes we have so far considered. While the fangs of a large cobra may not be much more than three-eighths of an inch long, the fangs of a large viper are well over an inch in length. That would be a rather awkward possession for the viper if the fangs were fixed in its jaws as are those of a cobra. They are not fixed, though; instead of being fixed they are attached to a bone which forms a kind of hinge so that the fangs can, at the snake's pleasure, be either folded flat along the roof of the mouth and so be out of the way when not in use, or turned downwards to stand out at right-angles to the upper jaw when

the snake is about to strike. This moveable bone is, in less specialized snakes, the chief bone of the jaw, called the maxillary bone, or maxilla, which carries the chief row of teeth; in the evolution of the vipers it has become more and more shortened and moved forward till, instead of a long bone forming the jaw, it has become a vertical bone at the front of the mouth, and the numerous small teeth of the ordinary snake have disappeared or been superseded by the one huge tooth or fang at each side. When a viper is about to attack, the jaws are opened widely, the fangs erected, and the head lunges forward, the fangs stabbing the victim, while at the same instant the muscles controlling the venom glands contract and a small but sufficient quantity of venom is forced through the points of the hollow fangs into the deepest part of the wounds made by them. The glands which secrete and store the venom are placed at the sides of the viper's head behind the eyes and are connected by ducts to the base of the fangs. The ejection of

venom from the glands is not an automatic consequence of the act of opening the mouth or of biting, but is entirely under the snake's control.

If a viper has attacked some animal as prey, the jaws will close and the hold will be retained for a perceptible period, but if the snake has struck what it conceives to be an enemy there will be an almost instant drawing back of the head in readiness for another lunge should the "enemy" not be overcome or retreat. So far as purposes of pure defence, as distinct from the killing of prey, are concerned, the viper seems therefore to have a far more effective weapon than the other types of poisonous snake.

One would imagine that with such relatively enormous fangs and so intricate a mechanism for their use, the viper must easily hold first rank in deadliness among all venomous snakes. Certainly some of the larger vipers are among the most terrible and dangerous snakes in the world, but the cobras and mambas, which have such small poison

teeth in comparison, are equally if not more dangerous. It may happen that the short fangs of an elapine snake may be unable to reach to the flesh through the coat of a thick-furred animal which the long teeth of a viper could penetrate with sufficient margin, and a cobra, for example, might find something of the same handicap in the thickness of human clothes. It is probable, notwithstanding, that far more humans fall victims to cobras than to all the vipers and other venomous snakes together. The disparity in this respect is aided by difference in temperament, for while the cobras are most of them nervous and irritable and, in certain alleged cases, definitely aggressive, the vipers are generally sluggish and easy-going; they are disinclined to make unprovoked attack and will not bite unless interfered with or hurt.

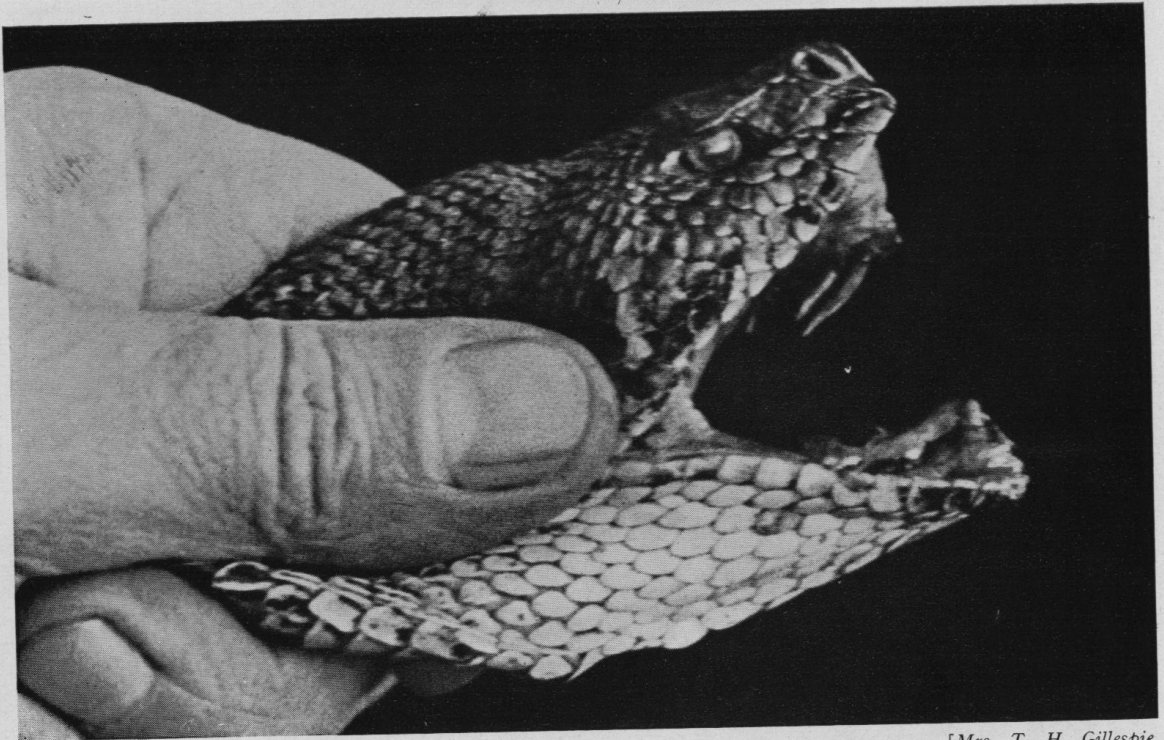
The slender fangs on which the venomous snake so heavily depends for his success in life may very easily be broken and Nature has made due provision to guard against so obvious a risk of disablement. The fangs are

regularly shed and replaced, and if a fang, or both fangs, should happen to be injured or lost, their owner will not lose his power for long, for the lost fangs will soon be replaced by a new pair just as would the pulled-out feather of a bird. If one examines the mouth of a cobra or a viper it will be seen that behind and beneath the pair of fangs in use, in a fleshy sheath, there is a series of reserve pairs of fangs in successive stages of development, the first of them being probably of full size and nearly ready to replace the functioning pair as soon as they are shed. It will be obvious, therefore, that one cannot, as many people seem to believe, make a venomous snake harmless merely by removing its fangs—at any rate not for more than a very brief period. Even if the fangs be taken away, the venom will still flow from the glands if the snake bites, and the scratches made by the snakes' smaller teeth might allow it access to the blood of the person bitten, though, of course, the result of such a bite would not be so rapidly or so certainly

fatal. Nothing but the removal of the venom-secreting glands will permanently and completely deprive a venomous snake of the power to kill.

There are two groups of vipers—true vipers (*viperinæ*) and pit vipers (*crotalinæ*). The true vipers are confined to the Old World. The pit vipers inhabit the New World, except for a few small species which belong mainly to south-eastern Asia. They take their popular name from the presence of two deep pits which lie one on each side of the head in front of the eyes and whose function is unknown.

One of the best-known and most dreaded vipers of the Old World is the African Puff Adder. It is not a beautiful snake, even to the eyes of a snake-lover, having a thick, bloated-looking body and a broad triangular or heart-shaped head. Its colouring is attractive, but in spite of this one charm it is a sinister and dangerous-looking snake. Its popular name is due to its habit (which, however, it shares with most vipers, and



Photo

[Mrs. T. H. Gillespie

HEAD OF A RATTLESNAKE, SHOWING THE FANGS

The length of this snake was about five feet and its fangs were five-eighths of an inch long

indeed many other snakes) of inflating its lungs till the body looks more than ever swollen and then expelling the air in a sharp hiss—a warning to intruders and an effort to drive off a possible enemy. Even more repellent in appearance than the Puff Adder are its close relatives the Gaboon Viper and the Rhinoceros Viper. The latter takes its name from two or more horn-shaped shields on its snout. It is one of the most beautifully coloured of snakes—in fact, all these three species have this one redeeming quality of lovely colours, in patterns resembling an Eastern carpet.

Another large viper, well known for its misdeeds, is Russell's Viper, which is common in India and makes a contribution to the death rate in that country probably only second to the cobras. The only poisonous snakes in Europe are vipers. One of them is common in Britain and will be referred to later.

The largest, or at least the longest, and probably the most terrible of all vipers is the "Bushmaster," whose home is in Central

and tropical South America. This snake may reach a length of more than fourteen feet, and may claim to be the largest of venomous snakes with the exception of the King Cobra, which may exceed it in length by a little. It is, however, unlike the majority of the larger vipers, a slenderly built snake. It differs from viper standards of fashion also in temperament, for instead of being a sluggish, easy-going fellow, it is active, nervous and irritable. When captured it generally refuses to feed (in which it resembles the British viper or adder), and Mr. Ditmars says that it is so highly strung that it always dies under attempted artificial feeding. Mr. R. R. Mole (of Trinidad), who has an extensive knowledge of South American snakes, believes that the Bushmaster injures its vertebræ by its habit of twisting itself when handled, and so causes its own death. It is, therefore, a snake rarely or never seen in captivity. As a menace to human life the Bushmaster is probably surpassed by another snake of the same genus (*Lachesis*), the Fer-de-lance, which

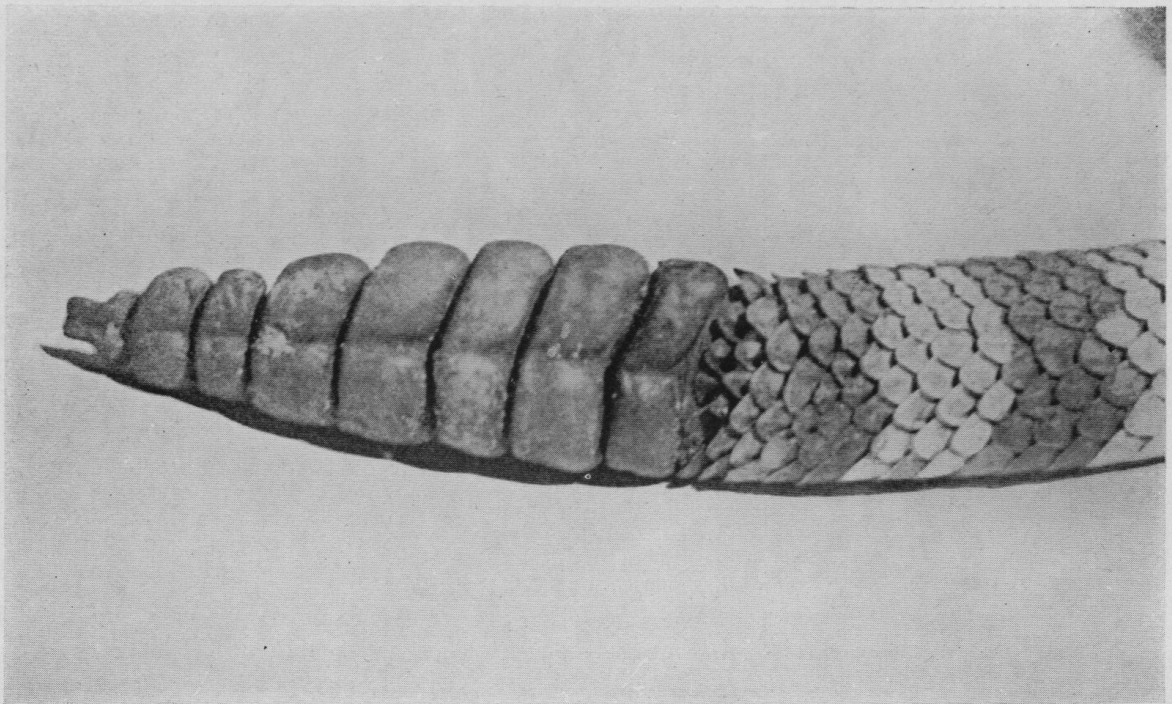
though much smaller—its average adult length is in the neighbourhood of five to six feet—is more numerous in more popular places. It is common in some of the West Indian islands. Its popular name it owes to the shape of its head, which resembles in outline the head of an arrow or spear—the “iron” of the lance.

