2. An Adriatic-Tunisian route, along the coasts of the Adriatic, Sicily to Tunis. By Laridae (*Larus ridibundus*); Scolopacidae; Gruidae; many small song birds.

3. An Italian-Spanish route from Austria-Hungary via North Italy, Po Valley to Corsica, Sardinia, Balearic Islands to South France and Spain: By Laridae; Charadriidae; Scolopacidae, etc.

From 1903–1919, 7,778 birds were banded at Rossitten and, besides 123,569 bands were distributed to outsiders. Of these 7,778 banded birds, 2,011 have been accounted for by reports received at the station. Observations now extending over 19 years have proved conclusively, that banding is not injurious to the birds and that it does not disturb or change their habits. All attacks made upon science by over-conscientious bird protectors have been disproven as based either upon misapprehension or upon wilful misrepresentation.

Berlin, Germany

THE CONNECTICUT VALLEY—A HIGHWAY FOR BIRD MIGRATION.[1]

BY AARON C. BAGG.

Plates. XVI-XVII

TRAILS are perpetually fascinating. From the dawn of history the wanderings of men and later, certain of their trade routes continually attract our attention. Just how a group became established in a given locality; by what route various hordes poured over a mountain-barrier or across a body of water; why another tribe did not remain settled or stationary but persisted in continual travel—all these are problems which the student of history likes to puzzle over. So in the study of ornithology the routes traversed by birds of passage equally charm the student or the layman. Long before white men braved the mad Atlantic to explore a new world or the warriors of the Six Nations established the now

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[1] Paper read before the Allen Bird Club of Springfield, Mass., Feb. 6, 1922.
My grateful acknowledgments are due Mr. J. A. Farley for his painstaking revision of this paper and for a number of contributions in data. A. C. B.

famous Mohawk Trail into the Connecticut Valley; yes, prior to the time that the Abenaquis first descended the Valley from Memphremagog and the headwaters of the river to its mouth for their winter's supply of pemmican, this Valley, like others, was used for centuries, if not ages, by the birds in their annual spring invasion and autumn exodus. The origin and cause of this habit of regular advance and retreat was always in the past an unsolved mystery. Consensus of opinion today, however, points to the Great Ice-Sheet, or better to the decline of the age of Ice, as being largely instrumental in bringing about this remarkable and regular phenomenon. Bird migration is now authoritatively considered to have begun by only short changes of location, corresponding to the first slight recessions of the ice cap from which must have come benefit in some form. So migration became gradually a habit; and more gradually still, the range lengthened with the shrinkage of the ice-sheet until the present migration routes have resulted from what the late W. W. Cooke of the Biological Survey calls: "the innumerable experiments as to the best way to travel from the winter to the summer home and return." The three chief routes of North American bird migration are the eastern and the western coastal plains, and that great jugular vein of our continent, the "Father of Waters." The Atlantic coast-line is a "short-cut" to the greatest breeding ground of the continent. Crossing or encircling the Gulf of Mexico, the main northward flight follows the seaboard as far as Long Island. Here a triple division occurs; one group of birds sweeps up the Hudson, another crosses the Sound and ascends the Connecticut Valley, while the remainder continues on up the coast. It is with the second of these routes that our subject deals.

The Connecticut River, rising near the watershed dividing Canada from northern New Hampshire and running for much of its length in a general southerly direction, furnishes the most direct and easily followed route for birds into eastern Canada. The river including the lakes, extends 360 miles to the sea, and is thus the principal waterway of New England. Its old Indian name means "Long River." As the bird flies, the route would probably be close to 300 miles. A natural basin among heavily wooded hills and mountains of the ancient Appalachian system gives birth

to this famous river. Dashing mountain streams in the northernmost corner of New Hampshire and less than one-half mile from the Canadian border, converge into Fourth Lake, a limpid mountain-pool, the uppermost of the quartet known as the Connecticut Lakes. It covers but a few square acres at an altitude of nearly 2500 feet, and is within a few score feet of the summit of Mt. Prospect. Still within half a mile of the border the outlet of Fourth Lake enters Third Lake at an altitude somewhat over 2000 feet. This lake has an area of three-fourths of a square mile and like the Fourth Lake is set in a dense mixed forest, made up for the most part of small spruce and fir. Second Lake is reached six and one-half miles below Third Lake by means of a fair-sized stream, which having gone five miles is joined by a stream equal in size, coming in another direction from the Canadian border. The Lakes increase in size and decrease in altitude as we proceed. Second Lake is two and three-fourths miles long by a mile or more wide at one point, and is more than a thousand feet lower than Third Lake. Four miles further south and the First or "Connecticut Lake" is reached, the largest of all and the body of water from which our river directly flows. This Lake is 1680 feet above sea-level, covers nearly three square miles and measures four miles long by two and three-fourths miles in extreme width. The surrounding hills are covered with deciduous trees, sprinkled here and there with evergreen; but the fields adjoining the Lake and for a considerable distance back have long since been cleared and summer cottages are becoming more and more numerous. Regarding this country, Mr. Charles L. Whittle, the geologist, after visiting the Lake region in 1918 says: "In the matter of the general character of the country outside the zones surrounding the Connecticut Lakes, I will state that with the exception of a few square miles of farming land about First Lake and stretching southwest to Canaan, Vermont, along the roads, the entire country is an unbroken wilderness covered in the main by a virgin forest of deciduous trees from which nearly all the conifers have been removed by the lumberman."

