

SYLVAN SECRETS

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Birds







SYLVAN SECRETS,

IN

BIRD-SONGS AND BOOKS.

BY

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AUTHOR OF

"BY-WAYS AND BIRD-NOTES," "SONGS OF FAIR
WEATHER," "THE WITCHERY OF
ARCHERY," ETC.



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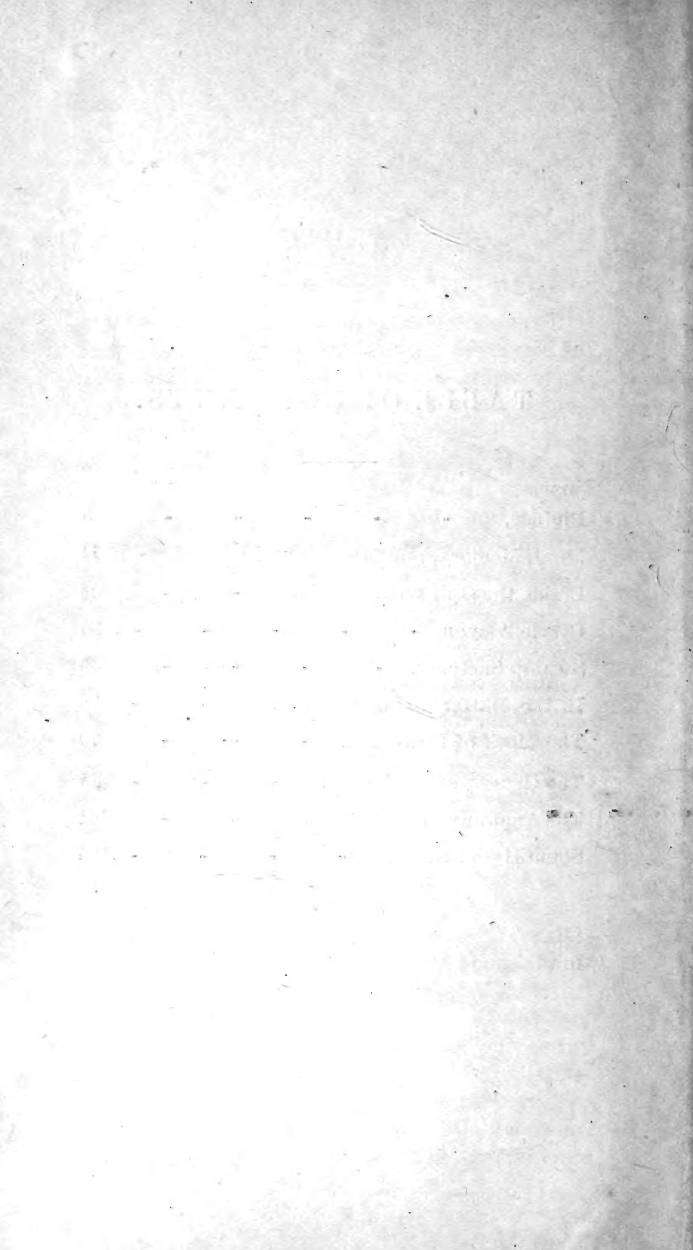
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PREFACE.

THIS little book is made up after the fashion of Nature's concretions. The parts seemed to have a sort of affinity for one another, without, in some instances, any discoverable kinship. A sheaf of essays (most of them written in the woods of the South) I offer to the reader just as it was bundled together after appearing at intervals and in separate wisps in the *Atlantic*, *Scribner's*, the *Library*, and other magazines.

From my earliest boyhood to the present hour, I have felt a constant and increasing pleasure in chasing sylvan secrets through sunlight and shadow, by river and brook, on mountain and in valley, all the way back and forth from the lakes of the North to the great Southern gulf. Many of these secrets I have caught, as in a net, a lot of rustling, chirruping, melodious things, like singing birds, or prismatic, glowing, odorous, flower-like visions robbing me of the power of expression, and yet ever demanding description. I have felt no other limitation quite so galling as the inadequacy of my insight. I can see almost to the nucleus of things—I can nearly make out this or that perfect form—I almost know what the serpent thinks, what the dove desires, what the mocking-bird sings; but the dainty film is always interposed, just at the moment of triumph, to shut out the perfect conclusion and to leave a haunting half-

knowledge in its place. It has cheered and comforted me not a little to find such men as Huxley and Darwin and Alfred Wallace turning disconsolately away from the same little difficult nebulæ that have worried my weaker eyes.

Possibly I am the only person in the world who ever fancied that the highest form of poetry may lurk in the problems of comparative anatomy and physiology. Be this as it may, behind the hints and correlations and suggestions of dry bones and dessicated fossils there appears to me an epic of awful glory and power and significance. What a romance is geology! What a melodrama is life from its lowest to its highest forms! We are apt to look upon Darwin as a realist; but when we read him well he is a poet like Milton, a dreamer like Pythagoras, a prophet like Daniel, a dramatist like Shakespeare.

The more I have studied Nature, the more I have become aware of God. When I approach the beginning I find Him, and His hand puts me gently but firmly away, as if to say: "I stand here all alone." When I approach the end, there too is God standing all alone, self-existent, sufficient, unimaginable, at once the cause and the culmination, the germ, the bloom, and the fruit of all things. I do not expect that men ever will find the secret of life locked in a cell or in any other minute division of matter. No analysis of the specialist, no synthesis of the generalizer can ever pass beyond the veil. God said: "Let life be," and life was. Still I believe in evolution; I feel it, I see it; but it is evolution by God's law, bounded by His limiting purpose. When we study Nature we study Him, not in the materialistic or pantheistic sense, but in the

Christian sense. The will of the universe is God's will, because God made the universe, as he made man, and blew into it the energy that fills it. I see no clash between Christianity and Science. Geology tells me the same story that Moses and the prophets tell me; the birds sing it, the flowers hint it, the winds murmur it, the aspirations of my soul are founded in it.

The following essays, however, are not especially devoted to evolution. Indeed some of them are not Nature-studies at all. The one on Shakespeare when it first appeared called down upon me the tremendous hand of a great scholar, and I was cuffed until my ears rang merrily; but I did not wince, and I would walk five miles to-day to clasp that hand. If some over-earnest follower of Huxley, Parker, and Macgillivray shall consider it worth while to show clearly that my conclusions in "Hyoid Hints" and the "Anatomy of Bird-song" are erroneous, let him proceed; but until he do this, I shall believe in my demonstrations with perfect complacency.

After all, the title, "Sylvan Secrets," under which this booklet goes forth, does not necessarily signify that the Secrets are explained; they may be merely catalogued as precious mysteries, valuable for the very qualities which render them insoluble. Perhaps there may be critics who will imagine that the most obvious secret of all is the *motif* of my work, and I am quite charitable enough to sympathize with the practical spirit of such, although I certainly must have had a purpose other than the mere pleasure of writing. I saw, felt, heard, tasted, dreamed, and fancied, and the substance of all was what I tried to put into words. What is stated as fact must

be taken as fact, what is offered as conjecture or inference must be weighed as such, and what appears to be the overflow of a cheerful and optimistic fancy may be done by as the reader please.

As for me, when I turn these leaves I hear the rustle of wild foliage and wilder wings, the songs of many birds, the bubbling of innumerable brooks, the wash of surf, and the tumbling of white-caps. Can the reader hear these by the same means? If he can, my writing has not been done without a touch of genius.

Who reads Nature without the side-light of many books? How shall one keep the art of literature out of one's interviews with things in the wilderness? If I hear a thrush or a mocking-bird sing, how shall I hinder the coming of the Persian and Provençal and old English poets with their rhymes about the Nightingale? Before I know it I am assuming the attitude of a singer, and am posing in Nature's face. How shall I be dumb while the very stars are eloquent? Here is Theocritus and here is Keats singing away, as young and happy as ever; why shall I not attitudinize in my day and way?

"But these essays are incongruous," suggests the critic. Well, then, they are incongruous; but what of it? Nature is incongruous, nay more, it is contradictory, as are certain of my essays. At one time my observations of facts clearly prove one thing; at another time they certainly establish just the opposite thing. I am not sure that this is altogether my fault, for Nature is tricky in her moods and as whimsical, now and again, as any pedagogue. She strings her creations together without rhyme or reason. The

violet and the stramonium, the ground-cherry and the night-shade, the clover and the nettle, the woodbine and the poison ivy are all bound in a volume. Man has done all the classifying, all the distinctive grouping. It is the botanist, not Nature, who does the assorting, separating and naming. The rain and the sunshine find the weed as well as the corn, and touch it as lovingly.