One of the most beautiful of the American vipers is the Copperhead, which is pinkish-brown, with large reddish-brown blotches, and resembles, especially in its head, the colour of raw copper. It is one of the vipers which thrives extremely well in captivity, and it is not at all an aggressive snake. Its fellow of the same genus and similar range, the Water Moccasin, is a snake more dreaded in the south-eastern United States; it is largely aquatic and prefers marshy country and the vicinity of slow-flowing waterways.

The most interesting, perhaps, of all the vipers, and those whose name is most familiarly known, are the Rattlesnakes. There are about twenty species of them, all confined to the United States and Mexico,

except one which is found in South America. They vary in size from a pigmy species which seldom grows to more than sixteen inches or so in length, up to the great Diamond-backed Rattlesnake, which may reach a length of eight feet. Length is not everything in a snake, and since the Diamond-backed Rattlesnake is a very stout, heavily-built snake, an individual which has attained the length mentioned might be as bulky and heavy as one of a slender species of nearly twice its length. The fangs of such a rattlesnake would probably be not less than an inch and a quarter in length. This snake may justly claim to be one of the world's three largest and most powerful venomous snakes.

The outstanding distinction of the Rattlesnakes is their rattle—an interesting and somewhat mysterious possession. The rattle, at the end of the tail, consists of a number of horny rings fitting loosely one into the other. When the rattlesnake begins life it has no rattle, but only a small horny knob at the end of its tail. When the baby “rattler”



Photo]

THE " RATTLE " OF A RATTLESNAKE

[*Mrs. T. H. Gillespie*

is preparing to slough for the first time, a horny ring is formed with the growth of the new epidermis, and as the old "skin" is cast the ring is uncovered and left. It is slightly smaller in internal diameter than the knob at the end and fits loosely on it. Each time the snake sloughs another ring is formed, every one slightly larger than the one before. Each ring fits against its predecessor, compactly but at the same time loosely enough to move against it. When the snake has attained what may be regarded as full growth, each succeeding ring is no longer larger than the one before it, but instead the rings become uniform in size. It is impossible, therefore, to tell the years of a rattlesnake's life from the number of rings in its rattle, but only the number of times it has sloughed. Often in a mature rattlesnake the end of the rattle may be broken off and lost.

When a rattlesnake is angry or excited or alarmed it raises the end of its tail till it is pointing upwards and vibrates it so rapidly

that one's eye can scarcely see the movement, and the rings, shaking against each other, make a curious kind of whispering rattle which is very penetrating and can be heard at a considerable distance. One can produce a sound somewhat similar by taking a handful of wheat in the ear and shaking it. No satisfying explanation of the presence or function of the rattle has ever been made. Vibration or twitching of the tail is a common action among snakes, both venomous and non-venomous, and is not dependent on the possession of a rattle. It seems unlikely that its purpose can be to warn away enemies; it would, one would think, be much more likely to attract hostile notice by advertising the presence of the snake. Another explanation sometimes suggested, that it is designed to attract prey by playing upon the curiosity of small animals, is also quite unconvincing; small animals have learnt, in this dangerous world, to avoid rather than to investigate, the source of mysterious noises.

One is often asked how one can recognize,

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One is often asked how one can recognize,

or whether it is possible to recognize, a poisonous from a non-poisonous snake by outward signs. It is not possible to do so unless one is so well up in snake lore as to be able to identify the species. Some of the most deadly snakes *look* dangerous. A Puff Adder or a Fer-de-lance, with its heavy bloated body and broad, ugly head, seems to express its potency in its appearance. There are, however, snakes that are quite gentle and harmless and non-venomous that look just as ugly and just as dangerous. On the other hand, many of the most highly venomous elapine snakes—the Mambas, for example, and, indeed, some of the vipers—are slender and graceful, with narrow heads and, so far as bodily form goes, as innocent looking as a snake can be. Nothing but a close examination of its mouth and teeth can be relied on to show with certainty whether a snake of unknown species is or is not dangerous.

The number of human beings who die in a year from snake-bite has been estimated (a few years ago) at over 100,000, of which

more than a fifth are in India, with South America coming second in the record.

When a person is bitten by a poisonous snake the venom, injected through the fangs, is carried into the blood stream and by it through the body, and the deadliness of the bite, and the rapidity or the reverse with which it will prove fatal, depend—in addition of course, to the nature of the snake—on the part of the body bitten. If the venom should happen to be injected directly into one of the more important blood vessels, it will travel quickly through the body, and death (if the snake be one of the larger and more deadly) will come rapidly. In one case cited by Mr. Fitzsimons, of a native bitten by a Mamba, the man died in ten minutes; that was because he was bitten on the neck and he had been running, so that his blood was in rapid circulation. If, however, the poison is left in tissue supplied only by the smaller blood vessels, absorption will be much slower and there may be time to apply remedies. Many old-fashioned remedies for

snake-bite have been credited with working cures, from stews made from the body of the snake which made the bite, or oil from its body, applied to the wound, to the drinking of unlimited quantities of whisky. None of them could possibly have been of any real use, and one may reasonably explain their supposed effect by those cases where people have either been bitten by non-venomous snakes whose bite was harmless, though they did not know it (in such cases people have been known to die of sheer fright), or where, owing to the hampering intervention of boots or clothing, a very small part of the snake's fangs and the venom from them reached the flesh and recovery took place by the body's own resources—and that in spite of, not because of, the remedy.

There are only two effectual methods of treating the bite of a poisonous snake. The first is to attempt to prevent the venom reaching the general blood stream and to drain away the contaminated blood and poison. The great majority of bites are

inflicted on the lower leg or foot or on the hand or arm, and the first thing to do is to bind a strong band—a handkerchief tied round and tightened up with a stick would do in emergency—so tightly round the limb, at some distance above the wound (the two small punctures made by the fangs) that the circulation in the limb will be checked and the poisoned blood localized. Then the wound should be enlarged so that the blood will flow from it freely and as much as possible drawn from it, after which the wound should be well soaked with permanganate of potash, which has powerful effect in minimizing or destroying the poisonous properties of snake venom. This may be regarded as “first aid” treatment. The other method, and the only one which can have any effect if the venom has had time to be dispersed through the blood, is by the injection of an anti-venom serum. It has long been known that small repeated doses of a poison taken into a body will give that body a great tolerance or immunity towards that particular poison

(the heavy smoker is an every-day example), and it is by that means that the professional snake-charmers of the East make themselves immune to the poison of the snakes they handle. Experiments showed that not only could an animal in this way be made so immune to the venom of a deadly snake that it could receive, without ill effect, an injection of the poison which would be rapidly fatal to an untreated animal, but also that the serum from its blood, if injected into the body of another animal, would render that animal also immune. After long experiment the preparation of anti-venine became a working success. An animal—usually a horse—is repeatedly injected over a long period with small but gradually increasing doses of the poison of one of the venomous snakes until it has become strongly immune. Then a quantity of its blood is drawn off and the serum separated and sterilized and sealed up in doses ready for injection.

The failure of the system, where it fails, is due to the fact that the venoms of the

groups of poisonous snakes differ from each other in their bio-chemical constituents, and the serum prepared from one is ineffective against the poison of another. An anti-cobra serum, for example, would be of little or no avail against the bite of a Russell's Viper (a snake which shares with the Cobras the responsibility for most of the deaths from snake-bite in India), or an anti-viper serum which would be effective against the bite of a Puff Adder would be useless against that of a Mamba. There is a considerable difference in the effect of the venom of the Elapine or Cobra group of snakes and that of the vipers. The former acts more directly and quickly upon the nervous system, bringing on a gradual paralysis which will, as it proceeds, stop the automatic action of the lungs and so cause death, while if it should happen to be injected into a large vein, it will be carried quickly to the heart and cause immediate death. The action of viper venom is less direct on the nervous system ; it tends to slow down the action of the heart and has

a powerful effect on the blood. Not only is the anti-venom serum prepared for one type of snake ineffective against the bite of a snake of another type, but the difference may extend even to closely related snakes of the same genus. In order therefore that the serum treatment shall be certainly effective it is necessary to know by what snake a man may have been bitten—which is frequently an impossibility. Nevertheless, the discovery of this method has greatly reduced the certainty of death from snake-bite.

CHAPTER VI

BRITISH SNAKES

THERE are in Britain only three kinds of native snake, but they are as representative as so limited a number well could be. There is, in the first place, the Grass Snake, or Ringed Snake, which may be taken to represent the large number of snakes which lack all means of injuring an enemy, or even of killing their prey save by swallowing and digesting it. The Grass Snake is very common in the more southerly part of England in districts where it finds the environment it prefers, usually marshy or damp localities (it is the "fenny snake" whose "fillet" was in the formula of Macbeth's witches), though it is sometimes found in woods in the vicinity of water, and even in hilly country far from water ; it will

never be found too far from the neighbourhood of the prey on which it feeds.