With a rapid, sizable current the river leaves Connecticut Lake and continues swiftly for two or three miles with an average width of 90 feet. Several other streams meantime contribute their quotas.

Eighteen miles from First Lake the river comes to the dividing line of Canada, New Hampshire and Vermont and in this distance descends 583 feet. It is now 1035 feet above sea-level. For the next 50 miles the drop is but 204 feet. Toward the end of this lap the proximity of the White Mountains pushes the river twenty miles to the west to where it joins the Passumpsic river, a good-sized tributary coming down from the region of Willoughby lake to the north in Vermont. From this junction to the Massachusetts line it is 118 miles as the crow flies and 137 miles following the course of the river. The descent is about two feet per mile. The Valley takes on now its characteristic appearance of a series of terraces. In the river bottom the rich soils nourish the prosperous farms all the way along, and with each successive terrace, sometimes five in number, fertility gives place to outcrops of various rock-formations or to remnants of ancient flood-plains which the glacial river overflowed each year. The highest terrace may rise as much as 200 feet, above the river. Where the Valley is narrow, as for much of its length on the line of cleavage between New Hampshire and Vermont, the terraces rise close and steep; for the river is not as yet the broad tortuous current that it becomes through Massachusetts and much of Connecticut. Contributing streams enter all along the way and here and there mountain peaks stand guard. East of Haverhill, New Hampshire, towers Moosilauke, 4790 feet above the sea, the outpost of the southwest extension of the White Mountains. Not far to the south in Orford is Mt. Cube, 2927 feet above the sea, while farther down on the Vermont side lies Mt. Ascutney 3168 feet, the highest elevation lying wholly within the Valley. At White River Junction enters White River the largest stream in Vermont east of the Green Mountains, while in the next twenty-five miles a half-dozen more tributaries join. Again the hills converge and hem in the river until at Bellows Falls it becomes a foaming torrent, the steep hills on either side rising to 1200 feet above sea-level. During the seventeen-mile run to Brattleboro, Vt., the river again broadens out and becomes placid and two tributaries join. Twenty miles away on the eastern edge of the Valley, Monadnock lifts his head to a height of more than 3000 feet. The Ashuelot, last of the New Hampshire rivers, enters the Connecticut within four miles of the Massachusetts

border. At this junction the river has already come 208 miles with a descent of 1412 feet, but is yet 206 feet above the sea and has 152 miles to go before entering Long Island Sound. Its total length in New Hampshire following all bends and turns is approximately 236 miles, but as the bird flies it is not more than two hundred miles.

Across the fifty-mile extent of Massachusetts the Valley varies in width, but averages about twenty miles. At the southern end, as at the north, it narrows between fringing hills. Miller's River, first of Massachusetts tributaries, enters from the northeast not far from Greenfield. West of here a group of hills appear which, turning southward, enter the Valley, extend along its center and twice cross the river as the Mt. Toby and Mt. Holyoke Ranges. A unique combination of ranges, hills and terraces, together with a great area of fertile fields through which the river meanders, sometimes even forming ox-bows, gives the Valley through Massachusetts its unequalled charm. Near Greenfield two other streams enter the main current. The Deerfield River by way of a considerable valley flows from the Green Mountains, while the Falls River, a smaller tributary, comes down from the north. In South Deerfield, the Deerfield chain of hills ends in a sandstone bluff, "Sugarloaf" by name, which overlooks the river; while directly opposite the group of hills forming Mt. Toby loom up. From this point the Valley widens out considerably, and the river flows on in great curves and bows, the greatest of these being the ox-bow at Northampton, opposite which lies the Mt. Holyoke Range. The river runs between this and the Mt. Tom Range. Mt. Tom itself, although but 1218 feet in height, rises head and shoulders above the surrounding country so that for long distances it can readily be seen up and down the Valley, particularly on a clear day or at night when its beacon-light shines. For the next fifty-there miles, or as far as Middletown, Conn., the Valley varies in width from three to ten miles. The river averages 1200 feet in width as far as the Connecticut State Line, and it reaches its maximum breadth at Longmeadow where for a mile it spreads to 2100 feet. On the east bank, along half of this mile, grows a wild rice, planted about 1880 by Robert O. Morris, Springfield's veteran ornithologist.

Just below the Connecticut State Line the river runs over a rocky bed for five and one-half miles to Windsor Locks, where because of rapids it seldom, if ever, entirely freezes in winter, particularly where the railroad crosses. For the next ten miles to Hartford the river again slows down, gains depth and averages 1500 feet in width, running in a comparatively straight course due south. From this point where a daily tide of two feet is registered, it becomes irregular again. During this interval several streams join forces with the main current. The chief of these is the Tunxis or Farmington River, which gains access to the Valley through its western ridge here known as the Talcott Range. From Hartford to Portland, where it is a half-mile wide, the Connecticut presents the curious phenomenon of a constantly changing course. Six miles below Hartford, for instance, in a little more than a decade, it has moved its entire width eastward. At Middletown there remains but thirty-eight miles to the end of the long run. The hills now rapidly close in until for about the distance of a mile, known as the "Straits," only forty rods separate shore from shore. In the short distance to the sea it broadens for the last time and enters the Sound at Saybrook with quite a wide mouth. "Thus does the Long River," according to Oliver Wendell Holmes, "loiter down like a great lord, swallowing up the small proprietary rivulets very quietly as it goes." To sum up: The Valley's eastern and western boundaries are the mountains of the Appalachian system, some in greater, but more in lesser height. Between the two main ranges of this system the watershed reaches a maximum of nearly fifty miles. The River by means of more than twenty tributaries, drains about three-tenths of New Hampshire and four-tenths of Vermont, or a total of 6900 square miles in both States and 11,300 square miles in its entire area. On the other side of these northern ranges rise rivers flowing directly into Canada and northern New England. With such directness, with so many prominent landmarks, with an unequaled number of connecting tributaries, does the Valley appeal to the birds of passage and become the highway that it is to the northern network of routes. The highlands of western Connecticut and Massachusetts including the Berkshire and Hampshire hills, the Green Mountains, the White Mountains, western and

