

XII NATURAL HISTORY

I. BIRDS

IN previous chapters of this book we have discussed the evolution of animals in general, the inclined plane of behaviour and the everyday life of the body, and it has been necessary to make many references to birds. But there are good reasons for devoting a special chapter to this great class. Birds have entered closely into human life, and in manifold ways. They supply food, and they are the poet's symbols. Their feathers keep us warm at night, and wing the arrow of the bowman. Birds save the world from the continual menace of prolific insects, and they gave the priests a basis for their auguries. To birds we must trace the enormous nitrate beds of Chili which have fertilised the soil of half the world, and we may thank them too for a share in the impulse that has led man to his mastery of the air. Moreover, most birds are joys for ever. Biologically regarded, birds are of supreme interest in their solution of the problem of flight—so different from that of insects, Pterodactyls, and bats; in their variability and plasticity within a comparatively narrow range; and in their fascinating behaviour with its remarkable blending of instinctive and intelligent activities.

§ I

Millions of years ago the evolution of

birds from a reptilian stock began, as has been already described in an early chapter of this work. At first sight it is not easy to see any resemblance between Birds and Reptiles, the one group warm-blooded, conspicuously active, and gloriously beautiful, the other cold-blooded, often sluggish, but perhaps also beautiful in their way. What kinship can there be between the falcon in the sky and the lizard on the wall? The student of comparative anatomy answers that the evidences of similarity are overwhelming: bone by bone the two creatures are built up on a plan that is certainly to a very great extent the same, however much the final products may be modified and adapted. Without much preliminary study of anatomical structure, these points might be difficult to apprehend and appreciate, and we cannot discuss them here; we must accept the verdict of the experts, and admit that birds are the descendants of a reptilian stock—not necessarily of any present-day group of reptiles, but rather of a common ancestor in the immensely remote past. Just one simple point of similarity between the two groups may be mentioned, the fact that both lay eggs, and eggs which are indeed closely alike in several respects.

We may imagine the ancestral forms as small lizard-like

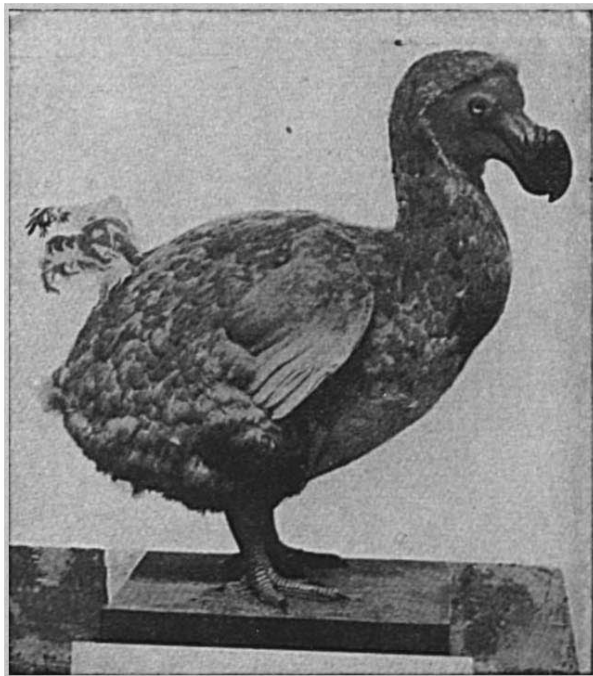


Photo: Royal Scottish Museum.

MODEL OF THE EXTINCT DODO.

The Dodo was a large flightless pigeon inhabiting Mauritius. It became extinct in the sixteenth century soon after the arrival of Dutch sailors on the island: the pigs which these men brought with them played a large part in the extermination.

"change their season in a night." So to-day we have birds peopling the whole earth and filling every land with the abundant beauty of their plumage and their song, and with the immense wonder of their eager, spirited lives.

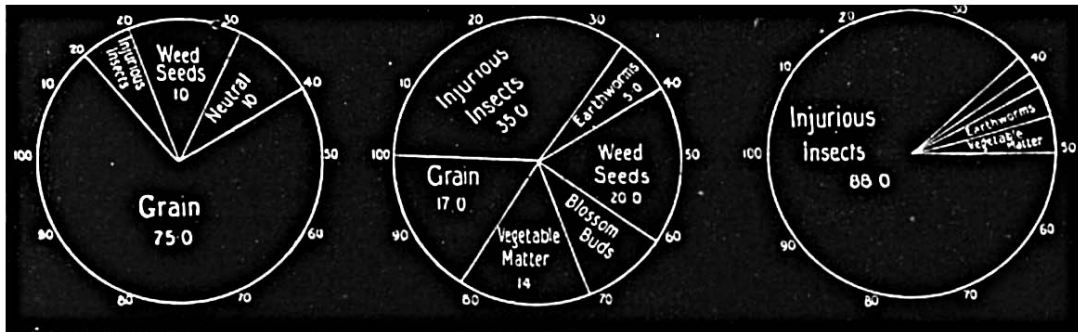
§ 2.

It is a strange side-issue, too, to find that the priceless gift of flight has not always been preserved. Over and over again since the reconquest of the ground-level, there have been birds which have discarded the faculty which was the making of their race; over and over again, also, they have paid the extreme penalty. Sometimes size and strength, sometimes an aquatic life, sometimes an island home, has been the factor giving security in place of flight, but with new conditions the exchange has frequently proved to be unfortunate: too often, in recent cases, the new condition has been the advent of modern Man and his civilisation.

Flightless Birds.

Several flightless species are indeed numbered among the birds which have become extinct within historic times. Among the Maoris of New Zealand there was a traditional knowledge of a giant running bird which they called "Moa," but which they had exterminated before the arrival of white men; from the bones and other remains which have been found in some quantity the birds appear to have been large members of the Ostrich tribe, one species standing 12 feet in height. A related bird of similar history was the *Æpyornis* of Madagascar, which forms the subject of the delightfully imaginative story by Mr. H. G. Wells. This bird is sometimes identified with the legendary "Roc" of the *Arabian Nights*; not only its remains but also its eggs have been found, and an egg in the British Museum (Natural History) measures more than 13 inches in length and 9½ in breadth.

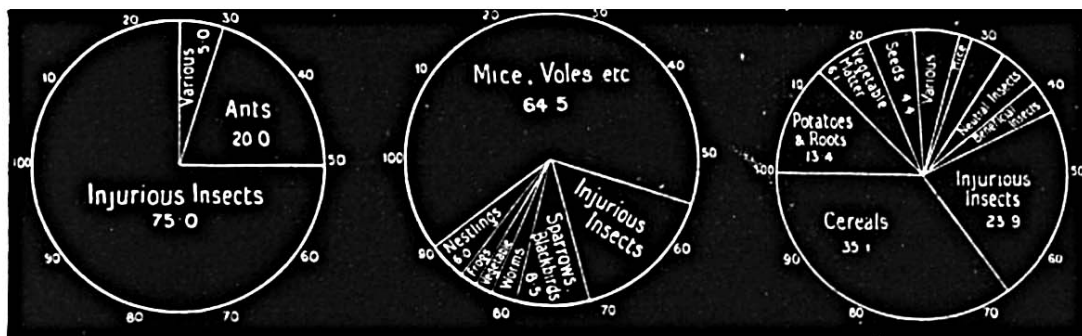
"Extinct as the Dodo" has become a proverbial expression. The saying refers to a bird allied to the Pigeons, about the size of a Swan,



Adult Sparrow in an agricultural district.

Adult Sparrow in a fruit-growing district.

Nestling Sparrow.



Green Woodpecker.

Kestrel.

Rook.

BIRDS AND THEIR FOOD.

This diagram illustrates to what extent certain birds are harmful or useful in respect of our food crops. The evidence is obtained by examining the bird's crop or gizzard at the time of death. The calculations were based on statistics published by Dr. Collinge in the *Journal of the Board of Agriculture*.

and of clumsy and uncouth appearance. It was quite flightless, and lived in security in

The Dodo. Mauritius until the island was visited by Dutch sailors in the sixteenth century. The hogs which these men brought with them were largely responsible for the subsequent rapid extermination of the birds, and now

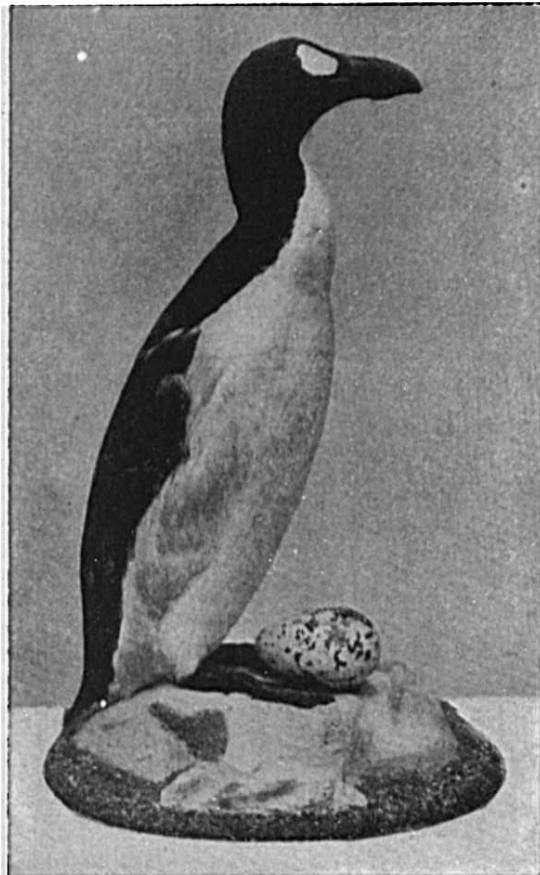


Photo: Royal Scottish Museum.

GREAT AUK (WITH EGG).

A large flightless species related to the Razorbill and the Gulltongue. It became extinct about the middle of last century, but was formerly common on the coasts of Iceland and Newfoundland and not unknown in British waters. Specimens and eggs are much prized rarities nowadays, and will command several hundred pounds if in good condition.

the Dodo is known only from some remains in museums and from the quaint drawings and descriptions of the early voyagers.

Among the birds of the present day, the Ostrich tribe and the Penguins are the principal examples of flightlessness. The Ostrich

The Ostrich Tribe.

and its kin are for the most part birds of large size, possessing a soft, hair-like plumage, diminutive wings, and strong

legs; they are capable of running at great speed across open country, and also of kicking with suddenness and force. Their breastbones lack the pronounced "keel" which is so noticeable in most birds, and which serves for the attachment of the great muscles for working the wings in flight. Best known, of course, is the African Ostrich, now being domesticated by man for the sake of its plumes, but there are also several kinds of American Ostriches or Rheas in South America, and of Cassowaries and Emus in Australasia. Unlike their fellows are the Kiwis of New Zealand, birds of no great size, timid and nocturnal in habit; their long beaks and their hair-like plumage combine to give an exceedingly quaint appearance, and there are no visible wings.

The Penguins are rather a different case, for their wings have by no means fallen into disuse; they have become, instead, adapted

Penguins. for swimming. There are many different kinds, but all belong to the Southern Hemisphere, and most of them to the far south. Many Antarctic explorers have brought back tales of their life, but it is to Dr. Murray Levick, who was with the *Terra Nova* in 1910, that we owe one of the best accounts, relating particularly to the Adélie Penguin. These flightless birds will return, "over hundreds of miles of trackless sea," to the same "rookeries" year after year to breed. Dr. Levick describes how the first penguin arrived at the "rookery" at Cape Adare towards the middle of October, the southern spring, and how four days later the birds were coming in across the still unbroken sea-ice in such numbers that they formed a line stretching northwards as far as the eye could see; within a month the colony was some three-quarters of a million strong.

The Adélie Penguin builds a large nest of stones, the only material available, and the uses of this are evident when the thaw comes and the ground is covered with water and slush. In this nest two large eggs are laid, and one of the parents goes off to the sea to feed while the other remains to incubate. The bird which leaves may be away for a week or ten days, and the other may therefore not break its fast for as much as four weeks in all.

"I know of no other creature," says Mr. Herbert G. Ponting, "from which man may



Reproduced by courtesy of Messrs. Methuen & Co. from "A History of Birds," by W. P. Pycraft. (After a painting by G. E. Lodge.)

THE AMHERST PHEASANT IN DISPLAY!

A fine example of ornamental plumage, lending itself to display in courtship. The male has this garb all the year round, but the hen is of sober hue. Like several other gorgeous species, such as the Golden Pheasant and Swinhoe's Pheasant, it is a native of China.

learn a finer lesson of how resolution and steadfastness may overcome every difficulty than from the Adélie Penguin." Their bravery is amazing; no blizzard, however violent, will drive these birds from their nests in the wild Antarctic regions. Mr. Ponting relates that they are found sitting on their nests buried deep in the snow. Wondering where the birds had disappeared to after a blizzard, he set out to investigate. "As I was struggling about, wondering whether my penguin investigations had come to an abrupt end, I was almost 'scared out of my life' by a muffled squawk, and felt something wriggling under my foot. I had stepped on the back of a sitting penguin—buried nearly two feet deep in the snow. As the victim struggled out, loudly protesting its wrath at this outrage, we were convulsed with laughter; then, roused by our noisy mirth, scores of black heads, with 'gollywog' eyes, suddenly protruded from the snow—to see what all the fuss was about. That was how we discovered them! They had *not* deserted the place; but were attending to their domestic duties *under* the snow—patiently waiting for it to blow away. There were penguins everywhere; it was impossible to walk without stepping on them."

The penguins are fond of all manner of amusements; leaving their young under the protection of a few of the old birds, most of the parents go off to disport themselves on the ice or in the water. "They will string out behind a leader and make for the near ice-floes, the party sometimes porpoising along the water, then tobogganing over the ice. They followed in a line behind the leader, doing exactly as he did. The fun became fast and furious, and I suppose they got a bit winded, for after a while the courier gave them a rest. Following his lead they sprang on to an ice-raft; then, still imitating his example, they settled down on their breasts and basked awhile in the sunshine—prior to doing a few more laps. That they all thoroughly enjoyed the game, there could be no possible doubt."¹

The Emperor Penguin is the largest species and may stand over four feet high. Unlike the Adélie it nests, or rather lays its single egg,

on the sea-ice itself, and it is remarkable for breeding in mid-winter.

Incubation lasts for as much as six or seven weeks, but the task is shared, not only by both parents, but by the strangely large number of barren birds living in the colony. The chick has the rather doubtful advantage of a number of foster-parents all desirous of participating



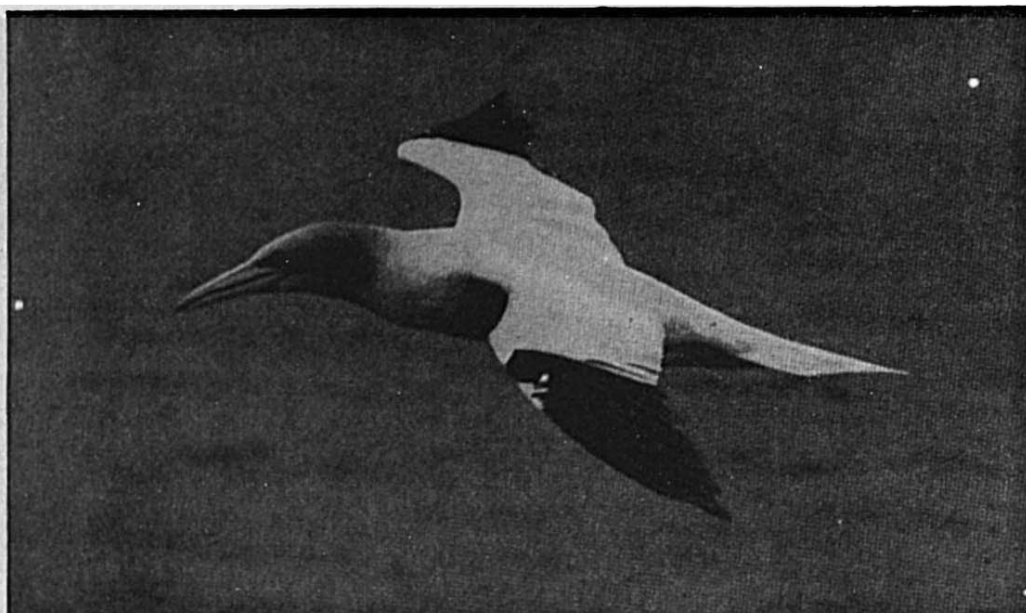
Photo: James's Press Agency.