One of the most distinguished of American scientists chanced to read the paper on the "Anatomy of Bird-song" while it was in the manuscript. "Nobody will care for this," he said. "You will not have twenty readers. Why, when I was attending Huxley's lectures in London, he spoke to more empty benches than to auditors. The truth is, dry bones are very poor picking at best."

This was not news to me; but I resented it all the same, for I see in geology, in comparative anatomy, in paleontology, in geographical botany, and in comprehensive analysis of Nature generally, the basis of all human inspiration, for these include the universe and man. Divine inspiration comes of God, and is independent. We must take it without a question. Our study of man is feeble and narrow, if we make it all foreground, leaving out the perspective of natural history. What is the human story comprised between the oldest monuments and the books of to-day, if we compare it with the story suggested by the hints of geology? What is the romance of the Cid, or the Romance of the Rose, or the Iliad, beside the romance of the peat bogs, or of the coal-measures, or even of the American mounds? There was a Golden Age of song, there was the idyllic life of Arcadia; but beyond these there was a

time when tropic flowers and spicy plants and grasses and odorous fruits grew around the boreal pale. To me all nature is romance; even the skull of a bird is the flower of a long *chanson de geste* coming up through a million years of adventure and change from the fish or the saurian. Every species of plant or animal has an heroic significance when I remember what a battle it has fought for existence. When I am out with the trees and the winds and the birds and the flowers, I am consorting with things of ancient extraction whose adventures and experiences reach back into the farthest mists of perspective. They have secrets to tell me, but how shall I know when they are told ?

THE AUTHOR.

SYLVAN SECRETS.

MIND, MEMORY AND MIGRATION OF BIRDS.

WITHOUT preliminary negotiations, or special preparations of any kind, I took possession of an old building which once had been a "gin-house." Now bear in mind that I do not mean gin-mill when I write gin-house, for the words are far from synonymous. My new abode was picturesquely dilapidated and stood in the midst of a dense growth of young pine trees. From a window I had a view, through a rift in the foliage, of a small blue lake and a wide stretch of green, rush-covered marsh. An ancient peach and pear orchard was close at hand, the venerable old neglected trees standing knee-deep in a mass of scrubby scions.

This gin-house, instead of having once been a place where intoxicating drinks were concocted and sold, was simply the wreck of an old plantation cotton-ginning establishment; indeed here was an abandoned and overgrown estate which formerly had been the pride of a Southern planter of great wealth and social and political power. The stately mansion had disappeared, saving the fragments and ruins of some stuccoed brick columns and the amorphous heaps of rubbish suggestive of chimneys and foundation pil-

lars; nor was there much left to remind one of the agricultural wealth, formerly the largest of this broad area now given over to a thrifty growth of strong young trees and to a wild, musical mob of birds. A considerable marsh, once drained by a rude wind-mill and cultivated in sea-island cotton, had been reclaimed by the tide-water (which now crept in rhythmically through many breaks in the little dyke) and had become a home of the herons and bitterns. Remnants, more pathetic than picturesque, of the tall shaft and pumping apparatus belonging to the mill lay in a mouldering and rusting heap beside the water.

My gin-house was a poor shelter if it should rain, but I could supplement it with my waterproof blanket; and then the climate was very kind at worst. How, indeed, could a climate be more tender in its concessions to one's preferences? A breeze from the gulf, salty and exhilarating, or a waft from the pine-woods, fragrantly heavy with terebinth and balm, was blowing day and night, and the medley of bird songs was accompanied with the effective counterpoint of the distant sea-moan. There was romance in the atmospheric perspective on both water and land as well as in the story suggested by the ruins all around me, and a few of my readers will readily recall from experience of their own how sweet an auxiliary to realistic study is this influence of romance. Science, through which realism works its only wonders (for realism in fiction is a fraudulent pretence), science, I say, is itself most charming when its light flickers on the filmy and misty verge of Nature's romance, and your genuine lover of science is far from averse to making his driest studies under circumstances of the

most picturesque sort. I do not claim that I chose my old cotton-gin house on account of its poetical suggestiveness; this quality was simply a great charm added to a spot possessed of many practical advantages in aid of my purpose, which was a peculiar line of bird-study.

On one side a fresh-water lakelet, on the other side the Gulf of Mexico—great marsh meadows and reaches of sand-bar—dense forests, thickets, old fields given over to Nature, orchards left to the will of the mocking-birds and their friends and foes—everything, indeed, to favor my quest was in view, with the romance and the beauty thrown in for good measure. So, swinging my hammock from the heavy beams of the gin-house loft, and leaving the care of the mule and the spring-wagon to my hired free man of color, who was to be my factotum, I abandoned myself to the study in hand, feeling that for once many elements had joined themselves together to enhance my physical and spiritual comfort. Here on the latest fringe of Nature's geological formation, with all the newest discoveries of natural science at hand in the shape of books and memoranda, and with fishes, birds, reptiles and mammals, water of sea, stream and lake, woods, marshes and swamps, with all the range of plants growing in them, what more could I wish?

It was comforting to realize what a difference there must be between life now and life some million or more years ago; for there has been a period in the past when I should have had to be content with sitting upon some bleak, sandy cretaceous shore and studying

those mockeries of birds with which Nature was fond of experimenting in her infancy.

Professor Marsh has carefully studied, described and figured the remains of an ancient bird which he has named *Hesperornis regalis*; and which in shape and habits resembled a loon. He makes a striking comparison between the brain cavity of the ancient and that of the modern bird, and draws the inference that, as in the case of mammals and reptiles there has been a steady increase of intelligence in the avian animal from the most remote period of its existence down to the present time. Here is a suggestion arising from the fact of this constant brain-development: may not brain-improvement, which is another phrase for intelligence-development, account in a large degree for the gradual self-modifying of species to suit the environment? Darwin's law of the survival of the fittest pre-supposes simply the fittest physically; but the film of vague intelligence primarily planted in the animal no doubt gave the impulse toward the proper habitat and also that initial elasticity, which has become so powerful, rendering self-modification to suit changes in surroundings not only possible but comparatively easy.

Probably, when all manner of life was largely elementary and weak, the conditions of change were almost infinitely mild and all the movements of Nature slow and gentle. In those times little intelligence was needed to enable the fittest to survive. It may be assumed that brain and nerve-centres increased in size and strength as necessity compelled an increase of nervous exercise; but such an assumption compasses a great deal not directly expressed by the phrasing of it,

for the influence of the mind upon the body, even in the case of a low animal, is great and manifold. Indeed, I believe that the whole matter of physical modification in animals brought about by the exigencies of change in environment, is referable, in an obscure and indirect way, to that influence. What we attempt to express by the word *desire* is nothing more than a natural (though it may be a sadly debased) impulse toward another state. In its broadest and freest sense desire is merely the initial effort of a being toward a new experience or a lost estate; in other words, it is the consciousness of a need coupled with an impulse in the direction obtaining it. The mind-cure fraud is based upon the efficacy of desire. The concentration of the mind upon any particular part of the body certainly affects the part, and the effect may be to produce local disturbance of a peculiar kind, or to destroy a result of local lesion, provided the lesion be not more than a disturbance of nervous equilibrium. From the point of view thus taken one may see one's way clear to an inference as simple as it is strong: evolution is the outcome of natural desire, and natural desire has been generated by a disturbance of natural equilibrium. There is nothing abstruse or occult in this proposition; it is merely a recognition of the development of intelligence and of the controlling power of the brain in animals.

Professor Marsh, in the course of his admirable monograph on the *Odontornithes*, or ancient toothed birds, suggests that certain wingless species had become so by *non-use* of the organs of flight. Perhaps the limit of this proposition would be found coinciding with that of brain-influence above

enunciated. The neglect of an organ implies that the organ is not needed, and that therefore it is not desired. On the other hand, if the need for an organ increase, the desire for it will strengthen apace, and the organ will be modified in accordance with this natural desire. The trouble about fully comprehending this law lies in our proneness to confining our idea of its operation within the space of a few years, as compared with the almost immeasurable ages of geologic time throughout which the law has operated with the effects we now observe. If we can force our minds to consider a million years, for instance, as the minimum space of time requisite to effect the elimination of a useless organ by the operation of natural desire, transmitted by heredity, we shall begin to feel the perfect reasonableness of our proposition.

