The TRAVELS of BIRDS

FRANK M. CHAPMAN

THE TRAVELS OF BIRDS

THE DAY FLYERS.

Geese,

Ducks,

Crows,

Blackbirds,

Swallows.

The TRAVELS of BIRDS

OUR BIRDS AND THEIR JOURNEYS
TO STRANGE LANDS

FRANK M. CHAPMAN
THE BIRD'S HISTORIAN

NEW YORK AND LONDON
D. APPLETON AND COMPANY

Printed in the United States of America

TO

THE MEMORY OF

WELLS W. COOKE

FOREMOST AMERICAN STUDENT

OF BIRD MIGRATION

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THE TRAVELS OF BIRDS

I

BIRDS AS TRAVELERS

BIRDS are the greatest travelers in the world. Some other animals also make long journeys. The fur-bearing seals that pass the summer on the Pribilof Islands in Bering Sea go as far south as southern California in the winter. The caribou, or reindeer of the Barren Grounds which border the Arctic Ocean, travel southward in the fall to find food and shelter in the spruce and balsam forests of the interior of British America.

Shad and salmon leave the sea and swim often hundreds of miles up rivers to lay their eggs. Certain locusts, which are called "grasshoppers," and some butterflies go long distances. But not

one of these animals can compare with the bird as a traveler.

It is true that man makes longer journeys than birds do. But it is also true that he could not make them without help from other men. He might walk where there was land, but he would need days to go as far as a bird could go in an hour. And when he comes to the sea he requires a sailing vessel or steamer with charts and maps and compass to aid him in finding the way; while in the hold there must be food for the use of the crew and passengers during the voyage.

But the bird traveler asks help from no one. He has no use for locomotives, automobiles or steamships. He carries no chart and no compass, and he can go with ease to parts of the world which it took man many years to reach, and to some parts of the world which still are unknown to man.

Think of the explorers amid the ice and snow of the Arctic. With what difficulty they fight their way through the ice-floes. At times they find it impossible to advance. They are in fre-

quent danger of being crushed by the grinding ice-fields, and while they struggle bravely onward, Gulls may go calmly floating by overhead without perhaps even making a stroke of their long, powerful wings.

Or in the Antarctic, Penguins slip through the leads, or openings in the ice, and, like feathered submarines, dive, when their path on the surface is closed, to travel even more swiftly under the water than on it.

There are mountaintops so high and so steep that man has never succeeded in climbing them. But the birds may use them as resting-places and soar about in the sky far above them.

So I think we may safely say that the bird is not only the greatest of aviators, but that he is also the greatest of travelers. Not even man can excel him.

Now to travel is one of the most interesting things we can do. We may see beautiful scenery, wonderful cities, and strange people. There is no end to the experiences which may befall the traveler or to the opportunities he may have to

learn. But if we cannot go to foreign countries ourselves, sometimes the next best thing we can do is to read about the travels of others. So far as I know, there is no way by which we could go with the birds on their travels. Even a tiny Hummingbird could laugh at the efforts of the best aviator, if he should attempt to follow him in an aëroplane from Canada to Central America.

Of course the birds cannot write books about themselves. If, therefore, we cannot either go with them or read their own accounts of their long journeys, how shall we learn anything about these great bird travelers? We must ask a naturalist who studies birds.

In the dictionary we will find him defined under the name "ornithologist," which means a person who studies and writes or talks about birds. It is a long name, but, like hippopotamus or rhinoceros, not so strange when you become familiar with it.

Then we shall discover that there are various kinds of bird students, or ornithologists. Some

of them study the food of birds; others their nesting habits; others still their migrations. By "migration," the ornithologist means "travels," though migration more exactly describes the journeys of birds than the word travel. Migrations are more regular and are made with a more definite purpose; while travels may be made at any time and to any place. So what is really meant by travel, as I have been using the word, is migration.

For many years I have been studying the migrations of birds. I have gone to their summer homes in the north and their winter homes in the south. I have seen them go and seen them come. I have been on little islands in the seas at which they paused for food, and on vessels in the ocean when they stopped to rest. With a telescope I have watched them flying at night, and while at the top of a lighthouse I have had the birds, blinded by the bright rays from the lantern, fly against me as they tried to continue their journey through the night. Then, of course, I have studied what other ornithologists

have written about this wonderful subject of bird migration. From what I have learned from them and from the birds themselves I propose now to act as the birds' historian.

I shall try to tell you how they prepare for the journey; how they find their way; when and where they go, and how they get there. And I shall be but a poor historian if I do not arouse in you so strong an admiration for these skillful voyagers of the air that you will give them a hearty greeting when they come in the spring and wish them good luck when they leave in the fall.

SUGGESTIONS FOR STUDY

Mention some of the bird travelers you have seen. When and where were they seen? Where had they been and where were they going? Were they traveling alone or in company with other birds? If in company, were their companions of the same or of different species?

What do you know about the seals of the Pribilof Islands? Are they the kind of seals from which "seal-skin" fur is obtained? Where else besides the Pribilof Islands do seals of this kind live?

Give some facts in connection with the migration of salmon; of shad. Name rivers up which these fish migrate. When do shad reach the vicinity of New York City in the spring?

What butterfly is known to migrate? In what countries are migratory or traveling locusts found? Describe a locust invasion. Are locusts injurious to vegetation?

In what part of the world are Penguins found? Do they live alone or in communities? How do they progress on land? In water? How many branches of ornithology can you define? In what way are birds indispensable to man?

II

PREPARING FOR THE JOURNEY

ALTHOUGH the bird traveler has no trunk to pack, guidebook to study, nor ticket to buy, still he must make some preparations for the journey.

The Warbler which nests in Alaska and passes the winter in northern South America, should not begin a seven-thousand-mile voyage through the air, over mountains, plains, and seas unless its engine is in good order and it has a proper supply of fuel.

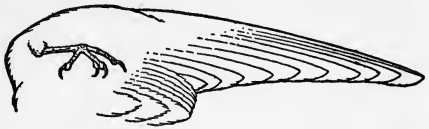
"But," you ask, "what is a bird's engine and where does it carry fuel?" A bird's engine is really its wings and the muscles which move them. It is one of the most perfect engines in the world. It is simple but strong. It works easily but is powerful, and it rarely gets out of order.

For many years man tried to make flying-

machines which would have wings like those of birds. But he never succeeded. He could not make even a feather! Finally he discovered that if he would make a machine that would fly, he must give it wings *and* an engine. So he constructed an aëroplane which has wide, stiff wings or planes measuring about thirty feet from tip to tip. These wings cannot be flapped, and, in themselves, they furnish no power. But to them man added an engine driven by gasoline and electricity. This engine turns a long-bladed propeller which urges the aëroplane forward, while the planes support it when it is in motion. But a bird's wing, we must remember, is both plane and engine. It gives support as well as power. It is therefore a far more remarkable machine than the one made by man.

Now let us see some kinds of birds' engines. Although they all work on the same principle they differ greatly in shape and size. We shall find that most birds which make long journeys have one kind of engine, while those that travel but little have quite a different looking engine.

Think of the Swallow's engine. It is quite as long as the bird itself; the feathers are stiff and strong, and when in motion they cut the air with graceful, sweeping strokes which send the bird forward easily but at great speed. A bird fitted with such an engine, we feel sure, could make a very long journey quickly and without

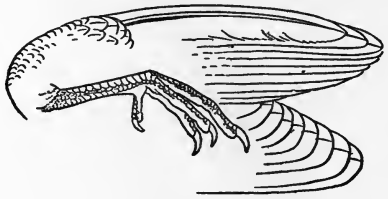


THE SWALLOW'S ENGINE.
The long wing and small foot of a Swallow, a bird that travels and feeds in the air.

tiring itself. So we find that the Barn Swallow, which glides and darts about our fields in summer, goes to Brazil to spend the winter.

Now let us see the engine of the Quail or Bobwhite. How short and round it is! And when the bird flies how rapidly it moves its wings—at least four times as fast as does the Swallow! The bird is so heavy, its wings so small that, although it can go swiftly, it is evi-

dently hard work for it to do so. It therefore makes but a short flight and soon drops to the ground again. So we are not surprised to find that Bobwhite spends his life near the place where he was born. He is no traveler. Most of the time he lives on the ground like a chicken.



BOBWHITE'S ENGINE.

The short wing and large foot of Bobwhite, a bird that stays at home and feeds on the ground.

And like a chicken he has large, strong feet, which not only carry him about from field to field in search of food, but can be used to scratch for it. He needs his engine chiefly to help him to escape quickly from some prowling fox or other enemy. He must go fast if not far.

If we should put Bobwhite on an island where there were no enemies to escape from and where

it was never necessary for him to fly, he might, in time, wholly lose the use of his engine and be unable to fly. Indeed this has happened to

GREAT AUK.

The Great Auk was flightless (note its small wings). It was therefore a stay-at-home among birds, and being unable to escape was killed by fishermen for its flesh, feathers, and oil. It is now extinct, none having been seen since 1842. Compare the Great Auk's "engines" with those of the Man-of-War Bird, figured on page 142.

some birds of the Rail and Gallinule family. They have lived so long on islands, where they never had to fly, that their wings have become

too small to raise them in the air. It is as though their engines had become rusty from disuse.

Not all the great bird travelers have such a splendid engine as the Swallow. Some, indeed, like the Sora or Carolina Rail, have such small wings that it is difficult to understand how they fly from Canada to South America. But we must remember that their bodies are light. It is not so much the size of the engine as the size of the train it draws that counts. The Hummingbird's wings are not much wider and longer than one's thumb, but they are large enough to carry the bird's tiny body over thousands of miles.

Everyone knows that birds' wings, or engines, are made of feathers growing from a very light but wonderfully strong frame of bones. Lightness and strength are indeed the main features of the bird's wing. But even the strongest feathers wear out. Then the engine must be repaired. No bird wears a suit of feathers longer than one year. The change is usually made in summer after the family has left the nest and learned to take care of itself. Then the old and worn

feathers drop out and fresh ones grow rapidly in their places. This is called molting.

If the feathers should fall out of one wing faster than they did from the other, the bird's flight would be unbalanced. It would be crippled, like an aëroplane with only one plane. Or if all the feathers were to fall out of both wings at once, the engine would be powerless. The bird could not get its food and it might fall a prey to its enemies. To prevent this, the bird's engines are repaired in the most wonderful way.

The feathers begin to drop from the middle of the wing; only two are lost at a time, and they are from exactly the same place in each wing. New ones at once sprout from the hole left by the falling feather. When they are about half grown, two more feathers are lost as before, one from each wing. These are probably the next feathers toward the outer ones. Again, the new ones sprout quickly. Now the third pair is lost; if the second pair fell from toward the outermost feathers, the third pair will fall from toward the body, or the innermost ones.

So the repair of the engine, or molt of the wings, continues. First a pair of quills from the outer half, then a pair from the inner. The process is slow, for it waits on the growth of the new feathers. But it never robs the engine of its power. At no time is there more than a pair of feathers missing from both wings. The wing is therefore always balanced and the bird can fly during the entire molt.

The molt does more than repair the engine. It may also disguise the bird traveler so that he can journey more safely. I say "he" because if a disguise is used at all, it is worn only by the male.

The brilliant male Scarlet Tanager replaces his fiery red body feathers with others of olive-green, like those of his mate, his wings and tail remaining black.

The Bobolink, as we shall see beyond, changes his costume of black, white and buff for an inconspicuous suit like that of his wife. Many other birds follow this custom. Why should they expose themselves to danger by wearing

gay colors when traveling? Or, at any rate, why should they don their courtship dress until the return of the wedding season the following Spring?

It is not until the molt is completed and the engine is in perfect order that the bird starts on its travels.

It only remains now to take the fuel aboard. This with birds is nothing less than fat. A runner training for a race tries to become thin. But many birds when preparing for a long journey put on a coat of fat. On it they live, to a greater or less extent, during the time of migration. If the bird can get food by the way, it is not necessary to carry so much with him. Swallows can feed as they fly. The Warblers and Vireos and other birds that fly by night can hunt insects during the day. But the Plover and other birds that travel over the seas cannot stop for meals. Like bears in winter they must live on themselves, that is, on their fat. When they start, their body is covered with a thick layer of fat, but when they arrive at their journey's end it

has disappeared. It was fuel for the engine.

Even the birds that travel overland, where food is plentiful, take some fuel with them. I have noticed when collecting and preserving specimens of birds in South America in the spring for the American Museum, that all the North American birds which were about to start on the long journey to their summer homes were very fat, while all the native birds, which were getting ready to nest, were practically without fat.

Still, there they were, living together; eating, probably, much the same kind of food. Why this food should make one bird fat and the other thin it is difficult to say. But we may be sure that in each case it was preparing the bird for the work it had to do.

SUGGESTIONS FOR STUDY

Compare a bird with an aëroplane. How does a bird's flight differ from that of an aëroplane? Mention some of the birds you know and describe the shape and relative size of their wings. Are they long and pointed; short and rounded; large or

small? Are they for long journeys or short ones? Count the number of wing strokes made by a flying bird in five seconds. Which makes the greatest number—long-winged birds or short-winged ones? What part does the bird's tail play in flight?

What can you tell about the bones of a bird's wing? Compare them with those of a man's arm and hand. Name the kinds of feathers attached to the wing and from which part each set grow (a chicken's wing might be obtained for this purpose). Name the parts of a feather. How are the feathers of the wing molted? What birds can you mention that wear differently colored costumes during the year? Compare their summer, with their winter dress. Do both male and female birds undergo this change in appearance? If the male differs from the female, which is the brighter? Why?

III

FIRST FLIGHTS

ONE of the best ways to prepare for a long journey is to make a short one. So we find that before many birds embark on their great air voyage which is to take them from their summer to their winter home, they first make daily trips between their sleeping quarters and their feeding grounds.

This is the habit of our Robin. Robins raise two and sometimes three families in one season. When the first family leaves the nest, early in June, it is taken by the father Robin to some dense, leafy growth of young trees to pass the night. To this place they return every night. Many other Robins, sometimes thousands of them, come to the same woods. Such resorts are known as Robin roosts. In flying to and from them the young birds learn how to find their way.

Meanwhile mother Robin is patiently sitting on her blue eggs from which in about two weeks' time another little family will appear. In two weeks more they also will be large enough to leave the nest and can join their brothers and sisters in the roost.

Grackles, or Crow Blackbirds, have the same habit. But since they have only one family, or brood, both the parent birds go to the roost with their young.

Sometimes the Robins are joined by the Grackles, and both by the European Starlings, which, brought to this country and released in Central Park in 1890, have since become one of the most abundant birds in our Middle Atlantic States. Such a roost is visited nightly by many thousands of birds. It is very interesting, at sunset, to watch them come streaming in from every point of the compass and to hear their good-night chorus before they all go to sleep.

In the morning they begin to leave soon after daybreak and by sunrise few are left. The place which was thronged by myriads is deserted.