northern New England, eastern Canada and the Provinces—all are directly linked up with this great Valley.

Three life zones are represented in the Valley. At the southern extremity the Carolinian fauna of the upper Austral zone after coming eastward from New York along the Sound shore line, extends north as far as Hartford. More specifically it approximates the Massachusetts State Line, although certain species seldom, if ever, occur in the Valley north of the Connecticut capital, such for instance as the Carolina Wren, Blue-winged, Hooded and Kentucky Warblers, Tufted Titmouse and Blue-gray Gnatcatcher. On the other hand such representatives of this zone as wander north either occasionally or else in small numbers into the Valley in Massachusetts are the Fish Crow, White-eyed Vireo, Orchard Oriole, Cardinal, Chat, Mockingbird and Golden-winged, Prothonotary, Worm-eating and Prairie Warblers. A notable southern bird that has occurred in Springfield is the Blue Grosbeak, which was seen by various observers including the writer on May 11, 12 and 13, 1922. Recently it has been established that the Rough-winged Swallow, while it is well known to be more or less a breeder in western Massachusetts, ascends into New Hampshire to nest. Portland, Conn., seems to be the dividing line in the Valley of the Purple and the Bronzed Grackles, as the former rarely wanders farther north. Intermediates are found in the vicinity. From the Connecticut line well into the valleys of the Green and White Mountains, birds of the Transition zone are found. Most of our common birds come in this group. Just as this section of the Valley, particularly in Massachusetts, is the mecca of geologists, so it is important ornithologically, not only as a highway but because it has been made famous for generations by the breeding of Duck Hawks. Year after year on such cliff-sided summits as Talcott Mountain near Hartford, Mts. Tom, Holyoke and Sugarloaf, and others farther north, *Falco peregrinus anatum* has nested. Most noted of these is the Mt. Tom eyrie fully described by Dr. J. A. Allen who published in November, 1864, the first authentic description of the nesting and eggs of the American Peregine Falcon.[1] In the early

[1] Proceedings Essex Institute, volume IV, page 153.

THE CONNECTICUT VALLEY.

View from west side of Mt. Tom Range, looking north, showing west bend of Ox Bow. This is the cliff of the Duck Hawk eyrie.

summer of 1921, R. L. Coffin of Amherst located in this section of the Connecticut Valley five of these nests with either eggs or young. Where the more northern climate and higher altitude are encountered, where spruce and fir supplant white-oak and chestnut, birds of the Canadian zone may be looked for. In addition to the region roundabout the Connecticut Lakes, such peaks as Ascutney, Moosilauke and Monadnock may be called isolated zones of Canadian faunal life; at least their summits may. Here one will find nesting the Golden-crowned Kinglet, Red-breasted Nuthatch and Myrtle Warbler. Moosilauke is famous for its nesting haunts of Bicknell's Thrush. This bird as well as the more northern breeding Warblers, the Hudsonian Chickadee, Philadelphia Vireo, Pine Grosbeak, Crossbills, Canada Jay and Spruce Partridge, are found nesting in the vicinity of the Canadian Lakes, rarely farther to the south. During the winter, such northern birds as Three-toed Woodpeckers, Snow Buntings, Redpolls, Tree Sparrows, Acadian Chickadees, Pine Grosbeaks, Crossbills, Goshawks, Rough-legged Hawks and Snowy Owls descend the Valley in search of food, often well into Connecticut and sometimes beyond. Several decades ago large incursions of Rough-legged Hawks occurred. Sixty were taken in one winter on the Hadley meadows in the vicinity of Mt. Holyoke—most of which were mounted for different museums. In another winter forty were collected near East Windsor Hill, Connecticut. The Northampton and Hadley meadows proved formerly a great attraction likewise for Short-eared Owls. Mr. Morris reports that during the eighties, colonies of them were found there in winter. Mr. Edward O. Damon of Northampton once encountered a flight which he estimated to be at least one hundred birds which were flying low down in the twilight. The only record we have of the Gyrfalcon is of one taken by Mr. Damon many years ago in this vicinity. Dr. J. A. Allen records a Raven taken in 1859, at Springfield. With the cutting off of more and more timber such rare birds are in late years seldom, if ever, observed even in the northernmost part of the Valley.