There is a great deal of variation in the colouring of the Grass Snake. The ground colour is greenish, generally of an olive shade, but varying from a dull ashy tone to a greeny-golden brown. In normally marked individuals there are two alternating rows of blackish spots along the back, with a row on each side of somewhat larger spots. The underside may be all black or blotched with black and creamy white. On the back of the head is a ring or collar of bright, or sometimes pale, yellow, with two black blotches forming a second almost complete collar behind it. This collar has gained the snake its second popular name, and, when present, it serves to distinguish the Grass Snake at a glance, not only from the Adder, but from practically any other snake. The yellow of the collar is, however, frequently lost by large old females, and in some individuals is never present at all. The spots on the back and sides also vary in arrangement and

are sometimes entirely wanting. It is not always easy, therefore, to recognize the Grass Snake by its colour. The scales of the Grass Snake have a kind of keel or ridge down the middle and are somewhat rough and coarse looking. On the Continent there are many colour varieties of the Grass Snake, many of them showing longitudinal pale stripes from neck to tail.

In size the Grass Snake is by far the largest of British snakes. Somewhat exaggerated (as I believe them to be) lengths are sometimes claimed for it. It is said that specimens of even six feet long have been found. I doubt very much whether in Britain it ever exceeds, and perhaps it seldom reaches, a length of four feet or so, though it may perhaps do so in Southern Europe. The longest specimen I ever had myself was forty-five inches in length, and it looked, as indeed it was, a veritable giant among its kind. I have had, in a period of thirty years, several measuring forty to forty-two inches. All of them were females. The largest male I have had was



Photo]

ENGLISH GRASS SNAKE OR RING SNAKE

[Mrs. T. H. Gillespie

twenty-six inches long. Three feet long may be taken as an average length of a fully matured female Grass Snake.

The Grass Snake feeds on frogs and small fish such as minnows, gudgeon, etc. As a rule a snake which has been accustomed to frogs prefers them and will not readily take fish, and *vice versa*. They will also feed on newts and in captivity I have known greedy feeders take half-grown toads, though I rather doubt whether the toad enters very largely into the menu of the wild Grass Snake. Warm-blooded prey they apparently do not take ; I have tried captive specimens (which were accustomed to feed readily upon frogs) with newly born naked mice and rats, but never found such food taken. Neither, so far as I have found, will they take small lizards. The earthworm is another excellent article of diet which the Grass Snake might, but, in my experience, will not, accept, though its relatives, the Garter Snakes of North America, will swallow worms without hesitation. It seems probable, too, that

newly hatched Grass Snakes must feed on such "small deer" as worms or insect larvæ, since they are unlikely to find frogs of a smallness to match their capacity, but if they do so they seem to outgrow the custom.

The Grass Snake is very quick of movement both on land and in the water, and can capture its prey in fair pursuit by sheer speed. They hunt, I believe, chiefly by sight. When a questing snake comes near to a frog the frog is sure to leap off in alarm. Instantly the snake dashes after it, throwing its body forward by wide lateral loops. It is able usually to perceive the direction of the frog's leaps and the spots where it rests, and it is probably only a matter of seconds and a leap or two till the frog is seized by the hind leg and the process of swallowing it commences. If the frog should take to the water, or if a minnow or a newt be the quarry, the Grass Snake is equally well qualified to deal with the situation, darting through the water by the sideways looping of its body in the same way as it winds

through grass or reeds. The Grass Snake, perhaps on account of the nature of its food, feeds more frequently and on larger quantities than the snakes which take warm-blooded prey, and it cannot fast for very long periods as they can.

The Grass Snake is, of course, quite harmless. When captured it will hiss loudly, but it never, or at least very rarely indeed, makes any attempt to bite. I have only known one specimen out of hundreds that I have handled do so. Even if it did attempt to bite, it would not matter, as its teeth are far too small to hurt a human hand. Its only means of defence—if that is what it is—is the capacity to emit a very vile smelling secretion which, coming unexpectedly to one's nose, may prompt one very quickly to drop the snake if one had taken hold of it. This may perhaps be a useful defence against carnivorous animals, and by an effect of surprise or of repulsion may give the snake a chance to dart off. Unfortunately the Grass Snake is not particularly useful,

since the animals it feeds on are themselves quite harmless even if they are not beneficial to man, but it is an inoffensive creature, and need not be, as it so often is, killed at sight.

The Grass Snake is more abundant in the southern half of England and in Wales than in the north. It has been claimed by some writers that its range extends so far north as the south-east of Scotland. I do not think it could be found very often in the more northern counties of England, and I doubt, almost to the point of denial, that it can be included in the wild life of Scotland. It is quite true that specimens are sometimes captured in Scotland; I have had quite a number of such specimens sent to me in the last twenty-five years. I believe, however, that in every case they have been escapes from captivity. The Grass Snake is quite a common subject of the pet-keeper's concern, and it has an annoying facility for discovering a cage door inadvertently left open, or an unsuspected chink in a box or case, and squeezing itself through. The interesting

question arises whether such an escaped snake, if, for example, it happened to be a recently captured female containing fertile eggs, might found a "colony" of Grass Snakes in the district in which it had regained its liberty. There is no reason why this snake should not be able to live in many districts of Scotland. The chief argument against the likelihood of its establishing itself in the north is not so much concerned with any difficulty in the way of the survival of the snakes themselves as with obstacles to reproduction. Unlike the Adder, which retains its eggs in its body till they are at the point of hatching, so that young adders are "born" alive and active, the Grass Snake deposits its eggs some considerable time before the young are developed and ready for independent life. The eggs, frequently laid among decaying vegetation or in manure heaps, which act as a kind of hot-bed, require a fairly high temperature, without a great deal of variation, over a period of some weeks, for successful hatching, and that is

a condition by no means so common in the north as in the south. It is mainly on that ground that I still retain my belief that any Grass Snake found north of the Tweed (and for a good many miles south of it) was brought thither by human agency.

The second of the native British snakes is the Smooth Snake. It is very different in type from the Grass Snake and is representative of several genera of snakes which feed on what one might perhaps call "dry" prey, either warm-blooded or cold-blooded—that is to say, on small mammals, birds, lizards, sometimes on snakes of other species, but not, at any rate as a rule, on frogs or newts or fish—and in which the faculty of constriction is more or less developed. In snakes of this type one can trace various stages in the development of the habit of constricting prey. In some species there is no more than an instinct prompting the snake to throw its own body across that of the prey in an effort to hold it down and minimise its struggles. In others, again, the body of

the snake coils itself round the prey in a way which holds the prey more or less firmly, but is not yet brought to that degree of constriction which will kill the prey. Then comes the stage at which the coils of the snake not only hold the prey firmly, but by the steady pressure on it are able to kill it. It is to this degree that the Smooth Snake has attained. In some of the Smooth Snake's nearest relatives, such as the King Snakes of North America (in which country snakes of this type are numerous), the power of constriction has been developed to a degree that almost surpasses that of the great constrictors themselves.

The Smooth Snake is, in my opinion at any rate, by far the most beautiful and most interesting of the three British snakes. It is, unfortunately, very local in distribution, and somewhat rare even in the localities in which it is found. It is found most often in the counties of Hampshire, Dorsetshire and Surrey. It may formerly have had a slightly wider distribution, and it is probable

that it is becoming gradually more restricted in range and reduced in numbers. It is probably owing to its limited distribution and comparative scarcity that it was not identified and recognized as a British species until the fifties of last century. A snake found near Dumfries near the beginning of that century was erroneously regarded as an example of a species new to Britain and was later confused with the Smooth Snake, and on that ground a wider range was once claimed for this snake. Whatever the Dumfries snake may have been, it is highly improbable that it could have been a Smooth Snake unless it had been taken there by human agency; it was most probably a foreign snake which had escaped from captivity. The Smooth Snake is common and has a very wide range on the Continent.

The Smooth Snake is rather slender and graceful in form, and it has a beautifully modelled head. Its scales, instead of being keeled and somewhat loose and rough, as in the Grass Snake or the Adder, are close-fitting and

smooth as polished metal,—hence its popular name. The usual colouring is a rather indescribable shade of yellowish or greenish-brown or sandy green, sometimes showing a pinkish tinge, especially on the underside. Down the back are two alternating zig-zag rows of brown spots, and on the neck is a Y-shaped brown or blackish mark. The markings are, however, inconstant, as is usual in snakes. The British Smooth Snake is said to reach a length of two feet. I have had Continental specimens of that length, but I have never had a British specimen more than eighteen inches long.

As food the Smooth Snake prefers lizards. The rather scarce Sand Lizard, which shares its range (in Britain), probably figures prominently in its dietary ; so does the Viviparous or Common Lizard, and it also takes young Slow-worms. It is said that it takes young mice and unfledged young of birds that nest on the ground, but no Smooth Snake that I have possessed would ever take voluntarily

any food but lizards (and so they had to be content with artificial feeding!).

The Smooth Snake is willing—more than willing—and quick to bite when handled, but its bite is, of course, perfectly harmless and its teeth are too small to pierce any but tender skin. It seems to know that, and will delay its attack till it has found a part of one's hand where the skin is soft, such as the inside of a finger. Its bite is interesting, as it shows not the quick and savage thrust and recovery practised by the vipers among venomous or the boas and pythons among non-venomous snakes, but the deliberate gnawing bite characteristic of the short-fanged types of venomous snakes.

Like the Grass Snake, the Smooth Snake, if it does no good, never does any harm to man, and should never be killed—all the more as it is so rare. It has, unhappily for itself, in the arrangement of its markings, a superficial but by no means close resemblance, at a casual glance, to the Adder, and to people to whom a snake is a snake and nothing more,

that is usually sufficient to ensure prompt dispatch. It can easily be distinguished from the Adder, if one has no further knowledge of the two species, by the glossy smoothness of its scales.

The Smooth Snake is viviparous ; that is to say, the eggs are retained in the body of the female till they are ready to hatch, and the young emerge alive.