THE KIWI OR APTERYX.

A small member of the Ostrich tribe, found in New Zealand. It is not only flightless, like its relatives, but also lacks visible wings. It is a shy bird of nocturnal habits: the beak, used for probing, is long and sensitive; the legs are powerful; the plumage is long and hair-like.

in its care, a strange condition of things which was well described by Dr. A. E. Wilson, who afterwards shared Scott's tragic fate on the return journey from the Pole: "What we actually saw, again and again, was the wild dash made by a dozen adults, each weighing anything up to ninety pounds, to take possession of any chicken that happened to find itself deserted on the ice. It can be compared to nothing better than a football 'scrimmage' in which the first bird to seize the chick is hustled and worried on all sides while it rapidly tries to push the infant between its legs with the help of its pointed beak, shrugging up the loose skin of the abdomen the while to cover it. That no great care is taken to save the chick from injury is obvious from an examination of the dead ones lying on the ice. All had rents and claw-marks in the skin, and we saw this not only in the dead but in the living. The chicks are fully alive to the inconvenience of being

¹ H. G. Ponting, *The Great White South*.



From "Our Common Sea-Birds" (Country Life, Ltd.).

GANNET—A LESSON FOR AVIATORS.

fought for by so many clumsy nurses, and I have seen them not only make the best use of their legs in avoiding such attentions, but remain to starve and freeze in preference to being nursed. Undoubtedly, I think that of the 77 per cent. that die before they shed their down, quite half are killed by kindness."

§ 3

With this strange and rather terrible picture of the early life of the Emperor Penguin amid the rigours of the Antarctic climate and on the naked ice of the frozen sea, we may turn from flightless to flying birds. The flightless birds, indeed, represent digressions from the main line of descent, and cannot be regarded as stages in the evolution of modern flying birds from the ancient forms which first mastered flight in the forests of long ago.

Birds share with mammals the distinction of being "warm-blooded," that is to say, having a high and constant body temperature independent of surrounding conditions. We may take this as an index of a high degree of vitality and of an advanced position in the evolutionary scale, and we shall indeed find many other features which lead towards the same conclusion. Birds are noteworthy for alertness of mind and

body, for quickness of movement, and for their mastery of the air. They have highly developed habits and complex instincts: they are in turn combative, amatory, parental, cunning in pursuit and escape, and in very many cases there is a surpassing beauty of plumage and voice which compels our intense admiration.

"Beast" is one of those words of variable and confused sense which drive men of science to use a language of their own, but the term "bird" scarcely needs to be defined, for its everyday meaning is also scientifically accurate. This fact may perhaps be attributed to the existence of certain very distinctive characteristics common to all birds, and to a large measure of uniformity in general appearance among the nearly twenty thousand different species which are known to science; there are, it is true, wide differences in size, in coloration, and in manner of life, but there are no gross divergences in form comparable to those found, for instance, among mammals—between the tiger and the goat, the kangaroo and the elephant, or the bat and the whale.

This distinctiveness and this uniformity may both be accounted for in one word—Flight. The whole body of the bird is adapted to this habit of flying. The bird's skeleton is a wonderful study from this point of view, but here it will suffice to mention the external features.

Flying
Birds.

Flight has brought with it feathers, and these are a unique feature: all birds have feathers, and nothing that is not a bird possesses any trace of them. Furthermore, the function of flight has secured a virtual monopoly over the fore-limbs, and it has thus brought two other striking adaptations in its train—a bird is of necessity a biped, walking on its two hind-limbs, and its mouth has had to take the place of a hand, thus leading to the evolution of a long flexible neck, and of a hard beak which is often wonderfully adapted to the feeding habits of the particular species.

§ 4

Birds are, of course, true heavier-than-air machines, and in former days man used

The Flight of Birds.

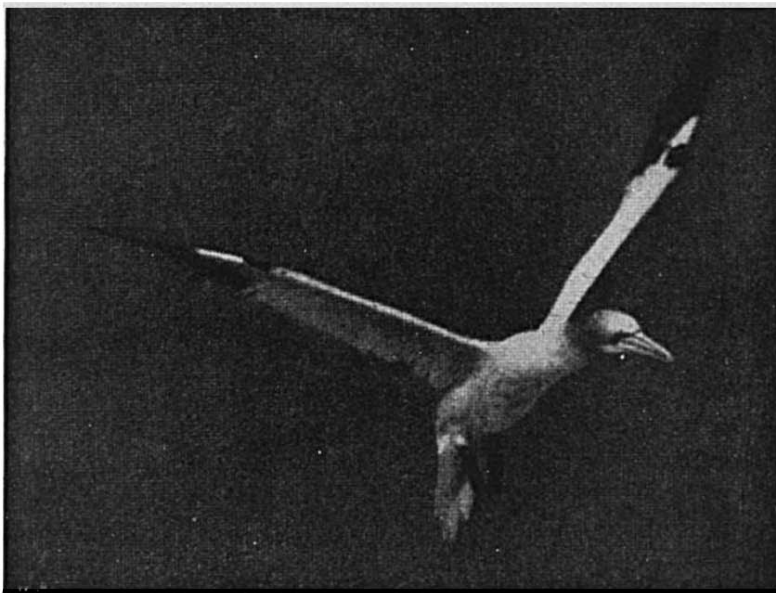
to strive to learn their secret for the purposes of the flying-machines which his heart desired; but within the last few years the main physical principles of the aeroplane have become so familiar that we may perhaps reverse the process by using them in the description of our present problem! Just as gliders preceded aeroplanes, so gliding flight may, as we have seen, have

been the beginning of the mastery of the air in the case of birds; and it is in gliding that the artificial machine and the bird are most alike. In both cases advantage is taken of the resistance of the air, and of the consequent upward tendency imparted to a body moving horizontally and having a flat inclined under-surface.

When we come to active flight a difference is at once obvious: the aeroplane propellers supply a motive force independently of the planes, while in the bird the wings are both propellers and planes at the same time. There is, indeed, a further difference in that the aeroplane's propellers, during level flight at least, exert force purely in a horizontal direction, the lifting force being wholly due, as in gliding, to

air resistance. In the bird the wing-strokes themselves supply part of the lifting power, as well as propelling the body forwards. Nor must we forget the bird's tail, which plays a part in steering and balancing as in the case of the aeroplane rudder; it is also often used as a brake, without which many a swiftly pouncing bird of prey would be apt to dash itself to destruction on the ground.

Some of the larger birds are adepts at soaring,



From "Our Common Sea-Birds" (Country Life, Ltd.).

THE GANNET—PUTTING ON THE BRAKE.

"The instant fish are descried swimming close to the surface, the Gannet comes wheeling round; down go the brakes 'hard all': its depressing planes are tilted; it sweeps downwards, half closing its wings; and then falls like a streak of white light, plumb to the water"—and there is one fish less in the sea.

and can remain in the air for a long time with motionless wings, and can even rise in slow spiral ascent to a great height. The late Mr. F. W. Headley, a keen and exact student of the flight of birds, came to the conclusion that this feat was inexplicable except on the supposition that advantage was taken of up-currents in the air, the bird's actual motion being merely a gliding one. He pointed out that gulls are adepts at this when flying above the edge of a cliff, but that they cannot do it at sea, where, as aviators and air travellers know, there are not the vertical disturbances caused by the varying ground-level temperature and by the changing elevation of dry land. Another feat, namely hovering, is familiar in the hunting methods of the Kestrel, which maintains a stationary position for an

appreciable time. Against a strong wind it would be easy to maintain a ground speed of *nil*, and it would be possible even with motionless wings. In still air, however, the ordinary gliding basis of flight is in abeyance, and altitude must be maintained by sheer vertical force of wing-stroke, the bird being thus more nearly equivalent to a helicopter than to an aeroplane.

The aviators of to-day compete to establish records for speed, for endurance, and for altitude.

Speed and Altitude.

How do birds stand in these respects? As regards speed, in the first place one must remember the difference between "ground speed" and "air speed." Both the aeroplane and the bird can, for a certain expenditure of power, attain a certain velocity in the body of air in which they are, but the velocity as measured from the ground may be a very different thing. Thus an aeroplane travelling at 100 miles per hour in a 20 miles per hour wind may seem from the ground to be going at 120 miles or at 80 miles per hour, accordingly as it flies with or against the air-stream; so also, of course, with the bird. All our speed records of birds, except a few made from aeroplanes, are necessarily in terms of ground speed, and in many cases the particulars necessary for a wind correction are unhappily wanting.

What are some of the actual figures? The



From "Our Common Sea-Birds" (Country Life, Ltd.).

Photo: J. C. Douglas.

HERRING-GULLS (*LARUS ARGENTATUS*).

The Herring-Gull gets its name from its habit of following shoals of herrings. The Gulls will follow shoals of small fish swimming near the surface. They usually swoop down upon them on a flat curving course, not submerging the body but merely immersing the head and bill.

recorded, but possibly only with a strong favourable wind); crows, 31-45; small song-birds, 20-37; starlings, 38-49; ducks, 44-59; he also quotes the case of a flock of swifts flying at 6,000 feet above Mosul, in Mesopotamia, which in their ordinary flight easily outpaced the observer's aeroplane when it was doing 68 miles per hour. The air speed of this astonishing flyer is, when accelerated, probably well over 100 miles an hour.

As regards altitude, it seems that although birds have occasionally been recorded as high as 15,000 feet, they are indeed rarely met with above 5,000 feet, while the greater part of flight, including migration, probably takes place within 3,000 feet of the ground.

§ 5

The power of flight has given birds the key to one kind of habitat after another that might otherwise have proved to be too dangerous or

available evidence has recently been summarised by Colonel Meinertzhagen, with special reference to speed during migration; he concludes that a bird has an ordinary pace, which is the one used in migratory flight, and an accelerated pace of which it is capable for a short distance under stress of danger or in other special circumstances. Here are some of his figures: carrier-pigeons, 30-36 miles per hour (over 60

too inhospitable. To the conditions of these different haunts, and, in particular, to different modes of procuring food, we see a great wealth of adaptations: there are hunters and fishers, catchers of insects and harvesters of seeds, eaters of crustaceans and eaters of worms, plant-eaters and honey-suckers, scavengers of carrion, and many a "picker up of unconsidered trifles."

Pride of place may be given to the hunters, and, as a type of them, to the Peregrine Falcon, described by the late Professor Alfred Newton as "the most powerful bird for its bulk that flies." It is a strong fierce bird with long pointed wings, spending no time on its comings and goings and dealing death in mid-air with relentless talons; in spite of game-preserving it still maintains its place as one of the most splendid of native British birds. Its prey consists mainly of other birds, and these it attacks in flight, "stooping" always from above, and killing, not by force of impact, but by the sheer grip of its claws. "Having arrived within a few feet of its prey," wrote Audubon of the almost identical Duck-Hawk of America, "the falcon is seen protruding his powerful legs and talons to their full stretch. His wings are for a moment almost closed; the next instant he grapples the prize, which, if too weighty to be carried off, he forces obliquely to the ground, sometimes a hundred yards from where it was seized, to kill it and devour it on the spot. Should this happen over a large extent of water, the falcon drops his prey and sets off in quest of another. On the contrary, should it not prove too heavy, the exulting bird carries it off to a sequestered and secure place." A peregrine can indeed carry a weight almost equal to its own, and a pair nesting on the Bass Rock, in the Firth of Forth, have been known to bring grouse and pheasants from the mainland across two or three miles of sea.

The Peregrine Falcon belongs to the aristocracy of the bird world. It has a haughty stare, a regal dignity, is absolutely fearless, has great reserve power, and, as Mr. Hudson says, possesses a courage commensurate with its strength and in hunting an infallible judgment. It is one of the most perfect of winged creatures, "so well-balanced in all its parts, so admirably adapted for speed, strength, and endurance." The lordly falcon is "the terror of the skies."

"Sooner or later the day always comes in early autumn to birdland when the peewits, feeding in silent battalions together, and the gulls, watching impatiently to rob the peewits of their worms, suddenly arise and wheel in wild disorder to the horizon; when the clustered partridge coveys crouch, like clods to the earth, and the flocks of small birds, feeding in the open fling themselves like a shower of stones into the nearest hedge; when the blackbird issuing from cover turns before he has flown a yard, and darts back again with a chatter of alarm; when,



Photo: Royal Scottish Museum.

GOLDEN EAGLE.

The largest of the British birds of prey. Soaring overhead, it is of majestic appearance. The young ones are taught how to hunt and how to kill as well as how to carry and skin their prey.

save for the distant cawing of rooks perched on lookout trees, a parish apart, sudden, perfect stillness holds the landscape. Then the peregrine falcon passes, smiting her way from horizon to horizon, and spreading terror as she goes. Who gave the first warning of her coming it is hard to tell. Possibly it was a rook. But the marvel is that the majority of the birds, being young ones of the year, can never have seen a falcon before; yet they fling themselves wildly to right and to left long before the speck

in the far skies reveals itself to human eyes as a bird of prey."¹

The Golden Eagle is the largest of our native birds of prey. The well-known lines of Tennyson spring to the mind :

He clasps the crag with crooked hands ;
Close to the sun in lonely lands,
Ring'd with the azure world, he stands.

The wrinkled sea beneath him crawls ;
He watches from his mountain walls,
And like a thunderbolt he falls.

The Golden Eagle looks well after its young, feeding them at dawn and dusk each day. "The Grouse that are brought to the eaglet are plucked



Photo : James's Press Agency.

RAVEN.

The brainiest of all our birds.

and headless ; the Hares and Rabbits are skinned and made ready in a larder distant from the nest ; the youngsters get only digestible food, being unable for some weeks to form pellets." The eaglets are taught how to hunt and how to kill, as well as how to carry and skin their prey. When they are about five months old they are driven away.

Very different from the habits of these birds of prey is the under-water hunting of the

The Fishing of the Cormorant. Cormorant, a bird of much less noble habits and aspect, which is notable for clumsiness in the air, and for uncouth appearance on land, as well as for the foul stench of its untidy nest !

¹ E. K. Robinson, *The Country Day* by Day.

Under the water, however, it is a thing of beauty, so perfectly adapted is it to the swift and dexterous pursuit of its active prey. In a tank with glass sides we may see this to great advantage, and note how the wings are kept close to the body—not used for swimming as in the case of penguins and auks—and how the air-bubbles cling to the feathers like bright jewels or polished silver. We can see, too, how the strong hooked beak is used to seize the fish, which is then borne to the surface to be tossed in the air, recaught, and swallowed, for the Cormorant does not swallow under water like a penguin. The Chinese train cormorants to catch fish for the market, a collar round the neck preventing the birds from swallowing their prizes ; the same thing was done in Britain at one time, although only for sport.