Two species that originally were a common sight when the settlers first came to the Valley are now extinct, namely, the Wild Turkey and the Passenger Pigeon—chiefly because they formed so

large a part of the people's food. Talcott Mountain had Wild Turkeys during the early part of the nineteenth century; but the Mt. Tom and Mt. Holyoke Ranges seem to have afforded the best protection to the species in the Valley for it was here in the early fifties that the last Turkey was captured. Passenger Pigeons, when the flights were on, came in an unending procession to and from the large forests to the north and west. They were abundant until the seventies when their ranks began to thin out, and the last Pigeons were observed in the spring of 1884 at Southwick Ponds and in the spring and fall of 1887, at Portland, Connecticut. John H. Sage shot a young male October 1, 1889, at Portland, which constitutes the last Valley record so far as we are aware. Two other species the Purple Martin and the Dickcissel, while not extinct, might as well be so far as our Valley is concerned. Nesting abundantly in former years throughout most of its length, but a few scattering Purple Martin colonies remain today. As with the Wild Pigeons, the Martins began to decrease in the eighties, largely due to the rapid increase of the English Sparrows, which drove them from their nesting places. A few colonies were breeding in 1912, in Portland and Middletown, but it seems only a question of time when we shall no longer number these attractive Swallows among the migrants of the Valley. Prior to 1840 the Dickcissel was a common bird in summer in the Valley. Dr. J. A. Allen records one taken in May 1866, in Holyoke, which seems to be the last authentic record.

But noted as the Valley is in these physical and faunal aspects, it is primarily famous as a pathway for migration. Every month of the year witnesses flights of various bands or flocks of birds; at times there may be but a few stragglers or only a solitary stranger. Even in the interim, before the spring and the autumn migrations, birds are moving to and fro; indeed it is difficult usually to tell when one migration leaves off and the other begins. Nor do the cold days and nights of winter, supposedly birdless, drive all bird-life from the Valley. Particularly is this true the nearer the river reaches the Sound. During most winters many birds remain in the vicinity of Saybrook and other shore towns waiting to ascend the river with the first signs of spring. For the most part such wintering birds are Grebes, Loons, Mergansers, Golden-

eyed and Black Ducks, Canada Geese, Great Blue Herons, Mourning Doves, Red-tailed, Red-shouldered, Rough-legged, Marsh and Duck Hawks, Kingfishers, Flickers, Cowbirds, Blackbirds, Meadowlarks, Vesper, Fox, White-throated, Song and Swamp Sparrows, Juncos, Cedar Waxwings, Myrtle Warblers, Pipits, Catbirds, Winter Wrens, Hermit Thrushes and Robins. All through the winter whenever there is open water, Herring Gulls may be seen flying above the river as far north as Holyoke; while Mergansers and Golden-eyed Ducks ascend the river at times to northern Vermont. In the bitter winter of 1918–1919, when a little open water still persisted in the Connecticut, at Newbury, Vt., where Wells River comes in, a few of the rare Barrow's Golden-eyes flocked with a larger number of the common species.

In early spring one might well compare the oncoming birds to the column in a thermometer. With the incessant change of New England weather the vanguard advance and retreat at first much as does the quicksilver. Birds that have bred for several seasons in a particular spot seem most anxious to escape the inactivity of the long winter months and to return to household duties again. Bluebirds are quick to return to the old nest and use the Valley in large numbers. I have in mind, likewise, a Phoebe that nested each year over the front piazza doorway of a South Deerfield farmhouse, the owner of which sometimes reported the return of his Phoebe in the spring as much as a week before one had been seen or reported in either Springfield or Holyoke. Northern nesting Robins are similarly anxious to be the initial claimants for the "early worm." With the advent of a warm wave Robins by the score will appear in the Valley and push rapidly northward. Then, next day, with the veering of the wind, the Valley may be once more in the grip of winter. Snow or sleet with much wind descends and sends the eager birds to cover. Hundreds and sometimes thousands of Robins may be seen now in large flocks either retreating down the Valley or scurrying back from the hill-country. Such storms bring about a retrograde movement, a good example of which occurred in the first day or two of April, 1919, when large numbers of Redpolls, Siskins and Robins drifted down the Valley before the storms. At Hatfield an observer

stated that Robins by thousands were taking refuge in the long stubble and grass of the fields. When starting up in simultaneous flight, they presented a tremendous array. In the vicinity of Holyoke, with the storm, came numbers of Tree and Fox Sparrows and Juncos—birds whose ranks were beginning to thin out—while Bluebirds, Red-winged Blackbirds and Grackles largely disappeared in retreat but put in appearance promptly again on April 3rd when the snow and ice had melted. A like movement of even greater proportions occurred with the severe storm of the last day of March, 1922. Seven or eight days of warm weather brought the early birds in considerable force. many of them ascending the Valley into Vermont. The unexpected snow storm caught them unawares; and with it unabated on the second day. retreat was their only salvation. Juncos by the hundreds, Fox and Song Sparrows and Robins by dozens were now to be found in the vicinity of Mt. Tom. Hawks and Woodcock which were observed a week before making their way northward could now be seen going in the opposite direction. Phoebes seemed sadly out of place amid the falling flakes. Something much out of the ordinary occurred near Brattleboro, when flocks of Canada Geese were observed coming back down the river where several days prior they had ascended. Yards, gardens and highways were suddenly filled with birds that we had not expected to see again till fall. Many that came to our trap proved to be in a weak, starving condition, with breast bone prominent. Birds that we had been trapping completely disappeared, and the forty birds we banded during these three days (23 Song Sparrows, 10 Juncos, 4 Tree Sparrows, 1 Fox Sparrow, 1 Chickadee and 1 Bluebird) were all newcomers. April brings more and more new arrivals. Immense flights of Sparrow bands, one after another in rapid succession, pass north during this month, filling our gardens and fields, our thickets and hedgerows. Of this procession the Juncos are in the van. many having passed the winter in the southern end of the Valley or vicinity. Like leaves before the October wind I have seen them billow past, twittering as they flew. Song Sparrows are here too, as are the Fox Sparrows, Savannah, Vesper, Field and Chipping, but especially the White-throats, with a sprinkling of the White-crowned. The real procession of passing