Late in the afternoon they begin to return and ere long the roost is again teeming with feathered forms.

RESTING BY THE WAYSIDE.

Swallows prepare for their great journey by gathering in large numbers at way stations in the marshes on the line of travel. While waiting for the time to leave, they fly out over the country each day when we often see them resting on the wayside wires.

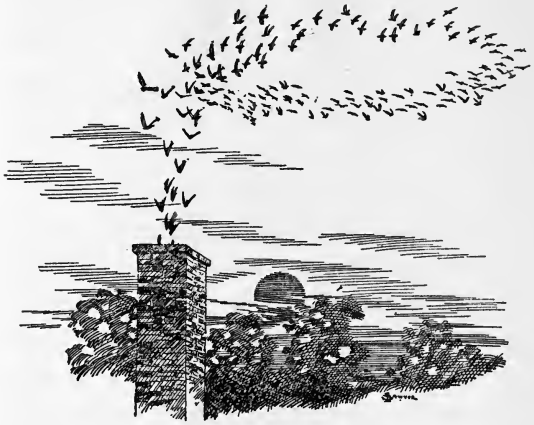
The little journeys of Swallows from their sleeping resorts to their hunting grounds begin in July and do not end until late September or

early October. Swallows sleep in the reeds or cat-tails which grow in vast marshes. There they are so hidden that you might pass very near them without seeing a bird. But suddenly, like an exploding firework which fills the air with sparks, they burst from their roost and there is a swarm of happy, twittering birds above you. A moment later they have gone, each one to hunt its breakfast.

At midday and in the early afternoon, one may see them resting in long rows on the electric wires. Late in the afternoon they begin to return to the marshes, darting for mosquitoes and other insects as they go. During the day they have flown far. Thus they gain the practice which makes them ready for the great journey to the South.

How they know when it is time to start, who can say? But that they all know it is certain. On that day all the Swallows which have been roosting within miles of one another rise up in the air together. From a distance they look like a snowstorm of great black flakes. There seems

to be much excitement. The great day has come! Soon they leave the marsh not to return until the following spring.



THE TRAVELERS' INN.

Migrating Chimney Swifts going to their roost. Thousands sometimes pass the night in the same chimney.

Chimney Swifts in their daily journeys scatter far and wide over the country. One may see a Swift coursing through the air here, and another there. But in the evening they all come racing in toward the chimney in which they are to pass

the night. Before this country was settled the Swifts nested and roosted in hollow trees. Now, as we all know, they use chimneys, and the roosting chimney is usually a large one.

The early arrivals do not enter the chimney at once. In fact no Swifts go to bed until practically all have come. Then they fly in a great, irregular troop around and around in the air over the chimney. Faster and faster they go, nearer and nearer they come to the chimney-top. Then, like a whirling column of smoke, a part of them pour into the chimney. The others go flying madly onward. Again they approach the chimney and another group of birds darts spirally into it. This performance is repeated until not a Swift remains outside. What a singular appearance the walls of the chimney must present at this time, with its hundreds and often thousands of soot-colored birds clinging to them! In the morning the Swifts leave in small parties, and at once separate widely over the country in search of food.

In southwestern Minnesota there is a small

lake, about five miles long and three wide, called Heron Lake. It is the favorite resort in the fall of the beautiful Franklin's or Prairie Gull. There are many thousands of them there and their daily journey from the lake to gather food out on the prairies is one of the most impressive sights I have ever seen in bird life.

The Gulls sleep near the center of the lake, all crowded closely together. They leave before sunrise. All rise at once and the air is then so filled with birds that one can scarcely see across the lake. Many drop back to the water, while others begin their day's wanderings. Again they all arise; a part take leave; those remaining return to the water, but within half an hour all have gone.

Some mornings they fly in one direction, on others in another direction. I think that they are apt to fly towards the point from which the wind blows. Their favorite feeding grounds are freshly plowed fields. Often they follow directly behind the plow, and it is a charming sight to see the snowy-plumaged birds hover over the

plowman and alight in furrows to pick up grubs exposed in the black earth. In this way they destroy many harmful insects.

The return to the lake begins late in the afternoon. At times they fly in even rows, perhaps half a mile in length but not more than three or four gulls deep. Or they may come home in V-shaped flocks with as many as seventy-five or one hundred Gulls in each arm of the V. But whether in long, billowy lines or even, flying wedges, the flights of the Gulls teach us in what an orderly manner birds perform these little journeys.

With the Robins, Grackles, Swallows, Swifts and Gulls, these daily trips to and from their sleeping quarters precede the real migration to their winter homes, where, in some cases, new roosts may be found and new flocks formed.

There are other birds which gather nightly in certain roosting places but which migrate little, if at all. Among these are Herons, which every evening gather in some marshy woods or thicket which perhaps has been used many years.

Crows flock together in great roosts in the winter. Some Crow roosts have as many as two or three hundred thousand tenants nightly. When the birds leave in the morning they fly low and search for food. When they return in the afternoon they fly high, heading straight for the roost. Hence the expression, "as the Crow flies."

Like the Chimney Swifts, Crows do not enter their sleeping place until practically the last bird has arrived. In the meantime they alight on the ground in near-by fields. As bird after bird returns and drops down among the others, the ground becomes black with Crows. I have seen several acres covered with them. They seem to have very little to say about their day's experience. It is almost dark before they go to bed. Then they arise from the ground and in orderly procession silently fly to their roost in the woods.

Beside these daily journeys to and from their sleeping place some birds, during the winter, wander about over land and sea. Their chief object in life at this time is to hunt for food, and

they go almost any place where it may be found.

So in the winter we may have visits from Crossbills, or Pine Grosbeaks. These birds feed on the seeds of cone-bearing trees. When there is an abundant supply of this kind of food in the Far North we see very few or none of them. But when the pines and spruces produce a small crop, then the Crossbills and Grosbeaks come to us in unusual numbers.

It is said that Herring Gulls have been known to follow a steamer across the Atlantic. They were not attracted by the steamer, we may be sure, but by the food which was thrown overboard from it.

The great Albatross ranges so far over the southern seas that it is called the Wandering Albatross. In the museum of Brown University there is a mounted specimen of a Wandering Albatross, which shows how well this name is deserved. When captured off the coast of Chili, on December 20, 1847, the bird had a small vial hung on a string about its neck. This vial contained a piece of paper, on which was written

the fact that the bird had been caught and the vial attached on December 12, 1847, by the captain of a whaling vessel when it was about 800 miles off the coast of New Zealand. The Albatross had therefore wandered about 3400 miles in eight days.

But if a bird is a migrant, its wanderings or its daily trips to and from the roost will end when the call comes for the great journey. Let us now see when this call will come.

SUGGESTIONS FOR STUDY

Have you ever seen birds go to roost? What kind of birds were they? Were they flying singly or in flocks? Where did they pass the night? When did they leave in the morning?

If you have ever found a Robin's nest, describe the situation in which it was built. What did it contain? Do you know whether it was a first or second brood? Have you ever seen a summer Robin roost? When do Robins begin to go to such a roost? If you have ever seen a European Starling, compare it with a Grackle. When was the Starling brought to this country, and where were the first-comers released? Is the Starling considered a de-

sirable bird? How do Swallows feed? What is their principal fare? What makes them among the most valuable birds to man? Have you ever seen a Chimney Swift's nest? Where was it placed? Where did these Swifts build their nests before there were chimneys in this country? Describe a Chimney Swift's nest. How do the birds gather the twigs of which it is composed? What is used to glue them together? Have you ever seen Crows flying over on a winter morning? Were they flying high or low? Have you seen them returning in the afternoon? At what height were they flying then? Why should they not fly at the same height both morning and afternoon? Have you ever seen Gulls following a vessel? Do you think the same Gulls followed it day after day? In what ways are Gulls useful to man? What famous poem mentions the Albatross?

IV

THE BIRDS' AIR LINE

BEFORE we knew as much about the earth as we do now, the complete disappearance of many birds in the fall and winter was considered a great mystery. With us one day, they were gone the next. Then, months later, they suddenly reappeared. Where had they been?

At one time it was thought that some birds flew to the moon. Others, particularly the Swallows and Swifts, were believed to fly into the mud and pass the winter hibernating like frogs; while the European Cuckoo was said, in the fall, to turn into a Hawk.

Why birds were ever thought to winter in the moon it is difficult to say; but that Swallows were considered to take refuge in the mud at this season is not so surprising. We have seen how these birds sleep in the reeds in the marshes.

Anyone finding them in bed, as it were, before they were fully awake in the morning, might be pardoned for thinking that they had just come out of the ground and were perched in the reeds waiting for their feathers to dry.

The belief that in the fall the European Cuckoo turned into the Sparrow-hawk of the same country is doubtless to be explained by the fact that the Cuckoo leaves for the south in the summer; while the Hawk, which it resembles in color, stays throughout the winter.

Now that we have explored nearly every corner of the earth, there are only a few birds whose "routes of migration," as they are called, are unknown. We have learned that these routes are followed just as regularly as though, like our highways and railroads, they could be seen.

The birds' air line, as we shall see, is not always the shortest distance between two points. It was not made in a day, or by one surveyor. Many, many years have passed since the first bird travelers on any one of the many air lines followed by birds began their spring and fall journeys;

and what was a good direction at one time may not have been at another.

HIGHWAYS AND HABIT

It seems to be a law among bird travelers that every bird must follow the route over which its parents flew. This the ornithologist calls "inherited habit." It is just as though children born in Arizona whose ancestors had emigrated across the continent from New York City should go to New York City over the route made by their father, grandfather, and great-grandfather, and perhaps great-great-grandfather.

The first part of this route over which their great-great-grandfather traveled may have led to what was then the western border of civilization at Pittsburgh. Then their great-grandfather, like a true pioneer, pushed onward to St. Louis. Here their grandfather was born, and when he became a man he emigrated to the great wheat-growing region of Dakota. In Dakota their father was born and when he grew up he moved to the copper mines of southern Arizona.

Perhaps these children may themselves emigrate to the forests of Oregon. Then what a zigzag journey they would make to New York if like birds they should be guided only by "inherited habit"!

Here comes in the difference between reason and instinct. Instinct would send our children from Oregon to Arizona, from Arizona to Dakota, from Dakota to Missouri, and finally through Pittsburgh to New York City.

Reason directs them to buy a ticket over the most direct railway line between Oregon and New York City, and they thus make their journey in the shortest possible time.

Let us see how many, many miles the Cliff Swallows of Nova Scotia might save if they were to buy a ticket over what we may call the short, Reason Route, instead of the long, Instinct Way.

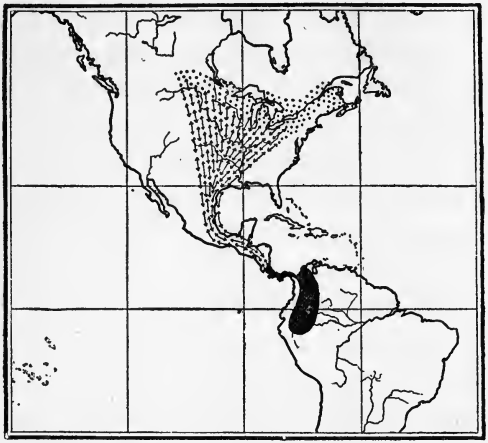
THE CLIFF SWALLOW'S ROUTE

The Cliff Swallow winters in South America and in summer is found over most of the United States, except Florida, and north to the Arctic

regions. If we look at a map we will see that Nova Scotia is directly north of Colombia in northern South America. The Cliff Swallows pass through Colombia on their northern journey. We might, therefore, expect them to follow one of the most traveled of birds' air lines. This leads across the Caribbean Sea and Gulf of Mexico and up the Atlantic coast through New England to their summer homes. But instead of going by this, the most direct way, they go westward through Panama, then northwest through Central America and Mexico. It is not until they reach Texas that they fly directly toward the place they desire to reach. They cross the United States by going up the Mississippi and Ohio Valleys, and avoid the southeastern states entirely.

Why is it that they thus travel two thousand miles more than is necessary? We can only believe that they are following the route made by their ancestors. The Cliff Swallow is a bird of the West. There it builds its singular, bottle-shaped mud nest under overhanging cliffs and

ledges. But in the East, where it is much less common, it places its close-set rows of mud tenements beneath the eaves of barns and other out-



THE TRAVELS OF THE MOURNING WARBLER.

Like the Cliff Swallow some Mourning Warblers travel from their summer home in Nova Scotia to their winter home in Northern South America through Texas, Mexico and Central America, instead of through Florida and the West Indies, a route 2,000 miles shorter. Dotted area—summer home. Black area—winter home. Arrows—migration route.

buildings. So it is probable that Cliff Swallows, or, as they are also called, Eave Swallows, have

come from the West to the East in recent times. In migrating, therefore, they go back over the old Instinct Way, or over the trail of their ancestors.

Long, roundabout journeys like this are the exception. I have spoken of them because they seem to explain better than more direct air lines how these wonderful highways, thousands of miles in length, may grow, little by little, from small beginnings.

MAIN TRAVELED ROADS

Now let us trace some of the more popular routes. If we were studying the travels of European as well as of American birds we should learn some of the most interesting facts. For instance, we should find that in flying from Europe to Africa birds cross the Mediterranean Sea at a point where the water is so shallow that it is believed the two continents were formerly connected there. The land bridge which, it is thought, formerly guided the birds in their flight has disappeared, but the

habit of crossing at this particular place still remains.

Though I do not know of any cases of this kind in America, we shall find equally interesting facts concerning the air lines of our birds. For example, how do you suppose the little Wheatear, no larger than a Bluebird, formed the habit of migrating from Africa to Greenland? Probably he comes by way of England and Iceland, but at the best it is a long journey and seems to take the bird much farther than it is necessary to go. In the fall he goes back to winter in Africa.

Doubtless some European waterbirds visit us every year, but the Wheatear, so far as I know, is the only land bird which migrates regularly between North America and Africa. With this exception no North American land birds leave the Western Hemisphere in their migrations. Their motto might be "See America first!" Certainly many of them see a large part of it.

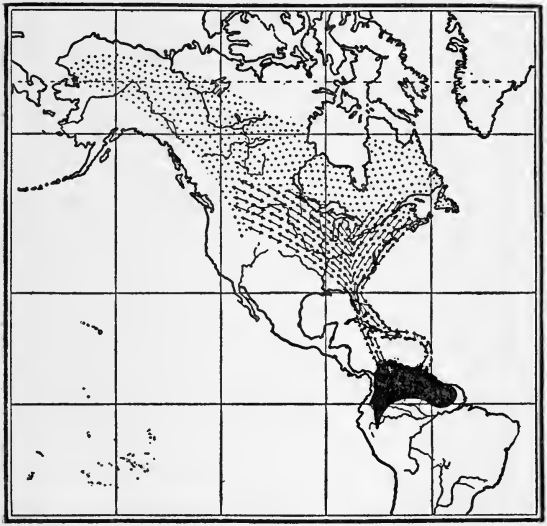
The birds of the western United States are not such great travelers as those of the eastern part

of our country. Some of them only travel from the higher parts of the Rocky Mountains or Sierras, where they nest, to the low, warm valleys in which they winter.