It is interesting to compare the different methods of fishing adopted by two of the Cormorant's relatives, the Gannet and the Pelican, and the different forms of beak which go with each. The Gannet, or so-called Solan "Goose," nests in great colonies on several of the rocky islets around the British coasts, and it may also be seen at most times off many parts which are far from these breeding stations. It is a bird of fine white plumage and noble flight, which, soaring at a height and then suddenly dropping like a plummet, uses its long straight beak to transfix fish swimming near the surface.

The Pelican, again, is a fisher of the shallows, which wades through the water with its enormous gape at full extent, and the great pouch below its beak ready to receive what comes. A party may work in concert, sweeping the pool in a long line like a living seine net. "The Cormorant pursues, twists, turns, and seizes ; the Gannet soars, plunges, and spears ; the Pelican sweeps and engulfs."

§ 6

We may refer here to the Raven. Like some of the larger birds of prey, the Raven takes a **The Wisdom of the Raven.** wife for life, and they use the same nest year after year. As an inland bird the Raven is now not so frequently met with, for it has been driven by persecution from many of its former mountain haunts. Luckily it is one of the hardest of

birds and can adapt itself to great extremes of temperature.

The Paven, the biggest of our Crows, is the brainiest of all our birds. "His family are the great legal fraternity among birds; nimbleness of wit mingled with audacity characterise them all, so that the very first time that I observed the hoodie crow at home I was struck with his laughable resemblance to a barrister in wig and gown. There was the same keen eye for the shortcomings of others, and the general look of mental superiority to ordinary folk."¹

The Raven has the reputation of being one of the longest-lived birds; it enjoys a reputation also for mimicry. If you climb to its roosting-place on some mountain precipice you may hear "in the silence of the hills how the ravens croon themselves to sleep, uttering reminiscences of the sounds they have been listening to throughout the day." Mr. F. B. Kirkman, in *The British Bird Book*, writes: "From the growing congregation on the ridge there descended through the thickening dusk the strangest of evensongs—a weird, wild medley of many sounds: the barking of dogs, the bleating of goats, the lowing of cows, the becking of grouse calling across the moorland, and now and then the deep belling challenge of the stag." Their intelligence is almost uncanny, and when we think that they are of savage character and have a deep, harsh, human-like voice, we can imagine some explanation of the evil reputation of the bird, and the sombre superstitions associated with it.

§ 7

It has to be confessed that we have a great deal to learn about the inner life of birds. It is difficult to get mentally in touch with them; they have evolved on a different plane from our own. Our sense of kinship with animals is still something novel, but it is ever widening and deepening as we view it more closely and with clearer vision: may we not claim this as one of the steps in the progress of Evolution?

With birds, as with mammals, there are many phases of social life. Some species of birds are

more social in their relationship than others; in some there is a more advanced state of community than in others. With individuals there may exist mutual friendship; companionship between two birds of the same species, or even between birds of different species, is often seen.

The helping instinct is characteristic in birds as in other animals; it is often touchingly human-like. We see it most often in parental care and in the feeding of each other by the sexes, but it is shown frequently in other ways. Mr. W. H. Hudson, speaking of the Military Starling of the pampas—a bird of social disposition—tells this story: "One day I was sitting on my horse watching a flock feeding and travelling in their leisurely manner, when I noticed a little distance behind the others a bird sitting motionless on the ground and two others keeping close to it, one on each side. These two had finished examining the ground and prodding at the roots of the grass at the spot, and were now anxious to go forward and rejoin the company, but were held back by the other one. On my going to them they all flew up and on, and I then saw that the one that had hung back had a broken leg. Perhaps it had not been long broken, and he had not yet accommodated himself to the changed conditions in which he had to get about on the ground and find his food. I followed and found that, again and again, after the entire scarlet-breasted army had moved on, the lame bird remained behind, his two impatient but faithful companions still keeping with him. They would not fly until he flew, and when on the wing still kept their places at his side, and on overtaking the flock all three would drop down together." As Mr. Hudson says, it is possible to mistake for friendship an action which, at all events in its origin, is of a different nature.

Instances of such altruistic behaviour, to be attributed to the *helping* instinct in animals of social habits, are common. Mr. Frank Finn relates that the upper bill of a Huia, an insectivorous bird of New Zealand, by some accident or natural deformity had grown into the shape of a corkscrew, and it was not apparent how it could get enough food to support life naturally. It seems it had been fed for some time by a devoted mate.

¹ Francis Heatherly, *The Falcon at the Eyrre*.

The development of a social habit at the breeding season is a well-marked characteristic of many kinds of birds, and it is by no means confined to those which are gregarious at other times; conversely, it is also true that some birds which at other seasons band together are among the least social at this special time. More than one factor is probably involved: the scarcity of suitable sites—for (marsh-fowl, for example—may be a

The Social Habit.



Photo: F. W. Bond.

SECRETARY BIRD.

The name is derived from the tuft of feathers looking like a quill stuck behind the ear. The bird lives in Africa and preys on small animals—notably snakes—which it kills with a swift stamp of one of its powerful legs.

reason for concentration in special spots, and strength of defence against enemies may often be an advantage gained. In other cases the problem of food-supply will tend to produce distribution rather than concentration, and this is especially the case with many of the smaller species of our common birds: among warblers, for example, there is a marked tendency for a pair to select a small territory within which they will remain and from which they will endeavour to exclude all other members of their

own species and even, in due course, their own young.

Many birds, like human beings, would seem to enjoy the company of their kind. The gregarious habit is common, for example, among rooks, starlings, pigeons, swallows; parrots roam in bands, apparently for the pleasure of one another's company.

We may have crowds and associations, however, without sociability; a community of separate individuals may exist without there being any corporate life or power of acting as a unity. Still, we do see many instances of a capacity for unified action and distinct features of a social life. "There appears to be an intellectual advantage in sociability, if we may argue from the fact that many social animals show a high development of wits. The three cleverest kinds of birds are rooks, cranes, and parrots, and they are notably social. There is, of course, the danger of putting the cart before the horse, for it may be that the sociability is in part the expression of good brains. It may also be argued that the non-gregarious crow is just as clever as the social rook, and many analogous instances might be given."¹

The Rook is the best example of our gregarious birds. There is no doubt that the members of the Crow family have fine brains, and great power of vocalisation which may develop to a remarkable extent. Experts tell us that the Rook has command of between thirty and forty notes. To learn to what extent they employ them one has only to listen to "the black republic in the elms,"¹ after the breeding season is over.

Professor J. Arthur Thomson, in *Secrets of Animal Life*, says: "Like many creatures well endowed with brains, rooks exhibit what must be called play. There are gambols and sham fights, frolics and wild chases, in which, curiously enough, jackdaws and lapwings sometimes become keenly interested. But who knows the real truth about rooks posting sentinels, which is so often alleged? Who knows the significance of the vast congregations that are sometimes seen, and who can tell us if there is any truth at all in the alleged 'trials' of individuals who have defied the conventions

¹ Professor J. Arthur Thomson, *The Wonder of Life*.

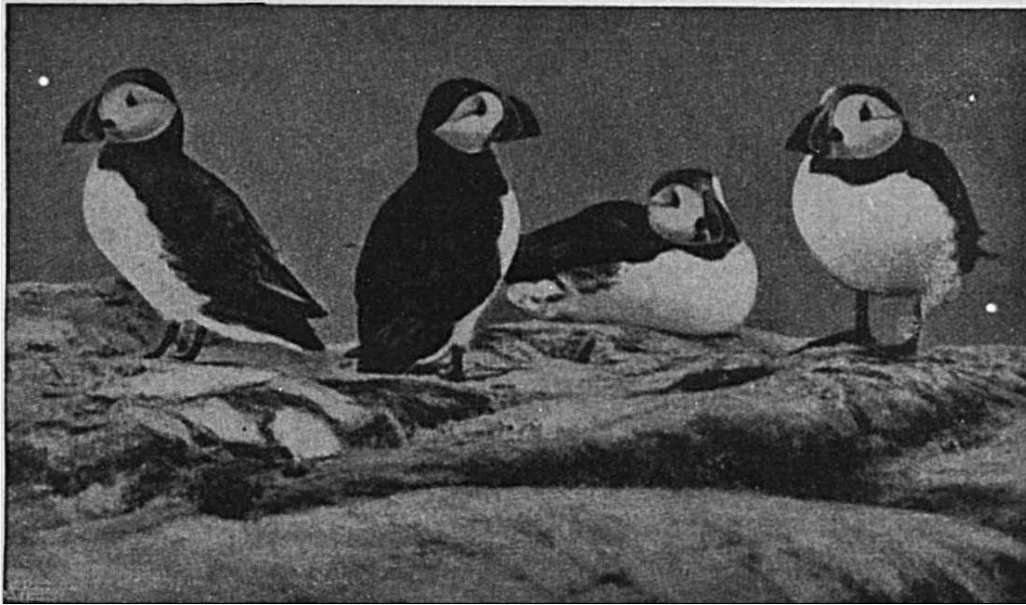


Photo: "Our Common Sea Birds" (Country Life, Ltd.).

PUFFINS.

The Puffin's beak is of singular appearance. After the breeding season its surface peels off in horny plates—shed like the deciduous bark of certain trees—a process parallel to the moulting of the plumage.

of the community? . . . But the central interest is in the rooks reaching forward to a communal life with certain conventions, and to the crowded nest in which we see the beginning of a continuous social heritage of objectively enregistered traditions." There may be far over a thousand nests in a rookery, and the same site may be used for more than a century.

Rooks certainly have a considerable vocabulary. There is not, indeed, any *language* in the strict sense—man has a monopoly of that; but the rooks have *words* just as dogs have, definite uttered sounds which have definite meanings. We hear the rooks use certain words when we move suddenly beneath the trees, and other words are uttered when a bird intrudes on its neighbour; there is a word when the rook sinks down upon the nest, and another word when it flies clear of the rookery and makes for the fields. What danger-signals, what scoldings, what chucklings, what exultation, what reproaches, what encouragement do we not hear?

Mr. W. P. Pycraft, in his *History of Birds*, says: "Among gregarious species some display a much more intimate association than others—are more social in their relationships. And

this is shown very clearly in the devices which some species have adopted for their mutual protection during sleep. The com-

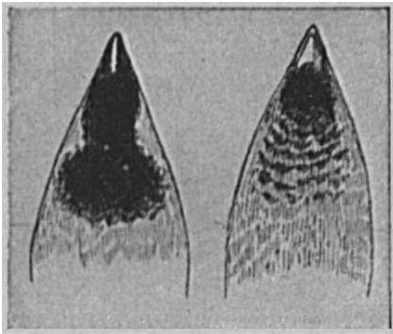
Mutual Protection. mon partridge, as is well known, lives in small companies, or 'coveys,'

which scatter only while feeding, and then not far enough to be beyond call. Later in the day, as soon 'as the beetles begin to buzz,' says Professor Newton, the whole move away together to some spot where they jug, as it is called—that is, squat and nestle close together for the night; and from the appearance of the mutings, or droppings, which are generally deposited in a circle of only a few inches in diameter, it would appear that the birds arrange themselves also in a circle, of which their tails form the centre, all the heads being outward—a disposition which instinct has suggested as the best for observing the approach of any of their numerous enemies, whatever may be the direction, and thus increase their security by enabling them to avoid a surprise. Ducks similarly take special precautions to secure safety during sleep, when this must be taken in exposed situations, as when, for example, they desire to doze between the intervals of feeding during the night, which they pass afloat. At such times they keep close together, and to avoid,

drifting ashore keep one leg slowly paddling, and thus drive themselves round in circles."

There is sometimes co-operation in hunting, as we have already noted in the case of pelicans, which combine in a crescent and, wading shorewards, drive the fish before them; when they have got them cornered they fill their huge throat pouches. It is said that a pair of golden eagles will occasionally hunt in concert, one beating the bushes while the other flies overhead, waiting to pounce.

With birds, as with other animals, we see, as we do in human beings, that some individuals are gifted above others of their kind. A few may have a keener sense, greater strength or power



The throat of the House-Sparrow has a very different appearance in summer (left-hand figure) than in winter (right-hand figure). This is due to abrasion; the light tips of the feathers are shed in spring, thus revealing the dark portions.

of leadership, a more helpful spirit than their fellows. This counts for much in a social state. "The action of the gander and of the trumpeter in driving their fellows home in the evening must be regarded as similar in its origin to that of the male swift, when he hunts his mate back to the nest, and of the sand-martin I observed chasing the females of the colony to their burrows. In a lesser way it may be seen in any flock of birds; they move about in such an orderly manner, springing, as it appears to us, simultaneously into the air, going in a certain direction, settling here or there to feed, presently going to another distant feeding-ground or alighting to rest or sing on trees and bushes, as to produce the idea of a single mind. But the flock is not a machine; the minds are many; one bird gives the signal—the one who is a little better in his keener senses and quicker intelligence than his companions; his slightest sound, his least movement, is heard and seen and understood and is instantly and simultaneously acted upon."

Many curious associations are formed by birds during the breeding season. The Puffin is quite capable of making a hole for itself in the face of some precipitous slope, but frequently it prefers to appropriate a rabbit's burrow, ejecting the rightful owner without ceremony. Other burrowing birds are often more accommodating, for the Burrowing Owls of America live amicably with the Prairie Dogs whose retreats they so often share, and in New Zealand the same holes are shared by Petrels and Tuatera Lizards without apparent friction. In cases of this kind, however, it is always possible that the partnership has other advantages—such as common defence or watchfulness—than the mere saving of labour on the one hand or on the other: there is the curious case, for instance, of the Ruddy Kingfisher of Borneo, which makes its nest in the hive of a peculiarly vicious kind of bee!

§ 8

The late Professor Newton has an interesting passage in which he shows that we can tell which birds were most familiar to our forefathers by their having a pet name added. Thus the Daw is the Jack Daw, the Redbreast is Robin, the Wren is Jenny, the Pie is Magpie, the "Mag" being short for Margaret. In early prints of ploughing, the closeness of the connection between men and birds is naively pictured. In one of the earliest illustrations of sowing, for instance, the birds crowd so closely on the heel of the sower that they have to be driven off with stones or even whips, and they are seen springing beyond the leap of the small dog that has been sent to chase them. In modern times the charm possessed by birds is partly that of friendship, but more that of delight in their songs and feathers. The following birds form only a few examples chosen for some special interest.

It has often been disputed whether the Nightingale's song is really the sweetest. It certainly owes something to the stage on which it is set, for when the bird arrives the field and garden are gay with spring flowers. The Cuckoo arrives just about the same time. It sings all day, but the Nightingale mostly in the evening, and the sweetness of his note is enhanced by the light of

Our Common Birds.

The Nightingale.



Photo: J. H. Symonds.
NIGHTINGALE.
 The mate of our most famous songster.

stars and the scent of blossom. Whether it is a melancholy or a merry song has long been disputed. It certainly is not loud, because when the Nightingale sings by day it is not noticed amid the clamour of other bird music. Mr. W. H. Hudson says: "Its phrasing is more perfect than that of any other British melodist, and the voice has a combined strength, purity and brilliance, probably without a parallel."