birds, however, may well be said to reach on the average its climax during the first half of May. Then one may well gain an idea of what an important highway the Connecticut Valley is by going afield well nigh anywhere throughout its length and breadth. In groups it may be, or in companies, singly or in immense flocks, the headlong stampede wings its way continually northward. Brightest and best of all the flying hosts are the Warblers. I recall a certain spring day not many years ago, when seated on a favorite stump, I was watching wave after wave of these sprites descend upon a clump of white birches above the western bank of the bend in the river, just north of Holyoke. In a score of minutes, I observed as many or more of the various Warblers, including the rarer Wilson's, Cape May, Tennessee and Bay-breasted. The never-to-be-forgotten week in May, 1917, readily comes to mind. A sudden turn for the cold not only held the Warblers in check but brought them to our very door-yards. Retarded likewise was all insect life and hundreds, possibly thousands, of Warblers must have perished. School children brought in many in starving condition and so feeble that they were readily captured. One farmer told of dozens of these little birds settling down all over him, his horses and load as he drew manure to his field. That same week a similar condition existed in most of the Valley as far north as Vermont. Mr. E. C. Bliss states that several carloads of manure happened to be piled in one place at South Deerfield ready for the tobacco fields. The heat from the compost brought out a small crop of insects which in turn attracted hundreds of Warblers. They completely covered the big pile measuring many cords, and had to be well nigh brushed off, so hungry and weak were they, before the men could load their carts. For most of that week a Yellow-bellied Flycatcher and several Tennessee Warblers remained in our front yard, and subsisted on barberries. Sometimes a Golden-winged Warbler, occasionally the Mourning, and rarely the Cerulean, accompany the main flight. For an entire week in May, 1921, R. L. Coffin reports that a Cerulean Warbler could be observed almost any time of day in a certain forsythia bush of a neighbor's yard in Amherst. The principal pleasure in witnessing a spring Warbler-flight is due to the fact that they usually precede the fully-developed foliage.

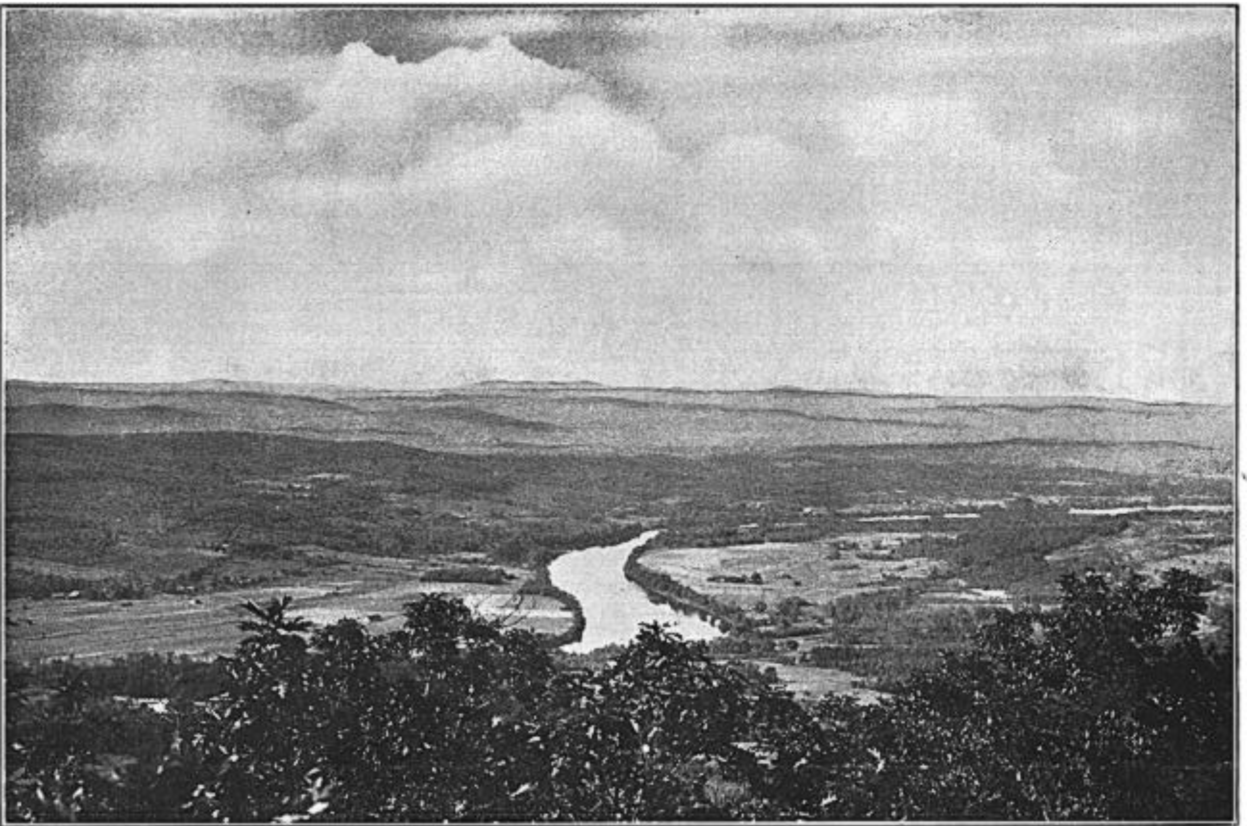
A much easier matter is it then to observe and identify the ever-moving birds and quite often to register their songs as well. May of 1921, brought a disappointment in this respect. The stage was all set for a bright pageant but no Warblers! The foliage pushed out to full bloom, and still they did not come. Finally there arrived a very hot morning when it seemed as if the birches and bush-bordered streams were deluged with birds. Not only were most of the Warblers represented but Flycatchers, Vireos and Thrushes were aplenty. Thinking we could augment the morning's list—at noon well upwards of one hundred—I visited in the afternoon Chesterfield and the hill-country. But not a Warbler anywhere; birds were extremely scarce. The Swamp Sparrow proved to be the only new bird we could locate. Obviously the flight was pouring up the Valley, but it had not penetrated the higher hill-country to the east or west. The heights were as free of birds as the Valley had been a few days before. The Warblers bring the spring migration to a dramatic climax, and when they have passed they leave one with a feeling of something lost.