Those that leave the United States go into Mexico. Some continue their journey as far south as Guatemala, but few go farther. They all travel overland, and do not therefore encounter the dangers to which many of our eastern migrants are exposed.

It is surprising that most of the bird travelers of Alaska migrate to the eastern United States. Some of them actually go to their winter homes by way of Florida and the West Indies! But when we examine a map we find that a large part of Alaska is east of the Rocky Mountain system. These mountains, like a great wall, have prevented the western birds from crossing to their eastern side; while the bird pioneers from the East have found nothing to prevent them from taking up fresh claims until they reached this same great wall in the far Northwest. So far as birds are concerned, therefore, Alaska is

like a small United States. The birds that live west of the mountains, on what is called the Pacific slope, travel southward with other western birds. Those found east of the mountains



THE TRAVELS OF THE BLACKPOLL.

The Blackpoll nests as far north as Alaska and travels 7,000 miles to winter in Northern South America. Dotted area—summer home. Black area—winter home. Arrows—migration route.

travel southeastward and then join in the journeys of eastern birds.

This is the route the little Blackpoll Warbler follows in his seven-thousand-mile journey from Alaska to northern South America. There is no question about the straightness of his air line! He lays his course directly across Cuba to Jamaica and from Jamaica to Colombia in northern South America. That is a journey anyone might be proud of. What a marvel it is that it should be made regularly twice each year by a creature only five and a half inches long!

In their travels across the United States, birds seem to follow coast lines and river valleys. They must pass through a country which will supply them with food when they pause to rest. Even if they fly over us we cannot expect them to stop if we can offer them nothing to eat.

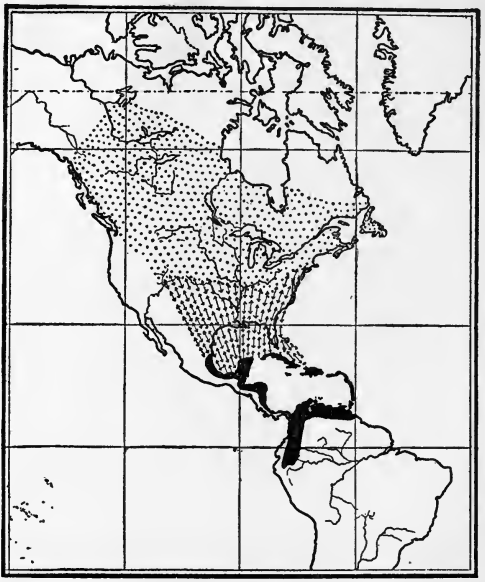
Near my home at Englewood, New Jersey, is a small ice pond. Sometimes the dam which makes it is raised and the water runs out. This happened once in August, a season when many

shore birds are migrating. When the pond was full I had seen none of these birds. But the very day that the pond became a field of mud, large numbers of Sandpipers of several species stopped to feast on the little aquatic animals which had been left stranded. So we cannot always tell what kind of birds may be traveling far overhead in the sky, unless we have some way of making them stop and call on us.

When we follow some of the more famous bird travelers in their journeys we shall become familiar with the routes they travel. Now we shall outline the routes of only those migrants which leave the eastern United States in the winter.

One route leads southward and southwestward into Texas and Mexico, Central and South America. Another does not enter Texas and Mexico at all, northwestern Florida being used as the port from which many birds embark on their seven-thousand-mile journey across the Gulf of Mexico to Yucatan, whence Central America is followed to South America.

A third route, which we have seen is used by the Blackpoll, passes from Florida to Cuba and thence to Jamaica and over the Caribbean Sea



THE TRAVELS OF THE REDSTART.

The Redstart nests over most of temperate North America and goes to and from its winter home in the West Indies and Northern South America by a number of routes. Dotted area —summer home. Black area—winter home. Arrows—migration routes.

to South America. A fourth leads from Florida to the Bahamas. A fifth, which is one of the most remarkable of any, crosses the Atlantic Coast from Nova Scotia to South America.

Some birds spend the entire winter at sea. Indeed they may never put foot on land except when they visit it to nest. Frequently in going by steamer to Florida or Cuba I have seen thousands of those little web-footed Snipe, the Red and the Northern Phalaropes. They were from fifty to one hundred miles off shore, riding the great waves like corks. Here they live from August until May, feeding on small forms of sea-life and sleeping in the "cradle of the deep." With them were many Loons. We think of these weird-voiced birds as solitary dwellers on woodland lakes, but off the coast of Virginia I have seen as many as 5,000 in a day.

The swallow-like Petrels which, during the summer, so often follow vessels in the North Atlantic, nest in February and March in certain islands in the Antarctic Ocean. When their young are reared they all travel northward to

spend what is really their winter off our coasts. Unless storms should blow them ashore, they probably never touch land from the time they leave their home in the Far South until they return to it.

SUGGESTIONS FOR STUDY

What bird travelers have you seen in their winter homes? When did they arrive? Where had they come from? How long did they stay? Do you know where any of our summer resident birds that come to us from the south in the spring spend the winter? Trace on the map a route from New York City to Oregon by way of Pittsburgh, St. Louis, South Dakota, Arizona, and Oregon. About how much longer is it than a direct line from Oregon to New York City? Trace on the map the route followed by a Cliff Swallow that winters in South America and nests in Nova Scotia. What European bird travels every year to eastern North America? Where do many of the migrating birds of the western United States spend the winter? Follow on the map the migration route of the Blackpoll Warbler. Trace on the map some of the principal migration routes of bird travelers of eastern North America. Mention some birds that spend the winter at sea.

Have you ever seen a Stormy Petrel? What is the origin of the name Petrel? Where do many of the Petrels nest that we see on the Atlantic Ocean during the summer? How does their "time-table" differ from that of a bird which nests in North America and winters in the Tropics?

V

THE BIRDS' TIME-TABLE

WHEN we consider the great distances some birds travel and the dangers they encounter by the way, it is remarkable that they usually arrive on time.

That the daily trips to and from the roost should be made regularly is not surprising. The birds have only a short way to go, and they leave soon after daybreak and return just before dark. But when, year after year, the Bobolink, the Baltimore Oriole, the midget Humming-bird, many Warblers and other birds arrive from journeys thousands of miles in length on exactly or nearly the same day, we ask how they can possibly be so prompt.

In order to answer this question we must know something about the birds' time-table. Anyone who has studied the birds about his home for many years can make a time-table giving the

dates of the arrival and departure of all the migratory birds which visit him.

In this time-table we will notice that the early birds—those which come in March—are much less prompt than the later ones—those which come in May. This is because the weather of March is so much more uncertain than that of May. In some years, near New York City, snow covers the ground and the ponds are frozen almost until April. In others, the snow melts and the ice disappears before the middle of March. But by May 1, the weather is more settled. The first week in May of one year is much like the first week in May of another year.

So it follows that the exact time of the arrival of the birds is more or less dependent on the weather. But it is not the weather which induces them to start. What can the Baltimore Oriole in Central America know about the weather near New York City? Not a thing. He leaves Central America without regard to the weather there or any other place. But his journey may be delayed by bad weather or hastened

by favorable weather. If, therefore, he finds the weather of one year much the same as that of another year, he is apt to reach the same place at about the same time year after year. Sometimes, encouraged by an unusually mild period, birds come so far ahead of their usual time that they are trapped by the sudden return of cold weather. Then, if they do not retreat, they may suffer for lack of food. I have seen Geese on the coast of Texas migrating northward in large numbers, urged onward by a warm wave.

The next day, to my surprise, they all came flying back. But the day following a severe "norther" suddenly arrived. The Geese had evidently encountered this storm and been driven back by it. Observations of this kind lead us to believe that birds are not such good weather prophets as they are commonly supposed to be.

The first birds to come in the spring are, generally speaking, the last ones to leave in the fall. In early March we look for Robins, Grackles, and Red-winged Blackbirds, and there

will be additions to the ranks of the Song Sparrows and Bluebirds that have passed the winter. These same birds will remain until November or even early December.

When the frost leaves the ground so that the Woodcock may probe for his favorite fare of earthworms, this great-eyed Snipe of the woods will appear; and he may stay with us until frost seals his hunting ground.

Almost as soon as the ponds, lakes, and rivers open, Ducks and Geese return, and, in the fall, many remain until they are actually "frozen out" by the ice which forces them to go further south.

Now none of the birds I have mentioned makes very long journeys. Robins, Grackles, Redwings and Woodcocks do not leave the United States, and the greater number of Ducks winter within our boundaries. In fact, all these birds may be found as far north as Virginia. Therefore, they are in the first rank of the vast army of birds which begins its northward march in the early spring. They may not start any sooner

than the Bobolink in southern Brazil, but they have a much shorter journey to make and so get here first.

THE BIRDS' PROCESSION

What a marvelous army it is! Four or five thousand miles separate the advance guard and

BIRDS AND SEASONS.

The Woodcock comes when the frost leaves the ground and he can probe for worms.

rear guard. Between them are untold myriads of migrant Flycatchers, Warblers, Vireos, Thrushes, and other birds. Some are already

under way, some are waiting the call to "fall in," but all in their proper season will take up the march and at their due date reach their destination.

THE ADVANCE GUARD.

Migrating male Red-winged Blackbirds. They are among the first birds to come in the spring, the males arriving before the females.

Let us take a position, say near New York City, and watch this vast army pass. If we were in Washington we should see it about a week earlier; while in Boston it would be a week later.

It is a joyous day when, early in March, we first hear the martial music of the Grackles and Red-wings, and the cheery salute of the Song Sparrow. Not a bud has broken, not a blade of grass grown. The birds bring us the earliest news that spring is near.

Soon we shall hear the fifing of the Meadow-lark and the musical whistle of the Fox Sparrow; while those who know its haunts may hear the strange twilight song and see the sky dance of the Woodcock.

Late in the month, when in some warm place gnats are floating in the sunlight, the Phœbe, earliest of Flycatchers, will be there to devour them. In early April the chant of the Field Sparrow, the bright, ringing notes of the Vesper Sparrow, and the gurgling, glassy call of the Cowbird will be added to the music of the feathered band. With them will be Chipping and White-throated Sparrows, Myrtle Warblers, Tree Swallows and Hermit Thrushes.

Thus far the army has advanced rank after rank in orderly array. All the birds in it have

come from their winter quarters in the southern United States, but about April 15, the Barn Swallow appears. He is the first bird to reach us from tropical America. Like an aërial scout he

SPRING'S FIRST FLYCATCHER.
The Phœbe comes when winged insects appear.

dashes ahead of the slower columns. A little later he is joined by the Cliff and Bank Swallows. Then, if we are so fortunate as to have Purple Martins as tenants, we may expect to

hear them chattering happily about the houses we have offered them as homes.

Some morning about April 25, when we open our windows to the warm sun rays, the House Wren will greet us with his merry little trill. He is bobbing in and out of a bird house—perhaps the very one he nested in last year.

A Catbird sings from the heart of a lilac bush, while from the topmost branch of some tall tree the Brown Thrasher, in loud, ringing notes, tells us that he is home again.

That evening we may hear the twittering of Chimney Swifts just back from Central America, and see their bow-and-arrow-like forms sailing overhead.

The army now is moving rapidly and with closed ranks. Company after company hurries by; others stop to camp with us. It is an exciting time for us on the lookout. Sharp indeed are the eyes and keen the ears that see and hear all that is to be seen and heard. Between May 7 and 12, when the migration is at its height, as many as one hundred and forty different kinds

of birds have been seen by one person on one day. This was at Oberlin, Ohio, a place through which many birds pass. For we have seen that there are certain lines of flight, or highways, which are followed by birds in their travels. On the Atlantic coast it is rare to see more than one hundred different kinds of birds in a single day during migration.

The first days of May will bring the Rose-breasted Grosbeak, Baltimore Oriole, and Scarlet Tanager, all famous colorbearers. Then we may look for the great Warbler cohorts. These active little wood-sprites are the most beautiful and the most numerous of any of the members of the great feathered army. Over thirty different kinds and an incalculable number of individuals will march by us. How few people know that every year we are visited by these gems of bird life! Although among the smallest members of the army, as a family they make the longest journeys.

The greater number spend the winter in the Tropics and the summer in northern New Eng-

land and Canada. But in spite of their size and the great distance they travel they closely follow the time-table. Generally it will tell us within a day or two when to expect them.

The Warblers form the rear guard of the army. After May 20, few migrants will arrive, and in early June only stragglers will be seen.

From the beginning, if we have watched closely, we have noticed several things. First, we have found that the male birds come before the female. Remember that all the Red-wings in the early March flocks had red shoulder marks; that the Grackles were all large and glossy; that the Cowbirds had brownish heads and shining bodies. When the male and female are alike in color and cannot therefore be distinguished, remember how often our attention has been drawn to a newly arrived bird by its song. Since the female rarely sings, we may safely say that any bird we hear singing is a male; and thus, even when he is colored like his mate, we know that the male is the first to come.

With the earlier birds the female does not

come until a week or ten days after the male. The male Red-wing, for example, returns to the marsh in which he and his mate lived the year before and calls his *kong-quer-ree* many times before she hears him and comes to choose a nesting place.

Then we will also see that while many birds march on to more northern homes others break ranks and make their homes with us. These the ornithologist calls "Summer Residents," while those that pass onward he calls "Transient Visitants."

By June 1, the invading hosts have taken possession of the country. Some have settled in the north; but from the Gulf of Mexico to the shores of the Arctic Ocean, no place is without some members of the great army.

Where, in the winter, all was silent, we now hear the sweet voices of many birds. How peaceful they seem as they build their nests and rear their young! But in truth they are valiant fighters; for this bird army has come to protect us from our insect enemies. All summer long

they will carry on constant warfare against the caterpillars, cut-worms, weevils, and other harmful insects, which, if they were not preyed on by birds, would destroy our crops.

RETURNING TO THE WINTER HOME

No sooner has the invasion ended than preparations for the retreat to winter quarters begin. We have already seen that in early June the Grackles and Robins drill their families for the great journey by daily trips to and from the roosting places. In July the young Swallows are given their lessons; and late in that month the Bobolink actually begins his southern migration. By August 20, the retreat is well under way and from that time until September 30, our woods are again thronged with traveling Warblers, Vireos, Flycatchers, and other birds. Most of them have changed the bright uniform of spring for a duller coat in which we may find it difficult to recognize them.

In October they will be followed by the Juncos and Tree Sparrows; and in November, if

food is scarce at the north, we may hope to see Crossbills, Redpolls, and even Pine Grosbeaks. All these late arrivals will stay with us until spring. By the ornithologist they are classed as "Winter Visitants."