The Blackbird's voice is remarkable for its great strength and for the wonderfully rich quality of its tone. He is a clever mimic, like several other songsters, and has been heard to imitate the

Nightingale's song with some measure of success. There are several recorded instances, too, of his crowing exactly like a domestic cock—"apparently enjoying the sound of the responses made by the fowls of the neighbouring farmyard"—and of his cackling like an egg-proud hen! Some prefer the song of the Blackbird to that of the Thrush. It certainly is the sweeter of the two, but it is not so long continued. It may vary with the district, and some hold that the Surrey Blackbird is the sweetest songster of his kind. The period of song is identical with the visit of the most delicately beautiful of all butterflies—the Orange-Tipped. Even the little Song-Thrush, a close relative of the Blackbird, is a louder and more persistent singer than the latter, although in that respect he does not compete with the larger Missel-Thrush, which can often be heard pouring out his bold loud notes from the topmost twig of a bare tree in the month of January. The song is in keeping with his character. Mr. W. H. Hudson thinks that "The Thrush is by far the finest songster. His chief merit is his infinite variety. His louder notes may be heard half a mile away on a still summer morning, his



Photo: Oliver G. Pike (in "Country Life").
WHINCHATS.

From its perch on the top of the hedges or on low trees, or whilst hovering in the air, may be heard the Whinchat's curious short whistle, *tick-tick-tick*, the latter two notes being exactly like the sound made by hitting two small pebbles together.

lowest sounds are scarcely audible at a distance of twenty yards. His purest sounds, which are very pure and bright, when contrasted with various squealing and squeaking noises, seem not to come from the same bird. . . . As a rule, when he has produced a beautiful note he will repeat it twice or thrice." While the Blackbird is cunning and secret in his ways, creeping round the roots of the yews and other shrubs, the Thrush boldly flams across the fields.

The songster most closely associated with the farmlands is undoubtedly the Lark. He is the earliest rising of all the birds, and when in full voice, as he is just about the time when the young wheat is tall enough



Photo: Oswald T. Wilkinson.

JACKDAWS.

One of the most entertaining and amusing of all British birds. Its passion for mischief is unexampled in the feathered world.

to cover him, he may be heard pouring out his song before sunrise. He is not one to confine his charms to his courting days, but has been heard in every month of the year except September, his moulting time. It is in Spring and early Summer, however, that he pours forth his best music. The song has words for it in the folklore of many counties, and the following rhyme succeeds in conveying an idea of it :

Tu whit, tu whit, tu whee,
No shoemaker can make boots for me,
Why so? why so? why so?
Because my heel's as long as my toe, my toe,

No voice is more closely associated with the beautiful wooded landscapes of England than

the love-song of the Wood-Pigeon. According to an ancient legend, the words it tries to say are "Tak two coos, Paddy," the

legend being that in the Golden Age the Wood-Pigeon laid its eggs on the grass, but they were trampled upon by two cows. An Irishman led one away, and the Wood-Pigeon prays in vain for him to take the other, to which the Partridge is supposed to reply "De'il tak it"—a wonderfully close imitation of its apology for a song. The Little Dove, the Turtle Dove, or the Croodling Dove has a sweet short song that fits in well with the whisper of the summer leaves. It is an old country saying that when you first hear the croodling of the Little Dove, then is the time to sow your swedes.

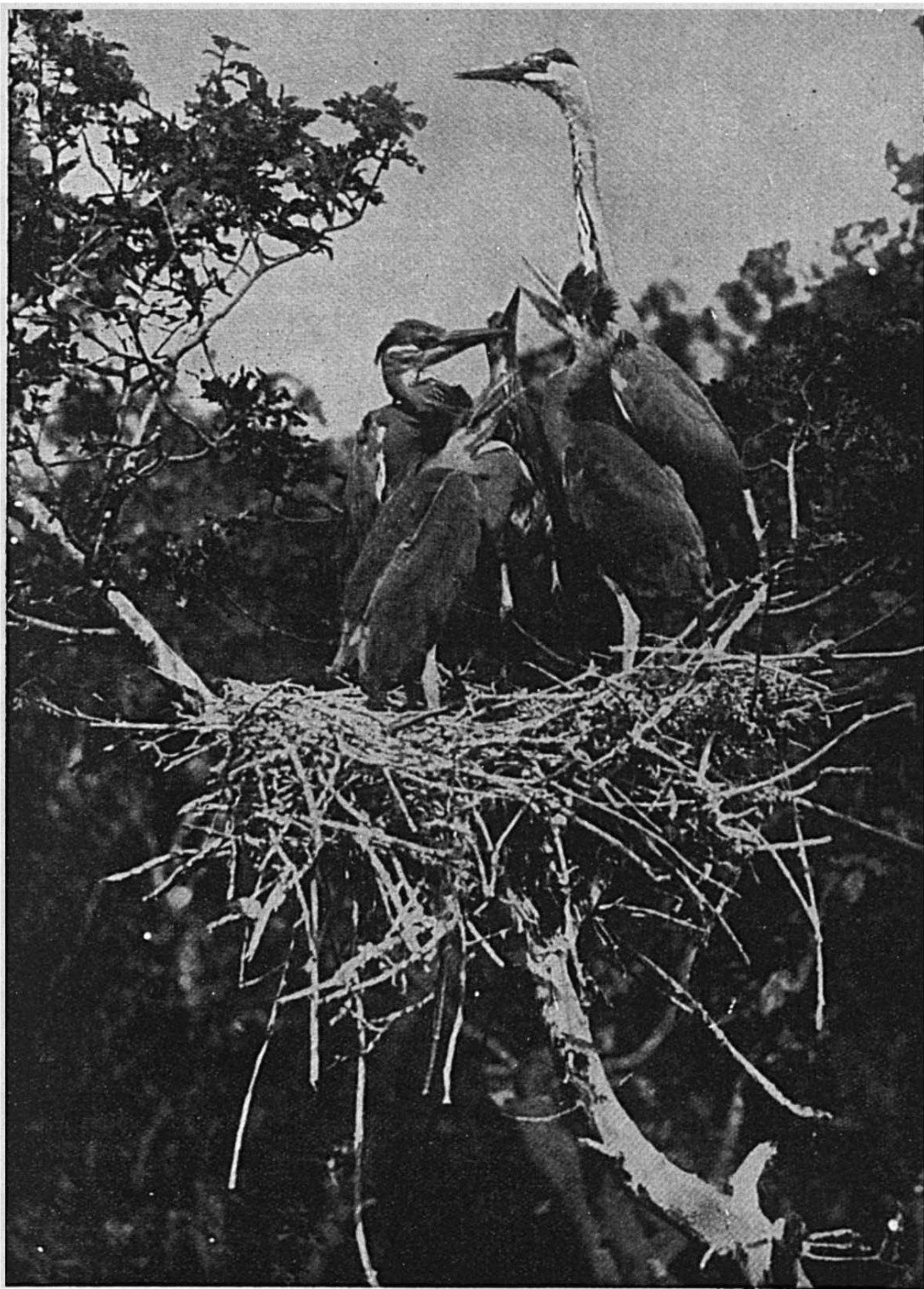
One has often wondered if there is a manner of accounting for the differ-

ent marital qualities that characterise

birds. Take the cock Partridge, and you find a model father—one that will stand up to anything in defence of his young—while the cock Pheasant is a very gay Lothario. The most faithful of our birds is the Bullfinch. The male and female do not only stick together during the breeding season, as is the case with most birds, but

along the lanes in winter you may see the male and female picking up morsels of food on the black hedgerows. They do not keep close together, but never go out of hearing of one another, and it is very easy to imagine words for the conversation which they keep up. The Goldfinch is perhaps the most beautiful of all the feathered folk in the English landscape. In Autumn it is a very pretty sight to see a little cluster of them feeding on thistle-down, and performing the most delicate acrobatic feats in balancing themselves so as to pick it from the plant.

Variety of character in birds is nowhere more marked than among the more familiar inhabitants of the woodland. Take the Jay—clean-



From "Wild Life in the Tree Tops."

HERON (WITH YOUNG).

The Heron, rising in the air and fleeing from its enemies, the Falcons, "will, in its efforts to lighten itself, and so keep above its pursuers, disgorge any food which may still be undigested. So that in watching such a fight one might expect to see a small shower of—for instance—fish and shrimps fall from the clouds."

made, bright-coloured, with a voice that is raucous but seems always in tune with the noise which the wind makes blowing through the tall trees. He is a gentleman in appearance, but his flight is as awkward as the gait of a yokel. Moreover, Nature has endowed him with a

thieving and lawless character. He steals the eggs from the nest, and makes a meal of any fledglings that he can lay hold of. Yet he is very cunning about concealing himself during the breeding season, when he has to think of the safety of the family as well as his own. For the time being, the loud cry is stilled, and the bird, on being disturbed, shifts slyly and quietly from one tree to another. He has a natural genius for concealing his nest, and in that way differs very much from his relative, the Magpie, whose idea of architecture is simply to pile woody twigs upon woody twigs, so as to make a conspicuous and monstrous habitation. The Magpie used to be a favourite domestic pet, but its numbers have now been greatly reduced, so that to see several of them together, which used to be considered very unlucky, is almost impossible in some districts. They very often go in threes, for some reason which we cannot explain. The Magpie can be taught to articulate a few words; he is inquisitive and loquacious. "The usual sound emitted by the magpie is an excited chatter—a note with a hard percussive sound rapidly repeated half-a-dozen times. It may be compared with the sound of a wooden rattle or to the bleating of a goat, but there is always a certain resemblance to



Photo: James's Press Agency.
MAGPIE.

the human voice in it, especially when the birds are unalarmed, and converse with each other in subdued tones." The Heron is a bird of the woodland, in so far as it is there he makes his heronry. It will frequently be found closely adjacent to a rookery, but the two colonies do not always live at peace, although in a case the writer knows of, quite near London, they have done so for many decades. The Rooks are numerous and aggressive, and though an individual Rook could not hold its own with a Heron, numbers usually prevail when a battle royal takes place. In habit the Heron is a bird of the brook and river, and there can be little doubt about his favourite diet being of fish. He loves to stand in a clear, shallow stream, apparently motionless, but should an eel creep out, or a bolder trout try to make a passage upstream, the Heron's keen eye sees it at once and down comes his beak like a sharp spear, the chances being that the next experience of the fish is that of being borne through the air, to be eventually swallowed and either wholly or partly digested. In the latter case, the process is stopped in order that the young may receive

the food in a softened condition.

The Green Woodpecker is a common British species, whose bright plumage is less conspicuous among the trees than might be thought, but whose presence is often betrayed by the loud cry—like a burst of demoniac laughter—or by the strong "tap, tap, tap" of its beak as it sounds the tree-trunks for rotten portions where insects may be found. The woodpecker's strong beak, adapted to its mode of feeding, is



MEADOW PIPIT CLEANING ITS NEST.

It picks up the excrement of the young, which is enclosed within a gelatinous capsule, and carries it off to a distance.

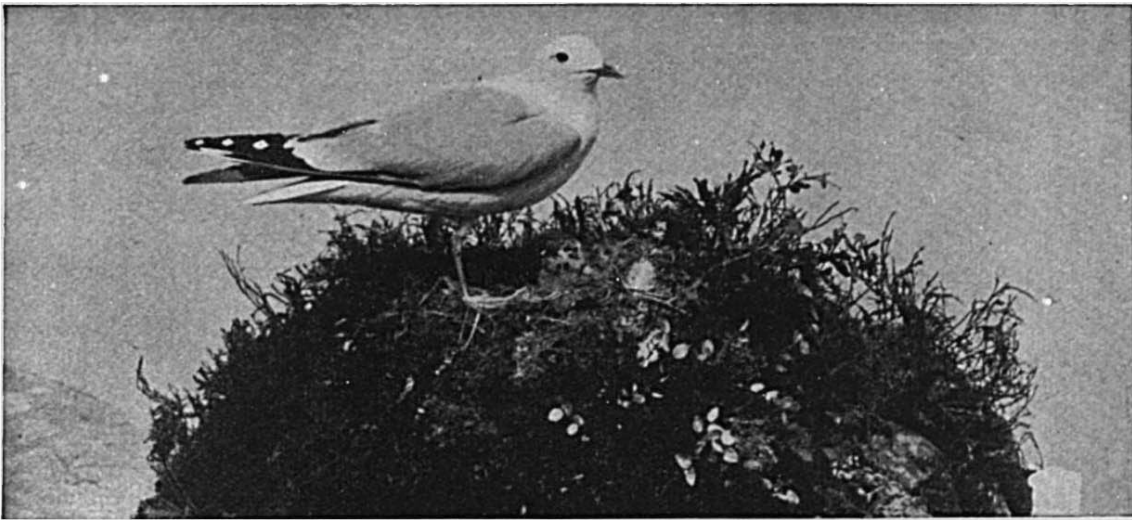


Photo: Royal Scottish Museum.

COMMON GULL (*LARUS CANUS*) WITH NEST, EGG, AND YOUNG.

Colonies of them are often found on lochs at a distance from the sea. The birds roam over moors and marshland, and they are often to be seen closely following the plough, picking up worms and grubs. Like the Herring-Gull, it has been observed dancing on the sand or mud of shallow pools to force up marine worms from below.

well suited also for the work of excavating a nesting hole, and a deep cavity with a small horizontal opening at the top is hollowed out.

The Waterhen looks black at a distance, but on closer observation discloses many charming shades of colour. It is a bird that seems to thrive and increase in numbers more than its companion, the Coot. Yet it nests often in a

perilous position. You may seek for the nest either among the rushes and flags at the border of a stream or

on the long willow branches that stretch out close to the surface of the water, if they are not touching it. Country folk believe that in every normal year there is a May flood, and when that comes the water very frequently lifts the nest of the Waterhen out of its mooring and carries it down-stream. The faithful bird will go a long distance in its curious little ship, but is compelled to vacate it at last, as such floods carry down the branches of trees, trunks that have been lying on the bank, and a great deal of miscellaneous debris capable of wrecking the poor craft. Not that the Waterhen is likely to suffer personal injury, as she will dive into the strongest running stream and escape scatheless.

The Little Grebe is to be met with on inland waters all the year round. In winter it resorts to rivers and larger bodies of water, when the small ponds beside

which it often nests are apt to be frozen over. Its supreme accomplishment is that of diving and hiding itself among the stems of water-plants or other cover. It must, of course, come up, but it is amusing to notice the length of time it will remain under the water, and the distance it will often travel before it makes a second appearance. The Great Crested Grebe is one of the stateliest and most beautiful of our inland water birds.

One of the most beautiful sights to be seen in this country is that of a colony of Black-headed Gulls nesting beside a lake or in swampy places far away from the sea-coast and estuaries where they may be found in winter searching for

small fishes or other food cast up by the tide. In days of old their eggs were prized as food, and even the young were taken, but the modern palate does not set so much value on them. The movements inland are made with great regularity, the birds appearing at one gull-pond, of which we know, about March 27, scarcely ever a day before or a day later. They raise their young while the Corncrake is singing its mournful and monotonous ditty in the new grass and the growing wheat. A hill country attracts them because of the little streamlets which provide plenty of food. They know as well as the angler does that the trout lie

The Waterhen and the Coot.

Visitors from the Sea.

with their heads up-stream, waiting for any little titbit in the shape of a worm or fly which the water brings down. When the Gulls are fishing, one can watch them beating their way up past a succession of gravelly shells into which they occasionally dip for a prey. When they come to the end of the beat, they fly back round the shoulder of the hill out of sight of the stream and resume operations where they started before.