With the great spring burst of bird-life; with all its song and color, all flights to the novice must seem diurnal. Many species, however, fly by night. While canoeing up the Connecticut River, near Mt. Tom Junction, early in May, 1921, our attention was called to the loud call-note of the Greater Yellow-legs. The high river water of spring had overflown the northern bank and left there a long lagoon-like pool of small width and depth. In this shallow water we discovered with the aid of the binoculars seven Yellow-legs, their heads bobbing and their call notes coming clear and rapid. Keeping under the lee of the high bank, we quietly paddled so near that the length of the canoe barely separated us. Very cautiously approaching, we obtained excellent observations at close range. Finally, to watch their flight we let our presence be known, when all flew off a short distance to a sandy beach of the river. Being unmolested they presently fell to preening their feathers and not long after one or two pulled up a foot and took a noon-day siesta, with heads tucked under wings. Most of the others followed suit and so we left them. Returning late that afternoon, I headed the canoe for the spot where we first discovered them. My companion impetuously broke the stillness to say

that it was useless to come to the high bank a second time; the birds surely had flown away. But he had scarcely said the last word when a chorus of alarm notes close by came from the lagoon, and presently the Yellow-legs rose in air. Their flight this time was different. Rising gradually they flew with strong wing-beat in close array into the western twilight until they were well up over Mt. Tom Junction. As they wheeled to the right high in air, we dimly discerned them as they faded out of sight in a direct course up the Valley, flying apparently straight over Northampton instead of following the meandering river. Doubtless when returning daylight came, it found them beyond the Canadian border, well on their long journey to northern Labrador or Ungava. On another May day I recall a single Nighthawk that lay lengthwise on a limb of an elm tree in our front yard, twenty-five or thirty feet above the sidewalk. Both eyes were closed, and he seemed to be sleeping undisturbed although the branch swayed with the breeze. His perch was within twenty feet of the house. Not till nearly dusk did he take leave. Such nocturnal flights are comparatively easy on a bright moonlit night, for the rivers stand out like silver threads as the birds wing their way on high. Like sleeping sentinels the taller hills or peaks lie revealed, and from this great height the most direct route is readily discernible. It is, however, in the fall when the great host, now voiceless and with many birds still in molt, makes the return journey that this pathless course of the upper air is employed to the largest extent. The late William Brewster after his intensive study of migration at Point Lepreaux on the Bay of Fundy, came to the conclusion that birds migrate either singly or in straggling bands; that the different bands are connected with others so as to form a practically continuous stream of birds; that adults precede or accompany the first flights of the young.

How often on a starlight night in late September or October can one hear the lisping notes of the Warblers, some faint, others low down and distinct as the multitude pass southward. Brewster found not only at Point Lepreaux but elsewhere that on favorable nights the sky is literally "alive with birds." (Such nights are not infrequent in our Valley when the flight is on.) He felt, moreover, that young birds whose parents had departed earlier,

fell in with the general procession; that because of a strong sense of locality and direction they "quickly learn to follow a path, even for thousands of miles, along which they have been in the first instance led by older companions, and the young bird after a few seasons becomes an experienced guide." This must be the case likewise here in the Valley, where, because of the guiding peaks and the north and south direction for so much of its distance, it must be a simple matter for even young birds to become accustomed readily to any portion of it. In the fall, then, we find the spring flocks now augmented with large numbers of immature birds, and distinct flights occur. In August for instance the Nighthawks pass down the Valley in some seasons in great numbers. Mr. James Mackaye, of Boston, tells of a flight of this kind in August, 1881, near Brattleboro when he observed hundreds flying overhead in one large flock. September brings by night the Warbler host accompanied by Vireos and Thrushes. By day the Swallows and Swifts take leave and the Hawkflights occur. In 1921, the Hawks came on September 18th, when seventy-five or eighty, mostly Red-tailed and Red-shouldered Hawks, were counted in one flight. In some years these flights vary according to the lateness of the season. In 1910 for example it did not occur until October 10th. This flight, however, was one long to be remembered for four or five hundred Hawks made up the lengthy line that drifted at noon over Holyoke. They were travelling at rapid rate although few wing beats were noted; all were taking advantage of the strong northerly wind which carried them along with so little effort. The older Hawks seem to await such a favorable wind before starting a flight of this kind down the Valley. October, like April, is the special month for the Sparrows—this time on the return trip. One would imagine it was the same flock in one's garden staying the month out; but bird banding has proven that a flock will remain several days until a storm arrives when they go on for the next lap. The same storm, however, brings in a new group which remain until the following storm, and so on. About the middle of October the Woodcock flight arrives. Then it is that the alder thickets harbor a host of these nocturnal travellers, particularly with the coming of the hunter's moon. Night after night they continue to arrive and move on, and many