Birds like the Golden Plover and Turnstone, that have to cross two thousand or more miles of ocean and are not believed to alight upon the water, cannot, of course, rest by the way. But the Warblers and other small birds that migrate chiefly over land evidently rest for several days after making an all-night flight. During this time they may travel a little by day, as they hunt insects from tree to tree, or if they have happened to come down into some small piece of woodland such as is found in city parks, they may remain in the same place until they are ready to continue their journey.

While they are waiting they may be passed by other birds of their own kind, and while these birds are resting somewhere on ahead they may in turn fly on ahead of them. An individual bird may therefore fly four or five hundred miles

in one flight, but because of these rests between flights the species to which it belongs does not make anything like this rate of speed.

Professor Cooke's studies for the Biological Survey at Washington have told us more about the speed at which the bird army advances than we knew before. Thus he has found that for the first month of their northward journey, Robins make an average advance of only thirteen miles a day. The next ten days they go forward at double this pace. Then, as the season becomes rapidly warmer, the rate rises to fifty, and soon to seventy miles a day. This increase in speed does not mean that the Robin flies faster but that its rests are shorter.

The same authority tells us that when traveling from the Gulf of Mexico to Minnesota, Blackpoll Warblers average only thirty to thirty-five miles a day, but before they reach Alaska they have raised this rate to two hundred miles a day. So while the journey of one thousand miles from the Gulf of Mexico to Minnesota takes thirty days, the two thousand five hundred

miles from Minnesota to Alaska is made in half that time.

Like flowers and trees, birds are closely dependent on the weather. How little change there is for weeks after the first skunk cabbage is seen, or the first pussy-willow blooms! Then, as the days grow warmer, the woods are suddenly filled with flowers and the trees thickly covered with leaves; and with these come the birds.

From this glance at the birds' time-table, we have learned that nearly every month in the year has its bird travelers. This is one of the reasons why the study of birds is so interesting. There is always something happening in the birds' world. Someone is coming or someone is going. We are continually greeting old friends or making new ones.

Will it not add greatly to our pleasure to know where they have been and whither they are bound?

SUGGESTIONS FOR STUDY

What is the first bird traveler you see in the spring? When does it generally arrive? Where

do you think it has passed the winter? At about what date does the Robin arrive? Does it come alone or with others? When does it become common? Do the first arrivals sing? Why should birds arrive with more regularity in May than in March? How does weather affect the migration of birds? Are birds good weather prophets? Where do most of the first arrivals come from? Where have many of the last arrivals spent the winter? Trace on the map the region occupied by the army of marching birds when the first ranks are passing the latitude of New York City. Mention some of the bird travelers of March; of April; of May. When do the Warblers come? When is the spring migration finished? What name is applied to those migrants which pass us to nest further north? To those which remain to nest with us? When does the fall migration begin? When is it concluded?

VI

THE DAY FLYERS

SOME birds travel only by day; others, only by night; while a smaller number travel both by day and night.

The day flyers are strong of wing. Many of them live in the open, in the fields or marshes and along the beaches. Or if their home is in the trees, they do not hesitate to leave them, and often make long flights in their search for food. All the birds which gather nightly in roosts, like Robins, Grackles, Swallows, Swifts, and Crows, are day flyers. Blue Jays, Waxwings, Bluebirds, many of the Finches, like Crossbills, Redpolls, and Snowbuntings, and even the tiny Humming-birds travel by day. "But," you may well ask, "why should not all birds travel when they have light to see the way, and sleep at night as they do when they are not migrating?"

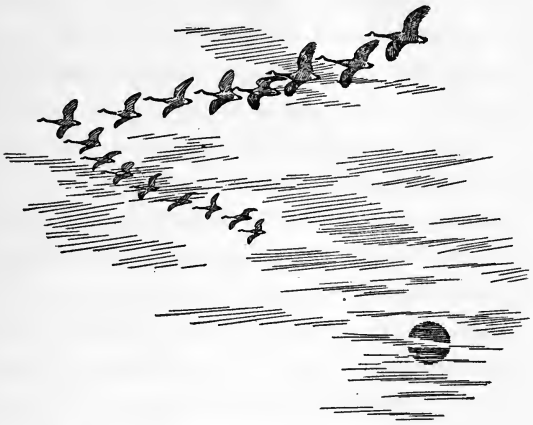
The answer is that only those birds venture

forth by day which can fly fast enough to escape from bird-killing Hawks. Not all Hawks prey on birds. Most of them live chiefly on mice. But Cooper's Hawk, the Sharp-shinned Hawk, and the Duck Hawk are all cannibals. Woe to the bird they chase, unless it is swift enough to outdistance them or escape to the nearest cover!

Ducks and Geese, most Snipe and Plover, and sea birds like Gulls and Petrels, travel both by day and night. They are among the birds which carry fuel for the engine and can go long journeys without stopping for a fresh supply.

Have you ever seen birds migrating by day? Sometimes it is difficult to tell whether passing birds are simply flying to or from the roost or whether they are actually embarked on their great journey. When, on some late summer or early fall afternoon, we see Swallows hurrying southward, we might well imagine that they were bound for their winter homes instead of their beds in the marshes. But when we hear the clarion honking of Wild Geese, and, looking upward, see the flying wedge cleaving its way

steadily and rapidly through the sky, then we know that we are seeing real bird travelers and we wonder where they have come from, where



THE FLYING WEDGE.
Migrating Wild Geese.

they are going, and how they can possibly find the way.

Then in the early spring, when the black flocks of chattering Red-wings and Grackles come and fly onward toward the north we know that they

belong to the army which soon will take possession of the land.

Robins usually migrate in scattered companies, or "loose flocks" as they are termed. Bluebirds have much the same habit but are perhaps even more scattered. When they are traveling one can hear their soft flight-note, *túrwee, túrwee,* all day long as bird after bird passes overhead.

Crows migrate much as they return to the roost. In March and October one may see single birds or groups of three or four flying rather high and as though they had an important engagement somewhere. Such flights may last all day, while the return-to-the-roost flight, we know, takes place only in the late afternoon.

Hawks also travel in this way. Some days in the fall one or more Hawks will be in sight from morning until evening, all flying in the same direction as though they were going to the same place.

In the spring, on the eastern slope of the moun-

tains of Vera Cruz, Mexico, I have seen flocks containing thousands of Hawks migrating northward. Although closely massed they did not move onward in a solid body like a flock of

HAWKS TRAVELING.

Hawks migrate by day and generally travel in scattered companies strung out through the sky. A "flight" may last all day.

Blackbirds, but, like a swarm of bees, circled about and among each other in a most remarkable and confusing manner. However, in spite of their wheeling they all passed rapidly northward and were soon out of sight.

Some years later, in March, in the same part of Mexico, I saw a flock of several thousand White Pelicans migrating northward. These great birds measure eight feet from tip to tip of their outstretched wings. Like the Hawks, their flight was not in a direct line, but in a series of intertwining loops. The sun shone on their snowy plumage, and against the background of blue mountains they made a sight of great beauty. They were as dazzling white as snowflakes in a squall, but unlike snowflakes their motions were as stately and dignified as those of dancers in a minuet. So, sweeping gracefully around each other, they, too, were quickly lost to view.

Why birds should travel in this manner instead of "as the Crow flies," I cannot say. It must at least double the distance they cover. We cannot believe they keep rounding up the flock to prevent any stragglers from being lost, for we have found in what scattered companies Hawks, perhaps of the same kind as those seen in Mexico, travel in the fall. Possibly these spring flights

may have something to do with the courtship customs of that time of year.

A PATHWAY IN THE AIR

It is most interesting to observe how closely widely separated flocks or groups of migrating birds follow the same invisible pathway through the air. I have seen Swallows flying northward in small bodies which followed each other at short intervals. The last ones to pass would be far out of sight before the next birds arrived, for they were flying not more than twenty feet above the earth; but each Swallow followed those that had gone before it as though guided by the marks of wing beats in the air.

In the same way I have seen Herring Gulls in the spring migrating over my home at Englewood, New Jersey. They were flying toward the northeast in flocks of fifteen to twenty birds and were about one thousand feet above the earth. At times several flocks could be seen at one time. Then several minutes would pass without any more Gulls appearing. But soon

another flock would come out of the southwest and follow as directly after those which were now several miles ahead, as though there were guideposts in the sky.

TRAVELING NIGHTHAWKS.
They migrate chiefly late in the afternoon and early morning.

Besides those day travelers which fly near enough to the earth to be seen, there are others which fly too far above us to be within range of our eyes. On September 30, 1894, an astronomer at Shere, England, was studying the sun through a telescope. Every few seconds, during

the ten minutes he watched, a bird was seen to pass slowly across his field. All were flying in a southerly direction; but with the naked eye not a bird could be seen.

Our ears really tell us more than our unaided eyes about the day flyers which are traveling far up in the sky. With nothing to turn them from their course, sound waves carry surprising distances either up from the earth or down to it.

Balloonists tell us how clearly they can hear voices of people who are almost indistinguishable. So we may hear the notes of passing birds which are traveling at too great a height to be seen. The mellow whistles of certain Snipe and Plover tell us that they are passing on the birds' air line when it is impossible for us to see them. But if we answer we may in time see a black speck in the sky, which responds to our call and finally circles close overhead.

On one occasion in Central Park, New York City, I heard the flute-like call of a Yellow-leg Snipe which was migrating high over the city. Perhaps he was calling to some companion in

the sky. Certainly there was nothing on the earth to attract him. But putting my fingers to my lips I whistled a loud imitation of his notes. Quickly he answered. I whistled again, and soon could see a black dot circling high above me. Larger and larger it grew, louder and more frequent became his cry, and within a minute, much to the surprise of the passers-by, the bird was flying anxiously back and forth just over my head. But unable to find the "bird" which had called to him, he soon mounted high in the air and continued his journey.

THE PASSENGER PIGEON

One of the most remarkable of day flyers was the Passenger Pigeon. At times several days were required for the migrating hosts to pass a given point. The procession stretched from horizon to horizon and was a mile or more in width. Often the sun would be obscured by the clouds of flying birds.

In 1808, Alexander Wilson, America's pioneer ornithologist, estimated that during a great flight

of Pigeons which he saw in Kentucky, 2,230,272,000 birds passed in four hours. Twenty years later they were still so abundant that Audubon wrote: "I have satisfied myself by long

A Famous Day Flyer.

Passenger Pigeons were once so abundant that during their migration in 1808 it was estimated 2,230,272,000 passed one place in four hours. Now there are none.

observation that nothing but the gradual diminution of our forests can accomplish their decrease." But Audubon did not realize the power of the market gunner unrestrained by law.

Forests we still have, but of the Pigeons not one remains.

SUGGESTIONS FOR STUDY

Mention some of the commoner day flyers. Have you ever seen any of them migrating? How far above the earth were they? Were they flying in flocks or singly? Which way were they going? Compare the habits of day flyers with those of night flyers. How do Crows migrate? Have you ever heard birds calling when they were at too great a height to be seen? Is it probable that birds migrate during the day at so great a height as to be out of sight? Do traveling birds answer the calls of others of their kind? What are the differences between a Mourning Dove and a Wild Pigeon? In what part of the country were Wild Pigeons once found; how many did Wilson estimate passed him in four hours? Did these birds nest in scattered pairs like Doves, or in colonies? How large an area is said to have been covered by a single nesting community of Wild Pigeons? How many nests have been seen in a single tree? What causes led to the extermination of the Passenger Pigeons? When was the last one seen alive in nature?

VII

THE NIGHT FLYERS

IT is difficult to believe that at times during the season of migration the sky at night is filled with birds from dusk until dawn. Onward they hurry through the darkness. If they see the earth below, it must be too dim to guide them on their journey. Still they find their way just as surely as do those birds which travel by day.

The day flyers, as we have seen, are hardy rovers which are used to the open and do not hesitate to venture far from cover. But the night flyers are the shy, retiring birds of thickets and undergrowth, which rarely go far from their own doorstep. Or, if they live in trees, their flight is usually only from tree to tree. The Thrushes, Warblers, Vireos, and small Flycatchers are all night flyers.

Most of the Snipe live along the beaches or

in treeless places, and, as we have learned, they travel by day. But that retiring member of this family, the Woodcock, lives in the dark, shady places and waits for the sun to set before he starts on his journey.

The Snipe and Plover of the open, with their long, pointed wings, need not fear Hawks when they are in the air. But the Woodcock, with his short, rounded wings, would have small chance of escaping if a bird of prey should give chase. For several reasons we know more about the travels of the night flyers than we do about those of the day flyers: first, because many more birds travel by night than by day; second, because practically all birds that fly by night are real migrants; third, because the night flyers seem unable to avoid the lighthouses in their way, and the number killed by striking these beacons erected for man's safety has given us a vast amount of information concerning birds that travel after dark.

By night as well as day our ears can tell us much about the number of birds that are passing

overhead. Indeed, during nights when many birds are flying, we can, from favorable places, such as high hilltops or cities in the birds' highway, hear their call-notes almost constantly. The hill brings us nearer the birds; and the city lights bring the birds nearer to us. Light seems to attract them as it does moths.

An ornithologist at Madison, Wisconsin, states that on the night of September 14, 1906, no less than 3,800 bird calls were heard from one place. The average was twelve calls for each minute. But at times so many calls were heard that it was evident the air above was thronged with birds.

Study the birds' time-table, and some night during the season of migration go out of doors and listen. You may hear the chirp of Warblers, the metallic *chink* of the Bobolink, the soft whistle of the Thrushes. Nothing I can write will make you realize more clearly how wonderful is the journey, through the darkness, of these small feathered travelers.

A NIGHT IN A LIGHTHOUSE

It would be a far more thrilling experience to pass a night in a lighthouse when many birds were migrating. Then you would see sights such as you never dreamed of. A lighthouse having what is called "a fixed white light" attracts many more birds than one that flashes, or revolves, or shows a red light.

When the Statue of Liberty was erected on Bedloe's Island in New York Harbor, it was at first fitted with a strong light which proved a deadly lure to many birds. While it was thus lighted I went with several other ornithologists one night, during the height of the fall migration, to spend the night on the island. Soon after dark we began to hear the calls of passing birds. The air seemed filled with them but they were flying too high to be attracted by the light. All was going well for the night flyers and they were making rapid time on their journey toward the south. But at eleven o'clock the sky became clouded. Distant thunder was

heard; soon it began to rain lightly. At once birds appeared about the light. At first there were only a few; but their numbers increased rapidly and within a few minutes there were hundreds of them.

From the feet of the great figure which holds in its hand the fatal torch, the birds, circling in the rays of light above, looked like a swarm of golden bees. In order that we might be among them, we climbed the long spiral stairway, which winds around and around inside the body of the goddess, until we reached her shoulder. Then we mounted the narrow ladder that runs through her up-stretched arm, and came out on the narrow balcony which surrounds the torch. Dazzling white pathways stretched out on every side into the blackness of the night.