Widely separated from the two snakes already mentioned is the Adder, the third and certainly not the least important of our three native snakes. It is a typical example of that most specialized family of venomous snakes, the Vipers. The Adder is in every way the most adaptable of the three, and because it is so adaptable it is by far the most widely distributed of the British snakes being found in almost every part of the mainland of Great Britain and in some of the islands of the west as well. It prefers a warm and dry environment and is a creature of forest and moor rather than of moss and marsh, but it is able to live in almost any

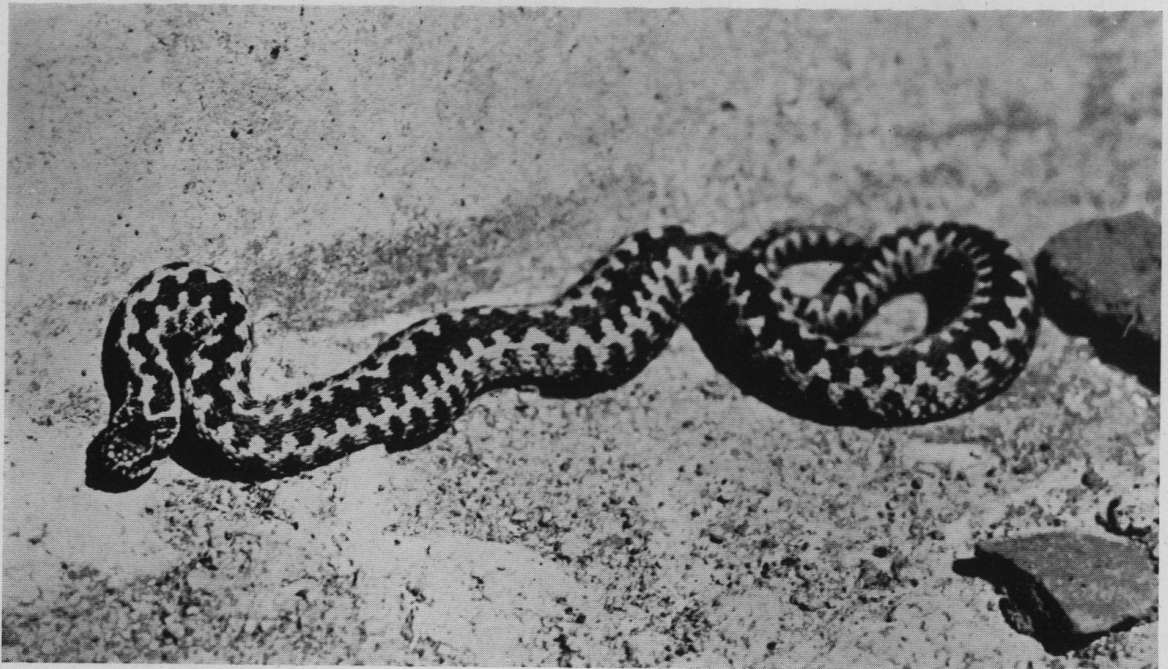
situation, from the top of a hill to the middle of a swamp. It is equally wide of choice in the matter of its food and takes such small animals as mice and young rats, voles, birds, lizards, frogs and probably newts, and also, it is said—but I have some doubt of it—birds' eggs and insects; newly-born adders may perhaps take the last. Mr. George Wateridge, of Lyndhurst, Hants, who has great knowledge of adders, tells me that he has seen young adders striking at flies, and his observations support the view which many hold, that insects and worms form the chief food of very small snakes. I have personally had scarcely any direct evidence on the point, but in September, 1936, a family of young adders were born in the Open-air Reptile Enclosure in the Edinburgh Zoo. One of them died a week later, and on opening it we found its stomach contained the half-digested body of a full-grown wall lizard! Considering its relationships and the tendencies of its family, the Adder probably prefers small rodents when it can get them, and it renders

a considerable service to the farmer in particular and to mankind in general by the destruction of mice and voles. Many vipers, the majority perhaps, will feed well and thrive in captivity, but the Adder is a marked exception. It will very rarely feed after it has been captured—at any rate if it is confined in the average sort and size of snake case. I have tried many adders and could never induce any of them to feed voluntarily, though every conceivable kind of food was offered to them. Even when I fed them artificially they never lived more than a matter of months. In the wide space and comparative freedom of our reptiliary at the Zoo the Adders do feed.

The Adder may reach a length of over two and a half feet, but seldom does so, and one of two feet long may be regarded as a fairly large specimen. Mr. Wateridge tells me that the longest specimens caught in the New Forest measured, in the case of a female, two feet eight and a half inches, and in the case of a male two feet four and a half inches,

both having been caught by him. Adders from the most southern counties of England may be expected to grow slightly larger than those from further north, and these lengths must be pretty nearly a maximum record. One sometimes reads in newspapers accounts of adders of three feet or more in length having been killed, but in such a case I venture to suggest that (1) the measurement was a mere guess, or (2) the measurer was accustomed to thinking of fish, or (3) the snake was not an Adder!

The ground colour of the Adder varies very much, being usually a greyish-olive or brown, or even reddish. Differences in colour are apparently to some extent sexual, females tending to the brownish or reddish tones and males towards the greyish. This distinction (if, indeed, it be one) is certainly far from constant, and one often finds grey-olive females and, less often perhaps, brown or reddish males. Pale grey and almost white specimens are sometimes found, and they are generally males. Black specimens also



Photo]

ADDER

[Mrs. T. H. Gillespie

occur.* In examples of normal colouring there is a strongly marked and very distinctive black, or very dark brown, zig-zag line running down the whole length of the back, and a V-shaped mark on the back of the head. When this zig-zag line and V mark are present they are a certain guide to the identity of the Adder and a means of distinguishing it at a glance from the Grass Snake or any other snake. It may happen, however, that the line down the back may not be continuous, but may be broken up into spots, and the V-mark may also be broken or entirely absent. It is not then quite so easy a matter to recognize an Adder or to distinguish it from a Grass Snake, though the appearance of the two snakes is really very different once one comes to know them. The Adder is more stoutly built than the Grass Snake; its head is relatively broader, the shields on the head are smaller

* A particularly beautiful Adder which I received just before writing this paragraph had as ground colour a pale fawn with the zig-zag mark down the back in rich reddish brown. It was large and a female.

and its scales have a looser, rougher appearance. A Grass Snake which is normally coloured and which has the yellow collar on its neck, could never be mistaken for an Adder. A Smooth Snake can always be distinguished from an Adder by the glossy smoothness of its scales. In Scotland any snake met with on hill or moor and well away from large towns is almost certain to be an Adder ; conversely, if it be found near a town or in an inhabited area it is most likely to be someone's lost pet—a Grass Snake probably.

If one should happen to meet a snake—any snake, anywhere—of whose identity one is not quite certain, it is the part of discretion to pass by on the other side and leave it alone.

What, however, is one to do if one finds an Adder and knows it to be one? Some say that an Adder should always be killed at sight on account of the damage it may do. It may do a great deal, and it is so plentiful and so adaptable and well qualified to survive that mild persecution is not likely to bring it within sight of extinction in this

country. Nevertheless, I do not like a counsel of such unhesitating slaughter, and I think that counsel perhaps forgets to set against the evil the Adder might do the good it certainly does do by destroying small rodents which are themselves always a potential cause of damage. The Adder is, in fact, of some economic value. There is no doubt, on the other hand, that it is a sufficiently dangerous little snake. It is a very rare thing certainly for a human being to die from adder-bite in this country, though there are a few cases on record. The Adder is comparatively a diminutive snake whose fangs on an average are scarcely a quarter of an inch long, so that it has little ability to bite through boots or thick stockings or other clothing usually worn in this country; it is, moreover, very unlikely that an Adder would bite at all unless it were interfered with. Unless, therefore, one happened to step on an adder with bare feet or ankles, or touched it with one's hand, there is little chance of being bitten. I

recently removed from a box over thirty Adders, taking each one in my hand (on which I was wearing a hawking glove); only four out of them all made any attempt to bite my hand. It is perhaps owing to the growing custom of walking over hill and moor in scanty raiment and to the popularity of picnicing far in the country that more cases of adder-bite have been occurring of late years. Whether the bite of an Adder, effectively delivered, would be fatal to a normal healthy adult, even if no treatment were given, may be doubted, though it would almost certainly cause a serious degree of illness; in the case of a child or anyone not in good health the result would doubtless be more grave. The Adder is not, therefore, like venomous snakes in other countries, a danger of any importance to human life. The case is different for animals, and many a dog and horse and sheep has fallen a victim to the little snake, being bitten most frequently on the nose or face. That is, very briefly, the case for and against the Adder.

CHAPTER VII

THE SNAKE'S NURSERY

IT is only by a considerable stretching of the elasticity of the word that one can refer to the snake's nursery since all but a very few snakes take parental responsibility very lightly.

All young snakes are hatched from eggs. Snakes have, however, more than one method of dealing with their eggs. Some snakes lay their eggs very soon after they have become completely formed, and while the embryos are little or not at all developed. Snakes who follow this custom are termed "oviparous" (bringing forth in the egg). In other species of snake the eggs are retained in the body of the female until they hatch and the young emerge from their mother as perfectly formed miniatures of her; they are, as it may be termed, born alive. Such

snakes are called "viviparous" (bringing forth alive). (Another term sometimes applied to the second method—"ovo-viviparous"—is really more accurate than "viviparous," which in strictness ought to refer only to mammalian birth.)

These differing methods of dealing with the egg are a superficial adaptation to prevailing conditions rather than an indication of a deep-seated distinction. In the case, for example, of snakes which lay their eggs the development of the embryos must take place after the eggs are laid, and for that it is essential that there shall be certain conditions of temperature and moisture and safety from egg-eating animals. If, therefore, the circumstances of a snake's environment provide these conditions and so permit the safe and successful development of the egg outside the body of the mother, it is an obvious advantage to her to lay her eggs as soon as they are formed; she then is freed from the burden of them and can go about her affairs of catching prey and escaping

danger unhampered and with the greater success. If, on the other hand, in the range of any particular snake, such necessary conditions for the successful hatching of the eggs are less easily obtainable, it might become necessary, or at least helpful, for the survival of that species that the mother snake should retain her eggs in her own body until the young had developed to a stage at which they would be capable of independent existence. In some such way the custom, if one may be permitted so to term it, of early laying or of retaining the eggs is related to the general conditions affecting the lives of different snakes.

It was at one time believed that the vipers alone were viviparous and the name "viper" is probably a contraction of "vivipara." Very many snakes come under this term, however. They are of quite distinct groups, for the habit of egg-laying or of retaining the eggs does not at all follow family relationships, and one finds the two contrasting methods in species which are closely related

as well as in those whose relationship may be remote. The European Smooth Snake, for example, retains its eggs until they hatch while some of its American relations of the same genus lay their eggs. The pythons lay eggs while their near relatives, the boas, produce their young perfectly formed and independent. There is always the possibility of a not too rigid adherence to the rules among individual snakes, and it may happen sometimes, for example, that a female of an egg-laying species may retain her eggs until they are very near the point of hatching or that a viviparous snake may extrude hers some time before the embryos have broken through the membrane which covers them.