There is no prettier adjunct to a moorland, or a bare field, than a flock of Lapwings. They fly together and alight together in Autumn and Winter when not breeding, but in nesting-time they go in pairs, though usually there are dozens

Birds of the Moorland.

a man come, they will indeed carry out the threat. No sooner are the young out of their shells than they begin to run, and if chased, will select a hiding-place. It may be close by stones as grey as themselves, or in the short herbage which early Spring brings with it. A trained eye is needed to distinguish them from their surroundings, even at a short distance.

The Curlew haunts the sea-shore during the greater part of the year, but in Spring retires to some slack or valley in hilly country, and makes a nest on the ground. The situation is generally very lonely, and the watchful birds quickly show themselves alive to the presence of a stranger. Usually, their note is a monotonous and melancholy sound, heard, as it often is, at



LAPWING OR PEEWIT, SETTLING DOWN ON ITS EGGS.

If an intruder comes near, the young will take warning from their excited parents wheeling overhead calling "pee-a-weet, pee-a-weet" and squat flat on the ground in absolute stillness. No noise will make them move a muscle so long as their parents call overhead.

and sometimes hundreds in the same field. The bird is a simple creature in so far that its nest is little more than a slight hollow on the bare earth. In Spring they can be seen sitting on their eggs without making the slightest attempt at concealment, so that the individual who goes out to collect their eggs need only march up to a sitting bird, but if it rises he must keep his eye on the place from which it springs. There never can be much doubt as to whether or not the nest is close, because, if it is, the birds shriek and swoop at the intruder, as if they were going for his head or eyes. Should an animal other than

night-time in the stillness of the moorland, but we know of no other bird that makes the clamour the Curlew does when its domestic privacy is invaded. It flies up and down the valley, shrieking to awaken the echoes, and looking as if it would like to do something dreadful to the human who had ventured into its domain.

The Snipe is the most difficult of indigenous game-birds to shoot, on account of its trick of half-stopping and suddenly darting. During the breeding season he performs curious antics in the air, rising to a great height, and "precipitating himself downwards with astonishing violence,

producing in his descent the peculiar sound variously described as drumming, bleating, scythe-whetting, and neighing." The peculiar drumming sound was long the subject of controversy, but recent observations have made it clear that it is due to the vibration of the two outer tail-feathers, which have a peculiar structure.

§ 9

The Cuckoo, as is well known, not only builds no nest of its own, but foists its eggs on other species, and has its young reared without trouble to itself but to the great detriment of the rightful children of the foster-parents. The story, indeed, is one of the most curious in the whole realm of natural history, and the facts are now becoming better known; among other new evidence, the recent intensive observations and wonderful cinematograph records of Mr. Edgar Chance have placed several points beyond doubt.

It seems to be the case that each female cuckoo has its chosen territory of operations and that deliberate choice of nests is made in advance of the date of laying. When the time for laying comes, the selected nest is approached, the cuckoo takes an egg from the nest in its beak, settles on the nest, lays its own egg, and then flies away with the stolen egg, which it either eats or drops at a distance. The whole manœuvre takes but a few seconds and may be carried out despite the frantic efforts of the small and unwilling hosts to drive off the intruder. Sometimes the procedure varies, for no cuckoo could lay in a wren's domed nest, for instance, and in cases of that kind the egg must be laid outside and inserted with the beak. The point of principle, however, is that the cuckoo certainly does not fly about carrying an already laid egg and looking for a suitable nest to victimise.

One cuckoo does not normally lay two eggs in the same nest, but different cuckoos may chance to select the same victim if there has been encroachment of territory. Once the act has been accomplished the foster-parents do the rest until the eggs hatch out; then begins the second part of the Cuckoo's villainy, for the young foundling has in

his earliest and comparatively helpless days the inborn habit of removing the other chicks from the nest by getting his back under them and heaving them overboard. So it happens that the foster-parents are soon left with but one charge, whose voracity keeps them perpetually busy and whose body speedily fills up the nest. Still the poor dupes go on feeding the parasite, even when he is much bigger than they are; one of Mr. Chance's photographs shows a bloated young cuckoo sitting on a post, while the much smaller pipit dutifully feeding him must needs stand on his shoulder, so to speak, for the purpose! The whole story is one of effective adaptation on the part of the Cuckoo and of the weakness of blind instinct on the part of the foster-parent.

The most interesting theoretical point about the Cuckoo has to do with the colour of the eggs, which is very variable, but tends to be like that of the eggs of the chosen foster-mother. That one hen cuckoo always lays the same type of egg seems to be thoroughly established, but it is still a matter of speculation whether the character is hereditary and, if so, in what manner.

The Cuckoo victimises a large number of different species as foster-parents for its young, but all the usual ones are small insectivorous birds. The degree to which the Cuckoo's egg resembles the others varies greatly; sometimes there is almost a perfect match, at least in colour, but in other cases the similarity is slight or even non-existent.

§ 10

MIGRATION

The scientific investigation of migration is greatly complicated by the difficulties of making observations. It is not now believed that the greater part of migration takes place at immense altitudes, and at an accelerated rate of flight which makes enormous journeys possible for birds in a single night. Nevertheless it remains true that a great deal of migration is nocturnal, and that, for other reasons also, it is difficult to observe. At certain times and places, however, much migratory flight can be actually observed. We have, for example, this recent description of the passage of swallows on Heligoland: "All

through the forenoon, as we sat in the autumn sunshine near the narrow northern apex of the island, the swallows came in over the sea from the north-east in the teeth of a southerly gale. No large flocks were seen; but, on the other hand, scarcely a minute elapsed without the arrival of a fresh party of from half-a-dozen to a score of birds. They seemed to fly low over the sea, but rose as they approached to the level of the cliff-tops. We could not make them out at any distance, for the observer can find no worse background for small birds than grey, moving water. The stream was continuous and the direction unvarying, so far as we could judge. Each party rose to our level on the top of the north point, flew unhesitatingly along the western side of the island, and disappeared again at the south-western corner. Not one in a hundred quitted this line or stopped to circle round; none seemed inclined to break their journey so early in the day, in spite of the contrary elements. The whole was for us just a momentary peep at one of the countless tiny channels by which the bird-life of northern Europe was then ebbing southward."

A more comprehensive idea of migration is obtainable from Gätke's observations extending over the whole length of a season;

Migration of Starlings.

let us summarise the diurnal movements of starlings, as observed by him on Heligoland during the autumn of 1878. Early in June came a few old birds in worn plumage, birds which had probably remained unmated or had early lost their broods. On the 20th June came the first great flights of young birds of the year, migrating by themselves in advance of their parents, although only a few weeks out of the egg. These youngsters continued to pass till the end of the month to the extent of thousands daily. In early July the daily passage was estimated in tens of thousands, and on the 25th the movement closed with the passage of "immense multitudes." Two months followed during which no starlings, young or old, were to be seen. On the 22nd September old birds, now in fresh plumage, passed in flights of many hundreds. During October the flights increased to thousands, and on the 14th the movement reached a climax with "starlings in hundreds of thousands." By the end of the month the great flights had ceased, but

through November, and even up to the 18th December, the birds continued to pass in "daily flights of from forty to sixty individuals."

Nocturnal migration is also often observed at lighthouses and lightships, and especially when the weather is foggy thousands of birds, dazzled by the lantern rays, dash themselves against the glass.

Lighthouse Scenes.

As Gätke says: "The whole sky is now filled with a babel of hundreds and thousands of voices, and as we approach the lighthouse, there presents itself to the eye a scene which more than confirms the experience of the ear. Under the intense glare of the light, swarms of larks, starlings, and thrushes career around in ever-varying density, like showers of brilliant sparks or huge snowflakes driven onwards by the gale, and continuously replaced as they disappear by freshly arrived multitudes. Mingled with these birds are large numbers of golden plovers, lapwings, curlews, and sandpipers. Now and again, too, a woodcock is seen; or an owl, with slow-beating wings, emerges from the darkness into the circle of light, but again speedily vanishes, accompanied by the plaintive cry of an unhappy thrush that has become its prey."

The modern method of marking with numbered aluminium foot-rings has already added greatly to our knowledge of the actual journeys performed by individual birds. By this means, for instance, white storks marked in the nest in East Prussia have been traced south-eastwards across Europe to Syria, Palestine, and Egypt, and thence up the Nile to Lake Victoria Nyanza—and also away eastwards near Lake Chad, in the very heart of Africa—and so southwards through Rhodesia to Natal, the Transvaal and Cape Colony. Five separate swallows, marked with aluminium rings in this country, have been found in South Africa in winter.

Many birds, such as lapwings, or peewits, marked in Scotland as chicks in summer have been recovered in winter from Ireland. Other Scottish lapwings have wandered further and have been recorded from the west coast of France or from Portugal. In a few cases, too, lapwings were reported during the winter months from their native districts. It is therefore evident that even within a single species, in a single

Migrations of Lapwings.

area, there may be resident and migratory individuals, and, among the migrants, some which go much further afield than others.

There is no doubt that many birds on their return make for their birthplace. A swallow marked when it was a young one has been found thus to return to its native farmyard. Birds would appear to return in spring impelled by a greater urgency than in the autumn migration, when we see sometimes a good deal of dallying. Some birds are known to make trial trips and begin their journey with short stages. On the return, some authorities believe there is evidence that the spring journey is more direct, that short cuts are found, and that haste is evident. When weather conditions are

very bad there is often great loss of life. "The streets of towns are sometimes strewn with thousands of birds that have gone astray and have perished in the cold. As many as five hundred nightingales have been gathered in a single day from one small town."

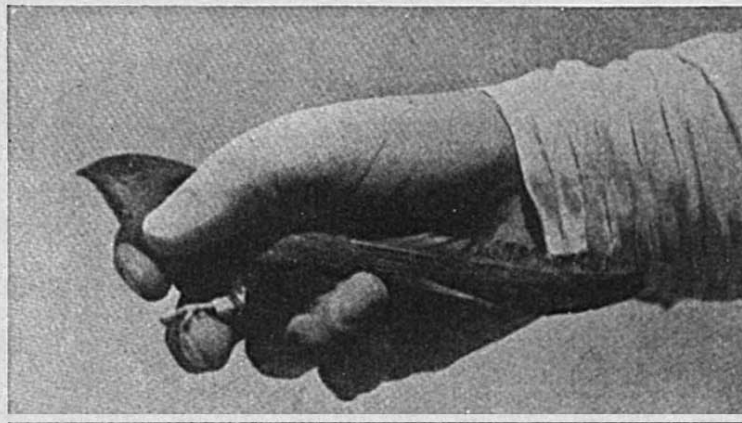
§ II

Migration must serve some good purpose and be of advantage to the species which possess the habit. It is, indeed, an expensive habit, involving the perpetuation of a complex instinct, the output of a large amount of energy, and the facing of great risks and a heavy mortality: these factors would surely be enough to wipe out a species in the keen struggle for existence did not some great compensating advantage also accrue. For the departure of many birds on the approach of winter we can perhaps see good reason, probably not so much in mere cold itself, but in the decrease

in food-supply, in the freezing of ground and water, and in the shortened hours of daylight. In the return from the south in the spring we may see an expression of a need for expansion during the breeding season—to obtain more room, abundance of nesting-sites, and fresh sources of food-supply.

We must distinguish carefully between reasons and causes of migration—between "why?" and "how?" Valid although the reasons given may be, they do not in the least explain *how*

the migratory habit has come to be; to miss this point is to fall into the trap of imagining birds as endowed with human knowledge and intellect—with the power of adopting a reasoned course of conduct, based on the fore-knowledge of sea-



From Smithsonian Report, 1913.

Chimney Swift ringed at Meriden, New Hampshire, U.S.A., in June, which returned to his old chimney after wintering in the Tropics in the June of the following year. Similar records have been obtained in this country in the case of the Swallow, the Swift, the Spotted Flycatcher, and other summer visitors.

sonal events and on an appreciation of geographical differences.

Two points must strike us as being significant. One is that migration is a very regular phenomenon, happening year after year according to the same pattern, without marked differences corresponding to annual variations in climate, and showing none of the features to be expected in an emergency effort created anew each season. Secondly, much migration takes place long before it seems to be necessary, for in the British Isles southward movements begin as early as July. Many migrants, too, go further than seems to be required, overshooting the mild winter of the northern subtropics to find a similar climate in the summer of temperate regions of the Southern Hemisphere.

The conclusion seems inevitable that migration is a very old habit, an inborn instinct which was developed ages ago, and which manifests itself year after year in a uniform manner and without any remarkably close

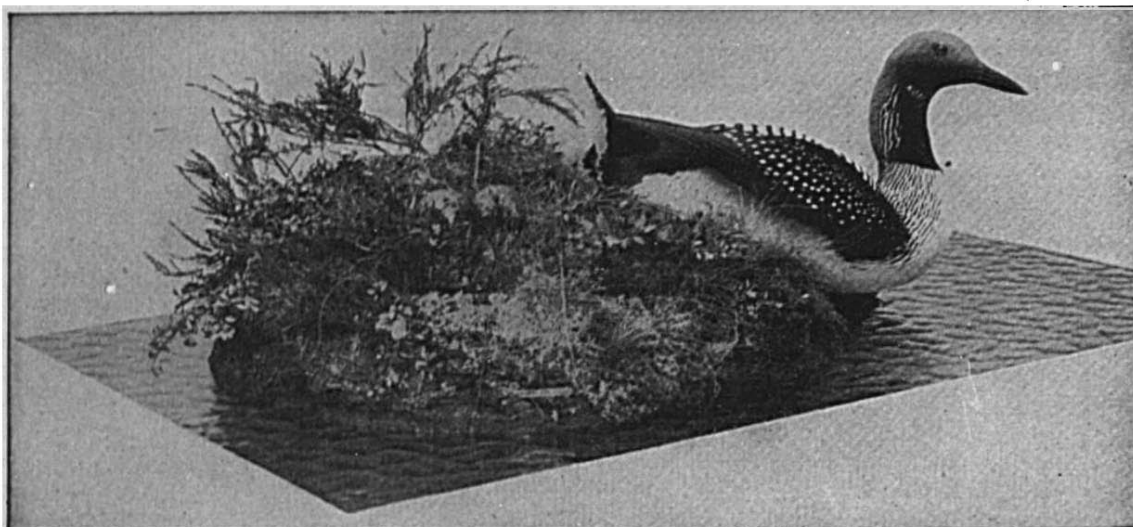


Photo: Royal Scottish Museum.

BLACK-THROATED DIVER (*COLYMBUS ARCTICUS*) WITH NEST AND EGGS.

A beautiful bird which nests in some remote parts of Scotland, but is commoner as a winter visitor to our coasts. The nest is usually close to the water on an island in some small loch. The bird's legs are set very far back for purposes of swimming and diving; on land, therefore, it does not stand upright, but pushes itself forward on its breast.

conformity to immediate conditions. For an explanation of this ancient origin of the instinct we should doubtless look to the former history of birds for some more compelling circumstance capable of initiating the habit which is still maintained. Some have supposed that the last Glacial Epoch, or Great Ice Age, may have driven birds gradually southwards, and after a long time allowed them to return gradually northwards; but during the second phase, it is thought, they would come north only for the summer and return in between to the alternative home they had learnt to know. Others have imagined birds as originating in the south and gradually extending their range in search of fresh feeding-grounds for the hungry mouths of the breeding season, going further and further each summer, but always returning in winter to the original cradle of the race.