The birds came from the north. We could first see them when they appeared at the end of the lane of light. There they paused for a moment. Then, as though drawn toward us by an unseen power, they would dart straight toward the lantern. Some hit parts of the statue or the

glass about the light, and two or three actually flew against us as we sat behind the low rail of the balcony. Others, more fortunate, passed onward and, so far as we could see, did not return.

In spite of the great numbers seen about the light, only about thirty hit it and none of these was killed. For every bird seen, thousands were heard passing. It was a scene of indescribable interest. We seemed to have torn aside the veil which hides the mysteries of the night and with the searchlight discovered some of nature's secrets. What a marvelous number of birds must be traveling when hundreds are killed at a lighthouse on a single night!

Before the first signs of day were visible the birds had disappeared from about the light. Tired and hungry, they now looked for food and shelter in some woodland. Surely at such a time New York City must seem a most unpromising place for breakfast. It is no wonder then that during the season of migration city parks should be filled with wing-weary travelers. From the

sky they must look like wooded islands surrounded by a sea of houses. So the migrating birds which in the country would be scattered over a wide area, in the city are all drawn to the only places where they may find trees to alight in and insects to eat.

THE NIGHT FLYERS THROUGH A TELESCOPE

It is surprising to look at a drop of what seems to be pure water through a microscope and find scores of little animals swimming about in it. It is even more astonishing to look into the sky at night through a telescope and see that countless numbers of birds are flying through it.

This can be done only when the moon is full or nearly full. Then it forms a background against which the birds are seen to cross between you and its bright, golden face. A small, or low-power telescope is used in order that all the moon may be in the field of the glass. In this way the background is made as large as possible.

At various times and places I have watched the night journeys of birds through a telescope.

One night in early September, near my home at Englewood, New Jersey, with a friend, I saw two hundred and sixty-two birds cross the moon between the hours of eight and eleven. Some

THE BIRDS IN THE MOON.

During the season when birds are traveling and the moon is full, or nearly so, with the aid of a small telescope the night flyers may often be seen crossing the face of the moon.

passed so quickly that they were mere blurs. They were evidently very near. Others were in sight for two or three seconds; the movements of their wings could be seen distinctly. They were undoubtedly a long way off and very high.

Now in order to realize what a very small part we saw of the birds that were traveling, we have only to compare the size of the moon with that of all the sky which we see when we look at the moon. Let us imagine that I could have seen just as well everywhere as I did in that long, narrow wedge of air which stretched from the telescope to the moon. What an amazing throng of birds I should have beheld, all hurrying down the air line to their winter homes!

If we knew exactly how far the birds observed were from us, it would be possible to tell how high above the earth they were traveling. Those that passed most quickly were, of course, the nearest and lowest. Probably they were flying at the height of those birds whose call-notes we can hear so plainly as they go over us. This, perhaps, may be anywhere between five hundred and one thousand five hundred feet. But calculations show that those which were farthest away were probably three miles above us. As we go upward from the earth we know that the air becomes thinner and that what is called its

pressure grows less. So it is much easier for a bird to travel at a height of two or three miles than near the ground. Beyond a certain height the air would become so thin that the bird could not live. Just how high this is we do not know; with man it is about five miles.

The tops of the highest mountain peaks in the Andes are nearly that height, but the great Condor soars easily far above them. On some of these same mountains small Flycatchers and Humming-birds live the year round nearly three miles above the level of the sea. Thus we know that at even this height the night flyers could travel comfortably.

MORE LIGHT ON THE NIGHT FLYERS

Few bird students have had a better opportunity to see birds on their night flights than was afforded Dr. Witmer Stone in Philadelphia. On the night of March 27, 1906, a great lumberyard in that city caught fire, and like a vast searchlight it showed the bird armies flying overhead. For at least several hours the feathered invaders

passed by steadily and at ten o'clock, when the flight was at its height, Dr. Stone estimates that there were two hundred birds in sight at once. "They flew," he writes, "in a great, scattered, widespread host, never in clusters. . . . Far off in front of me I could see them coming as mere specks, twinkling like stars, and gradually growing larger as they approached until their wings could be distinguished as they passed overhead. . . . Over all the illuminated area and doubtless for a greater distance beyond, they seemed about evenly distributed, those immediately over the flames glowing like coals of fire, those further away appearing silvery white."

Dr. Stone believes that most of the birds were Juncos and Sparrows of several kinds and the discovery of the partly burned bodies of some of these unfortunate night-flyers that had come too near the flames proved that he was correct.

SUGGESTIONS FOR STUDY

How do we know that birds travel at night? Why do some birds migrate only after dark? Men-

tion some birds which travel only at night. Have you ever heard birds calling at night? When? Where? Were they flying over? Were their calls answered? Where is Bedloe's Island? Who made the Statue of Liberty? By whom was it given to the United States? Have you ever seen bird travelers in city parks? Why should they visit them? Do you know of any parks in which feeding stands and baths have been arranged for the entertainment of bird visitors? In order to understand clearly how small a section of the sky can be examined through a telescope which takes only the moon in its field, draw on the blackboard a diagram representing the moon at one end, a telescope at the other. It is, of course, only through the narrowest part of this area, that nearest the telescope, that birds are visible. How many have been seen through a telescope in three hours? At what height can birds fly? Describe the observations of Dr. Stone.

VIII

THE TRAVELS OF THE BOBOLINK

THE Bobolink has come! What welcome news this is to the bird-lover! Once more the meadows will ring with his wild, tinkling, rollicking song. From a perch, or on fluttering wings in the air, he pours out his "mad music." When he begins to sing it seems impossible for him to stop until, like a music box, he has run down. A little rest, and he seems wound up again and ready to repeat the melody which has won him a place among our best songsters.

It is the first week in May and we have been expecting this black and buff musician of the pastures. He is as much a part of spring as the wild flowers or apple blossoms. We know almost to a day when he will come; just as we know when they will bloom.

The flowers and the trees have not left us.

They are only waiting for the warm rays of the sun to break forth into bud and blossom. But Bob has thousands of miles to travel and many dangers to escape before he can keep his appointment with us. It is a marvel that he is so rarely late.

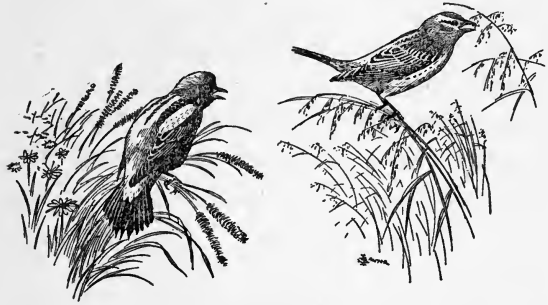
Where has he come from? How did he get here? Now that he is here the best way to answer these questions will be to go with him to his winter home. Then we can return with him in the spring.

BOB AT HOME

Within a month after his arrival Bob and his plainly dressed, sparrow-like wife will have chosen a home. So cunningly will they hide it on the ground among the grasses, and so wary will they be in going to and from it, that we must watch them closely and hunt carefully, if we would see the five or six heavily spotted eggs it contains.

In about two weeks these will hatch, and the first week in July the young Bobolinks will be

on the wing. All of them, whether brother or sister, following the law among birds, will look like their mother. Even Bob himself will now change his black and buff and white wedding dress for the streaked costume of his wife. It



THE BOBOLINK.
The left-hand figure shows his wedding dress; that on the right, his traveling suit.

has doubtless served its purpose by making him a handsome fellow in the eyes of his bride. But it has also made him easy to be seen by foe as well as by friend. Why, therefore, should he wear it until he again woos a mate?

It is even more important that the young Bobs should wear a protecting coat. So now we have

them all clad alike. In changing their plumage they have also changed their name. The Bobolink of summer has become the Reedbird or Ricebird of fall.

At this time the practice flights to roost in the marshes begin. The wild rice is approaching the milky stage and the birds gather in great flocks to feed on it. This fare not only gives them the only name by which many people know them, but it supplies them with fuel for the great journey they are about to begin.

Sadly enough it is this fuel—or fat—which makes the Ricebird so highly prized for food. Strange as it may seem, the much-loved musician of May is now hunted as though he were an outlaw. Thousands and thousands of these wonderful songbirds are killed by so-called sportsmen to eat. But surely there can be no sport in killing such small birds, while to kill them for food is just as unpardonable as it would be to make a potpie of Nightingales. Soon, let us hope, the law will forbid Bob's murder. Then perhaps

he may return to places from which in recent years he has vanished.

Long ago Bobolinks were common in summer about my home. To hear them singing was one of the delights of my boyhood. But it is years since they have nested there. Trapping in the spring and shooting in the fall are doubtless the reasons for their disappearance. What would I not give to bring them back again! The morsel which makes a mouthful when dead had within its tiny throat, when living, the power to give one weeks of pleasure.

THE JOURNEY SOUTH

On the Atlantic coast no Bobolinks nest south of Philadelphia. So when they are seen in Washington during the last week in July we know that they are already embarked on their great voyage to the South. They travel both by day and by night. The watchword is *chink,* a clear, metallic note which, once it is known, cannot be mistaken for that of any other bird. Often we may hear it from birds that are too

high to be seen. But our eyes are not needed to tell us that Bob is traveling.

The wild rice marshes of New Jersey, Delaware, Maryland, and Virginia have great attractions for the Ricebirds. It is not until the latter part of August that they reach Charleston, South Carolina. Great quantities of cultivated rice were once raised here on the coast. The Ricebirds' time-table seemed to be arranged so as to bring them to South Carolina just as the kernels of rice had reached the milky stage.

In clouds they swarmed on the plantation. If they alighted in the rice field its crop was soon destroyed. No effort was spared to keep them on the wing. Negroes were placed on platforms built in the fields. Some were armed with whips having long lashes; others had guns.

When a great flock of birds appeared the whips were snapped with a pistol-like report, guns were fired, the men shouted. Everything was done that could be done to prevent the flock from alighting.

So numerous were the birds that killing

seemed to make no decrease in their ranks. It was more important to frighten them than to kill them.

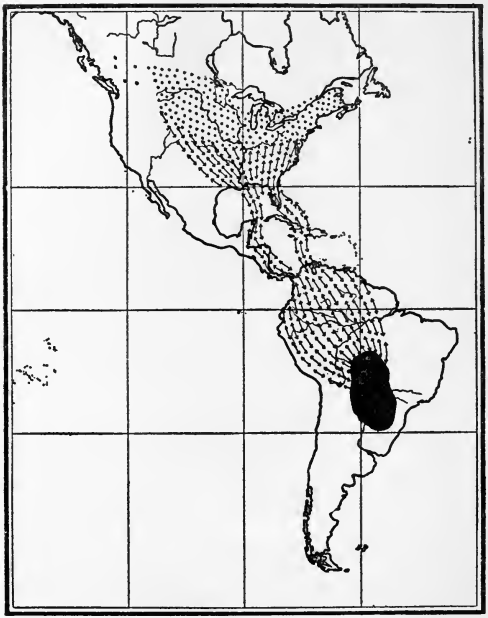
It must be confessed that Bob and his family did great damage to the rice crops. But he did equal harm to himself. His enemies, the gunners, accused him of being a pest. For this reason it has been impossible to have laws passed protecting the Bobolink south of the country in which he spends the summer.

From South Carolina the Ricebirds continue their journey southward through Florida. Then they cross directly to Cuba, where they arrive in September.

Still the birds fly southward. Some may fly directly across the Caribbean Sea to Colombia, a journey of about 500 miles; others follow the coast of Central America. Many stop for a while in Jamaica. They reach this island in October, and because of their fatness are called Butterbirds.

Whether some Ricebirds fly all the way from southern Cuba to northern South America we do

not really know. But beyond question they must fly from Jamaica to the mainland of Central or



THE TRAVELS OF THE BOBOLINK.

Some Bobolinks nest west of the Rocky Mountains, but all Bobolinks leave the United States from the Southeastern corner when traveling toward their winter home in Southern Brazil. Dotted area—summer home. Black area—winter home. Arrows—migration route.

South America. This is a journey of not less than 400 miles. Probably the birds make it in one night.

One might think that having reached South America the Ricebirds would find suitable winter quarters on the great savannas of Venezuela and Colombia. But still the way leads southward. Down the Andes they go; over the great tropical forests, across the Amazon, beyond the campos of Brazil to the great plains and marshes on the upper waters of the Paraguay River. Here they are all crowded into a region not more than one-third as large as that in which they live during the summer.

We have been following the Bobolinks of the North Atlantic states, but the Bobolink's summer home stretches across the continent from the Atlantic almost to the Pacific.

It is a pleasure for us to know that if Bobolinks have been becoming rare in some parts of the eastern United States they have been growing more common in some western states.

Bob is a true pioneer. He has followed the

farmer to the West. When irrigation turns the desert places into fields of grain and alfalfa, the Bobolink in time appears. In recent years he has crossed the Rockies to Utah and Nevada and British Columbia. But like the children that might have gone from Oregon to New York by way of Dakota and St. Louis, Bob goes to his winter home in Brazil over the route which his ancestors gradually opened.

Bobolinks are practically unknown in Texas and Mexico. So we know that even the Bobolinks of Nevada and Utah leave the United States by way of Florida. There they probably join others from the eastern states and journey with them to South America.

THE RETURN IN THE SPRING

The winter is passed with no household cares. It has sometimes been supposed that birds might rear a family in their winter as well as in their summer home. But this is not so. No bird, so far as I know, nests in two widely separated places.

The return journey is begun in early March when Bob's summer home is still icebound. But before leaving Bob again completely changes his clothing and puts on a curious-looking costume of dark, dull yellow, with bits of black showing in places. The truth is that he really has on his black, buff, and white wedding dress. But almost every feather of it is fringed with dull yellow. It is as though he wore a traveling coat. As he goes northward the fringes slowly wear off, as if he were losing a disguise. By the time he reaches his summer home they have all gone and Bob shows his true colors.

In the spring Bobolinks follow backward over the route they used in the fall. Then young and old, male and female travel together; but now the males go alone, some days ahead of the females. They reach Jamaica and Cuba early in April.

About April 15 they arrive in southern Florida and some of them remain in the state until May. For this reason they are called May-

birds. Few people who use this name know that they are giving it to the same bird they called Ricebird in the fall.

While in the South the Bobolinks remain in close flocks, like Red-winged Blackbirds. Like the Red-wings they sing in chorus. Multiply the song of one Bobolink one or two hundred times and you may have some idea of the music a whole flock of Bobolinks can make.

Although the last Bobolink does not leave Florida until late in May, the advance guard reaches Washington the last week in April. May 1 they are due at New York, and a week later at Boston.

The Bobolinks of northern New England and New Brunswick have been traveling for two months over a route about four thousand miles long, and they make this great journey twice a year to spend but little more than two months on their nesting grounds. But in this short time they can rear their families. This is what they come for. Why, then, should they stay longer?