Going a step farther, I think there is much evidence tending to prove that birds are endowed with what may be called hereditary memory and hereditary desire. It seems that if ever man possessed this hereditament he has lost it in the over-development of his higher mental powers.

I have noted the following facts:

A bird, when reared in captivity and far from any of its kind, will utter exactly the notes of its ancestors. It will also build a nest after the fashion prescribed by ancestral habit. It will feed its young in accordance with hereditary custom. It will migrate, or not, as ancestral influence directs. It will capture its food after the style and by the same means established in its tribe by immemorial usage. It will seek the habitat always haunted by its kind.

I knew a boy who took a pair of unfledged

woodpeckers from the parental nest and reared them by hand. He kept them in a cage nearly a year, and then freed them. They lingered about the premises and soon pecked a hole in a dead pear tree, after the true *picus* pattern, and therein reared a brood. Nest-architecture evidently was hereditary with them.

I have heard a mocking-bird, reared in captivity and alone in a Northern state, utter, with absolute precision, the characteristic cry of a Southern bird whose voice it never had heard in its life.

It will be evident to every close observer that the habit of living in a cage is becoming hereditary with the canary bird.

Domestic fowls are losing, by an infinitesimal process, their wing-power. The need for flight is diminishing and with it the natural desire for wings. The body and legs and brain of these birds are rapidly increasing in weight and strength. On the other hand, our domestic fowls have largely lost their ancestral traits—hereditary memory with them is beginning to go no farther back than to the limit of this domestic state of existence.

I witnessed a striking incident in bird life which was very suggestive: a wild goose, by some accident separated from its flock on the spring flight northward, circled low in the air uttering now and again its loud cry. A domestic gander preening himself beside a meadow brook, heard the clanging voice and lifting his head answered it with emphasis. I could not help wondering if an almost irresistible wave of memory had indeed been started in the brain of the domestic bird by this low-flying migrant. Dimly, perhaps, but wildly, sweetly, came in the old hereditary

desire for the far northern water-brinks, along with an elusive and tantalizing recollection of a time, thousands of years ago, when he, in the body of a remote forebear, or clamorous male ancestor, voyaged the high thin air in one of those triangular flocks sketched on the violet sky of spring, or on the gray-blue heaven of autumn.

I have seen a flock of domestic geese, in early spring or late autumn, rise suddenly and fly around in the air, uttering wild cries and exhibiting every sign of ecstatic impulse, for which there appeared no sufficient cause in their surroundings or condition. I have not a doubt that this is an almost involuntary movement toward migration generated by a feeble return of the old hereditary natural desire.

The foregoing facts and instances, to which might be added many more of a like character, all tend to prove that birds possess something like hereditary memory. On the other hand a few facts may be cited tending to establish the proposition that wild birds are modifying themselves in response to the exigencies arising out of recent changes in their surroundings.

The red-headed woodpecker is rapidly becoming an expert fly-catcher, a pursuit for which his physique does not especially fit him, and he is already a grain and fruit-eating bird, although his bill and tongue are made for extracting insects from rotten wood.

Chimney swallows have almost quite abandoned hollow trees for their nesting-places, even in our most thickly wooded areas, preferring our chimneys.

The high-hole, or flicker, has become almost entirely a ground bird in its feeding habit,

and is modifying its bill from the ancestral wedge shape of the woodpecker's beak, to that of the slender, curved mandibles belonging to the thrushes and the meadow-lark.

The house-wren rarely builds its nest in the crevices of cliffs or in the hollows of logs and trees, as it once did. It seeks the habitations of man and is modifying its nest architecture to suit the new situation.

The sap-sucker (yellow-bellied woodpecker) is losing the power to protrude its tongue far beyond the end of its bill, a very striking modification going on apace with its departure from the true woodpecker habit of feeding. Some of the woodpecker species, the hairy woodpecker, for instance, can thrust forward the tongue more than two inches beyond the point of the bill, while the sap-sucker can reach scarcely one-third of an inch.

In the case of wading birds, those species which have chosen to live near small streams have shorter legs and neck than species which prefer larger streams, lakes or sea-borders, and, taking the little green heron as an example, as our streams diminish in volume year by year, the bird modifies its habit in accordance with necessity, and in my mind there is no doubt that its legs and neck will be affected, in the course of a comparatively short period, to a noticeable degree.

The blue-jay is either a corvine croaker passing into the song-bird's estate, or a song-bird whose natural desire for singing is fading away, leaving it to relapse into the crow's unmusical condition; for its voice has a strain of genuine melody in it mixed up, almost comically, with the harsh discords of the true crow-caw.

It would seem that this power of self-modification serves the bird in the same way that the inventive and constructive faculties serve man. The instance of the soundless flight of night-birds of prey is a striking one. A hawk in swooping down upon a quail at mid-day makes a loud roaring with its wings, while an owl falling by night upon its quarry is as silent as "snow on wool." The stillness of night has operated for countless ages to create a natural desire in owls for the power to strike their prey in utter silence, and the desire, transmitted by heredity, has finally so modified the bird's wings and plumage as to respond perfectly to the persistent thought.

Birds of the polar areas of snow and ice are white, those of the tropics are vari-colored and brilliant-hued. The condition in each instance has been reached through a natural desire to hide by blending with the prevailing tone of Nature. Thus the quail and the partridge, the meadow-lark and the flicker, the snipes, the woodcock, the prairie grouse and, in fact, nearly all the ground-feeding birds, resemble one another in general color or plumage-tone, simply because their environment has induced parallelism of natural desire—the desire to blend with the prevailing brown tinge of their feeding-places as the most effective protection against the sharp eyes of their enemies. Some of the game-birds have even acquired the power to withhold their scent from foxes and wolves, and from the sportsman's dog as well. There is a good reason why this desire to perfectly disappear, so to speak, in the color of the environment, has been more persistent and successful in the case of game-birds than in that of any other. On account of the sweetness of its

flesh the game-bird has a host of greedy and ever-watchful enemies, and therefore its life has been an intensely tragic experience from its beginning down to the present time.

The aquatic birds, viewed in the light of paleontology, have changed less than any others in their structure and habit; this because their habitat and their methods of feeding have remained constant in a general way. From the *Ichthyornis* and *Aptornis* of the cretaceous shores and seas down to the terns of the present time, the seas have been the feeding places and the homes of this sort of birds, and the food has changed little in its character. Probably the marine fish-eating birds are all of very ancient origin, and have developed very slowly, while the kingfishers and other fresh-water birds are, comparatively, of recent creation, or have been greatly modified from some ancient form, because the conditions and resources of fresh-water bodies have always been less constant than those of the salt oceans and seas.

While my sojourn at the old gin-house lasted I made the herons and shore-birds and the noisy songsters of the pine wood and live-oak swamps my boon companions. I was not in a shooting mood most of the time, preferring to drift about in my boat, or to walk stealthily among the wild things, watching their movements and studying their attitudes—always with reference to the suggestions contained in the foregoing notes. It is curious how one's imagination helps one under such circumstances, by lending to every visible thing that coloring which never was on sea or land. I soon came to regard my stately herons and wide-winged pelicans as venerable birds, probably older than the land upon

which my gin-house stood. Why should a heron ever die of old age? He has no grief, no sorrow, no nagging conscience, no indigestion, no tendency towards drunkenness or other vice. Look at that big ash-blue fellow yonder, as he stands beside that wisp of tall marsh-grass, and tell me when and where he was hatched; may it not have been ten thousand years ago? Perhaps it was he who shed the feather, the fine impression of which now rests somewhere in the lowest stratum of the quaternary! Brave old fellow! he lived before the western mountains were lifted out of the sea, and while yet the upper cretaceous rocks were sediment held in suspension. He was too wary to leave his bones beside those of *Hesperornis* and *Ichthyornis*! With his jewel-like eyes he has seen every step of man's development.