THE CONNECTICUT VALLEY.
View from Mt. Toby, looking north. Tops of the Green Mountains in the distance.

linger very late in the fall. In 1908 one lingered until December 8, but was picked up in Agawan having died only a short time previous. A Woodcock has been captured in January, not far from Saybrook, with six inches of snow on the ground and a gale blowing. It was found near an open spring-hole, and was in an emaciated condition. Another was observed as early as March 8 in 1919, in the vicinity of Holyoke. With the coming of colder days and nights in November the Robins and Bluebirds retreat. All through the fall they had been going south in scattering bands or mixed flocks, but now even the rear guard disappear, although a few Robins occasionally winter especially in the vicinity of the Mt. Tom and Mt. Holyoke Ranges. During the winter of 1921–1922 a flock of eleven Meadowlarks remained near the Amherst Agricultural College Campus, and three or four more near the Mt. Holyoke College Campus. November witnesses the gathering of immense flocks of Crows from the wooded hill country to the east and west. They come into the Valley as severe weather sets in. Sometimes Crow flights occur. Mr. Mackaye records one of these flights in the late fall of 1881 near Brattleboro. He first noticed the Crows in a long cloud-like formation coming down the Valley and gradually settling and coming to rest on a hill where, even though more than a mile away, the babble of so many voices made a great noise. With the coming of inclement weather many Crows desert the valley of the Connecticut and its tributaries north of Massachusetts. Upon the return of the species with the passing of winter, the Crow in many places (as in Haverhill, N. H.) is regarded as a harbinger of spring as much as the Robin or the Song Sparrow. Early in November, 1919, a similar gathering of several thousand Crows was noted at Worthington, Massachusetts. With the initial snowfall such flocks retreat into the Valley to pass the winter in the vicinity of Mt. Tom and Mt. Holyoke where favorable roosts are found. When the snow becomes deep, however, they retire still further south. The season comes to a close with the flight of Canada Geese which occurs usually in late November or sometimes early December. Again, Brewster believed that along every route could be found "stations or points of departure"—favorable places where the "migratory tide hesitates or halts" either for rest or food. Let me mention several in our Valley.

A few hours flight from the Sound brings most birds to the section of the Valley, where there are numerous ponds, streams, swamps or tributary valleys, ideal natural locations for every sort of refuge and food. I have in mind particularly the region extending roughly from the Connecticut state line to the vicinity of Mt. Tom. Mr. John H. Sage tells of several hundred acres, known as the Little River Meadows, on the opposite side of the Connecticut River from his home at Portland, Conn. From boyhood days he annually witnessed there great Swallow flights in August. There were Barn, Eave and Tree Swallows, principally the last, all of whom took refuge for the night in the water-oats which grew in abundance. In close ranks one above the other they clung to the standing stalks. They first began to gather, he noted, early in August, and continued until late in September, when the majority departed. He has found a few there until the last week of October and states that it is an excellent place likewise for "Rail, Marsh-Wrens and many other birds" ('The Auk,' Volume XII, p. 83). These marshes are likewise a favorite roosting place of Grackles, thousands of the Purple and the Bronzed varieties flocking there in the late summer, and according to Mr. Sage, outnumbering in early November all other species. I have already mentioned the wild rice fringing the river for half a mile in Longmeadow, just above the Connecticut state line. The expense of securing the wild rice was shared by Mr. M. B. L. Bradford and Mr. Morris. They secured the seed from Minnesota. Mindful of the proper time in the fall for planting they carried it down the river by rowboat, and were successful in starting a strip about two hundred yards long close to the shore. Each succeeding year saw the growth of this rice widen and lengthen until today it is about half a mile long and fifty yards wide. It has attained a height of six feet or more. Here and in the fields adjoining Mr. Morris has collected many of his unusual records including Bonaparte's Gull, the Common Tern, the King Rail and the Yellow Rail. It is here, too, that nearly every fall, late in August, he has recorded the Black Tern. The Black Rail has also been observed here. In the fall the wild rice proves an attraction for not only Sandpipers, Snipes and Ducks but for large flocks of Blackbirds and of Savannah and Swamp Sparrows which with an occasional

Sharptail congregate there. The only record we have of a Savannah Sparrow wintering is of one which Mr. Morris found near here in 1895–96.