SUGGESTIONS FOR STUDY

Have you ever seen a Bobolink? When? Where? Describe the colors of the male and female in the spring; of the male in fall and winter. When does the Bobolink reach your latitude in the spring? Describe the Bobolink's call-note; his song. Where does the Bobolink place his nest? When do the young take wing? Is there a second brood? Outline on the map the area in which Bobolinks are found during the summer. By what name is the Bobolink known in the fall? When does the fall migration begin? By what is it preceded? Trace on the map the route followed by a Bobolink in traveling from Massachusetts to its winter home. When does it reach Jamaica? How far is it from Jamaica to the nearest part of the coast of South America. What has induced the Bobolink to extend its summer range westward? Trace on the map the route of a Bobolink in traveling from British Columbia to its winter home. Why does it not go southward overland through Mexico?

IX

SOME FAMOUS BIRD TRAVELERS

SURPRISING as are the travels of the Bobolink there are other birds which make even more wonderful journeys.

When we see how in our own time the Bobolink has gone West with other pioneers, we can to some extent understand the manner in which it may have learned the way from its summer to its winter home.

But when birds migrate regularly to and from islands which are hundreds or even thousands of miles from the nearest land, we are at a loss to explain how they can have learned to make so long a journey over seas with no place to rest between the ports.

MIGRATION TO THE BERMUDAS

One February when I was sailing to the Lesser Antilles, about midway between the Bermudas

and Porto Rico, we passed a beautiful, snowy-plumaged Tropic Bird. The bird was headed northwest toward the Bermudas, was flying rapidly, and seemed to pay no attention to our steamer.

Doubtless he was hurrying to join the hundreds of his kind which every year, late in February, go to the Bermudas to rear their young.

Now this little group of islets is about six hundred miles from the most northern of the Bahamas and the same distance from the coasts of South Carolina and Nova Scotia. On every side it is surrounded by water of great depth and there is no reason to believe that there ever was any land nearer to it than those places which I have mentioned.

So the Tropic Birds which every February go to the Bermudas could not have learned the route little by little, as the Bobolinks have crossed the continent. There was no halfway house. The first journey had to be made just as the latest ones are, in one flight.

We cannot believe that the first Tropic Birds

to reach the Bermudas deliberately set out like explorers to discover new worlds. Perhaps, like Columbus, they chanced to land upon the Bermudas just as he did in the Bahamas. We may also suppose that, finding plenty of fish to live on and holes in the coral rock to nest in, they stayed, laid their one egg, and raised their downy white chick. When it could join them they returned to the West Indies whence they had come.

Possibly the parents never flew back to the Bermudas but the chick, prompted by that love of the land of his birth which plays so important a part in bird migration and which we shall speak of later as the "homing instinct," may have flown back to the Bermudas the following year. "How could he find the way?" is a question which I will try to answer in a later chapter. That his offspring do find the way, their return in hundreds every February clearly proves.

The Tropic Bird is not the only migrant which each year visits the Bermudas. Certain shore birds frequently stop here and, among land birds,

the Kingfisher, Yellow-billed Cuckoo, Bobolink, and Water-Thrush are sometimes found during the fall migrations.

The course of these smaller birds after leaving the Bermudas is unknown to us. Possibly they may head due south for Porto Rico, or they may go southwest toward the Bahamas.

I have wondered whether it was a flight of birds from the Bermudas to the Bahamas that Columbus so fortunately saw when his discouraged sailors were about to mutiny if he would not turn back home. On October 3 of that eventful year Columbus records that they were uttering "murmurs and menaces," but on the following day they were visited, he writes, "by such flights of birds, and the various indications of land became so numerous, that from a state of despondency they passed to one of confident expectation."

Finally, on October 7, birds became so abundant, all flying toward the southwest, that Columbus changed his course to follow them. So we see that it was due to the migration of

birds not only that Columbus landed in the Bahamas instead of on the Florida coast, but perhaps that he landed at all.

MIGRATION TO HAWAII

If we think the Tropic Bird's flight of at least six hundred miles across the sea to that little dot which marks the Bermudas on maps of the Atlantic, remarkable, what shall we say of the birds which every year visit the Hawaiian Islands?

These islands are said to be farther from a continent than any other part of the earth's surface. From California on the east and the Aleutian Islands on the north they are distant two thousand miles, while Japan is even farther away. Nevertheless these islands are the regular winter resort of great numbers of Golden Plover, Turnstones, Tattlers and Curlew, all of which are believed to rear their young in Alaska.

Here, then, we have an over-sea journey more than three times as long as that to the Bermudas; and furthermore it is made to a winter, not a summer home.

Unless what is called the "homing instinct" acts in the fall as well as in the spring and thus leads birds year after year to the same place in winter just as we know it does in summer, I can give no reason for the return of these birds each autumn to this remote group of islands.

Whatever may be the true explanation of the origin and cause of this journey, it is in many respects the most marvelous of all bird travels. Perhaps the Golden Plovers of the Atlantic may fly just as far without resting as those of the Pacific, but if they are overtaken by storms there are numbers of islands scattered along their route, or they may reach the mainland.

But when the Golden Plover starts on his journey to and from Hawaii he has at least two thousand miles of water to cross without one single place in which he could take refuge from a storm.

For a true sea bird like a Petrel, or a Sea-snipe like the Phalarope, such a journey would be an easy matter. When they were tired they would simply drop down on the water, tuck their heads

under their wings, and thus "ride out" the most violent gale.

But the Plover is believed rarely if ever to rest upon the water. Once under way he must keep on flying until he reaches his desired haven, or falls exhausted into the sea.

Just how long it takes the Plover to fly two thousand miles no one knows, but Mr. Henry W. Henshaw who has made a special study of the migration of this bird gives us an estimate of the probable speed at which it travels. He thinks that Plovers can easily fly fifty to seventy-five miles an hour, and believes they can travel at the rate of about forty miles an hour for the entire journey. At this pace the birds would cover nine hundred and sixty miles a day, and if they steered a true course they would go from the Aleutian Islands to Hawaii in just two days and two hours.

During this time they are without either food or rest and we may well believe that when they land they are not only very tired but very hungry birds.

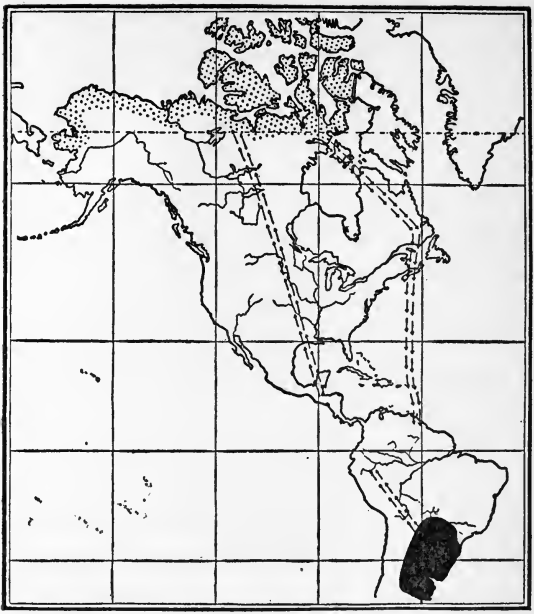
A TWO THOUSAND FOUR HUNDRED MILE FLIGHT

The Golden Plovers that nest on the shores of the Arctic Ocean spend their winters far from those that nest in western Alaska and pass this season in Hawaii.

The young Plovers are born in June, and in July, when they are large enough to fly, they all go to the coast of Labrador. Here, by feasting on crowberries, they become very fat, and thus store fuel for the long voyage which lies ahead.

From Labrador they cross the Gulf of St. Lawrence to Nova Scotia and then strike out across the ocean for northern South America, two thousand four hundred miles away.

If the weather is fine they are seen passing over the Bermudas and Lesser Antilles. But if the conditions are unfavorable they may rest on these islands or they may seek refuge on the mainland. When they reach northern South America they still have two thousand seven hundred miles to go before they arrive at their winter quarters in



THE TRAVELS OF THE GOLDEN PLOVER. (After Cooke.)

This Plover leaves North America from Labrador and starts on a 2,400 mile flight across the ocean to Northern South America; but in the spring it goes back to its Arctic summer home overland through Central America and the Mississippi Valley. Dotted area—summer home. Black area—winter home. Arrows—migration routes.

Argentina, nearly eight thousand miles from their nesting ground. Here they remain for about four times as long as they do in their nesting resort before beginning their northward journey.

The path they select in the spring makes the Golden Plover's migration route one of the most puzzling things in bird migration. They do not return to the Arctic Regions over the road by which they came from them, but take a wholly different course. This leads them first to northwestern South America whence they go through Central America, or over the Caribbean Sea to the Gulf of Mexico. They then cross the Gulf, migrate up the Mississippi Valley, and finally reach their Arctic summer home through British America.

There are other birds which have a double route. For example, the Connecticut Warbler migrates northward up the Mississippi Valley, and southward along the Atlantic coast.

The Black Tern evidently follows a similar course. In the spring it is rarely seen on the

North Atlantic coast but from August to early October it is not uncommon there.

How can we explain these double migration routes in which a bird goes south one way and returns another?

Here there is no gradual advancing followed by retracing of steps, generation after generation, as there has been, for example, with the Bobolink. These birds never go back by the route over which they came, and how they have learned either to go or come I am sure I do not know.

THE WORLD'S CHAMPION MIGRANT

What Professor Cooke well calls the "world's migration champion" is the Arctic Tern. This bird looks much like the common Tern which was so nearly exterminated by milliners' collectors not many years ago, but, thanks to protection on its nesting grounds, is now becoming more numerous.

The Arctic Tern nests from the coast of Maine northward to the very northern limit of land and

it winters along the borders of the Antarctic Continent. The distance between its summer and winter home is, therefore, about eleven thousand miles. This means that one bird flies nearly half-way around the earth and back each year. This great journey is made by thousands of Arctic Terns; but in spite of their numbers and the length of their route, few ornithologists have ever seen them traveling, and no one knows just what route they follow. On the Atlantic coast they have been seen south of their nesting ground but once. So it seems probable that, like the Golden Plover, they migrate far out at sea.

Professor Cooke calls attention to the interesting fact that the Arctic Tern "has more hours of daylight than any other animal on the globe. At the northern nesting-site the midnight sun has already appeared before the birds' arrival, and it never sets during the entire stay at the breeding grounds. During two months of their sojourn in the Antarctic the birds do not see a sunset, and for the rest of the time the sun dips only a little way below the horizon and broad daylight

is continuous. The birds, therefore, have twenty-four hours of daylight for at least eight months in the year, and during the other four months have considerably more daylight than darkness."

What wonderful lives these famous bird travelers live! Almost constantly they are on the go. The scene is ever changing. Here today, they are hundreds of miles away tomorrow. Once the brief nesting season is over they are free for the rest of the year and in their winter homes may wander whither the fare is most to their liking. But we must not forget the dangers to which their long journeys expose them. Thousands fall by the way; and of those that leave us in the fall possibly not more than half return the following spring.

SUGGESTIONS FOR STUDY

Where are the Bermuda Islands? How far are they from the nearest land? When were they discovered? To whom do they belong? What bird travelers visit them? Where are the Bahamas? When and by whom were they discovered? What part did birds play in their discovery? Where are

the Hawaiian Islands? To whom do they belong? How far are they from the nearest land? What birds visit them in winter? Trace on the map the migration route of the western Golden Plover. At about what rate of speed is it believed to travel? At this rate, how long a time would it require to fly from the Aleutian Islands to the Hawaiian Islands? Trace on the map the route of the eastern Golden Plover in traveling from its summer home to its winter quarters; and in returning. In what respect is its journey remarkable? Mention some other birds which have a double migration route. Trace the route followed by the Arctic Tern.

X

THE DANGERS BY THE WAY: A CHAPTER OF ACCIDENTS

"HOVEL" is the name by which the farmers near my home called a certain kind of barn in which hay was stored. The entrance to the loft was through an opening large enough to admit a pitchfork full of hay. There was no way of closing this opening except by hay, which, after a good crop, sometimes filled it. But ere spring came most of the hay had been fed to the cows which slept beneath the hovel, and then the doorless doorway was hospitably open to the Barn Swallow.

Few hovels were without them; joyously, freely they darted in and out. One which I used often to visit had no less than twenty-two Swallows' nests built bracket-like on the face of the rafters or supported by various projections.

At the proper time practically every nest

would be overflowing with young Swallows, which, in this snug retreat, seemed to be removed from the many dangers which beset nestling birds.

So each season, beside the forty-odd old birds, some eighty young ones probably left this hovel to join others of their kind on the great journey to the tropics. But the following spring only forty-odd birds returned to the loft. What became of the others?

There were no colonies of Barn Swallows near by; nor, so far as I know, were any new ones started. Furthermore, in spite of their safe, well-protected nesting places, Barn Swallows did not seem to increase in the neighborhood.

So I could tell you of other bird communities with which I am familiar. Year after year many more birds leave in the fall than return in the spring; and we may well ask why so few come back.

Birds, of course, like other animals, are mortal, and each year a certain proportion of them die, but we must find other causes than death

from old age if we would account for the heavy toll which each year demands of bird life; and chief among the causes are the dangers to which migrating birds are exposed.

BIRDS AT SEA

I do not think that I have ever made an ocean voyage during the season of migration without having bird travelers come aboard the steamer.

Sometimes, when we crossed their regular line of flight they visited us for only a short time, like the Curlew mentioned in a later chapter, which took passage with us for Ireland but decided to continue the trip alone. I remember, too, a Northern Water-Thrush which, early in May, flew aboard our steamer when we were in the Gulf of Mexico about midway between Tampico and Key West and, therefore, on the birds' highway from Yucatan to the United States. It seemed in no way tired but moved about freely and fearlessly. Finally it entered the captain's cabin, hopped about on the charts as though it

were making an observation, and then it disappeared.

On another occasion, this time in the fall, a Myrtle Warbler flew aboard a great Atlantic liner just after it left New York Harbor.

Although the steamer's larder was stocked with every variety of food the most exacting passenger could demand, no provision had been made for Myrtle Warblers. The bird made its headquarters in the smoking cabin—surely a strange choice—and in this emergency the passengers who gathered there devoted their time to hunting and catching flies for the little feathered stowaway, who soon became so tame that he readily took food from one's hands.

But not all feathered waifs are so fortunate. Sometimes they themselves become food for larger bird passengers, and Gerald Thayer tells of a Chuck-Will's-Widow which he saw catch and swallow Warblers that were following a steamer off the Carolina coast.

Even in clear weather birds may lose their way and perish at sea, and when they encounter

severe storms they are wrecked in untold numbers.