The eggs of a snake are round, but as they are covered, not with a hard shell, but with a parchment-like skin, their shape may be altered in the direction of a sausage-like figure by pressure. The number of eggs a snake may lay varies considerably. It may be no more than ten or a dozen, or it may amount to six or eight times as many. The

eggs require a considerable period of incubation before they hatch, and during that time they must be in a temperature that does not fall too low and which, though it may fluctuate to some extent, does not run to extremes. It is necessary also that the eggs shall not become too dry or the skin will shrivel and its contents dry up, nor, on the other hand, must they become too damp or the growth of mould may be encouraged, which will attack and destroy the embryos. Some snakes have the habit of laying their eggs in masses of decaying vegetation where the increase of temperature caused by the fermentation of the vegetable matter produces the effect of a hotbed and assists the development of the young snakes. In tropical countries such an aid to incubation may not be necessary, but the snakes of cooler countries must find the extra heat very helpful in hatching their eggs. The time that must pass between the laying of the eggs and their hatching is probably variable, not only as between different species, but in a species

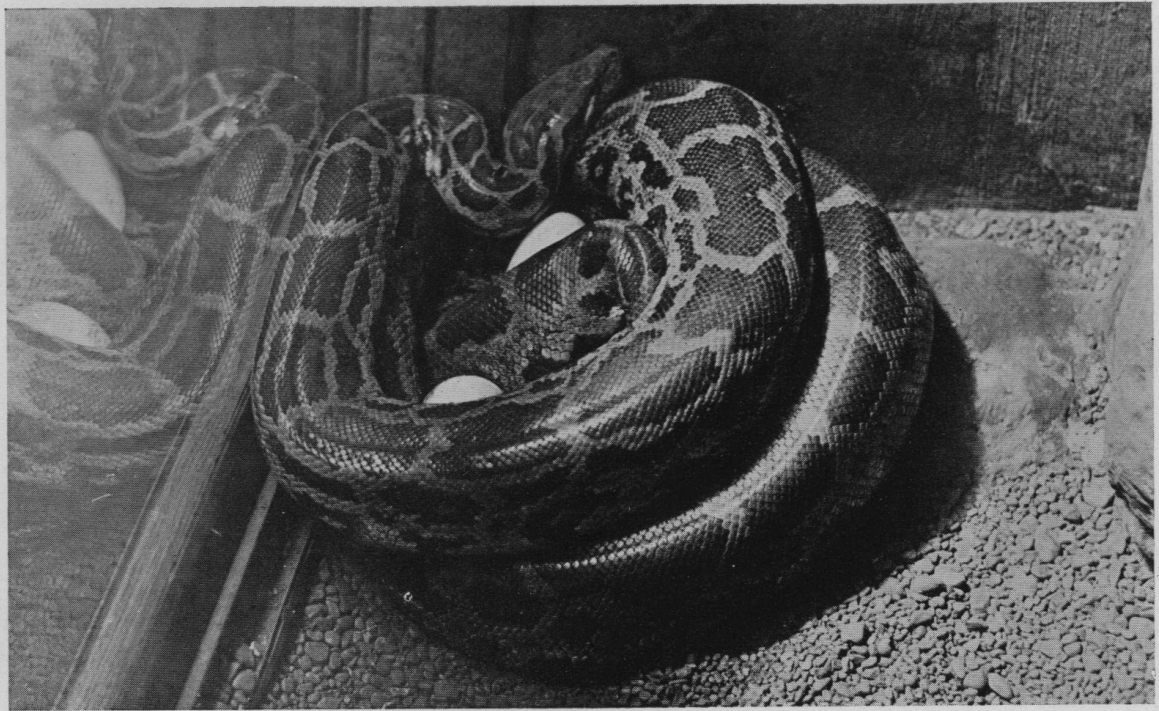
itself, and depends in part on the temperature to which the eggs have been subjected as well as on the time the embryos may have had for growth before the eggs were laid. It is almost impossible to gauge these factors in the wild, but one can gain some idea of the matter from eggs laid by snakes in captivity. I have often had eggs laid by my own snakes, especially by Grass Snakes, and on one or two occasions, among many failures, I have succeeded in hatching them. The chief difficulty I found was in keeping them sufficiently moist to prevent them shrivelling up, and at the same time to guard against the attack of mould or mildew. In one successful effort I proceeded as follows : I filled a large flower-pot with clean sterilized sand up to an inch and a half below the rim, and I buried, just beneath the surface of the sand, the thirty eggs which had been laid by a Grass Snake. I stood the flower-pot in a saucer on one of the heating pipes in my reptile-house and kept the saucer filled with water. A sheet of glass placed on top

of the pot enabled me to keep the sand and the eggs it covered ventilated and damp enough, but not too wet. A temperature of about 85 to 90 degrees (Fahr.) was kept up on the surface of the sand and young snakes, twenty in all, hatched in roughly nine weeks (there was an interval of two or three days between the first and the last to hatch). I have also been able to hatch Grass Snake eggs by using peat moss litter instead of sand.

It has been stated that a Grass Snake, after she has laid her eggs, will remain in their neighbourhood as if she were guarding them. I doubt very much whether her lingering near them implies guardianship or anything more than perhaps some exhaustion, and, in the case of most egg-laying snakes, when the mother has deposited her eggs in the place she has selected for them her interest in the affair is ended. The eggs, if all goes well with them, will hatch in due course and the young snakes are capable, from the very beginning, of looking after

themselves and will very shortly set about finding food, and the other concerns of life. Some egg-laying snakes make a nest by gathering together a heap of leaves and bits of grass which is shaped and rounded by the snake winding her coils round them. The King Cobra is one of the snakes which follow this practice, and it is said that she remains on guard beside them and attacks viciously any intruder who may approach them.

A few snakes have a much stronger maternal sense, and not only guard their eggs, but incubate them. The first snake known to do this was a python in a Paris Zoo, which laid fifteen eggs and incubated them. Subsequently many pythons in captivity have demonstrated that the pythons regularly guard and incubate their eggs. The eggs are laid in a more or less rough heap and then, when the snake has finished laying, she winds her coils round the heap of eggs and, travelling round and round them, gradually works them into a conical pile with her body wrapped round them. It may be that the



Photo]

AN INDIAN PYTHON LAYING HER EGGS

[*T.H.G.*

primary purpose of this is to guard the eggs from enemies, but it seems certain that it also assists the development of the young snakes not only by insulating the eggs, as it were, against changes of the surrounding temperature, but also by supplying heat, for it has been found that a marked increase takes place in the body temperature of the brooding snake as compared with that of the surrounding air. This increase, measured between the coils, may average some five or six degrees and has been known to rise as high as twenty degrees. In a recent case of pythons breeding in the London Zoo there was evidence that the male may share in the work of incubation.

When the eggs of a snake are left buried in sand or earth or in decaying vegetation the young snakes probably never see their mother; if they do it is most probably only by accident, and that perhaps a rare one. The young of snakes which incubate their eggs as well as those of viviparous snakes have the privilege of at least one interview

with a parent. It probably advantages them little, though, for the baby snakes are able to capture and, according to their species, constrict or poison their prey as soon as they appear. They are quite independent and soon separate from their mothers and from each other as they wander off in search of food. Sometimes one finds a mother adder with her family round her, but in such a case they are probably newly or very recently born and have not yet been driven to separate to hunt for prey, although if food is not scarce and nothing disturbs them there is no reason why the family may not remain together for a time.

DO SNAKES REFUGE THEIR YOUNG ?

There was—nay, there yet is—a widespread belief that some snakes, in particular vipers, provide for the safety of their young, should an enemy appear, by opening their mouths and allowing the young snakes to take refuge in their throats till the danger is past. It is

a very old belief. Spenser alludes to it in the "Faerie Queene," and many writers of the sixteenth and seventeenth centuries mentioned it. In the nineteenth century it was constantly cropping up as a subject of keen controversy, both sides of which have been held by people of education and training whose observations and opinions cannot be regarded too lightly.

Those who believe it to be fact that snakes do refuge their young base their case entirely on evidence—that is to say, on the observations of people who have claimed to have seen the fact occur. Their opponents' case is chiefly one of destructive criticism. Very many people, not only rural workers and gamekeepers, but also many who, in the middle of last century, might claim to have in a considerably higher degree the power of trained observation and critical judgment, have stated in unquestionable sincerity that they have seen snakes swallow their young when they were alarmed. A good many of these observations have had as their subjects

American snakes, but a considerable number also concern the British Adder. A Mr. Thomas Ryder, for example, stated, with details of date and place, that he had seen a number of little Adders, about* *three* inches long, go down their mother's throat. His statement was made in the *Field* in the autumn of 1866, and in subsequent correspondence he stated that he had not only seen the young Adders clearly, but that on killing the mother two of the young *had fallen out of her mouth*. Among other correspondents of the *Field* at that time who accepted his statement was Mr. Thomas Bell, an authority on reptiles. Numerous other letters have been contributed at various times, not only to the *Field*, but to other magazines and newspapers to a similar effect, the writers claiming either to have seen the little snakes entering their mother's mouth or to have killed the mother and found the young ones in her throat.

Against the general proposition that a snake could give refuge to her young by swallowing

* A young Adder is about *six* inches long at birth.

them, it was argued (*a*) that the young would very quickly be killed by the action of the gastric secretions, and (*b*) that even if they did not penetrate so far as the stomach they would be suffocated in the snake's gullet. To these arguments it was answered, on the other side, first, that the digestive action of a snake's gastric secretion is slow and that it has often happened that a frog which had been swallowed by a snake has been disgorged alive and uninjured, and, second, that snakes use so little oxygen in their breathing that they can spend a considerable time in a very confined space and not only survive it, but apparently suffer no ill effect from it. I can support both these answers from experience. I have known many instances of a snake being half swallowed by another and having its head in the other snake's gullet for a matter of five minutes and which, when I had freed it, had immediately seized a frog and swallowed it, and I have also many times known frogs to be swallowed by snakes and afterwards disgorged none the worse for the adventure.

On the second point, I have had snakes sent from London to Edinburgh by parcel post, packed in a tin box and wrapped in brown paper with no holes for air, yet the snakes were perfectly fit when they were unpacked more than twelve hours afterwards. I do not think, therefore, that there is any physical reason why young snakes should not survive ten minutes or quarter of an hour in an old snake's gullet.

The definite statement by a great number of observers that they had actually seen the old snake open her mouth and the young ones enter it, is explained away by the suggestion that the young ones, being alarmed, had made for cover and that their mother's body being near, they had sought that cover among her coils, but that the observers were mistaken in their belief that they had seen the young ones actually enter her mouth. This is really a question of the credibility of evidence, but when one considers how quick are the movements of a startled snake and how difficult it is to follow them with the

eye clearly and precisely, also how that difficulty is intensified when the snakes are tiny and their movements confused by their number, the objectors' argument carries much weight. It is also argued that an Adder is seldom far from cover and that the young may disappear in grass or loose earth or other concealing material so quickly that the observer, because he could not see where they had gone to when they disappeared, jumped, erroneously though quite sincerely, to the conclusion that they had gone down their mother's throat.