But the mocking-bird yonder, how old is he? How has he survived the great upheavals and the great down-sinkings—the floods and the ebbs? It is not known; but he is here, nevertheless, as young and fresh and free as he was when Adam drew the first breath of a living soul. What migrations and re-migrations he has had to make to keep on land and to follow the shiftings of climate-centres, during all these geologic oscillations! The time was, perhaps, when he sang in fruit-fragrant groves around the North pole; for that was a warm and luxuriant spot once, as is shown by the vegetable fossils of the later rocks. All the way from the gulf-coast northward to where the paleozoic deposits dip under the eternal ice and snow of the boreal region are found traces of a flora which grew under tropical and, perhaps, even torrid conditions of climate. The age of riant vegeta-

tion and of summer heat was followed by the gradual coming on of what is called the glacial age, when vast accumulations of ice, in the form of glaciers, swept down from the far north and destroyed all life in America, as far south at least as the Ohio River valley. During the time this enormous body of ice was accumulating and moving down in the form of a glacier, toward the gulf, our birds began to feel a desire to move away southward before the chilly invader. This desire was not born in a day, or a year, or a century; it slowly grew by hereditary descent and accretion, so to say, operating differently in different species. Some birds by infinitesimal degrees modified their physiques to conform somewhat to the exigencies of the climatic changes; others, following the call of natural desire, crept away in the direction of warm sea-currents and genial sunshine until they were huddled in some lost Atlantis, some tropical garden of preservation washed by tepid ocean-streams over which the glacial rigor could not prevail. Then came another oscillation of Nature. The tropical region began to return toward the pole, drawing the birds along with it, and now here they are again swarming in to the land out of which the ice-king drove them hundreds of centuries ago!

As I swung in my hammock under the grimy beams of my gin-house, listening to the mocking-birds' songs and to the mellow moan of the sea, I began to analyze and compare all the foregoing facts, and it seemed to me that I discovered the solution of this mystery of bird migration which has troubled naturalists so long.

During the countless centuries of the qua-

ternary age there was a series of climatic oscillations, the tropical temperature swaying back and forth over a wide area from north to south. The birds migrated to and fro under the impulse of a natural desire to keep within an agreeable habitat. These oscillations of temperature were on a large scale; but, from the nature of things, there were intermediate disturbances of a like character, and of far slighter effect. No doubt the birds resisted these changes with stubborn persistency, giving way before them only at the last moment, and returning upon their haunts with each temporary relaxation of the icy grip, to be driven away again and again through a long series of generations. This struggle for the old northern home, kept up for ages, became a hereditament of bird-nature, an instinct, as we call it, a natural desire, indeed, irresistible and perpetual. The migratory birds are the old birds of the north. With them the polar region is a dim and tender memory transmitted from a remote ancestral source.

The non-migratory species are those birds whose physiqués were long ago so modified that natural desire for a lost habitat was extinguished and equilibrium reached.

The aquatic and semi-aquatic birds are mostly very distant migrators, and yet, apparently, they have the least need to migrate at all. Why, for instance, should a Florida gallinule leave the plashy, lily-lined margins of the southern lakes in spring and go far north to less eligible waters? Why do so many wood duck, teal, snipe, herons and bitterns come out of the South to breed? The fact that many, very many, of these birds do not migrate at all is strong proof, I

think, that the hereditary memory is growing weaker year by year, and that the time may come when migration will cease. In many cases the *need* for migration does not exist, therefore the desire is merely traditionary, as it were, and must be fading out. The mocking-bird's habit is an instance of the imperfect migratory memory. Why should a few of this species come as far north as the Ohio valley to nest when the great body of them are happy to remain far south? Such a question might be asked regarding many other species. The answer is to be found in transmitted memory and hereditary desire.

BESIDE THE GULF WITH RUSKIN.

LET me sketch a bit of landscape before I begin to write, a bit with which I have been so charmed day after day that I have not looked at anything else. The point of view is a high swell of sand thinly set with tall, slender pine trees, and our seat is a smooth, weather-beaten log. Behind us is a dense forest, stretching away for miles, a forest in which the blooms and tassels are beginning to show, albeit it is the second day of February. Before us, and but 150 yards away, shines the white beach and pale blue water of the Gulf of Mexico. There is a sound overhead, a strange moaning, made by the breeze in the pine-tops, and the rhythmic sea-boom seems to flow close to the ground at our feet. We can see the sky in violet streaks and fragments through the foliage, and we can catch at times glimpses of stately ships standing far out along the horizon, apparently motionless, but in reality bowling along before a good breeze "from lands of snow to lands of sun." The temperature of the air is such that we need no wraps, and yet are not too warm, and there is a June-like balm felt with every breath we draw. Here is where my friend and I come to lounge—to "loaf and invite our souls." We have been reading Ruskin, too, or rather my friend has been reading aloud to me, while I have lain in a most receptive mood, watching the ever fresh color-changes of the landscape. Ruskin describes clouds,

but how could he ever find a phrase with which to picture a gulf-cap, as I see it yonder in the far south-west, suspended between sea and sky? The fact is that here on the gulf coast I find some of the most delightful weather and many of the most charming bits of scenery I have ever enjoyed. One could almost afford to have a sharp attack of inflammatory rheumatism in order to get sent down here (for a month or two of convalescence) where one may lie on a log like an alligator and listen to the wind and the sea and the roaring pines, while an obliging friend sits buzzing and humming over a volume of Ruskin like a bee over a flower. Few books will bear reading in the open air, in the full, strong light of nature. Even Ruskin would suffer under the test.

How apparent becomes the utter isolation of a mind like Ruskin's when one gets thoroughly apart with it and at a great distance from the clashing activities of worldly life! Emerson, Carlyle, and Ruskin—three lonely spirits talking to mankind in the language of seers and prophets, and all without much result, so far as effecting their purposes is concerned. This is good mind-food, all this brilliant literature, suggestive, thought-provoking, soul-delighting; but the old world and the new world heed not its philosophy, flinch not under its goads, adopt not one suggestion it offers. A few read and are strangely affected; they feel a fertilizing element flung into their minds, and they wonder why all the world is not down at Carlyle's, or Emerson's, or Ruskin's feet; and yet even these few do not go much farther than mere receptivity impels. The activities of life are, indeed, little influenced by the great abstract

thinkers. This world is a material one, and, hate materialism as we justly may, it is affected most by material forces. One sees this more plainly when one is at a distance from the world, shut up, so to speak, in the heart of nature, where one may be secure in peeping forth to watch

With an eye serene
The very pulse of the machine.

Hence, reading Ruskin in the open air of the pine woods, with the blue gulf of Mexico purring at your feet, is quite different from perusing him in a closely-curtained and overheated library. While my friend was reading yesterday, in the mellowest tones imaginable, and while I was watching a steamer trail a dim line of smoke along the wavering horizon, lo! the first mocking-bird song of the season came rippling forth from a neighboring thicket of wax-myrtle bushes. You know these myrtles bear thick bunches of fragrant, oily berries, from which the people of this region formerly made wax for candles used by Catholics in certain church and funeral formalities. We forgot Ruskin in giving our ears over to this fresh music bubbling from the well-spring of nature. Think of it, a genuine gush of bird-song on the second day of February! And such a song, too! bright, airiose, full of spirit, and yet rich and deep, almost too melancholy at times, running through a hundred changes in as many seconds, and filling the whole wood with melody. It is very unusual for a mocking-bird to sing so early as this, but the weather has been superb, and already the violets are blooming blue and white all through the forests along this coast. My friend threw aside the

volume of Ruskin and went slipping away toward the thicket in a vain attempt to surprise the singer at his song. Here is fame! The greatest of living art critics is forgotten in the presence of American song-birds! For one I am patriotic enough to be proud of the bird's superiority. Whatever is good and at the same time genuinely American, is worth honoring, if it is nothing but a song of freedom sung out of season by a free wild bird. But the mocking-bird is far more typical of America than is the eagle, for it is found only in our country, and then its restless and enterprising disposition is the very counterpart of that which has placed our nation in the fore-front of progress within so short a period of time. It is interesting to go back through the writings of the naturalists and note how they all have done homage to the mocking-bird, *le moqueur* as Buffon called it. Fernandes, Nieremberg, Catesby, Bartram, Wilson, Audubon, Nuttall, Baird, and Coues have built monuments of praise to it, poets have sung to it, musicians have tried to imitate it, and everybody has admired it. No wonder then if its song drove Ruskin from our minds. The digression was short, however, for, like every other true genius, the mocking-bird is not overgenerous with song-giving, and always quits before he has quite satisfied you.