A naturalist who chanced to observe such a disaster on the Gulf of Mexico describes it as follows: "April 2, 1881, found me in a small schooner on the passage from Brazos de Santiago, Texas, to Mobile, Alabama. At about noon of that day the wind suddenly changed from east to north, and within an hour it was blowing a gale; we were now about thirty miles south of the mouths of the Mississippi River, which would bring the vessel on a line with the river and the peninsula of Yucatan. Up to the time the storm commenced the only land birds seen were three Yellow-rumped Warblers that came aboard the day previous, keeping us company the most of the day; but within an hour after the storm broke they began to appear, and in a very short time birds of various species were to be seen in all directions, singly and in small flocks, and all flying toward the Mississippi River. These birds, of course, must have been far overhead and only came down near the sur-

face of the water in endeavoring to escape from the force of the wind. By four o'clock it had come to be a serious matter with them, as the gale was too strong for them to make any progress. As long as they were in the trough of the sea the wind had very little effect on them, but as soon as they reached the crest of the wave it would catch them up and in an instant they were blown hundreds of yards back or else into the water and drowned.

"A great many flew on to the deck of the vessel to be washed about by the next wave that came over the side. Although I made no attempt to count the number of specimens that came aboard, I should estimate them at considerably over a hundred, and a great many more struck the sides and tumbled back into the water. It was very sad indeed to see them struggling along by the side of the vessel in trying to pass ahead of her, for as soon as they were clear of the bows, they were invariably blown back into the water and drowned. Most of those that came aboard were washed into the sea again, but the next day we

found about a dozen dead bodies that had lodged underneath the galley."

When crossing the Great Lakes migrating birds are sometimes overtaken by a storm and before they can reach land are beaten to the water by thousands. Probably only a part of those so drowned are washed ashore, but Mr. H. W. Henshaw states that after a heavy storm in early September on Lake Michigan the shore of the lake was so thickly strewn with the bodies of dead birds that if they were as numerous on the whole eastern shore as they were on the part of the shore he examined, over half a million birds must have drowned and washed ashore in this one storm.

STORM BOUND TRAVELERS

It is not only when migrating over water that birds are killed by storms. Mr. H. P. Attwater writes from Rockport, Texas:

"Thousands of Warblers undoubtedly perished here last week during the 'norther' which lasted three days commencing on March 16.

"In the evening of that day flocks of Warblers were noticed around the gardens and houses here, and the next day many were found dead or were caught in a half-perished condition. About fifty per cent of them were Black and White Warblers. The remainder were about equally divided between Parulas and Sycamore Warblers. Many Sycamore Warblers and Parulas were captured alive in the houses.

"On the 19th, among many dead Warblers which were brought to us were a specimen of the Louisiana Water-Thrush and one Hooded Warbler. Many Yellow-rumps were in company with the rest, and, though much tamer than usual, none was found dead or was captured. On the 19th I made a trip for the purpose of observation, and found many Black and White Warblers and Parulas lying dead on the ground at the foot of live-oak trees. From many of the ranches in the country round here, came reports of similar occurrences and many dead birds of the species mentioned have been sent to me."

Longspurs are hardy birds of the Far North and no doubt can endure most severe weather. But on March 13, 1904, when Longspurs were migrating northward in great numbers through western Minnesota, they encountered so heavy a snowstorm that, becoming exhausted and confused, they perished in vast numbers. In places the surface of the snow was thickly dotted with their bodies and a careful survey of the storm-swept region through which they were passing showed that several *million* Longspurs died on this one night.

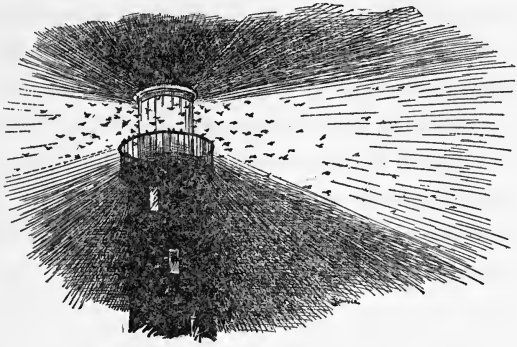
THE LURE OF THE LIGHTHOUSE

It would be pleasant to think that man could in some way free the path of migrating birds from danger, or that they might find refuge from the storm with us. But, sadly enough, man has added not a little to the perils of their journeys.

Telegraph wires, tall buildings, and electric lights all prove fatal obstacles in the birds' highway, while the lighthouses which have been

erected to warn man of danger or guide him to safety yearly lure many thousands of feathered voyageurs to their death.

The night I passed in the Statue of Liberty,



THE NIGHT FLYERS' BEACON OF DANGER.

Lighthouses, particularly on cloudy, stormy nights, attract migrating birds as a candle does moths, and many are killed by striking the lenses that surround the light, or some part of the lighthouse.

of which I have already written, although many birds fluttered into the statue none was actually killed or badly injured. Migrants do not always escape this great monument so easily, and on many mornings after a stormy night in the season

of migration, hundreds of birds have been found dead or dying about the base of the statue. Fortunately it is not now so brilliantly lighted as it was when first it was erected, and is therefore not so destructive to the winged travelers.

But real lighthouses do not dim their beacons. The more powerful their light the greater their value to man and their danger to birds. Placed in exposed, conspicuous places they seem to be especially designed to destroy migrating birds. There is not a lighthouse along our coast which has not its ghastly record of birds killed, but some of them seem to do much more harm than others.

A naturalist who spent a misty October night in the lighthouse on Cape Hatteras tells of seeing thousands of small birds flying around the tower at one time; he writes: "The whole element was ablaze with them shining in the rays of the light like myriads of little stars or meteors." So many struck the light that night that he gathered three hundred and fifty dead birds about the balcony of the watch room and one hundred and forty

more were picked up on the ground at the base of the light.

Many of them were Warblers. These little feathered gems all migrate by night and for this reason, as well as because of their abundance, they always figure largely in the list of killed and wounded migrants at the lights.

Of three hundred and ninety-five birds which were killed by striking Fire Island Light, Long Island, on the night of September 23, 1887, over half the species represented were Warblers, and of these no less than three hundred and fifty-six were Blackpoll Warblers.

LOST BIRDS

I might give many more sad facts of this kind, and then not tell of half the dangers which bird travelers encounter. When hundreds and thousands die we are apt to know of it, but of the many thousands of single birds which lose their way and, in the end, doubtless die, we know but little.

When we do find them we call them "Acci-

dental Visitants" and record their presence in our bird magazines.

I shall never forget the pleasure with which, soon after I began the study of birds, I discovered a Lark Finch near my home in New Jersey. This is a bird of the Mississippi Valley and the West, which had been recorded from New Jersey only once before, and its visit caused me quite as much excitement as though I had found a wholly new species.

During migrations, particularly in the fall, thousands of birds stray from the proper line of flight and are lost in this way. Generally they are born during the preceding summer and hence are young and inexperienced.

However much we may regret their misfortune, I must confess that long after one has learned to know all the birds that should come, the probability of seeing some stranger from a distant part of the country adds not a little to the keen interest with which we watch the migrants stream by.

Nor should we lack for all of them that feel-

ing we have for those who we know are about to face a great danger.

BIRD TRAVELERS AS WARDS OF THE GOVERNMENT

We have seen that through the erection of lighthouses, towers, and tall buildings, and of wires for conducting electricity, man has added greatly to the dangers which beset traveling birds. He has also claimed for his own purposes vast areas which once teemed with bird life and are now the sites of cities or under cultivation.

This is an inevitable consequence of man's progress in his conquest of the world. Still he will never reach a point where he can afford to do without the service rendered him by insect-eating birds. They are nature's guardians of our forests, fields, orchards, and gardens.

Our insect enemies seem to increase with the size of our crops. Potato beetles, cotton-boll weevils, alfalfa weevils, coddling moths, and scores of others have only become pests since man supplied the food on which they thrive and increase in such numbers as to threaten the very

existence of their own chief source of nourishment. So, more than ever before, man needs the help of those birds which are nature's principal means of keeping injurious insects from becoming unduly abundant.

As we have already seen, these birds, as a group, are among the greatest of bird travelers. By far the larger number leave the United States in the fall to winter in the tropics, some going south of the Equator. It follows, therefore, that besides all those dangers that threaten the lives of birds during the nesting season, these feathered allies of ours are also exposed to the great perils of migration. Not only that, but twice each year they must run the gantlet of glaring lighthouses, shadowy towers, and wire entanglements which we seem to have placed in their path with the express object of destroying them.

If not from a sense of fairness and humanity, it seems clear, then, that in our own interests we should surely do something to make the lives of this feathered army of insect fighters as safe as

we can under the circumstances. We cannot abandon our lighthouses and electric wires; we cannot control fogs and storms; but we should be able to control those of our fellowmen who are so short-sighted as to want to kill these birds for one reason or another.

Not so many years ago they were killed in countless numbers to be placed on women's hats; long after this was prohibited by law in some states, it was permitted in others; while in certain markets in the South one could see great bunches of small insect-eating birds hung up for sale.

It is impossible, of course, for the law of one state to follow these wonderful little travelers on their long journeys. Here today, they may be hundreds of miles away tomorrow. No state, therefore, can claim them as her citizens. They are more nearly citizens of the Republic, and as such they should be wards of the United States Government. This is the conclusion reached by eminent lawmakers who are also familiar with the ways of our migratory birds and their value

to man. A law known as the Federal Migratory Bird Law has therefore been passed by Congress. Under this law migratory game birds can be legally shot only during a certain time in the fall or early winter, and not at all in the spring when they are traveling to their nesting grounds, while all the host of migratory insectivorous birds cannot be legally killed at any season or any place in the United States or its territories.

It is true that this law does not follow these birds beyond our boundaries, but let us hope that some day we may have treaties with Canada to the north and with other countries to the south, which will insure safe conduct to Citizen Bird throughout the length and breadth of the countries in which he travels.

SUGGESTIONS FOR STUDY

Mention some birds which build their nests in our houses or barns. In becoming our tenants, how have they changed their nesting habits? Do you know of any birds which have either increased or decreased in numbers? What caused their change in numbers? To what dangers are migrating birds

exposed? Have you ever seen land birds board a vessel at sea? Have you ever found a dead bird? What do you think was the cause of its death? Why are more lost birds found in the fall than in the spring?

Why are insect-eating birds especially valuable to man? Describe some of the ways in which birds catch insects. What kinds of birds feed on the wing? What kinds feed from the leaves, buds, or blossoms? What kinds feed on bark-haunting insects, insects' eggs and larvae?

Mention some insects injurious to agriculture; to fruits; to forests. Why are insect-eating birds exposed to more dangers than seed-eating birds? For what purposes have birds been destroyed? Why can a Federal law give migratory birds better protection that a state law? How are birds protected in your state?

XI

THE BIRDS' COMPASS

HAVE you ever been in a small boat off-shore in a fog? It is not a pleasant experience. You venture out, perhaps to fish or sail, on some fine, clear day, when suddenly a bank of fog comes creeping in from the sea. Almost before you see it, softly, silently, swiftly, it surrounds you. The shore becomes dim and soon disappears. Probably you have no compass, and unless a fog siren, the wind, or the tide gives you a clew, you may soon be quite at a loss to say where the land lies.

Then you will be fortunate if somewhere near by there is a nesting colony of sea birds. In the Gulf of St. Lawrence, where I have had such an experience as I am describing, there may be Murres, Auks, or Puffins. Off the coast of Maine we would find Herring Gulls. If we

were near Nantucket we might expect to see the Terns that nest on Muskeget Island.

If some of these birds also had gone out to fish at sea, when the fog came what would happen to them? The deep, bellowing roar of the siren could mean nothing to them. I doubt if they would notice the direction of either wind or tide. Nevertheless, bird after bird would go swiftly through the fog, returning to its home just as directly and surely as though it could be seen distinctly. Then if we were wise, like many fishermen before us, we would set our course by the birds and reach land in safety. So the birds would then be our compass. But what compass do they steer by?

Some years ago, when nearing the end of a voyage across the Atlantic, I discovered a Curlew aboard the steamer. The season (it was in May) and the fact that several Wheatears had also just taken passage with us showed that we had entered one of the birds' highways of migration.

The Wheatear is a small bird about the size of

a Bluebird. It is one of the few birds which regularly travel from Europe to eastern North America. The first Wheatears reach England from the South about March 1, but at that time they certainly could not continue their journey to Greenland and Labrador. Possibly, therefore, the early comers settle in England. If this is true, it is probable that the later birds are the ones which cross the Atlantic to nest in North America. Perhaps the very birds which had boarded our steamer were making this wonderful journey.

They seemed so small and weak when seen flying above the ocean over which they had embarked so bravely, that one could not believe their tiny wings were strong enough to battle with its storms. Then as one thought of the length of their journey over the trackless waters, it seemed even more remarkable that they should be able to steer a course which would bring them safely to the land for which they had started.

How do they do it? What is the secret of the power which guides them on journeys where

man, without the aid of chart and compass, sextant and chronometer, would surely lose his way?

If the Curlew did not give me an answer to this question, he had at least given me an exhibition of the confidence with which birds set out on voyages from which man, unaided, would shrink. The Wheatears, when I walked too near them, flew to some other part of the steamer. Evidently they welcomed a lift on their long flight. But the Curlew, as I attempted to photograph him at short range, without the slightest hesitation left his perch on one of the steamer's boats and flew out to sea. He did not swing around to the stern to follow us but flew on ahead. There was no wavering in his course. With as much certainty as the man at the wheel pointed the steamer's bow toward the Irish coast, so did he point his bill toward land. He seemed to *know* where he was going. His speed was much greater than ours and soon he was lost to sight.

At this time Fastnet Light, the nearest land, was distant one hundred and forty miles. From

the height at which the Curlew was flying, the horizon was distant not more than six miles. Even if his eyes were like telescopes he could not, therefore, have seen the coast. But if it had been so near that the beaches and marshes where he might find his favorite fare were in plain sight, he could not have started for them more directly. Small use had he for the steamer! Doubtless before we arrived he had found a hearty meal.

"Seeing is believing," says the old proverb, and this Curlew, boldly, confidently striking out ahead of us with all our equipment for following the proper route, seemed to prove that he was possessed of some special power which held him to the proper course.

But if it was surprising to see a bird start on a voyage of one hundred and forty miles, what would we think if we should see the Turnstones begin their two-thousand-mile journey from Alaska to the Hawaiian Islands? Or what should we say of a Golden Plover as he began his two-thousand-four-hundred-mile flight from

Nova Scotia to South America? Or how shall we express our amazement that tiny Warblers, Vireos, and Flycatchers can wing their way through the blackness of the night and after traveling thousands of miles arrive on the date on which they were due?

So we repeat the question which people for years have asked before us—how do they find the way? Or, in other words, what is the birds' compass? Sight may be of assistance to birds on short journeys, but, as we have seen, it would be of small service over hundreds, not to say thousands, of miles of water. The sense of smell is poorly developed in birds, but in any case it would be of no value over the distances they travel. Their sense of hearing is very acute. When they are migrating they frequently utter their call-notes. Doubtless these serve to keep birds of the same kind together. But the leaders of a flock or company hear no calls ahead to guide them.