If we admit that the immediate seasonal changes are insufficient in themselves to cause migration, beginning so early in each autumn as it does, we must yet invoke them to some extent to complete the other theory. If migration is an ancient habit, annually reborn, there must still be some immediate factor stimulating the latent instinct. Events not in themselves of sufficient strength as causes may yet serve to release more powerful energies, just as a detonator explodes the bursting-charge: so may subtle

changes, either in the seasons or perhaps in the functional cycle of the bird's life, awaken the compelling instinct which causes birds to cross unknown seas and continents in accordance with some ancient plan.

What routes do migrants follow, and how do the birds find their way? We must remember here, again, that migration is in the main a very orderly phenomenon which takes place year after year according to the same pattern.

We have now evidence, too, that as regards summer quarters, at least, it is common for birds to return to the same places with great accuracy. Any suggestion, therefore, of a mere haphazard movement with a vague general direction may be dismissed as being inconsistent with the facts as we know them. Other points to be remembered are that much migration takes place at night, and that wide stretches of open sea are habitually crossed. Furthermore, the young of the year in many species migrate southwards before the parents—in the case of the Cuckoo, long after their parents—and must thus find their way without any memories to guide them. Anything which lies in the experience of the race, as distinct from that of the individual, must in these cases be handed on by inheritance purely and not by tuition and imitation.

How do
Migrants
Find their
Way?

Our knowledge of the routes that birds follow in their migratory flights is still very scanty. Hooded Crows caught and marked as birds of passage at the south-eastern corner of the Baltic have been shown to come from Southern Finland and the Petrograd district of Russia, and to follow the coasts southwards and westwards as far as the north-eastern corner of France. Black-headed Gulls ringed at the same place, but as nestlings, have been reported from right round the coasts to the Bay of Biscay, from along the courses of the Rhine and the Rhone, and as far as the Balearic Isles, and from along the courses of the Vistula and the Danube and across to Northern Africa.

In its migratory flight the whole life of a bird is raised to a higher pitch. It is estimated that many birds attain a speed of fifty miles an hour, and a carrier-pigeon has been known to keep up the rate of fifty-five miles an hour for four successive hours. It is unlikely that this is often surpassed by migratory birds on long-distance flights.

The question "How do birds find their way?" is not one which can be answered at "Homing." present. More must first be learnt of the nature of the routes which are in fact followed by migrants, of the relationship of particular summer quarters to particular winter quarters, and as to whether winter quarters are as clearly defined and as accurately sought out as summer quarters are known to be. It is probable, however, that the question may be narrowed down by the elucidation of that special acuity of the senses, or what-

ever it may be, which underlies the "homing" capacity so well known in birds. Recent experiments by Professor J. B. Watson and Dr. K. S. Lashley have had as their subjects the Noddy and Sooty Terns nesting on the Tortugas Islands in the Gulf of Mexico. Birds taken from their nests and transported by ship in closed cages were shown to be capable of finding their way back from Galveston (to the east) or from Cape Hatteras (to the north), distances of over 850 miles, or from intermediate points at sea entirely out of sight of landmarks of any kind. In being taken northwards, too, the birds were removed beyond the limits of the species' natural range, and the absence of any previous experience in that direction was all the more certain. At least, therefore, we must concede a very highly developed "sense of direction" or "bump of locality."

§ 12

PLUMAGE, COURTSHIP, AND MATING

It does not come within the scope of this work to go into the question of the general classi-

fication of birds, neither can we consider in detail the characters of bird structure or of feathers and plumage. A bibliography is given at the end of this chapter which will be useful for readers who wish to have more information on these interesting subjects. A volume might be written on any one of them. We cannot pass over altogether, however, the nature of feathers and plumage.

The acquisition of feathers must have been one of the great steps in the progress of birds

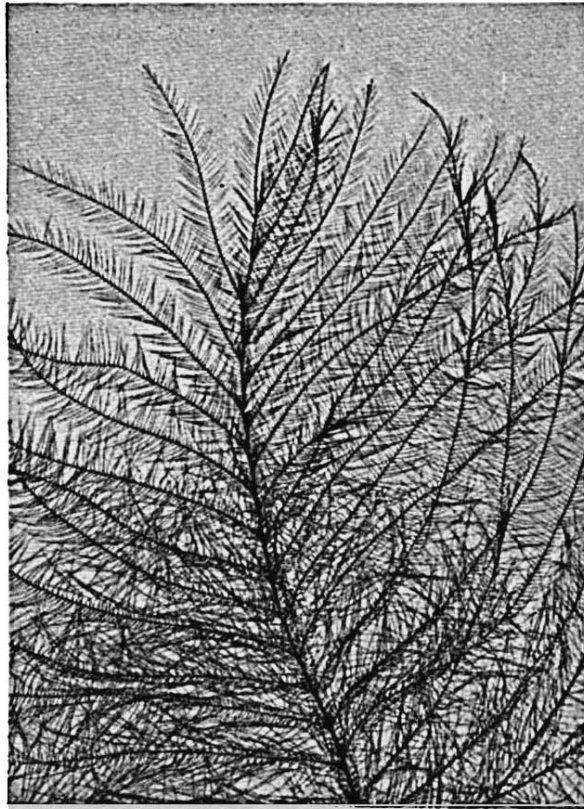


Photo: F. R. Hinkins & Son.

Portion of tip of downy feather from the under tail-coverts of the Mistle-Thrush. (Highly magnified.)

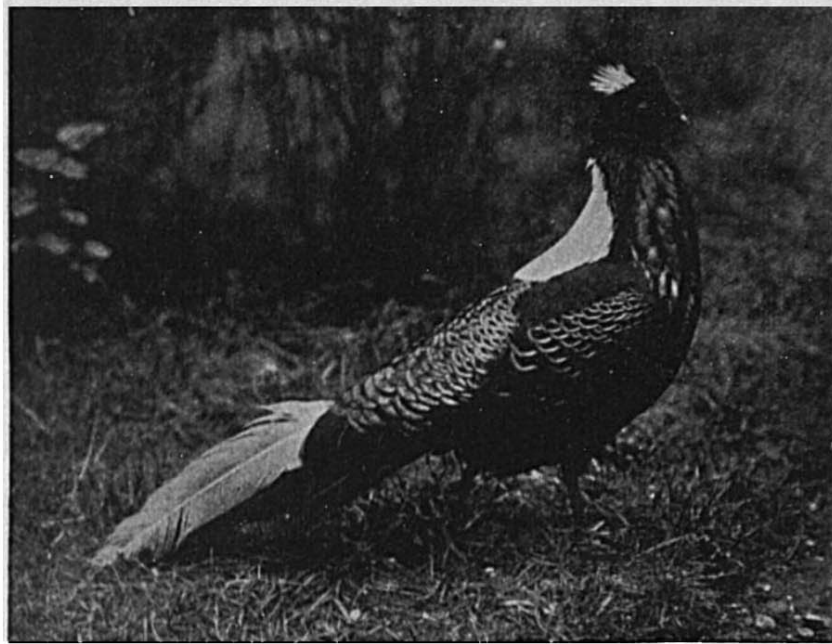


Photo: James's Press Agency.

SWINHOE'S PHEASANT (MALE).

Another example of brilliant plumage lending itself to "display" during courtship.

towards their present position as the supreme flying animals *par excellence*. It is indeed but to forge another link in that evolutionary history to find that feathers are modified scales and therefore closely akin to the typical covering of reptiles. Let us notice, too, that the unfeathered parts of a bird bear ordinary scales, the one form, as it were, simply replacing the other where it is more suitable. The scales on the toes are often suggestively reptilian in appearance, and when there are also feathers about the toes they grow not *on* the scales but from *between* the scales—from between the other scales we may indeed say to emphasise the point.

The feathers of many birds are richly coloured, and even those of sober hue may be very beautifully marked. In some cases the colours may be due to actual pigment; but in others, especially blues and greens, the minute physical structure of the feathers is responsible and wonderful effects of iridescence are produced.

Brilliance of plumage is often associated with the mating season, but this is far from being a general rule. In some instances the male has a special breeding plumage, and sometimes both sexes have this, examples of each kind being

found among the Plovers. In other cases the male has brilliant plumage for most of the year, like the Mallard, while his mate is always dull. In many species, on the other hand, the sexes are alike and have a similar appearance all the year round; this permanent plumage may be dull-coloured as in the Song-Thrush or Curlew—wonderfully beautiful birds, nevertheless—or brilliant as in the Kingfisher. Most birds that have a permanent bright plumage, however, are dull in their first year, as is the case with the afterwards splendidly iridescent Starling, but in some cases, such as the Kingfishers and the Parrots, the gorgeous plumes have appeared before the birds leave the nest. One other kind of change must also be mentioned, namely, the seasonal changes of the Ptarmigan, which is white during the season of snow and of duller appearance when its native hills are brown once more.

Some of the most interesting habits of birds are those associated with the mating season. In many cases there are curious ceremonies of courtship, often with wonderful "display" of brilliant plumage or with great exuberance of song, and sometimes there are fierce fights between rival males. The Peacock spreads and erects his

Plumage
Coloration.

Courtship
and
Mating.

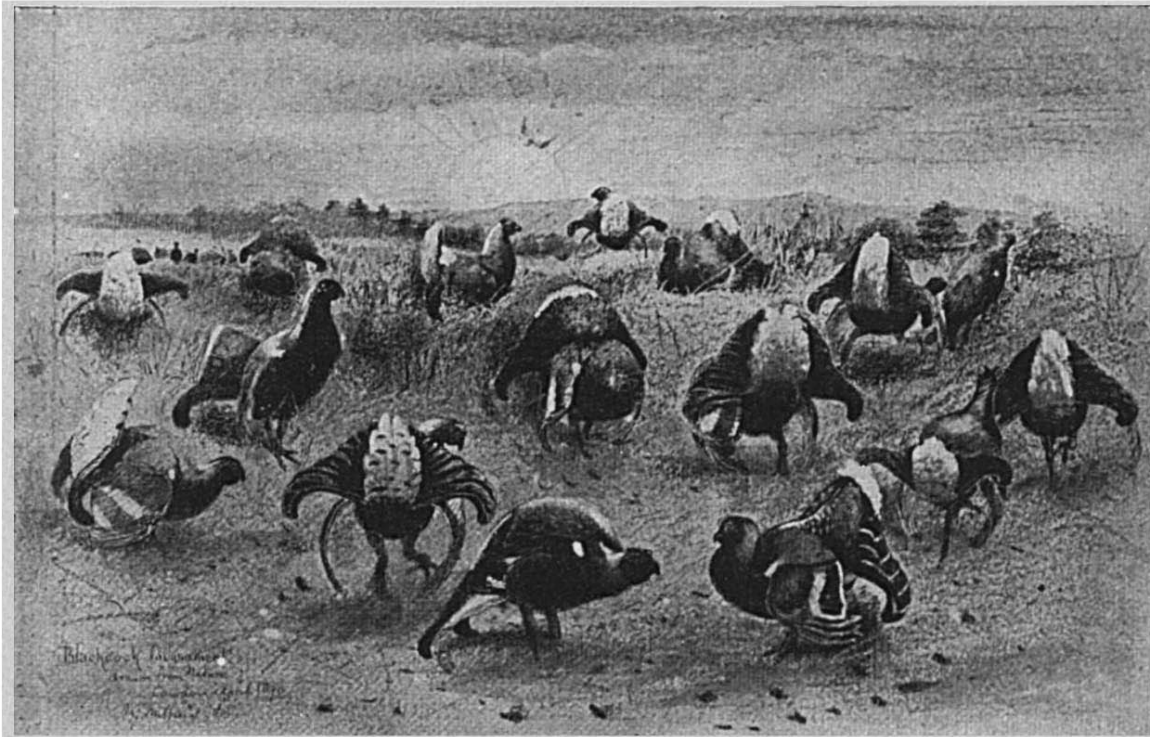
magnificent train, the Argus Pheasant displays long plumes on his wings as well as on his tail, and the different Birds of Paradise glow with gorgeousness in their almost every feather. Many a relatively "dowdy" bird—as judged by human eyes—may also be seen posturing in much the same way as his more ornamental brethren, and we must be chary of denying to any bird strange beauty in the sight of his love!

In the ordinary Black Grouse we may find a habit of display as well marked as that of any inhabitant of tropical jungles; it

or, as sometimes happens, these harmless encounters may develop into fierce fights and sometimes a duel to the death.

"At intervals during each separate fight, blackcocks emit a curious call; it is almost a hoarse screech, resembling the noise too painfully familiar to us, namely, that of cats on housetops supplemented by the said animals being afflicted with sore throats. The sound is both wild and unmusical in the extreme.

"We will suppose that the observer has come early on the scene, before the greyhens have made



Reproduced by permission from "Game Birds and Shooting Sketches," by J. G. Millais.

BLACK-COCK ON THEIR PLAYING-GROUND.

gives, indeed, an example not only of individual display but also of a collective "tournament" in which rival blackcocks strive to impress the greyhens which they wish to win as mates. In Scotland, say, the fortunate may perhaps witness a gathering of blackcocks at break of day early in the breeding season. The birds assemble in some open spot and indulge in the wild whirring calls that form their song of love and war, and the racket may be heard two miles off.

Then the tournament begins. It may be mere skirmishing, a display of fencing, or "sparring,"

their appearance. The approach of one of the latter is the signal for an immediate cessation of hostilities on all sides, and intense excitement prevails amongst the assembled blackcocks. Her approach has been observed by a single bird, who has been sharper than the rest in detecting the lady afar off . . . he will suddenly draw himself up to a rigid position of attention, till he is sure she is really coming. Having settled this in his mind to his own satisfaction, he throws himself into the air and flutters up a few feet, uttering the while hoarse notes with all the power and effect he can muster.



NEWTON'S BOWER-BIRD.

There are several species of Bower-bird, all displaying remarkable habits in their courtship. In the case of the Gardener Bower-bird the nest itself is in the tree; at the foot of the tree a kind of cabin is built. "In front of it is arranged a bed of verdant moss, bedecked with blossoms and berries of the brightest colour"—regularly renewed as they wither. "The use of the hut, it appears, is solely to serve the purpose of a playing ground or as a place wherein to pay court to the female, since it is built long before the nest is begun."

"This is, of course, done to impress the lady in his favour, and arouse in her breast a proper sense of admiration, which he considers his due. His example is immediately followed by all the others, who, on alighting, dance about in the most absurd manner, each one trying to see who can screech the loudest and be the most ridiculous in his antics.

"When a hen has alighted on the playing ground the male that is nearest to her pairs with her, and fights off any other that disputes his possession. She then meanwhile walks sedately round her lord and master, picking about the grass coquettishly, and pretending to be feeding. Each hen on arrival causes the same general excitement and is appropriated by one or other of the successful cocks till the harems are filled up, one cock having at times as many as six or seven

hens. As the season advances, after the first few mornings of the hens coming to the ground, they resort to the same spot each day and stay with the same cock who has previously trodden them, and are not interfered with afterwards by other cocks, who acknowledge the superior claims of the male to whom they rightfully belong."¹

In some cases there are special aids to display, such as the pouch in the neck of the Great Bustard, which the cock can distend at will and use as an aid in the erection of his feathers; Pigeons, too, have a similar habit of inflating their "crops," although they lack special plumes; and the Frigate-bird has an external pouch which itself serves as an ornament, being of naked skin, bright red in colour, and very extensible.

¹ J. G. Millais.



From a photograph.

STAGS FIGHTING WITH THEIR FORE-FEET.

by J. E. Russell, Dingwall.