My reading friend began where he had left off with a passage like this: "The guilty thieves of Europe, the real sources of deadly war in it, are the capitalists." From a man who was born a capitalist and who has never known the need of a dollar, that is a strange assertion, but if any rich man has or ever had the right to make it John Ruskin is he. A capitalist who gives \$50,000 per annum to the

poor is quite entitled to air his opinions touching the doings of his own tribe of men, and we are bound to give his opinions considerable weight. But when one is in the woods and as free as the breeze one is apt to smile at any mere opinion. At this distance men appear to be divided into two classes,—viz.: capitalists and those who would very much like to be capitalists. The capitalists are glad they are capitalists, and the others are angry because they are not capitalists. I say that thus it looks to a free man far down in the Southern woods, no matter what Ruskin or the anarchists may say. It is curious to note how surely every argument against the natural processes of human intercourse and government tends toward anarchy. Worldly wisdom long ago constructed, by a process of crystallization, the only true economy—namely, that controlled by the principle of make and keep. The laborer is worthy of his hire and he must have it, but he must save a part of it if he would become independent. This is all that can be said from now till doomsday. The laborer is the only free man. So soon as he ceases to be a laborer he is no longer free, and so the danger to organized laborers bound in a body is the loss of personal liberty in the loss of the right to labor at will.

But we must not let Ruskin lead us into the labor question; for how can we think clearly on such a subject here in this dim wood, with the lazy, balmy breeze fanning us, and the gulf waves murmuring at our feet? Give us a vision of the stones of Venice, O large-hearted but impractical Ruskin! or lead us over to Rome, or to Verona in a trance, but do not mention political or domestic economy

again, for we are idlers and health-hunters, lounging along the gulf shore and reading for pleasure, not for profit.

Indeed, one must read for pleasure when one would thoroughly enjoy Ruskin, and then what a charming outdoor companion he is. His theories and quirks and carpings all disappear in his brilliant phrasing and musical cadences. Color, color, color, harmony, finely-sketched outlines, impressions set against the most witching backgrounds, and above all a rare sincerity ever present, and saturating the whole like the juice in ripe fruit, or like the sunshine in summer air. One must mix one's figures in attempting to characterize Ruskin's style, for it is as changeable and curious as the inside of a kaleidoscope. He sees things from an isolated and exceptional point of view, but he is never purposely eccentric or odd in his ways of expression. He is original, and, more, he is always strikingly picturesque, so that when you read his works in the open air, or hear them read there, it is almost as if his figures and thoughts stood out upon the landscape against the sky or the sea, for above all he is an artist of the best sort and harmonizes his creations with the great scheme of nature. He believes that he is a realist of the pre-Raphaelite kind, but he is, nevertheless, a romancer, a thorough-going idealist, always glorifying and beautifying something common and vulgar till it shines like a sunlit cloud. Indeed, even nature is not a realist of the analytical, microscopic sort in her best work, for she is not content with showing things just as they are, but must hang a luminous atmosphere about them and touch them with heavenly colors. She knows the blue enchantment of distance, the

value of romantic suggestions, the power of dim lines and mysterious shadows. She sketches here, she indicates an effect yonder, at one moment finishing the minutest details, at another dashing a formless wonder on sky, or sea, or mountain side, but she never stops work to analyze motives or to call attention to her methods.

“Not with the skill of an hour, nor of a life,” reads my friend, “nor of a century, but with the help of numberless souls, a beautiful thing must be done.” Ah, Mr. Ruskin, you are right. By such a plan all creation has been wrought. Nature knows it. With the help of numberless energies the seed germinates, the plant grows, the leaves leap forth, and the flower flashes like a sun. What eons of years it has taken to build a rose up from the almost formless plant sketch set in the ancient rocks! What a slow process has been the building of the present man up from the man of the cave and the peat-bog! Nature is never in a hurry save when in a destructive mood. She broods over her working plans and saturates her materials with life from a myriad sources before her dream begins to take material form. Ruskin disputes himself, however, and repudiates this doctrine presently, for he affects to despise the practical part of paleontology and archæology, and to laugh at the scientists in general. Perhaps he is in accord with nature here, too, for she disputes herself and denies her acts, whenever it can serve her turn, to say nothing of the way she snubs the scientists. “Does not Mr. Darwin show you that you can’t wash the slugs out of a lettuce without disrespect to your ancestors?” reads my friend, and I see a smile of deep satisfaction on his refined

face, for he cannot endure evolution. But it occurs to me that the choice between a slug on one hand and a hideous cannibal on the other gives one no great æsthetic latitude in selecting a forefather. It is not what we have risen from that should make us blush, but what we are now. Our progeny, not our ancestors, should make us glad or sad. All the more honor to the man if indeed he has come up from the germ in the old dust of chaos, has wriggled past the worms, swam past the fishes, outstripped the birds, and made himself the lord of all the animals. Indeed, as I sit here in this tropical springtide, with my eyes full of color-visions and my ears full of soothing sounds, I am willing to consider myself a manifestation of nature's patient work, the end of a labor begun when life first stirred in the most favored spot of the earth.

The trouble with Ruskin is that he has come to look upon art as the whole of life. He would make the world a great studio—he would change human passion into a figure to be drawn on canvas and cut in marble. Hear my friend read again:

“Do you fancy a Greek workman ever made a vase by measurement? He dashed it from his hand on the wheel, and it was beautiful; and a Venetian glass-blower swept you a curve of crystal from the end of his pipe; and Reynolds or Tintoretto swept a curve of color from their pencils, as a musician the cadence of a note, unerring and to be measured, if you please, afterward, with the exactitude of divine law.”

This is a fine sketch of true genius; but I look at the slender, shining wake on the water yonder, where a wild duck has been swim-

ming, and I note the same freedom of curve, the same unconscious sweep along the line of beauty which has immortalized the painter, the glass-blower, and the carver. And hark! the mocking-bird again—a gush of artless melody rippling away through the slumberous wood—sweet as the flute-notes of Marsyas or the lyre-chords of Apollo.

I do not hear half of what my friend reads, for how can I listen to sea and wind and pine moan and bird song and Ruskin all at once. I watch the fishing-smack out yonder, beating in against the breeze. Now the mainsail is white against the sky; anon it is black as ink; again it is gray touched with brown. I used to see pictures of ships with gloomy sails blotching an almost indigo sky, and I thought the pictures in bad color. Now I feel how true they were. Even Ruskin might make the same mistake in a criticism. This for instance:

Both Raphaël and Rembrandt are masters, indeed; but neither of them masters of light and shade, in treatment of which the first is always false, the second always vulgar. The only absolute masters of light and shade are those who never make you *think* of light and shade more than nature herself does.

But I find that nature makes me think of light and shade all the time. Indeed, I see nothing else in nature so emphasized here, so accentuated there, so graded, so obtruded, so dashed about and experimented with, so insisted upon at every turn, as light and shade, and he must be a vigorous brushman, certainly, who can get into a picture more light and shade than nature habitually uses on her smallest canvas. Even now the sails of the smack are shining like a flake of moonshine

against the dark magnolias of a low shore line, as it glides into the little harbor.

After all even Ruskin is hard to read in the "lap of nature." Give me something lighter, a volume of Keats or Wordsworth; or—no, give me nothing by nobody; let me lie in this balmy spot and dream and see visions and be free from the cunning of genius and the tricks of talent.

CERYLE ALCYON.

THE kingfisher is a dash of bright blue in every choice bit of brookside poetry or painting; he is a warm fragment of tropical life and color, left over from the largess bestowed upon our frigid world by one of those fervid periods of ancient creative force so dear to the imagination, and so vaguely limned on the pages of science. The bird, by some fine law, keeps its artistic value fully developed. You never see *Alcyon* out of keeping with the environment; even when going into the little dark hole in the earth, where its nest is hidden, the flash of turquoise light with which it disappears leaves a sheen on the observer's memory as fascinating and evasive as some fleeting poetical allusion.

Ceryle Alcyon! how sweet the name in the midst of those jarring sounds invented by science. Coming upon it in the catalogues is like hearing a cultured voice in the midst of a miner's broil, or like meeting a beautiful child in a cabinet of fossils. *Ceryle Alcyon* suggests sunshine, bright water, dreamy skies, and that rich foliage growing near streams—a foliage to which the adjective *lush* clings like some rather ornamental caterpillar, with an underhint of classical affinity very tenuous and filmy. It is a disappointment to one's imagination at first to find out that so beautiful a creature as the *Alcyon* cannot sing; but there is just compensation in

the knowledge which soon comes, that instrumental music is the bird's forte—he plays on the water as on a dulcimer, bringing out pure liquid notes (at long intervals, indeed) too sweet and elusive to be fixed in any written score. To watch *Ceryle Alcyon* strike the silver strings of a summer brook and set them to vibrating—is worth the sacrifice of any leisure hour. It is the old touch of Apollo, swift, sure, masterful, virile, and yet tender as the very heart of nature. “Plash!” A sudden gleam of silver, amethyst, and royal purple, a whorl as of a liquid bloom on the water, rings and dimples and bubbles, and in the midst of it all, the indescribable sound from the smitten stream, its one chord rendered to perfection.