Taste and touch have certainly nothing to do with it. So we conclude that birds possess a sixth

sense. This has been called the sense of direction. The sense of sight we know exists in the eye, and the sense of hearing in the ear, and in the nerves leading from these organs to the brain. But no one knows where the sense of direction is situated. Indeed, it is only within the last few years that naturalists have ventured to speak of a sense of direction as something which actually exists.

Sometimes this sense is designated as the "homing instinct." So we speak of the homing instinct of Carrier or Homing Pigeons. But the homing instinct and the sense of direction are really two different things. The first impels the bird to start; the second guides it on its way. Everyone knows in a general way that when Carrier Pigeons are taken from their homes and released, they at once start on the homeward journey.

But, generally speaking, Pigeons are at first taken for only a short distance, and they gradually learn to make long flights only after they have made shorter ones. The owner of the

Pigeons usually does not care to risk losing his birds by taking them so far from home that they may never return. But it is also true that the first homing flights of Pigeons are often over routes which they have never seen before. The journey may be short, but like the sea birds in the fog, they would not know what direction to take if something did not tell them, and this something is the homing instinct or sense of direction.

Before the discovery of wireless telegraphy, Captain Reynaud of France was forming a Pigeon post service for the French Army. Among his experiments he released Pigeons from steamers when they were out of sight of land. I still have a message which he sent me from the steamer on which he was returning from this country to France. Surely something more than sight was required to bring the bird that bore this message back to its home in New York City. It has been suggested that from the cage in which they were confined the Pigeons might see the country through which they were passing. They could then, some people have

supposed, remember the main landmarks and thus find their way back.

But there are not many landmarks at sea, and another experiment by Captain Reynaud clearly proved that Pigeons can return to their homes over a country which they could not possibly have seen. In this experiment he took five Pigeons, when they were under the influence of chloroform, from Orléans to Évreux, France. This is a distance of about seventy miles. After two days, when they had thoroughly recovered from the effects of the drug, they were released, and at once returned to their home in Orléans. These birds, therefore, were certainly not guided by anything that they had learned of the route while traveling to Évreux.

The natives of certain islands in the South Pacific use Frigate or Man-of-War Birds for messengers. Probably this custom is of much older origin than our employment of the Pigeon. The Frigate Bird is a great wanderer. With wings which measure, when spread, about eight feet from tip to tip, its body is not much larger

than that of a good-sized chicken. It can therefore remain in the air for long periods and, if necessary, make great journeys without resting. We cannot prove that the birds used as messengers on the Pacific had not in some manner learned the routes over which the natives sent

MAN-OF-WAR BIRD.

With a wing-spread of eight feet and a body no larger than that of a good-sized hen, this is one of the world's famous flyers. Its feet, however, are so small that it can barely walk.

them. But in the experiments which I am about to relate we know that the birds used had never before made the journey from the place where they were released to the place from which they were taken.

These experiments were planned by Professor Watson of Johns Hopkins University. The birds used were Sooty and Noddy Terns. Many thousands of these birds nest on Bird Key, a tiny

islet in the Dry Tortugas. In order that he might study their habits Professor Watson lived alone on the Key with them for three months.

Birds which know nothing of man generally have little or no fear of him, so Professor Watson was soon on friendly terms with the Terns of this remote island. He could go among them and cause no more alarm than one would in walking through a poultry yard. This tameness permitted him to learn many interesting things about their home lives. He also made a number of tests to see whether birds which were taken some distance from the Key and released would return to it.

He caught several birds and with aniline dyes stained their feathers various colors in order that he might recognize them. First he took three Noddies. Some were set free only twenty miles, others sixty miles, from the Key. All returned within from one and three-quarters to about three and a half hours after being given their freedom.

Then two Noddies and two Sooties, after

being colored, were sent to Havana, a distance of one hundred and eight miles. They were released on the morning of July 11th, and returned to the Key the next day. It may be said that these birds had flown over this route before, but in the next test the birds used were taken on a voyage over a part of the sea about which they could have known nothing.

On June 13th, three Noddy and two Sooty Terns were caught and marked, and sent from Bird Key to Key West. Here they were placed in the hold of a northbound steamer. They were carefully fed and watered, and on June 16th were released about twelve miles east of Cape Hatteras, off the coast of North Carolina. This is about one thousand and eighty miles by water from Bird Key—a long journey even for the most highly trained homing Pigeon. But the birds' compass pointed the way, and on the morning of June 21st, both the Sooties were found on their nests, and one of the Noddies was seen several days later.

Still we might say, as someone indeed sug-

gested, that these birds simply followed the coast line until they reached their island home. Though why they should go south instead of north, or turn westward through the Florida Keys instead of eastward to the Bahamas, where many Terns of their kind live, is not explained.

However, to make it perfectly clear that the birds were not guided by landmarks of any kind, Professor Watson finally sent several Sooty and Noddy Terns across the Gulf of Mexico to Galveston. This city is distant eight hundred and fifty-five miles from the Tortugas, and the intervening water is unmarked by islet, shoal, or reef. Nevertheless, one of the birds returned to Bird Key in six, one in seven, and a third in twelve days from the time of release.

It is, therefore, practically certain that the birds used could not have been familiar with the route, nor could there have been other birds of their kind to guide them. From the hold of the vessel they certainly could not have observed the water over which they were sailing, and if they had, it would not have given them a clew to

a return route. We can, therefore, explain their remarkable feat only by believing that they were guided by what we call the sense of direction.

No experiments that I know of seem to prove more clearly than these of Professor Watson that birds possess this sense.

Doubtless it is this sense which each year leads fishes to their spawning grounds and seals to their "rookeries." It appears also to exist to some extent in man, particularly uncivilized man. But man, besides being more intelligent than the animals below him, possesses powers of observation and reason which make him less dependent on the promptings of instinct than they are.

SUGGESTIONS FOR STUDY

Do you ever have any difficulty in naming the points of the compass when you are in a strange place? Have you ever been lost in a fog? Can you find your way about an unfamiliar city easily? Have you ever seen Homing Pigeons flying back to their loft? Do you know anything about the length of the journeys these Pigeons make and the time required to make them? If you have ever seen birds

flying through a fog, describe the circumstance. Have you ever had a bird fly aboard your steamer when at sea? What was the nearest land at the time? What was the season of the year? Where do you think the bird had started from and was bound for? Do you think it was on or off its course?

Describe some of the experiments of Professor Watson. Do they indicate the existence of a sense of direction in birds? Do you know of any cases of domestic animals finding their way home? Had they been over the route before? By what sense or senses were they guided?

Define the difference between the "homing instinct" and the "sense of direction."

XII

WHY BIRDS TRAVEL

BUT while we may prove that birds possess a sense of direction and may learn all there is to know about when, where, and how they make their great journeys, we still do not know why they make them. That is quite another and much more difficult question to answer.

We can see the Wild Goose on its travels. We know where it is going, where it came from, and when it will arrive. We even think we know how it finds the way. But we do not know why it started. That it should leave the North at the approach of winter is not strange. But why should it leave the bays and lagoons of our southern coasts, with their rich store of food, to follow close upon the heels of retiring winter? So eager is it to return to its summer home that it sometimes is caught by late cold storms and forced to retreat southward.

The Bobolink and many other birds begin their journey to winter quarters before the summer is half over. They stay only long enough to rear their broods and get new suits of feathers; then they are off on the first stages of their four-thousand-mile journey to southern Brazil. Thus we see that they travel eight thousand miles every year to spend only about two months on their nesting ground. What is it that causes them to undertake this remarkable journey with all its many dangers? Why can they not nest in the great campos and marshes of southern Brazil and northern Paraguay just as well as in the meadows of Massachusetts?

When I have been studying birds in April in tropical countries—in Cuba, Yucatan, Colombia, or Trinidad—I have often seen flitting about with the native tropical species, many of our own summer Warblers, Vireos, and Flycatchers. At this time the rainy season was approaching. Trees were blooming, some fruits ripening, insects becoming more numerous. But in spite of this increase in the supply of food, and the fact

that many tropical birds were already nesting, day after day the Redstarts, Water-Thrushes, Blackburnian and Canadian Warblers, Red-eyed Vireos, Acadian Flycatchers, Olive-backed Thrushes, and other familiar North American birds were leaving the land of plenty to start on a flight of several thousand miles. Who can say why they go?

Now an instinct is merely a habit of such long standing that we cannot say how it was formed. So when we attempt to explain the origin of this homing instinct we must remember, first, that birds have been migrating for a very long time—how many thousands of years I shall not attempt to say. Second, that during this time there have been far-reaching changes in the climate of the world. Places which have now an Arctic climate, we know once had a warm or subtropical climate.

Thus the discovery of the imprint of magnolia leaves in the rocks of northern Greenland tells us that magnolia trees once grew on the shores of the Arctic Ocean. In a similar way the grooves

cut by glaciers in the rocks of Central Park show us that a great ice sheet once spread southward as far as New York City.

If there were magnolia trees in Greenland, it is more than probable that there were also various kinds of birds that we associate with these trees. And if New York was covered with ice, it must have been the home of birds which are now found only in the Far North.

Geologists tell us that in the later history of the earth there have been not one, but several, climatic changes. That is, the climate at one place might be warm, then cold, then warm, and then cold again. When, therefore, we try to explain how these variations in climate acted on the birds which may have lived in a certain place when first it was warm, we set ourselves no easy task.

It is a good rule not to try to answer the whole of a very difficult question at once but to take some little corner of what seems to be the easiest part of it. So I will not now try to tell why

birds migrate. I will only attempt to tell why some particular bird migrates.

Following this plan, let us take some simple case, where, so far as we can see, neither climate nor food has anything to do with the matter. The Brown Pelicans of the east coast of Florida will serve our ends admirably.

During the greater part of the year we find these birds scattered up and down the coast. In diagonal files they sail in stately fashion just above the breakers to their fishing grounds, there to plunge recklessly on the menhaden which form their principal fare. At night they gather on some favorite sand bar to sleep. So their days are made up of flying and fishing and sleeping. Then there comes a time when with no change in the seasons and, so far as we know, no decrease in the number of fish, all the Pelicans from the Keys to Georgia, and perhaps farther, have a desire to go to a little mud island about half-way down the Florida coast. This is Pelican Island in the Indian River, opposite Sebastian.

If you were on this island in October you would be surprised by the sudden appearance of a flock of perhaps two or three thousand Pelicans. You might then imagine that they had been traveling together for some distance, if you did not know that until the call came they had been distributed in small companies for a distance of at least four hundred miles. Then, just as though a Pelican king had sent out a wireless command, they all hastened to the island, forming a great flock as they met there. But this command did not come by wireless or from a Pelican king. It came from within each Pelican. What was it? What did it tell them to do?

It told them that the time was at hand for nest-building and egg-laying. In other words, the instinct of reproduction awakened. This, in turn, aroused the homing instinct, which, under the guidance of the sense of direction, draws a bird back to the place of its birth.

But what awakened the sense of reproduction? What makes an apple tree bloom? It is true that Pelicans and apple trees are not much alike; still

both are subject to the same laws of nature. A Pelican could not lay eggs, hatch them, and care for young Pelicans throughout the year any more than an apple tree could bear several crops of apples in a year. To develop either eggs or apples takes strength, and the continued use of one's strength means that one becomes tired and must rest.

So when the crop of Pelicans, or of apples, is ripe, the parent Pelicans as well as the parent apple trees, rest. The Pelicans shed their feathers, and since they could not live without them, get a new set at once. The apple tree sheds its leaves and the new set comes later. Then fall and winter follow, and in both bird and tree the instinct of reproduction rests. The return of warm weather sets the sap flowing in the trees, the buds begin to swell, blossoms open, leaves unfold, and, in due time, the fruit ripens.

With most birds, also, the coming of spring, if it does not actually start the sap flowing, sets new forces in action. These are the reproductive forces. They produce not buds, blossoms, and

fruit, but eggs, and the eggs when incubated give birth to birds. So we see that in reality birds, as well as trees, bloom; that both have their regular season of blooming and of reproduction, and this season is generally in the spring when increasing warmth sets the sap flowing.

It is true that the Pelicans of Pelican Island begin to nest when the weather is becoming colder instead of warmer. Why they should do so no one knows. On the west coast of Florida the same kind of Pelicans do not nest until April. This is doubtless the proper nesting time, but for some as yet unknown reason the birds of eastern Florida have chosen a time of their own.

The important fact here is that they all go at the same time and for the same purpose. In everything, therefore, but length, their journey to Pelican Island is as much a migration as is that of a bird which flies from the tropics to the Arctic regions. Both go each year at a certain season; both go to nest; both are prompted to start by the awakening of the nesting instinct with its desire to go to a proper place in which

to rear the young; and when this task is finished the birds leave the nesting ground.

"But," you may ask, "if the Brown Pelican goes only as far north as Pelican Island, why does his cousin, the White Pelican, go all the way to Great Slave Lake in British America?" You might ask the same question about many other bird travelers that winter in the South and nest in the Far North.

We have every reason to believe that when last the Arctic regions were warm, White Pelicans fished along the borders of the Arctic Ocean. When the climate began to change and became cooler and cooler, they, of course, had to retreat slowly southward. Finally, we know that the great ice sheet reached as far south as the central part of the United States. At that time the White Pelican must have lived on the Gulf of Mexico and probably farther south.

Then as the climate began to grow warm again, the ice slowly melted; each year the great sheet grew smaller until at last the land was free as it is today. As the ice disappeared, the White

Pelicans gradually returned to the country from which they had been driven. Now, as we have seen, they have actually gone as far back as Great Slave Lake. But every winter when the water freezes they go South, only to return as soon as the ice thaws in the spring. So through many centuries they slowly formed the habit of making a journey which gradually grew longer and longer.

So then we may think of the marvelous travels of birds as due, first of all, to those changes in climate which turned a warm Arctic to a cold Arctic. As the ice gradually receded, the homing instinct led the feathered exiles back to the land they had been forced to desert. The "blooming" or reproductive instinct tells them when to go, and the sense of direction guides them on their way.

SUGGESTIONS FOR STUDY

Have you ever seen Wild Geese migrating? Describe their flock formation. Can you suggest any reason for the birds' journey? Do our summer birds leave their winter quarters in the tropics be-

cause of any change in the climate there? Because of any failure in the supply of food? If you have ever hunted hens' eggs, have you noticed that the birds often hide their nests in places where they never go except to lay? Mention several places of this kind. Why do you suppose the hens select them? Why do many kinds of birds visit remote and inaccessible islands on which to nest? Does not the difference between the habits of hens and sea birds in nesting in out-of-the-way places consist largely in the difference of the length of their journeys? What prompts the hen to return to her nest? What prompts the sea birds to go back to their islets? Compare a year of a bird's life with that of a tree. What evidence have we for the belief that a much warmer climate once existed in the Arctic region? How do we know that the greater part of North America was once covered with ice? How far south did the ice sheet come? Describe the change in climate due to the gradual freezing of the North, and the invasion and retreat of the ice sheet. How is it believed to have affected the migration of birds?

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