The Red Deer stags grow and shed their antlers annually. During the period of growth the horny substance is traversed by nerves and blood-vessels and is covered by a soft, sensitive sheath of "velvet." When the antlers are fully developed they become hard, non-living structures and the "velvet" dies and is rubbed off. A few months later the whole antler is shed and the process begins anew. The fiercest combats are in the mating season, and then the antlers are used, but when the new horn is still "green"—and again when the old antlers are being shed—fighting is with the fore-feet in the manner shown. (See *Natural History: II. Mammals*, page 331.)

Examples could be multiplied almost indefinitely, but we must here confine ourselves to one other case which has a novel feature of its own. The different species of Bower-birds found in Australasia build various types of "bowers" which serve as playgrounds in which the cocks court their mates. These "bowers" are often large and complex structures of twigs or flower-stems and are decorated with collections of blossoms, shells, or brightly coloured berries. One species builds a little cabin, some two feet

The Bower-birds of Australasia.

weapons of offence is well known, and in some kinds of birds there are several pairs. Other birds fight with their wings, and lapwings may be seen buffeting each other in mid-air; an Egyptian relative of the Lapwing, the Spur-winged Plover, has a weapon on its wings which is said to make a fatal result no uncommon occurrence. The Ruff, a kind of sandpiper now numbered among the rarer English birds, has a frill of feathers round the neck, which is a shield of defence as well as an ornament for display in the regular tournaments which are held; the

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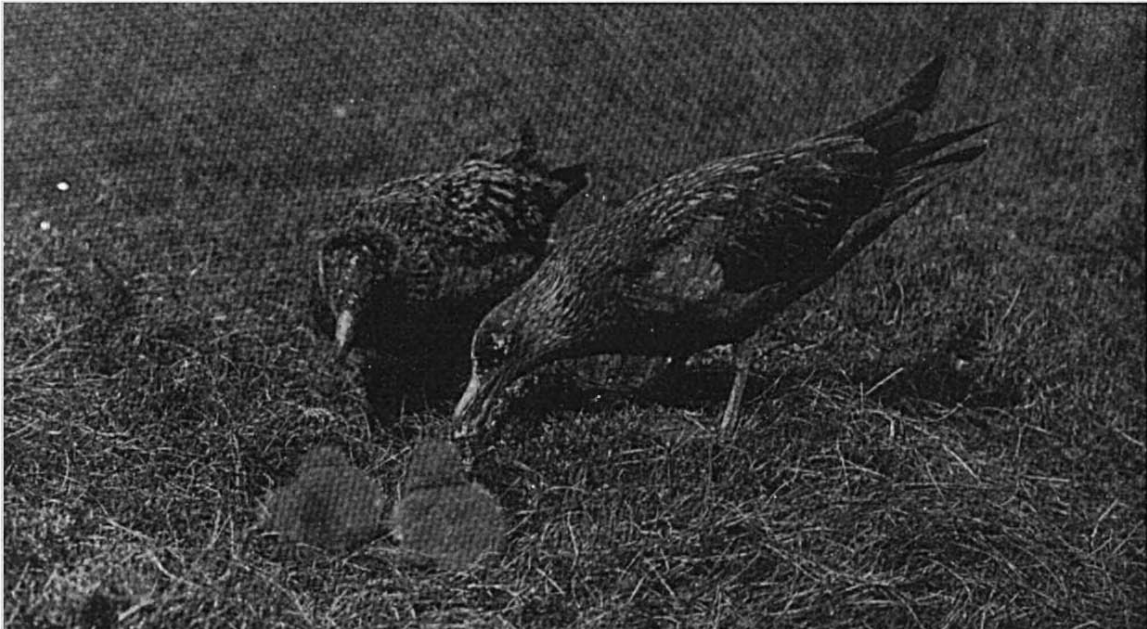


Photo: R. Chislett.

A PAIR OF GREAT SKUAS AND THEIR YOUNG.

The Great Skua is a species related to the Gulls, on which it preys by compelling them to disgorge the food they have just obtained. The similar Arctic Skua, to lead unwelcome visitors away from the neighbourhood of its nest, will cunningly sham a broken wing or leg, luring the intruder to give chase. When at a safe distance from the nest the bird will suddenly rise in the air and fly away.

high and three feet in diameter, at the foot of a tree and with a wide mossy "lawn" in front, while another makes a tunnel several feet long and completely roofed over with twigs. These bowers form the birds' courting grounds and are quite distinct from the nests, which are built in trees at a later stage.

Fighting with rivals plays a part of varying magnitude in the loves of different birds. Some species are well known for their pugnacity, the familiar Robin for instance; and in cock-fighting this has been turned to account as a source of human entertainment. In the domestic cock and in pheasants the development of spurs as

females, called reeves, lack the distinctive adornment.

The seat of the voice in mammals is in the larynx, at the top of the windpipe. In birds, however, the vocal cords are at the foot of the windpipe in a special enlargement called the song-box or syrinx.

The sounds are due to the rapid passage of the air over the tense cords. In the course of evolution the significance of the voice has broadened out. From a simple parental call it became a means of recognition of any kindred, and in the course of ages it became expressive of particular emotions—emotions of joy and

of fear, of jealousy and of content. While a certain amount of vocal ability is part of the hereditary make-up, there seems little doubt that the gift requires educating. The song of the first year is sometimes what one might call tentative and generalised. It improves with practice and is probably helped by emulation and imitation. The way in which some birds, e.g. skylarks, steal snatches of one another's music suggests the importance of imitation as a factor in educating the vocal powers.

We have spoken of song as the vocal part in the display of courtship, but it would be wrong to think of it as being no more.

Song. Song is, indeed, not confined to the breeding season, but the periods differ with the species; the extent to which the females can sing also varies. It is not possible to draw a sharp dividing line between true song and the notes which constitute the ordinary language of birds, and this gives another reason for not over-emphasising the sexual significance of song.

The definition of song must not be too strictly confined to notes which sound musical to human ears. Outside the ordinary song-bird group, there is quite commonly found some note or cry which is especially associated with the breeding season and which may be regarded as the equivalent of a song. Many of these cries seem harsh and discordant to us, but others have an obvious charm, at any rate, in their native surroundings; amid the rugged beauty of a wild moorland the weird bubbling spring-call of the Curlew is perhaps more appropriate music than the dainty lilt of the sweetest warbler. There are other notes, too, which are not vocal: pigeons, for instance, can clap their wings loudly together in flight, the White Stork rattles the halves of his beak like castanets, and the Snipe "bleats" or "drums" in spring-time, as we have already remarked.

§ 13

NESTING HABITS

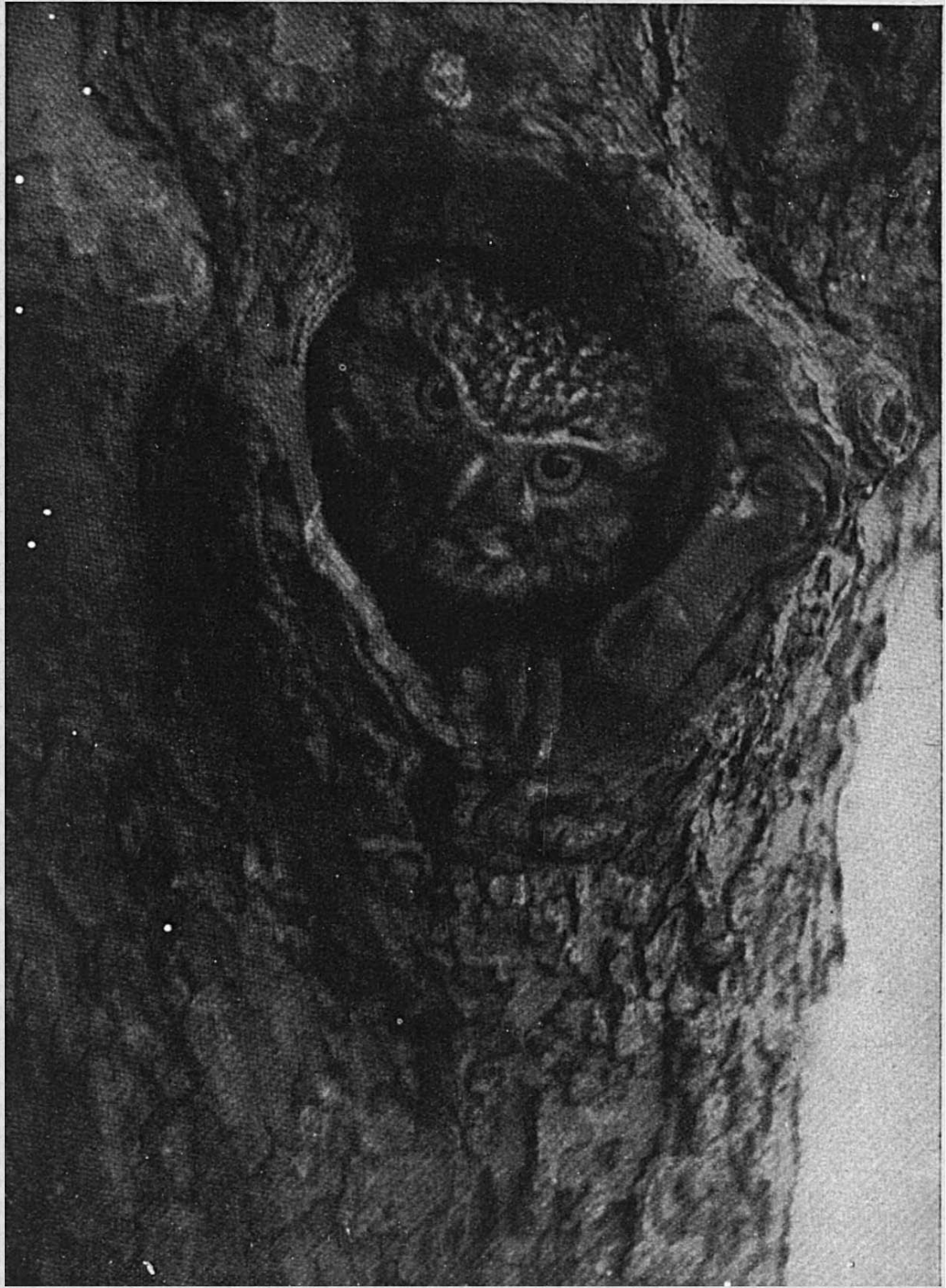
If the earliest birds were arboreal, as we have reasons for believing the primitive nesting sites were doubtless also in trees. The **Primitive Nesting Habits.** elaborate structures made by many present-day birds, however, are obviously products of a highly specialised habit

which has been evolved in the course of ages. At an earlier stage the eggs would be laid in such natural sites as were available without the necessity of building, and modern examples of a similar habit are not wanting. A species of White Tern, for instance, inhabits tropical islands and frequently deposits its single egg on the strong horizontal leaf of a palm-tree. As Dr. H. O. Forbes says, "The egg is laid in the narrow angular gap between two leaflets on the summit of the arch of the leaf, where it rests securely, without a scrap of nest . . . yet defying the heaving and twisting of the leaves in the strongest winds. The leaf, as in all palms, goes on drooping further and further till it falls, and among the settlers [on Cocos Keeling Island] it is a subject of keen betting, when they see a tern sitting on an ominously withered leaf, whether the young bird will be hatched or not before the leaf falls. 'The result . . . has always been in favour of the bird; if the leaf falls in the afternoon, the tern will have escaped from the egg in the morning!'"

Examples of birds which nest in holes in trees, in accordance with the probably ancestral custom, are the Owls, the Parrots, the Titmice, and of course the Woodpeckers.

Another hole-nester is the Hornbill, of which various species are found in many tropical lands, and its story is a very strange one indeed. When the eggs are laid and the hen begins to sit, the opening in the tree-trunk is walled up with mud by the cock until only a small orifice remains through which the sitting bird can put no more than her head. The device is doubtless a means of defence against snakes or other enemies, but it involves the imprisonment of the hen during the whole period of incubation. During this time, however, she is by no means left to starve, but is fed assiduously through the "grille" by her devoted mate, who is indeed said to work so hard and to forage so unselfishly that he is worn to a mere shadow of his former self before the task is done.

Among the tree-nesting birds the most primitive type of wholly artificial nest seems to be the platform of sticks or twigs made by such birds as eagles, herons, and pigeons. These structures are often of great size, being added



From "*Wild Life in the Tree Tops*," by Captain C. W. R. Knight, F.R.P.S.

A LITTLE OWL, IN ITS NESTING HOLE.

This small and amusing species has become common in parts of England owing to artificial introduction from the Continent. It is more frequently to be seen in the daytime than some of its relatives.

to year after year. The simplest platforms are quite flat, but others are more or less cup-shaped, as in the case of crows. Finally, this type reaches its highest point in those birds which add a dome-shaped roof.

More promising material is used by **More most of Complex the small Structures. birds**

which nest in trees or bushes, and with pliable twigs, grasses and roots, moss, and perhaps animal hair, much more complex structures are possible. The Finches, for example, make elaborate and beautiful cup-shaped nests, while others, such as the Wren and the Dipper, make spherical nests which can be entered only by a small hole in one side. In addition to the actual structure there is often a distinct lining of specially selected material; for this purpose small feathers, hair, and fine fibres are greatly favoured, but in the familiar case of the Song-Thrush, for instance, a complete lining of hardened mud is a characteristic feature. Few nests reach such a high development as that of the Tailor-bird of India, so called from its habit of "sewing" leaves together to make a beautiful pouch, a very triumph of the nest-builder's art.

From nesting in holes in trees to nesting in holes in the ground is an easy transition, and the



Photo: J. H. Symonds.

THE REED-WARBLER'S NEST IS A BEAUTIFUL CUP-SHAPED STRUCTURE SUSPENDED AMONG THE REEDS.

the Petrels, some Penguins, the Kingfisher, and the Sand-Martin. The last-named nests in colonies, and each pair tunnels many feet into the chosen bank and hollows a little chamber at the end; the Bee-eater makes a similar tunnel, which may be as much as ten feet long. As with holes in trees, a lining may be added, say of grass or other vegetation; the Shelduck, like others of its kind, uses a plentiful supply of down plucked from its own breast, while the Kingfisher lines its nest with an unsavoury collection of fish-

gap is bridged by birds like the Stock-Burrowers. **D o v e ,** which use either site according to the opportunities which a particular district may happen to afford; this bird gets its name from the habit of nesting in holes in the "stocks" of old trees, but among the sand-dunes on many parts of the British coastline it uses rabbit-burrows instead. In similar haunts we may also find another burrow-nester — the bird which Mr. W. H. Hudson calls "the strange and beautiful Sheldrake." Unlike most of the duck family the male Sheldrake is not subject to an "eclipse" moult in the midst of the breeding season, and he is therefore able to stand by his mate, who, furthermore, has a bright plumage similar to his own.

Other birds which nest in burrows are



Photo: British Museum (Natural History).
THE WONDERFUL NEST OF REMEZIA, THE PENDULINE TIT-MOUSE.

Note the funnel-shaped opening leading to the chamber; below is a pocket which is supposed by some to be a roosting-place for the male bird. The nest is made of cotton and seed down, and to the touch resembles a fine felt carpet.

bones and other remains of its prey. The Megapodes go to the extreme of completely burying their eggs either in pits or under specially constructed mounds.

Very many other birds nest either on the open ground or among the long grass and herbage.