Nature sketched the kingfisher, in the first place, with a certain humorous expression, which still lurks in the overlarge crest and almost absurdly short legs; but the bird itself is always in earnest. It may look at times like a bright, sharp exclamation point at the close of some comic passage in the phenakism of nature, but it is the very embodiment of sincerity; in fact, the birds are all realists of the prosiest kind. One might as well look for something large and morally lifting in a minutely analytical novel, as to expect a bird to be sentimental. A worm—in the case of the kingfisher a minnow—is the highest object of avian ambition—the realist dotes on one's motive in twisting one's thumbs—and ornithic life does not generate poetry. The kingfisher knows his brook from source to mouth, for he has conned it during countless ages. Not that he has lived so long individually, the knowledge exists in heredity—the transmitted sum of ten thousand ancestral

lives devoted to the one end, analysis of the brook, minute observation of the minnow's tricky ways, the time to strike, in a word, how to get a living on the wing. He has gazed into the wavering shadowy water so long that he has become habitually given to a see-saw motion suggestive of vertigo in a harmless form. I have lain on a favored spot and looked, with half-closed eyes, far down the sheeny course of a rivulet at the flight of this happy knight of the fish-spear as he came toward me, and I am sure there is some obscure correlation between the motion of his sky-mailed wings and that of the flowing water.

Evolution tinges everything. One grows like what one contemplates, and *Alcyon* may well be said to have grown, through ages of transmitted and accumulating contemplation, like the swaying and lapsing water he was created to love. But his voice is the very irony of mirth, a derisive and soulless chuckle, sounding like one long, rasping note broken up into a score of rusty fragments and shaken through a sieve; indeed, his vocal organs, including his tongue, are rudimentary, shutting away the possibility of song. Wilson likens the cry to the sound of a watchman's rattle, but it has an expression of its own, in consonance with that of the babbling waves and rustling aquatic plants. Stripped of its *entourage*, it closely resembles the chattering, rarer cry of the tree-frog.

Our belted *Alcyon* is an expert flyer, balancing himself adroitly in the air above a pool or rapid, until he fixes the precise lurking-place of his prey, then swooping down with almost electrical quickness into the water to strike it. When in level flight the bird

has a peculiarly flattened appearance for one of its bulk, which gives its big head and long, thick bill accentuated prominence verging on the ludicrous in effect. At rest it appears to sit unnecessarily close to its feet, so to speak, its short legs being much bent, as if in readiness for a leap into the air. Therefore, for obvious reasons, the kingfisher has been the despair of artists, luring them with incomparable colors and repelling them with absurdly unmanageable attitudes and outlines. The poet even must falter at the mouth of the bird's dismal subterranean den, wherein are stored the beautiful white eggs. This semi-reptilian nest habit, not much better than that of the land turtle, is singularly out of keeping with the beautiful cleanliness of the kingfisher's aerial and aquatic life. So nice, indeed, is he, for the most part, that water will not wet him when he plunges into it, and he even comes out of his dank, musty burrow without a touch of dirt on his resplendent feathers.

The family (*Alcedinidæ*) to which *Ceryle Alcyon* belongs, consists of nineteen genera and over a hundred species, but the fish-eating members are the only burrowers, probably, while the insect-eating and reptile-catching ones nest, as a rule, in the hollows of trees. We have but one genus (*Ceryle*) and two species in the United States, the second species being the Texas green kingfisher (*Ceryle Americana cabanisi*). *Alcyon* ranges as far north as Michigan, even much farther, oscillating back and forth with that weather temperature which keeps the small streams free of ice. Leaving Michigan in early autumn, where I saw *Alcyon* on the northernmost point of the Leelenaw penin-

sula, I reached St. Augustine, Florida, in the first week in November, finding the bird on all the streams that I examined between the two points.

It has always struck me as most singular that minks, weasels, and snakes do not exterminate *Ceryle Alcyon* on account of the burrowing habit. Many of the nest-burrows that I have explored have been quite large enough for an averaged-sized mink to enter, and the least of them would have been traversed easily by a weasel, to say nothing of snakes. Of course, in the incubating season the bird might guard the nest; but it would seem that the young must be terribly exposed; still not more so, perhaps, than those of the whippoorwill.

The burrow is usually in the clayey bank or bluff of a stream, entering almost horizontally to a distance of from two to ten feet; but I found one that descended vertically two feet and then turned at about right-angles. This was near the edge of a brook bluff in Middle Indiana.

Drawing upon my notes and my recollections of *Ceryle Alcyon*, I see again the hundreds of trout-brooks and bass-streams I have whipped from the Manistee to the Kissimee, and all the little rivers I have voyaged upon from the Boardman to Pearl River, but the one stream that I remember as fairly haunted with this bird is the Salliquoy, a strong rivulet in the hill-country of Cherokee, Georgia. In a half rotten tulip pirogue I made a slow voyage down this stream during the last of April and the first of May, a season when the leaves and flowers of that wild, strange region are at the fullest stage of their development. I started far up among the

little mountain billows that break around the north-eastern rim of Dry Valley and worked down to the beautiful and deep Coosawattee. It appears to my memory now that nearly every bough that swung over the water bore its belted kingfisher, while the sound of their diving in the shallows was almost continuous. I dare say distance has trebled the number of birds and exaggerated their activity, but nowhere else have I spent so happy a fortnight with *Alcyon*. I remember that my companion remarked, with perfect youthful sincerity, that it was a comfort to realize the inability of the kingfishers to catch the two-pound bass we were angling for. This same companion, standing in the stern of our pirogue, balancing himself like the born canoeist that he was, and playing one of those gamey mountain bass, was as picturesque a figure as ever delighted an artist or emphasized a landscape. He was the prince of archers, too, and many a whistling shaft he sped at the wild things in the air and on the banks. So intense was his sportman's delight in every phase of outdoor excitement that it was almost painful to witness his ecstasy of hesitation when one fine morning, just as he had hooked a large fighting bass, which was determined to break out of the water, he saw an ibis, a rare stranger in that region, standing not more than forty yards from him. His bow and arrows lay at his feet, the bass was demanding the strictest attention, a word would scare the bird away! I forbear to fill in the sketch. The reader may finish it to suit himself.

But to get back to *Ceryle Alcyon* and its ways. It is probable that *Halcyornis toliapicus*, a fossil of the eocene, may have some re-

mote relationship to our bird, but the testimony of this does not amount to evidence. We must take *Alcyon* as he is, without any genealogical table or ancient armorial relics. He is not an aristocrat, if the index of aristocracy is a well-formed foot, for, like all his family, he has but three good toes, and they are as rough and ugly as warts. Compared with those of the mocking-bird, indeed, his feet appear scarcely more than rudimentary (about on a par with his vocal organs, advancing the comparison so as to weigh his rattling laugh with the ecstatic song of *Mimus polyglottus*), still he perches very firmly and, after a fashion, gracefully. His descent upon a minnow is a miracle of motion, accompanied by a surpassing feat of vision. We will imagine him seated on a bough thirty feet above the brook-stream. The sunshine comes down in flakes like burning snow upon the twinkling, palpitating water, making the surface flicker and glimmer in a way to distract any eye. Down in this water is the minnow which *Alcyon* is to catch and swallow, a minnow whose sides are silver just touched with gold, flitting and flashing here and there, never still, flippant as the wavelets themselves. Mark the bird's attitude and expression as they blend into a sort of serio-comic enigma—crest erect and bristling, eyes set and burning, bill elevated at a slight angle, tail depressed, wings shut close, the whole figure motionless. Suddenly he falls like a thought, a sky-blue film marking the line of descent to where he strikes. He pierces the pool like an arrow, disappearing for a second in the centre of a great whirling, leaping bubbling dimple of the water, with a musical plunge-note once heard never forgot-

ten. Rarely does he miss his aim. If your eyes are quick you will see the hapless "silver side" feebly wriggling in the grip of that powerful bill as *Ceryle Alcyon* emerges from the dancing waves and resumes his perch, happier, but none the wetter, on account of the bath. Now the wonder of this vision-feat is not in seeing the minnow from the perch, but in continuing to see it during that arrow-like descent into the water; or, if you choose to refer the success of the stroke to accuracy of flight, then try to understand what amazing accuracy it is! For, in that case, *Alcyon* must take into exact account the difference between the apparent and the true position of an object in the water as viewed at an angle from without.