Then we come to the second group of eye-witnesses' statements—that when the Adder was killed the young ones were found in her throat or dropped out of her mouth. The opponents of the belief meet this by suggesting that in such cases the mother Adder was killed while she was full of eggs which had just hatched and that the young were not in her gullet, but in her oviduct, and that in the smashing of her body when she was killed the intervening membranes were broken

down and the young forced into the gullet. This again is purely a matter of accuracy of observation and credibility of evidence.

The question will never be settled entirely beyond doubt until two or three trained and critical witnesses can disturb an Adder and her young ones, see the young ones enter their mother's mouth, then pin down the mother snake and very carefully open up the anterior part of her body and discover whether or not the young snakes are actually there. Such unchallengeable evidence has never yet been offered.

On the whole question, while I am, I hope, open to conviction, I have the strongest possible doubt that such a thing ever takes place. I think the argument *a priori* is all against it.

The whole object of such a proceeding must naturally be the protection of the young for the benefit of the race—it can have no other purpose ; in other words, it must have survival value, otherwise the habit could not have arisen or could not have been

maintained. Let us suppose that an Adder and her newly-born family are basking in the sunshine and that suddenly an enemy appears; that the mother snake, in order to protect her young ones, immediately opens her mouth and receives into her œsophagus her family of, say, twenty little snakes, each about six inches long. The mother's defence, if the danger draws nearer, is to gather into her coils with her head and neck drawn back ready to lunge at the invader. If she has the whole of her family in the anterior part of her body her ability to strike and recover must be greatly reduced—so greatly that she must be rendered almost defenceless. If flight were her resource she would be as greatly hampered by the presence of her family in her throat. The only kind of enemy, so far as one can see, that might be defeated by such a device would be one that might threaten the safety of the baby snakes, but was too small to count against that of their mother. There are not many such enemies (for it must be remembered that the

baby Adders are armed with fangs and venom and able to defend themselves in the manner of their race against an enemy within the compass of their size), but on the other hand there are many who, if they should persist in their attack, would be able to destroy not only the old adder herself, but her entire family as well, almost, as one might say, at a single blow. Suppose, however, that the Adder has no such habit and that on an enemy appearing there is an instinctive *sauve qui peut* and that while the mother possibly coils on the defensive her family scatter in all directions, the probability is that only one, or, at most, a few of the group would be killed and that the others, or at any rate the majority of them, would escape. In the face of this I should require very convincing evidence of fact before I could believe that such a thing as a snake refuging her young in her throat ever happened.

CHAPTER VIII

THE SNAKE IN THE HOME

WHILE to the majority of people a snake would, I suppose, be almost the last thing that would appeal as a pet, there is nevertheless a quite respectable minority who find it interesting to keep snakes ; a smaller number still, perhaps, who are really fond of them. It may therefore be not inappropriate, in a book dealing with the popular aspect of snakes, to include some hints on their treatment in captivity.

As a pet the snake has many qualities to recommend it. It can show beauty of form, colour and movement, and though its behaviour may be rather limited in scope, it is, within its limits, as absorbing as that of any other living thing. The snake is, or at least it may be, inexpensive to acquire, it

is easy to accommodate and care for, and it never makes a noise to disturb a reader or scatters seed or crumbs on the carpet. To the juvenile pet-keeper these last are distinct advantages! From the snake's point of view it is also to be considered that few creatures are more suited to a life in bondage and that in a confined space than a snake.

The pet-keeper who demands response from his pet may perhaps not find a snake to his taste. If they are properly looked after and kept in good health and frequently handled snakes will usually become tame very quickly—that is to say they will allow themselves to be picked up and will coil themselves round their owner's hand or arm or neck or travel slowly over him, without struggling to escape or showing signs of fear or uneasiness. Beyond that I do not think one should expect a snake to go. I should not like to say that a snake may not come to recognize the particular human being who regularly handles it and cares for it, and distinguish him from other human beings, though I cannot feel

sure of even that degree of ophidian friendship ; at any rate, I cannot feel that I have had certain evidence of it among the hundreds of snakes that I have had. On the other hand, there are those who claim that a tame snake may show not only recognition of but actual affection towards its owner. Anyone who has read the late Professor Romanes' book, " Animal Intelligence," may remember the description he gives of a tame Boa Constrictor which was said to be so attached to its owners that it moped when they were absent from home and showed " every symptom of intense delight " when they returned. Well, perhaps some people may inspire more affection in snakes than others, and I am one of the others !

There is first to be decided the kind of snake one is to keep. I advise very strongly that no one should attempt to keep a venomous snake of any potency (which means any venomous snake except some of the smaller " back-fanged " snakes) in a private house. Snakes are inquisitive people and are so

prompt to take advantage of any opportunity to go on an exploring expedition that no matter how careful one may try to be an escape is very likely to take place sooner or later. A snake can often squeeze through a chink or seam in a case that one would never imagine it could possibly pass, and then one *may* forget some time to fasten a case door! Apart from the poison people, any snake may be kept that one can gain possession of and accommodate and feed properly, from the common Grass Snake up to the large constrictors, which latter are, in my opinion, the most beautiful and interesting and in many respects the most satisfactory to keep.

The snake is often an acquired taste, and it is very likely that the seed may be sown by the chance capture of a Grass Snake when one is in the country, or by seeing some in an animal dealer's shop and taking a sudden fancy to have one. That may be only the beginning! It is, however, quite a good beginning, for the Grass Snake is gentle and

never attempts to bite, needs no artificial heat or elaborate housing, and is easily kept, and can be bought for a couple of shillings, or sometimes less. In addition to English-caught Grass Snakes (which, for some reason are not as common in the shops as they used to be), there are many pretty varieties of the same species from Southern Europe on sale in the dealers' shops during the summer and a collection of them (I assume that by now the seed has begun to sprout!) is very attractive. Nearly related to the Grass Snakes are the Garter Snakes of North America, of which there are a number of varieties, many very prettily marked with brightly coloured stripes along their bodies. The Garter Snakes are, I think, more lively and more interesting than the Grass Snake, but of course, being imported from a distant country, they cost a good deal more. They quite frequently breed in captivity, and as they are viviparous there is no difficulty of hatching eggs in the matter. The young are not difficult to rear, and will feed readily

on earth-worms. A number of different species of hardy European snakes are imported regularly by dealers every summer. The most attractive of them, and one of the largest of European snakes, is the Four-lined Snake, which owes its name to four light-coloured lines which run, two on each side, along its body. It is usually very gentle and thrives well. It is a constrictor, feeding on birds and small rodents.

If one wants something more ambitious, the Boas and Pythons offer a fairly wide choice. The most inexpensive and probably the hardest snake of that family is the Indian Rock Python. Young specimens of five to six feet long can often be bought. It is a handsome snake, and though at first a recently captured specimen may be savage and may bite, if given the opportunity, at that age and size it is easy to control and the bite is a minor matter; if the snake is handled regularly it will soon get over its fear and allow itself to be taken up without resenting it. If it is kept under proper con-

ditions it will grow fairly quickly. My first python was an Indian Python, and was about six feet long when I received it. In four years it grew to nearly ten feet long. It was, however, kept in a very warm place and well fed and in such conditions the rate of growth is at its maximum. Had it been kept in a cooler temperature it would probably have grown more slowly. This snake never attempted to bite from the first day I had it and could be handled quite freely. The two other large pythons—Seba's Python and the Reticulated Python—can also frequently be obtained from the larger dealers and can be kept in the same way, but the Reticulated Python is not quite so hardy and is decidedly more expensive than the Indian Python. The most charming of all the family, however, is the Common Boa (*Boa constrictor*). It is much smaller than the pythons mentioned, and one can often obtain specimens of three feet and even two feet long. If it thrives it will, of course, grow, but it will never be likely, at its largest, to exceed a manageable

and controllable size, and it is likely to become most tame and gentle.

There are also many North American snakes of substantial size that can be kept such as the Bull Snake, Black Snake, Indigo or Gopher Snake, King Snake, and others. All are fairly hardy and not difficult to cater for (except perhaps the King Snake, who will most probably demand snakes for his diet). Many of them are ready to bite, but the teeth are small and the bite merely a scratch.

Having decided upon the snake or snakes one intends to keep, the next step is to prepare some kind of case or vivarium as a home for it. A snake can find life supportable in very cramped quarters sometimes. I knew a python some years ago which a friend of mine kept in a small box with a few small holes in it for air. The snake was wrapped in a blanket and was kept warm by a rubber hot-water bottle in the bottom of the box, which was refilled twice a day or so. This python used to feed regularly

and greedily in the small box and was a very healthy snake. That, however, is not the best way to house a snake and was adopted only as a matter of compulsion. It is much better to have some kind of case with at least one side of glass in which the snake can move freely and in which its behaviour can be watched. With regard to the size of the case, one may make it as large as circumstances and means permit, but for *minimum* dimensions I used to adopt, as a rough guide, to make it as long as the length of the longest snake it is to contain, making the breadth half and the height two-thirds of the length. That provides much more spacious quarters than may at first sight appear; for example, in a case three feet long, eighteen inches wide and two feet high a snake of three feet long would seem small and would have really quite spacious quarters. The simplest type of case is one with wooden bottom, top, back and ends, with a glass front and with gauze-covered apertures in the ends and top for ventilation,

and a door in the back through which one can put in food and water and attend to the inmates. The glass front should be removable to facilitate cleaning arrangements. One may, of course, have much more elaborate quarters than that for one's snakes if the exchequer and other conditions permit. It is most important that all doors, shutters, ventilators, etc., should be close fitting and securely fastened ; otherwise, as I suggested before, the snake will undoubtedly go off one day exploring and would then doubtless bring fear to the neighbours, odium to its owner and death to itself. Some means must always be provided if the case is in a sunny position, for the snakes to get shade if they want it, and indeed to be able to get away from light altogether at times ; pieces of rough cork bark laid on the floor are very suitable for that purpose. The floor of the case may be covered with a sheet of felt, which can be easily dried and brushed when it is soiled or, better, with coarse sand or gravel, which can be changed from time to

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time. A vessel, large enough for the largest snake to lie in, and kept filled with clean water, must also be provided.