A dozen miles directly west of Springfield lie Southwick Ponds or Congamond Lakes. They comprise a group of four narrow, connected lakes, two and one-half miles long by one-half mile wide. Gulls, Ducks, Geese and other waterfowl visit these ponds frequently. Mr. Morris for a long time was of the opinion that Laughing Gulls came occasionally up the Valley as far as Massachusetts. While rowing on the Ponds early in October, 1920, he noted a Gull resting alone on the water. On coming within twenty feet he discovered it to be a Laughing Gull which seemed not at all disturbed by his proximity. Rarely the White Egret visits these ponds. In mid-July, 1920, early in the morning, Mr. E. S. Smith of Holyoke, after an all-night fishing trip, came upon an Egret in the shallow water near shore. It appeared unusually white in the mists of early dawn. It was here too, that a large flight of Snow Geese, the first in many years, were reported in late November or early December, 1921. Three were shot on Thanksgiving Day, in Westfield Little River, the Springfield Museum specimen, an immature Greater Snow Goose, being one of them. One was taken at Portland, Conn.; another at East Windsor Hill; and a small flock was observed about the same time at Glastonbury. All undoubtedly were part of the main flock estimated at upwards of one hundred which visited Southwick Ponds.[1] In the days of the first settlers these Geese numbered thousands, and every year in the fall flight in particular they used the Connecticut Valley as a highway. Today we have their kin —the Canada Geese—whose spring and fall flights usher in and bring to a close the main migration season. Their V-shaped formation and loud honkings are familiar occurrences in mid-March and late November. The last two seasons have brought the largest flights recorded in many years. Sometimes they arrive much hampered by sleet and ice storms. The writer's grandfather in his early days caught by hand several geese so coated were they with ice. This occurred about a century ago near his farm in West Springfield, Massachusetts.

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[1] See Auk, vol. XXXIX, Apr., 1922, p. 251.

A score of miles north of Southwick, the confluence of several small valleys in what is known as Fomer brings about conditions especially favorable to migrating birds. During the winter of 1918–19 came a large influx of Downy and Hairy Woodpeckers. On Lincoln's birthday of that winter, which was an unusually open one, the writer saw at Fomer the Arctic Three-toed Woodpecker reported wintering there since November. We found him peeling bark and boring for timber beetles (Buprestidae) in a burnt-over patch of white pine. That same day we observed not far from there a dozen Robins in one flock. On November 29, 1921, an immense flock of Pine Grosbeaks was noted here, spread out over half an acre and numbering it was estimated, from three to four hundred birds. There are many more such stopping places equally favorable that we might tell of. Hampden Ponds, Ashley Ponds, the Island in the river at Holyoke, Aldrich Lake, Forge Pond, Carver's Pond and others in the vicinity of Holyoke all come within such a group. The Hadley meadows mentioned earlier in the paper equal perhaps any other such place we could mention. It was here through the seventies and eighties that Mr. E. O. Damon of Northampton collected among others, such unusual birds for the Valley as Knot, Buff-breasted Sandpiper, Hudsonian Curlew, Red-breasted Merganser, Prothonotary Warbler, Gyrfalcon, Great Grey Owl, American Hawk Owl, and Northern Raven. Clerk of Courts Chilson of Northampton was an expert in collecting Rough-legged Hawks here. "If you went afoot with a gun," he relates, "your hawk was sure to see you and take flight a long way off, but a passing horse and buggy they would not suspect. By driving my horse at first in large circles and gradually cutting these down until within range, and then galloping rapidly toward the tree, I could usually secure my specimen."

Various sea birds driven inland by storms are taken from time to time in the Valley. A Red-throated Loon at Hartford caught itself in the electric street wires during a fog and was captured on November 20, 1895. A Brunnich's Murre was taken by Mr. Morris, November 30, 1899, in Longmeadow and two more were taken near there—one on December 19, 1897, following a severe gale, the other in January 1901; still another was taken February 1,

1902, in Ware. The Dovekie has been taken at Greenfield and Belchertown where in 1872, large numbers were secured. The Leach's Petrel was taken September 2, 1900, at Agawan; October 11, 1905, at Hampden Ponds; and in October, 1908, at Smith's Ferry. A Black Skimmer was found exhausted in the latter part of August, 1893, in West Springfield. In 1877 or 1878, a number of Double-crested Cormorants were taken from small flocks near Springfield. Red-breasted Mergansers have occurred—one April 28, 1908, in Longmeadow and one prior to that in Northampton; also Gadwalls—one October 14, 1904, at Glastonbury, Conn., and one November 5, 1883, at East Hartford. Old-squaws, American, Surf and White-winged Scoters, and Brants have been either identified or taken near Springfield. Two species of Phalaropes have been known to use the Valley in the fall as well as the Purple Sandpiper, Red-backed Sandpiper and Willet.

By the keeping of migration dates up and down the Valley, museums, scientists and interested bird students have collected much valuable data relative to arrivals and migrations. It is hoped to establish a series of banding stations throughout the length of the Valley. Bird banding more than any other agency should reveal all and more than all that can be written emphasizing the importance of the Connecticut Valley as a highway for migration; and of its constant use, year in and year out, by thousands of migrants in both directions.

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BLUE FEATHERS[1]

BY WILDER D. BANCROFT, EMILE M. CHAMOT, ERNEST MERRITT, AND CLYDE W. MASON.

PHYSICISTS distinguish between pigment and structural colors. Pigment colors depend on the chemical nature of the material and are due to the absorption of certain wave-lengths by the mole-

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