The negroes of North Georgia had caught from the Cherokee Indians the art of making the blow-gun, and I found one old slave who firmly believed that a blow-gun arrow, pointed with the lower mandible of the kingfisher, was the only one with which the bird could be killed. This fanciful conceit may be added to the long catalogue of superstitions which cling to the history of *Alcyon*. My archer companion of the Salliquoy had the upper band of his quiver decorated with a kingfisher's head, to signify that his arrows would fly straight to the living target. And the badge was not an idle boast, for he stood in my canoe and killed a green heron, stopping it in mid flight with a pewter-headed shaft from a mulberry bow.

Ceryle Alcyon digs its own burrow, which it may be said to do on the wing, so rapid are the motions connected with the performance. The beginning of the excavation is made with the bill, while the bird balances on its wings

close to the face of the clay bluff into which it means to project its adit. There is a fine suggestion of blended royalty and democratic self-dependence in the apparition of this splendid creature turning itself into a richly jeweled tunnelling-machine or drifting apparatus, hurling itself beak foremost into the earth.

Day by day the digging goes on, the male and female both laboring, I am led to believe, until the mine is completed, a mine, by the way, admirably constructed for self-drainage, but scarcely ventilated at all; a grimy, dark, filthy den at best, and often unspeakably loathsome. No wonder *Alcyon* laughs as soon as he emerges from such a cavern into the sweet light and air of a May morning! No wonder, either, that the laugh has in it a strong touch of reptilian indifference to vocal harmony! Here is the best instance, speaking without any reference to comparative anatomy, of a bird still attached to the lower life of its archetype, the life of a burrowing, grovelling, repellent amphibian, but enjoying also, to the full, the broad liberty, the sweet luxury, the inexpressible delight of avian pursuits by flood and field.

What would our noisy mill-streams and bass-rivulets be without *Ceryle Alcyon*? As for me, I should find a prime æsthetic value gone from angling, were the kingfisher withdrawn from brookside nature. His laugh may come in now and then just in time to taunt one over a piscatorial disaster, and hence be very ire-provoking, but, as a rule, I have found it a rather refreshing giggle of delight over the landing of an unusually game fish.

“Pid-d-d d-d-d!” sang out *Ceryle Alcyon*

one morning on the Salliquoy, just as the archer saw a three-pound bass he was playing leap out of the water and shake itself free of the hook. "Pid-d-d-d-d-d!" It was the most inopportune jeer imaginable to the ear of the baffled angler. Down went the rod along with some classical allusion to hades, and up came the bow and arrow from the bottom of the pirogue. The archer had a most becoming phrensy in his visage as he poised himself and drew the arrow almost into the bow.

Alcyon sat on a dogwood branch, amid the clusters of great white flowers, distant sixty yards from the bowman.

There was a tragic pause for the aim, a knotting of the muscles on the straining arms, then the recoil of the bow, the low sibilation of the missile. I watched with attentive eyes, throughout the flat trajectory, the flight of the feathered shaft.

"Take that, you snickering idiot!" exclaimed the irate archer, just as he thought the arrow would strike.

"Pid-d-d-d-d-d!" retorted *Alcyon*, taking to wing just in time to give his space to the shaft, and away he went down the winding course of the stream until he was lost in the gloom and sheen of distance. A spray of dogwood blooms, severed by the shot, fell upon the water, and then the "tchick" of the arrow-head, striking among the pebbles of a shallow "riffle" far down the stream, came back like an echo of the bird's final note, to make the archer's defeat most emphatic.

The semi-comical *grotesquerie* of the kingfisher's ways is exemplified in his attitude while suspending himself in the air above the water by a peculiar alar motion, when his head is thrust forward and downward to the

full extent of his somewhat constricted neck, with the crest erected so that each feather stands to itself, and the short tail spread like a fan. When, after a season of rain, the streams are not clear, *Alcyon* hovers in this way close to the water's surface, and plunges upon his prey from on the wing, after the manner of the prairie hawk.

A gentleman in Alabama told me that while trolling with a float and silver minnow in one of the bass-streams of the Sandmountain region, he actually hooked and caught a kingfisher which struck at the bait. The incident, though unusual, is not wonderful, and might happen at any time when the troller should have out enough line to relieve the bird of fear.

The swallowing capacity of *Alcyon* is enormous; he makes nothing of taking down a stout minnow of three inches in length, an operation nearly always followed by a rasping snicker of gustatory delight and a wriggle equally expressive. Upon such an occasion he looks down upon the stream which has furnished him the delicious morsel with a glare of supercilious ingratitude in his half-fishy, half-beautiful eyes, as if he never should ask another favor or want another fish.

Near an old mill, in which I had my quarters for a bream-season, two kingfishers had their burrow, the entrance being just above the longitudinal timbers of the race-way. I used to sit on the cap of the fore-bay with the big water-wheel jarring and groaning under me, and cast my lure into the stream far below. From this same perch I could watch and study the busy *Alcyons* as they speared the minnows and bore them into the burrow.

to their young. The miller told me that for years the pair had nested in the same place, and he would not permit me to explore it. He went on to detail a number of reminiscences in which the birds figured picturesquely; one I remember was to the effect that a hawk had pursued the male kingfisher so savagely, once upon a time, that the poor fugitive had rushed into the mill and hidden itself in the hollow of a grain-shaft. This love of the miller for his birds struck me as beautifully romantic, especially as the mill was in a remote mountain "pocket" where any thing to love was as hard to find as were the deer in the pine thickets on the stony foot-hills, and considering the fact that he was an old sinner as tough in his fiber as the oaken beams of his race-way.

The kingfisher has inspired the genius of poets, legend-makers, superstition-mongers, and scientists all the way from Ovid down to Mr. R. B. Sharpe of our own day, who has published a brilliant and wonderful monograph of the *Alcedinidæ*, with many excellent figures. M. Rolland in his "*Faune Papulaire de la France*" relates a legend to the effect that *Alcyon*, in leaving the ark, flew straight toward the setting sun, and that his back caught its blue from the sky above, and his breast was scorched by the luminary below to a brownish, clouded hue. Its head is worn as a charm by savages and was conspicuous on a fetich string I saw in the possession of a negro conjurer. Its dried body was once thought able to ward off lightning and to indicate the direction of the wind. But, no matter what may be true of the European and other foreign kingfishers, our *Ceryle Alcyon* is not gifted with any *supra-avian*

powers, and outside of his dismal den is a bonnie blue sprite of the water-ways, living a bright and happy life forever, perhaps; for I never have found a sick, a decrepit, or a dead one, nor have I ever heard of any body who could testify that any of our wild birds ever die of true disease or of old age.

The most beautiful kingfisher superstition or legend I ever have known of was told to me by an old negro in Georgia. How far it extended among the Southern slaves I have no means of knowing. Here it is:

“When you is a leetle boy, not mo' 'n six year old, ef yo' go to de ribber an' see de minner at sunrise fo' de kingfisher do, den yo' nebber die 'ceptin' yo' git drowned; an den ef yo' *does* git drowned, de kingfisher tote yo' sperit right off ter hebben, 'ca'se der's no use 'r talkin' 'bout habin' any bad luck ef yo' got de eye like de ole kingfisher.”

I say the superstition is very beautiful, but in effect it is the same old story of the heavy chances against the seeker after lasting happiness, for how much harder is it for a camel to amble through the eye of a needle than for any living being to see a minnow in the water quicker than can the incomparable eyes of the *Ceryle Alcyon*?

SWAMP SKETCHES.

A SOUTHERN swamp is to me a very fascinating place, a genuine land of dreams. In a realistic sense it is mere mud, water, tussocks, gloom, tangled vines, and dusky tree-masses; but there is that in those dim, damp, luxuriant jungles which appeals to all that is romantic in one's nature. It was my fortune once to pitch my tent on a ridge of sand lying between the waters of the Gulf of Mexico and the mazes of a swamp whose almost impenetrable woods and brakes stood like a black wall by night and like a sheeny screen by day set against a sky as tender as the petals of a hyacinth. No sign of human life was near, not even a fisherman's hut.