Perhaps the strongest objection that could be urged against the snake as a pet is the kind of food it needs, and the objection there may be to providing it. As I have explained in another chapter, snakes feed on other animals, which it is natural to them to require to be alive. It is true that they can very often, if not always, be trained to take their prey dead, provided it be freshly killed before it is offered to them, but I do not see myself that that altogether removes the objection. One could not, for example, order a rabbit for one's python from the poulterer, for a so-long-dead dinner would almost certainly be declined by the snake ; if the python were to be expected to take a dead rabbit it would have to be killed just before it was put into the case, which means killing it oneself. It seems to me there is just as much to be urged against killing the rabbit oneself as against letting the python kill it—much

more, in fact, because if a human handles and kills the rabbit it is going to experience a considerable amount of fear before it dies, whereas if one puts it living into the case with the python it will, in at least ninety-nine times out of every hundred, be unconscious of any danger and have no fear of the snake, and death, when it comes, will come suddenly and quickly. Except to a practising vegetarian the objection is a very illogical one. There is no more reason why one should object to killing a rabbit for one's python, or allowing the python to kill it itself than there is against allowing cattle or sheep or poultry to be killed for our own use. If the snake were left at liberty it would kill a certain number of other animals during its lifetime ; the matter is no worse by its being allowed, in captivity, to kill a similar number. Nevertheless, there are many people who can never become reconciled to the idea, and fortunately it is not difficult to keep many snakes successfully without the direct killing for the purpose, either by oneself

or by the snake, of anything; that is by feeding them artificially.

I have already mentioned the natural food of most of the types of snake which any snake-lover is likely to keep, and one need not elaborate the subject again. It is sufficient to say that with frogs, mice, rats, rabbits and pigeons one can feed most of the snakes the amateur snake-keeper is likely to have—except those which feed on lizards.

In the days when I kept a private collection of snakes I rarely used any method except artificial feeding. There are several methods of doing that. The crudest way is simply by opening the snake's mouth and pushing a dead mouse or rat, if any are available, or a piece of raw meat down its throat. In doing this the food must be worked very gently into the snake's jaws and into the throat, and it can then be pushed well down the throat by a piece of stick or something (whatever is used for that purpose must be quite smooth). It is not easy to do this without the risk of injuring

the snake's mouth. The method I always used was to give the food by means of glass tubes fitted with ram-rods. One takes a glass tube of a size suited to the snake on which it is to be used ; one end should be held and turned for a minute in a bunsen flame to round off the sharp edges, and a piece of stick is planed or scraped down till it fits the tube as a ram-rod which will just reach to the end of the tube and be stopped from going further by a thicker portion which serves as a handle. The tube is filled with the food, the ram-rod inserted half an inch into it, then the snake is taken up and held by one's left hand just behind the head, the mouth is gently opened, and the end of the tube, dipped in water or milk to lubricate it, is passed gently into the snake's throat and some little way down it, and the ram-rod is pushed down till all the contents of the tube have been discharged into the snake's gullet, and the tube is gently withdrawn. One can deal with small snakes single handed ; for large snakes an assistant is almost a

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necessity and is no disadvantage with even the smallest. I have had snakes fed in this way living and thriving for years. Some individual snakes will not do well on it, but very probably they would not have done well in captivity in any case. The food I always used for the artificial feeding of my snakes was a mixture of scraped raw beef and raw egg and a little milk. I used to feed them at a regular interval of a week or a fortnight. Sometimes it is a little difficult to fill the mixture into small tubes, and I used the following method: the mixture was filled into a large glass tube two inches in diameter, which was fitted with a ram-rod and also a number of corks, each of them pierced with a hole to take one of the different sizes of small feeding tubes. When a cork was put in and the appropriate tube fitted to the hole in it, a slight push of the ram-rod in the large tube squeezed enough of the mixture into the small tube to fill it. The small tube was then inserted into a snake's throat and its contents discharged

with its own ram-rod. All the snakes to which that small tube was suited were fed in the same way and then the cork was changed for one to take a tube of larger size, and so one worked up to the largest size of feeding tube. After all the snakes were fed, the tubes, corks and ram-rods were scalded and thoroughly cleaned and were ready for the next week's feeding. In this way I kept and fed for years a large number and variety of snakes ranging from Smooth Snake and small Grass Snake up to Boas and Pythons. In feeding snakes in this way there are several points to be kept in mind. The first is that the food used must be absolutely fresh and the utensils quite clean. The second is to be careful that nothing in the least sharp or rough be put into the snake's mouth and that great care be taken not to injure its mouth or tongue or throat. Once a fortnight is often enough to feed many snakes, but frog-eating snakes require rather more frequent feeding and should not go for more than a week.

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The proper interval will depend to some extent upon the quantity given at each time, the kind of snake and the temperature at which the case or vivarium is heated. When a snake is first fed artificially it may disgorge the food given to it, an accomplishment in which its race is quite proficient. If the meal given be too large, or if the snake is not in good health or is indisposed to feed, the food is almost certain to be returned. A snake which does this should be fed again with a smaller quantity and if, after two or three attempts, it still refuses to retain the food, it is probably ill. In every case after a snake has been fed it should be returned gently to its case and left undisturbed for some time. One has to exercise some judgment to determine the proper quantity of food to give. It is certainly better to give too little at first rather than too much, and the quantity can be increased if it appears that the snake is not getting sufficient to keep it in good condition.

Snakes, being cold-blooded, are dependent

on their surroundings for the heat necessary for the continuance of their vital processes. If the temperature be too low they become torpid and will not—cannot, indeed—feed. If one feeds them artificially they use such energy as remains to them in sooner or later disgorging the meal, which, even after an interval of some days, may show no sign of digestion. Most of the European snakes can be kept, at least in the southern half of England and Wales and in the west of Scotland, without artificial heat in summer, though it will be necessary that their case shall be placed where it will receive direct sunshine for a good part of the day. Sufficient shade must, in such circumstances, be provided for the snakes, and attention must be given to the ventilation of the case to prevent it getting too hot, since, unlike lizards, snakes cannot bear too much heat. In the colder half of the year hardy snakes, that is to say those from temperate countries, may, if they have been well fed during the summer and are in good condition, be allowed

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to hibernate as they would have done if at liberty. If they are to hibernate they should, as soon as they show signs of becoming torpid, be put in a box and well surrounded with hay or straw or old blanket or some insulating material, and stowed away in a cellar or outhouse where they will be as cool as possible, but secure from the reach of frost. They ought to pass through the winter and be ready to come out in spring, when, if all has gone well with them, they will be thin but hungry and ready to bathe and feed. Reptiles in captivity, however, do not always hibernate as successfully as they would do in a wild state, and personally I prefer, if one has the means to do it, to keep them in heated quarters and active and feeding throughout the winter. If that is done they will not require feeding so often or to have so much food at a time as during the season when they would naturally be active. Even in the summer, in many parts of this country, we do not get a long period of really warm weather, and there is much to be said for a

little artificial heat throughout most of the year.

It is not a difficult matter to apply artificial heating to small snake cases. One way is to have a tank in the bottom of the case, with a small boiler connected to it by flow and return pipes outside, the water in the system being kept hot by either a paraffin lamp (if one lives in the country) or a small Bunsen burner if gas is available, or an electric heater. I did a good deal of experimenting at one time with various ways of heating cases, and fell back on what is the simplest of all. I made the bottom of the case not of wood, but of sheet-iron and placed beneath it a paraffin lamp with the top of the chimney about an inch below the bottom of the case (the case itself standing on a box to raise it to the required height). The sheet-iron bottom of the case was covered with sand at least an inch deep, and the heat from the lamp soon warmed up the mass of sand which radiated the heat through the case. In adopting this method one has to find out by

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experiment the size of lamp necessary and the proper size of flame and distance from the case bottom. It is, of course, specially important that the sand shall not get so hot as to burn the snakes. They should be able to find the degree of heat they like by lying either directly above the lamp or at some distance from it. The temperature in the case can also be regulated to some extent by having a moveable cover over the ventilator on the top so that the amount of cool air passing through the case can be controlled. My first snake case was a small one only two feet long by a foot wide and high and was quite sufficiently heated by one of the small paraffin hand-lamps which one can get in any drysalter's or general store. The case stood on four legs long enough to bring its thin sheet-iron bottom about an inch and a half above the top of the lamp chimney. Later, when matters had developed considerably and my cases were much larger, I still found the same method very successful. For a case some six feet

long, however, and correspondingly wide and high, a paraffin lamp (unless it were a fairly large heating stove) is not enough in cold weather, and I used a Bunsen burner, playing directly on to the sheet-iron bottom of the case, but since that would have made the sand much too hot, a second bottom of perforated zinc was fixed some three or four inches above it and covered with sand. The advantages of this method are its cheapness, simplicity and the fact that one gets the maximum of heat in the case from the amount of fuel consumed. The disadvantage is that if the lamp should by any chance go out unexpectedly the case becomes cold almost immediately, whereas with a hot-water tank the water, once heated, retains its heat for a considerable time, and the mishap may be discovered before the snakes have had time to be chilled as they might be in winter if the heat were off for long. A further disadvantage is that the arrangement is apt to become one that would make a fire insurance inspector faint! I recall, in fact, one or two

very narrow escapes from setting the house on fire with my own early arrangements, though I learned by experience to eliminate many of these liabilities. One of these lessons was always to use metal tubing for connecting a Bunsen burner to the gas supply, and a second was to enclose oil-lamps so that dog or cat or other domestic pet cannot knock them over! As my own collection of reptiles increased they arrived at the dignity of a greenhouse specially heated by a boiler and an adequate battery of pipes, and that is no doubt the best way to keep snakes.

If a snake is in good health when one receives it, there is every reason to hope that it may continue in the same state for a considerable time, and the best means to ensure it are adequate temperature, sufficient and correct food, and cleanliness. It may be, especially if one is buying a snake from a dealer, that it is not in good health. The mouth of every snake one acquires, or contemplates acquiring, should be carefully examined, for snakes are particularly liable

to a disease of the mouth, usually called "canker." It will show itself at first in inflamed spots from which comes a cheesy-looking matter. It starts in all probability from some injury to the mucous membrane of the mouth, such as might be caused by the snake striking at a stick or some other hard object. If the bodily resistance of the snake be low at the time, which may result from the disturbance of capture or, more likely, from its being kept for some time at far too low a temperature, the wound may become infected. The invading organism quickly increases and, working inwards, ultimately attacks the bone which becomes necrotic. In early stages "canker" can be cured. The sores should be very carefully cleaned by washing with a gentle antiseptic solution (such as diluted hydrogen peroxide or "Listerine"), and then lightly dusted with some dressing powder. I used to use xeroform, but iodoform will do almost as well. This should be done every day, or if the condition is very bad, twice a day, till

the sores have healed and the mouth appears clean and healthy again. Even though a snake's mouth appears healthy when one gets it, it is wise to examine it at regular intervals to make sure that all is well. A snake suffering from canker will not feed, and if the treatment is prolonged it may be necessary to feed it artificially, which must be done with great care to avoid further injury to the already damaged mouth. Boas and pythons seem more susceptible than most other snakes to "canker." Snakes exposed to too low a temperature for long may contract pneumonia, of which a symptom is a discharge of mucus into the throat and mouth. I have had one or two cures—if my diagnosis of the disease was correct—by painting the mouth and throat twice a day with extract of witch hazel.