Sometimes there is a well-built nest among grass, as in the case of the Skylark or the Meadow-Pipit; at other times there may be

a bulky heap of vegetation or of other material; the Cormorant, for instance, often raises a mound of seaweed, and some kinds of Penguin build a Spartan nest of stones. Still, again, there may be a mere hollow scraped in the ground, as in the case of the Lapwing or of the Tern, perhaps with a lining, a pretence at a lining, or with no lining at all. Finally, the bird may lay its eggs on the ground without any attempt at a nest, as the Oyster-Catcher does among the riverside shingle.

Somewhere between the tree-nesters and the ground-nesters we must place those birds which nest on cliffs, for although a nest on a rock ledge may seem in some ways very like a nest on flat ground, the dependence on inaccessibility rather than on concealment makes the habit also akin to tree-nesting. Some of the burrowers, like the Puffins and the Petrels, might well be classed in this group as their holes are usually on precipitous faces, but more typical are those species which breed on the open ledges, like the Guillemot and the Razorbill. A highly specialised type of

Cliff-Nesting.



From "Wild Life in the Tree Tops," by Captain C. W. R. Knight, F.R.P.S.

STRANGE NEST MATERIALS OF A CARRION-CROW.

Some nests are composed of the bones of departed birds and mammals. There may be also quantities of string, cigarette packets, and even, in one case, a lady's handkerchief.



Photo: British Museum (Natural History).

NESTS OF THE EDIBLE SWIFT.

The saucer-shaped nests are made entirely from the saliva of the birds, and form the source of the "birds'-nest soup" which is considered a delicacy in China.

nest, too, is that which is built of mud against the sheer rock face, and for this purpose—as in the House-Martin—the habitations of man are often found to serve as well as natural faces of rock. Sometimes the mud and other materials are made more coherent by the addition of the salivary secretion of the builders, and with the Edible Swift of Borneo this substance, like hardened glue, forms practically the whole structure and is the source of the "bird's-nest soup" beloved of the Chinese gourmet.

Many birds return to their old nests and use them again and again, while other kinds habitually build afresh each year. There are birds, too, which commonly use the old nests of other species, with or without additions of their own, although they are not always incapable of building for themselves if faced with the necessity. This habit is not uncommon in the case of birds of prey; the Kestrel, for example, often uses the old nests of crows and pigeons. The Green Sandpiper, belonging to a very different order of birds, uses the old nests of thrushes and other tree-nesting

The Use of Old Nests.

birds—and even squirrel's "dreys"—although most of its own kin are typical ground-nesters.

§ 14

It is impossible to leave the main question of nesting habits without some reference to the striking differences observable among the newly hatched young of birds.

These fall into two well-marked groups in accordance with the condition and stage of development at the date of leaving the egg. Technically these groups are the *nidi-fugous* and the *nidicolous*, terms which we may translate as nest-quitting and nest-dwelling, though perhaps something of the distinction is conveyed in the two ordinary names "chick" and "nestling." The chick of the domestic fowl is notoriously a nest-quitter; so also are ducklings, whether domestic or belonging to one of the many wild species, and so likewise the young of the plover kind. All these birds leave the egg prepared to take an immediate active part in life; they are open-eyed and lively, able to walk—and, in appropriate cases, to swim—

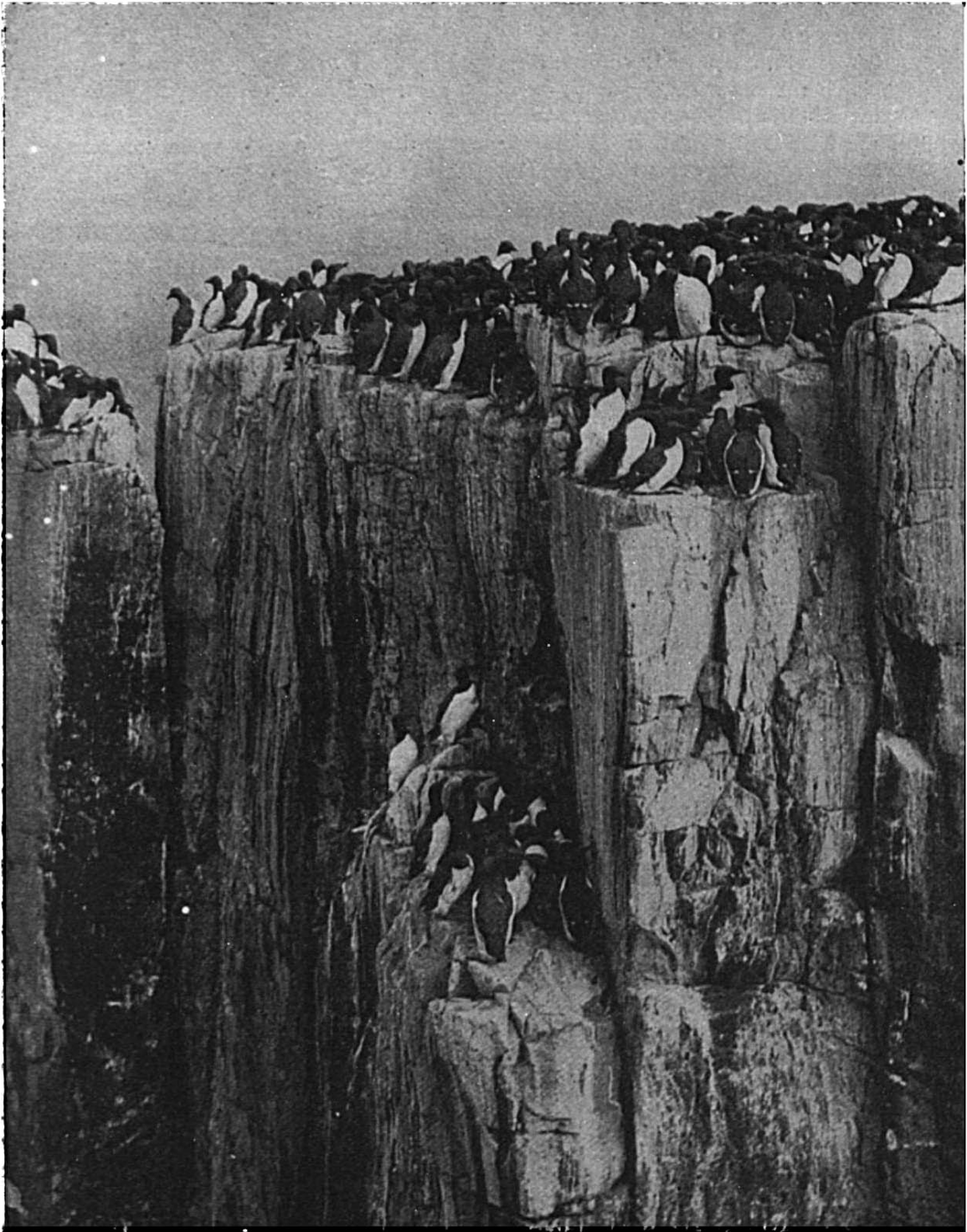


Photo: "Country Life."

GUILLEMOTS.

The Guillemot, one of the Auks, is common on precipitous parts of the British coastline during the breeding season. A single egg is laid on the bare rock of a narrow ledge. At other times of the year the birds keep to the sea, but dead ones are often washed up on the beach after storms.

and capable of finding their own food with no more than the guidance and protection of the parent. Contrast these with, say, young thrushes—helpless, blind, almost naked, and rather repulsive-looking creatures, which would die miserably without the food their parents so assiduously bring. The difference is, indeed, a most striking one, but some of the nest-dwelling young are not quite so unlike the more active chicks; the nestlings of the birds of prey and of the owls, for instance, are clothed in down and are open-eyed and alert, although they remain in the nest at first and are wholly dependent on their parents for food.

We have an illustration of how some birds make use of their wits in the way they transport their young. In this connection **Transporting the Young.** Lord Grey recently told how he watched a Wood-Duck (Carolina) whose nest was a hole in a tree 21 feet from the ground and 300 yards from the water. "Presently the duck flew down from the hole into the grass, and began calling; then one by one the little ducklings came to the edge of the hole and *fell to the ground*. When measured the nest was found to be 2 feet below the hole. For the newly hatched birds to climb that distance, to fall 21 feet, and then follow their mother 300 yards to the water was, I think, a tremendous tribute to the energy of nature."

The female woodcock, when threatened with danger, is known to transport her young, one at a time, to another place. She does so by carrying the young ones with her feet, holding them in her claws, or pressed between her thighs. It is also said that where she nests at a distance from the feeding-ground, she will carry her young to and fro in the morning and evening.

§ 15

We cannot here discuss fully the eggs of birds. A wealth of matter for speculation lies in the why and wherefore of size and shape, of texture and colour, and of the numbers forming a clutch. All these characters show wide limits of difference, but on the whole they remain very constant and characteristic for any one species.

The size of the individual egg is variable, apart from the question of due proportion to

the size of the parent bird concerned; this is related in a large degree to the length of the incubation period, while this in turn depends to an important extent on the state of development of the young when hatched, a subject which has already been discussed.

In texture of shell, eggs vary from the brilliantly polished egg of the Tinamous to the soft chalky eggs of the Cormorant, from which the white outer surface can be scraped to show a pale-blue layer beneath. Thickness of shell is also a variable factor, apart from the mere relation to general size.

It is, however, the colours of eggs that have always attracted most attention; some of these are exceedingly beautiful both in tint and in the patterns of marking. Blues and greens are common especially among tree-nesting birds, while ground-nesters usually show neutral brown tones which are most effective for purposes of "camouflage"; some splendid red tones are characteristic of the birds of prey. Markings may be small spots or larger blotches, and they may be evenly distributed or concentrated in a particular zone; fine lines also are found in some cases, witness the Buntings, and in many birds there is a plain marked ground-colour. Pure-white eggs are usually found in species which nest in holes, and this is perhaps of some use in the dark, although the more important point is probably the absence of any occasion for an attempt at "camouflage" coloration. Coloration in many instances serves a protective purpose, and, generally speaking, it is related to some extent to the nature of the bird's environment. There are, curiously, no pure black eggs.

§ 16

More than any other creatures, birds have claimed the attention of those who are fond of what Fabre called "scrutinising life." There is often an extraordinary subtlety as well as beauty in their habits. They are big-brained animals, and the senses of sight and hearing are developed to great perfection.

The question is how much in the behaviour of birds we must ascribe to instinctive endow-

The Study of Birds' Eggs.

Behaviour of Birds.

ment, that is, to inborn impusions or hereditary nervous predispositions, and to what extent must we credit the bird with intelligent learning? When a young moorhen swims deftly the first time it touches the water, or dives perfectly when the fit and proper stimulus is forthcoming, we interpret this as instinctive. Its physiological side is a concatenation of reflex actions. Its psychological side is inborn impulse and endeavour. Similarly, when an unhatched lapwing utters its characteristic call-note "pee-wit" from within the egg, we say this is instinctive—independent of instruction, learning, or imitation.

for learning. The young chick's capacity for rapidly learning simple lessons, mostly associations, has been proved up to the hilt by many experiments.

"In the quiet of the wood one sometimes hears the song thrush breaking snail shells on its stone anvil, and one may easily find the tell-tale evidences of its appetite. Is this habit, which comes so near using a tool, an inborn gift or has it to be learned? The answer is given by Miss Frances Pitt in her admirable *Wild Creatures of Garden and Hedgerow*. To a young thrush which she had brought up by hand she offered some wood-snails (*Helix nemoralis*), but

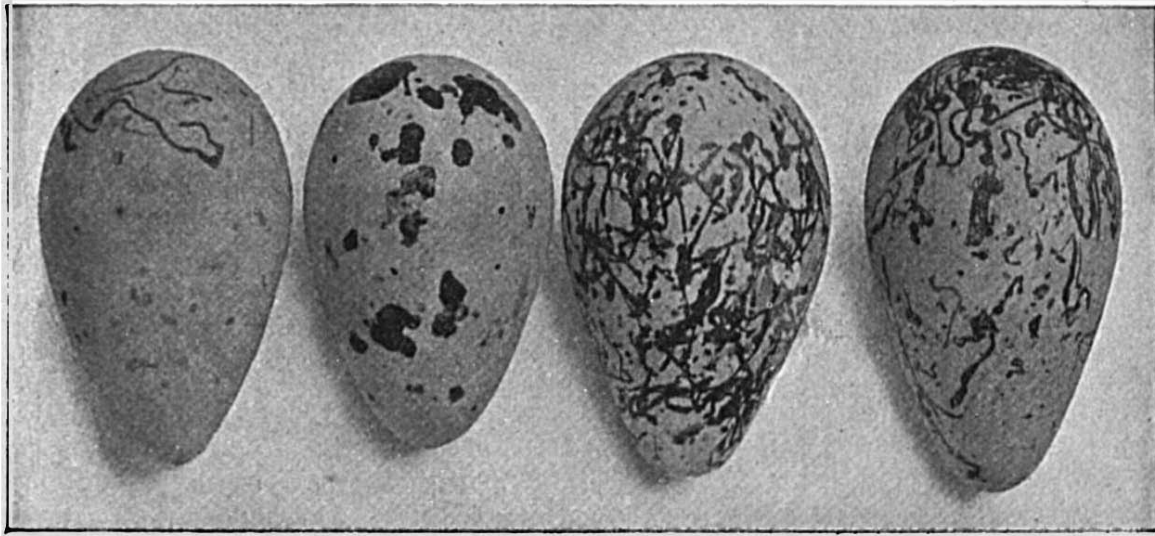


Photo: "Country Life."

EGGS OF THE GUILLEMOT.

These show an extraordinary range of variability, both in marking and in colour. Browns, yellows, reds, greens, blues, and whites are found, and they may be blotched, spotted, lined, or streaked. The shape is believed to serve a useful purpose in preventing the egg from rolling—except in a small circle—and thus from falling off the cliff ledge on which it is laid.

But a different note is sounded in the behaviour of the Greek eagle, which lets the tortoise fall on the rocks from a great height, so that the carapace is broken, or in the similar device of the Rook that lifts the freshwater mussel and lets it fall on the riverside stones. The Herring-Gull sometimes lifts the sea-urchin, or the clam, in its bill, and lets it fall on the shingle, so that the shells are broken. Without necessarily supposing that these birds thought out the expedient, we can hardly avoid the conclusion that they utilise the discovery intelligently. In many cases the bird must be credited with an appreciation of circumstances, with an awareness of what is significant, and with a capacity

he took no interest in them until one put out its head and began to move about. The bird then pecked at its horns, but was bewildered when the snail retreated within the shelter of the shell. This happened over and over again, the bird's inquisitiveness increasing day by day. The thrush often picked one up by the lip, but no real progress was made till the sixth day, when the thrush beat a snail on the ground as it would a big earthworm. At last on the same day he picked up a shell and hit it repeatedly against a stone. He tried one snail's shell after another, until after fifteen minutes' hard work he managed to break one. After that all was easy. He had cracked his first snail. After long trying

he had found out how to deal with a difficult situation. We may say, then, that while a certain predisposition to beat things is doubtless inborn, the use of the anvil is no outcome of a specialised instinct, it is an intelligent acquisition."

The general impression that one gets in regard to the cleverness of birds in such activities as nest-

building, capturing booty, and dealing with food is that on an instinctive basis, varying in definiteness, there is built up a superstructure partly due to easy education and subsequent imitation, and partly due to an intelligent appreciation of the lessons of experience. But an appreciation of the relative importance of "nature" and "nurture" requires careful observation and experiment.

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