Bad or incomplete sloughing is itself a sign of indifferent health, and is a matter that requires treatment. If when the time for casting the old epidermis arrives it is not completely shed, but comes off in fragments,

with portions left adhering to the new "skin" the snake should be bathed in tepid water till the patches of dead "skin" are well soaked and softened, and they may then be gently rubbed and eased off a little bit at a time till they are all removed. This may take some time. If the patches of old skin are so firmly attached that they cannot be removed in this way, there is not much more that one can do except wait till the next casting is due and in the meantime keep the snake warm and as well fed as one can, in the hope that matters may right themselves.

APPENDIX

NOTES ON THE BEHAVIOUR OF VARIOUS ANIMALS IN PRESENCE OF A SNAKE

THERE are two somewhat differing grounds on which animals have good reason to dread the snake. Animals which are small in relation to the snakes of their region form, in most cases, the prey of those snakes, and in that there is a sound foundation for fear. Animals which are much too large and physically powerful to be in any danger of being treated as prey by snakes may yet conceivably have learnt the fatal power of the venomous snake, and so in them also a general fear of all snakes might possibly have developed. Obviously, however, no animal either swallowed by a snake or bitten and killed by a venomous snake could possibly hand on to offspring any effect of its own

experience, and so the only way in which an instinctive or inheritable fear could be established would seem to be by witnessing, not once, but repeatedly, the fate of fellow animals. That, in the former case, is not so improbable, but in the latter case it would mean not merely witnessing the bite, but connecting with it, as a cause, the death which was its effect—a feat of observation and reasoning which I cannot believe to be within the capacity of any animal except perhaps the higher apes. One would expect therefore that if there were any indication of an innate or instinctive fear of the snake it would be found in the smaller—that is, the food—animals, and in chimpanzee, gorilla or orang outan.

Regarding “food animals,” I had had ample proof that such animals as rabbits, rats, mice, fowls, ducks and pigeons when put into the cases of captive snakes showed no signs of fear of them; if the snake be not in a mood to feed and remain motionless they do not seem to realize that it is a living



Photo]

THE CAT HAS NO INHERITED FEAR OF THE SNAKE ! [Mrs. T. H. Gillespie
(The Snake is a Sand Boa)

creature, and a pigeon will perch on it and preen its feathers or a rabbit hop into the centre of its coils and sit up and wash its face. Such behaviour has been witnessed scores and scores of times. If the snake be inclined to feed and begin to move towards the prey, the birds still seem unworried and indifferent, while the reaction of the rodents suggests curiosity more than anything else, and they will often approach the snake to investigate. I have seen rats adopt an attitude of watchfulness as if they had some doubts, though even their attitude was not one of shrinking or fear. These are domesticated animals, however, removed by uncountable generations from any wild ancestor which could have had a racial contact with snakes, and it occurred to me that small mammals and birds of wild species might show a different response to the presence of a snake. I had long disbelieved in any general instinctive fear of the snake in human beings, and was convinced that the horror and dread so many people express

and, I have no doubt, genuinely feel, is the result of tradition and education. After the opening of the Zoological Park gave me opportunity and material, I made a series of tests on a large variety of animals, but I find I have mislaid the notes I made at the time, and so I made a fresh series of experiments for the purpose of this book.

For the tests I used a Common Boa about six feet long. I chose this snake as being large enough to attract the attention of any animal and to seem dangerous to any animal that might recognize danger in a snake, but not so large as to inspire fear through mere size alone. I took the chimpanzees first, and I was able to make a much more interesting experiment with them than I had been able to do twenty years before since we not only have a much larger number of individuals, but have also a young one born in captivity. I think the results are interesting enough to be worth giving in some detail.

The snake was first shown to "Andrew,"

who was born in the Zoological Park and was fourteen months old at the time, having just been separated from his mother. Living with Andrew is a young female chimpanzee, "Gretel," who, though born in freedom, is not much older than Andrew himself. Neither of these little chimpanzees showed the slightest fear of the snake ; they looked at it, seemed to make up their minds quickly that it was not edible and took no further interest in it, even when it was allowed to put its head through the netting and advance some short distance into their cage.

Next came the turn of two other very young chimpanzees, a male, "Hansel," and a female, "Sarah." They are, of course, forest bred, but they are certainly not yet more than two years old—probably not quite so much. Both of them showed evident concern at the sight of the snake and retreated to the farthest limit of their cage. They clung together silently while the snake was near, and as soon as it was removed to some distance they gave loud barking cries of

defiance or of anger. Both these little chimpanzees are very tame and of courageous disposition.

I went then to "Friday," a male, who is now about seven years old. He was a pet from early infancy of a resident in Nigeria, but was allowed complete liberty to go to the bush as he wished, till he was about three years old, when he came to the Zoological Park. Friday was as terror-stricken at the sight of the snake as anyone could be, climbed to the top of his cage, shrinking at the slightest movement of the snake, and expressed his fear and anger with the full force of his lungs.

"Ikey," a male about seven years old, and "Pauline," a female of about the same age, are living together. Ikey came to the Park when he was about two years old; Pauline was grown up when she came, and was probably nearly adult when captured. Pauline seemed quite indifferent to the snake. Ikey did not retreat far from it, but he showed a certain degree of uneasiness and

did not come close to investigate it as he would have done if he had not been rather afraid; even the offer of walnuts, which he loves, did not tempt him to come close till the snake had been withdrawn. He is extremely tame and friendly, and his attitude rather suggested that he was afraid of the snake, but had confidence that I would not let it hurt him.

“Flannigan,” the father of Andrew, is about eight to nine years old, and came to the Park when he was between two and three years of age; he has never been tame or friendly. “Wednesday,” Andrew’s mother, is about eleven years old; she was brought up from infancy by a resident on the Gold Coast and was allowed complete liberty till she was about eight years old, when she was sent to the Park. Flannigan, as soon as he saw the snake, retreated some yards, then showed great anger rather than fear, but did not come near again. Wednesday came at once to look at the snake and put her hand through the wire to take hold of it; she

showed no sign whatever of fear or uneasiness.

“ Phillip ” was also brought up from early infancy by a resident in Nigeria and had the run of house and jungle until he reached the age of about eight years ; he is now approximately twelve years old. Living with him is a female, “ Bunty,” who is, I should think, not more than seven or eight years old (her early history is unknown to me). Phillip is very tame, but he showed abject terror at the first glimpse of the boa, and fled to the top of a tree in his enclosure. Although he always comes to talk to me when I go to him, nothing would induce him to come down till the snake was removed. Bunty also showed fear, and that spontaneously and not after seeing Phillip’s behaviour.

There are six more chimpanzees in the house, but as they are not tame and would have retreated from me in any case, it was not worth while trying them.

I afterwards brought a smaller snake (a Garter Snake about thirty inches long) to

the ape-house and showed it to the same chimpanzees. The effect was pretty much the same, except that Hansel and Sarah were not so afraid of it as they had been of the larger snake.

These reactions were largely contradictory of each other, but that fact itself seems to indicate that there is no general and instinctive fear of the snake in the race, the conflict in their behaviour being due probably to differences in individual temperament and experience.

The experiment with monkeys was also interesting. A large and old male mandrill and two females with him all rushed away in panic when they saw the boa. As against that, however, an adult male drill in a nearby cage was not in the least afraid, but was decidedly interested and tried to reach the boa with his hands. In another cage a half dozen patas monkeys showed not fear, perhaps, but a decided wariness; they gathered together about a foot back from the front of the cage and the snake, and but

for the cage front preventing I think they would have made a combined attack on the snake. A similar number of young vervet and green monkeys in the next cage showed almost identical behaviour. It was otherwise with Eastern monkeys. A group of rhesus monkeys retreated to the back of the cage in evident fear. Common macaque, pig-tailed macaque, stump-tailed macaque and lion-tailed monkey all exhibited extreme nervousness at least and in some cases abject terror. South American monkeys all showed fear. Lemurs, on the other hand, were not in the least afraid, and one or two of them tried to take hold of the snake.

Lions, tigers, leopards, hyænas, bears, cheetahs and wolves were all either perfectly indifferent or tried to reach the snake. They behaved exactly as they would have done had the animal shown to them been, say, a rabbit or a bantam.

The elephant, when shown the snake, stretched out her trunk to take hold of it, apparently expecting that it was edible and

desirable. Cattle, antelopes, deer, etc., in no case took any notice of the snake.

Among small mammals, such as squirrels, agoutis and the like, I had expected to find that fear was general, but, to my surprise, the sight of the snake made no impression on them. Yet such animals bulk largely in the dietary of snakes.

Birds also provided a surprise for me. I expected, when I took the boa to the Tropical Bird House, to find clear and universal signs of fear. I found only the most complete indifference. The first to which the snake was shown, a mixed group of troupials, cardinals and other birds of similar size, paid no attention to it. Neither did a cageful of mynahs. As there was no risk of the snake being hurt, as it might have been if placed within reach of chimpanzees or other large mammals, I put it inside the cages and let it travel over the floor. That made no difference; the birds watched it with heads on one side, but did not show any alarm nor were they disturbed in any

way. The same result was obtained from successive aviaries containing toucans, tanagers, laughing kingfishers, Parroquets (such as Pennant's, Bauer's and the like), weaver birds and small finches.

In the large parrot aviary much the same thing occurred. One sulphur crested cockatoo certainly did lift its wings and back away, but another immediately came forward as close to the snake as it could and addressed it as "Pretty cocky," thereby cancelling the effect of its kinsman's show of fear! A macaw also came close to the snake to investigate it, but the remainder of the birds in the aviary showed no interest.

Much the same was the result when the snake was shown to birds of prey, though some, such as a vulturine fish eagle and a pair of caracaras, were eager to reach the snake, probably influenced by what seemed to them the prospect of a good dinner. The only birds which showed any uneasiness were one or two crows, among them the ravens.

Lizards apparently do not recognize the

danger latent in the snake ; at any rate, I have repeatedly seen, on the Reptile Rockery, Green and Wall Lizards lying basking cheek by jowl with Adders and Grass Snakes.

I have only found one animal which always shows instant recognition and fear of the snake, and that is the frog.

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