The beach of my sand bar was the most perfect I ever saw—white, hard, and gently sloping out to sea, where the greenish waves ran through dreamy sunshine to the far white line of the horizon. A week of southeasterly winds brought up from the Caribbean islands a soft fragrance and balm, and kept the water in brisk motion, so that it lapped the sand with a melodious roar, and so that a dancing zigzag line of silvery spray marked the surf margin as far as one could see.

In the south-west a long crescent of marsh ran from the swamp to the sand. There all manner of sea birds congregated at times with a shimmer of wings and a clash of

voices that touched the imagination strangely enough.

My boatmen, both of whom were creoles, so-called, could not imagine why I should have taken such a considerable voyage merely to stay a few days on a sand-bank reading books under a tent-fly, or to make journeys into a dismal and lonely swamp, neither of which would have afforded them any pleasure whatever. They evidently deemed my motives obscure and mysterious, if not wholly unchristian.

I chose this particular place more by accident than otherwise, but it proved to be the best for my purposes that I could possibly have found. The sand ridge ran for a long way back into the swamp, and thus gave me a safe and easy road to the heart of a typical jungle.

The outer fringe of the swamp growth was a line of marsh grass growing about waist-high and of a dusky olive-green in color. Next came a dense growth of cane with scattering clusters of bay trees, then a hummock of live-oaks, beyond which, lonely, gloomy, and set in eternal wastes of water and mud, stretched the moss-hung cypress forests and magnolia groves. From a little way out to sea this vast jungle had the appearance of a mass of low hills running in a billowy line against the sky.

No one without actual experience in exploring such a region can form any adequate idea of even the general effect of its features.

Except where the cypress trees grow thin in basins of water the plants of all kinds, from immense live oaks down to the smallest aquatic weeds, are packed together so that one can scarcely force a way through them,

And yet the soil is not at all rich, even on the hummocks, as compared with the soil of our Western prairies. It is by night that the swamp shows itself to the full expression of its gloom, its solitude, and its real grandeur. Leaving the boatmen at the camp, I spent the greater part of a night in the very heart of the jungle simply to study it.

The moon did not rise till after ten, so I had two hours of intense darkness during which I used my ears instead of my eyes.

Silence vast and profound is the rule in the swamp, but the exception is often very impressive, sometimes startling. As an instance of this: I was comfortably seated on a log between two cypress trees, about five feet above the ground, waiting for the moon to rise. There was no light to relieve the oppressive blackness save a faint gleam of sky overhead where some pale stars winked through a rift. The sea breeze could not reach me, but it sighed very lightly in the topmost feathery tufts of the trees. The beach was so far away that only a faint, mellow roar came from its swashing surf.

I had a gun across my knees, and so felt no actual fear, but yet there was an unpleasant sense of my helplessness in the presence of darkness, silence, solitude, and the spirit hovering in the midst of them. It was as if a hand were about to be laid upon me from behind, or as if a great mesh of destruction were upon the point of closing around me in the darkness. A damp chill hung in the still atmosphere, accompanied by a peculiar musty odor, comparable to nothing else, except, perhaps, the noisome wafts from old tombs and caves.

In the midst of all this an owl hooted not

far off, and the cry was so emphasized and exaggerated by contrast with the environment that its effect was indescribable. At first I did not recognize it as an owl's voice, but referred it to some wild beast,—a panther, perhaps,—and put myself on the defensive. During the years that I was a soldier I was never half so frightened in fight as I was by that sound. Of course I pulled myself together in a moment, but the sudden impression was one never to be forgotten; a pang of awful terror whisked through me like an electric shock.

I suppose that every one who has sat all alone in a forest by night has felt the peculiar impression as of a dusky presence drawing stealthily closer and closer to him. It is imaginary, but no real thing could be more clearly outlined to one's inner sense. For a while after the owl's hideous notes had died away in diminuendo echoes throughout the forest caverns this breathless black spectre of the night oppressed me, but I finally shook it off.

The next sound that I heard was that of a body, perhaps a raccoon, passing down a tree-trunk near by with a scratching and scrambling that was a relief to my nerves, for it was familiar and realistic. At length the little animal reached the ground and made its way to a puddle of water, where it played for some time. Then something frightened it,—it may have become suddenly aware of my presence,—and it scampered far away through the woods. Somehow its precipitate flight affected me strangely, and I half imagined that some hideous being of the darkness had approached from the depth of the jungle and frightened it away. I listened

with suspended breath, but not a sound came to my ears. There must have followed nearly an hour of utter silence, such as no inexperienced person can possibly imagine, a silence felt as a positive element far exceeding in impressiveness the mere absence of all sounds.

No doubt my self-consciousness, as I sat there systematically observing every sensation and every fancy generated by the surroundings, helped to heighten the influence of the situation. Moreover, there was an atmospheric oppressiveness owing to the denseness of the jungle and the lack of free ventilation.

It was with a sense of relief that I noted the first gleam that foretold the coming of the moon; but instead of softening the effect the slowly-increasing light added a myriad grotesque features to the landscape around me.

I could understand now how the early Spanish and French explorers of these Southern regions came to tell such wonderful stories of old castles in Florida, and of ruined cities in the midst of almost impenetrable swamps; for when the moonshine became strong enough to guide me I wandered from place to place, fastening in my memory the scenes as they appeared, and the commonest form of the cypress and live oak clumps seen beyond any opening, especially over water, were those of ruined villas and castles, old moats, and crumbling battlements.

The frogs and alligators began a desultory grunting and booming as the moon came up, but these sounds died out soon, giving way, apparently, to the wild hilarity of a great laughing owl, whose voice was equal to a medium steam whistle in its shrillness and

compass. It was answered by another, far away, ringing vaguely and faintly, like an echo lost in the interminable jungle.

As the moonlight grew I made my way from place to place, noting the wonderful changes that came over the landscape with each turn. The trees seemed to grow taller and taller, the shadows blacker and blacker in contrast with the slanting streams of pale, yellowish light falling through the rifts. The tangles of vines and the dense masses of bay and haw trees often forced me to make wide detours. I crawled over great heaps of fallen logs, branches, and tree tops, and through nets of green-briar, till at length I came to the shore of a lakelet, which instantly brought into my mind Poe's

Dark turn of Auber
In the ghoul-haunted woodland of Weir.

It was a still, dark, sullen sheet of water framed in a fantastically grotesque border of jungle, upon which the moonlight was falling with ghostly effect.

I was tired, almost overcome, indeed, with the exertion of my ramble, and was glad to perch myself on a huge cypress knee with my heavy rubber boots dangling and dripping. I had come to study the swamp, and nothing was to prevent me. Mopping my face and panting, I looked out over the only scene I ever saw that would wholly excuse the adjective weird. Imagine slanting shreds of pallid fog hanging like giant wisps of gossamer from the water, which was like ink, to the tree-tops which were like charcoal masses against a filmy sky, and then remember the awful solitude, the desolation, the stillness, and that nameless hovering spirit

of night which haunts remote, uninhabited regions. No phrasing may suggest more than a shadow of such a scene. Some large white birds, snowy herons I supposed, startled by my approach, had risen into the air out of a patch of saw-grass and were flapping aimlessly hither and thither, now in the light, now in the shadows, as silent as the brooding silence itself. If I had been the only man in the world, I could not have realized more fully the meaning of the word solitude. I knew what the swamps of the coal-age of geology looked like; indeed for the time I was back in the days when the groves of lepidodendron and the thickets of giant cane were slowly sinking into the "carboniferous seas." Below me were vast forests buried in the mud and sand, and still the process was going on.

I have often mentioned the peculiar effect of the plashing sound made by a fish leaping out of still water in the dead of night: A large bass, at least I thought it was from its motion, sprang up in the midst of a dreamy spot of moonlight where the water was deep, and, fairly somer-saulting, fell with a plunge back into the ripple he had made.

On the side of the lake over against where I sat, a group of immense cypress knees looked like a castle with towers reduplicated in the water underneath them. Farther away fantastic clouds of fog bleached by the moonlight drifted against a black wall, like that of Babylon, upon which stood giant sentinels with spears and shields and grotesque helmets.

Higher climbed the moon, a wan, lop-sided disk of silver, and the scene changed slowly until the lake was shimmering like quick-

silver, and the fog had arranged itself in beautiful lace-work patterns falling like filmy curtains before the dark masses of the jungle. Although I could not notice any air current, this beautiful drapery was swung gently so that it undulated and was folded upon itself in the most delicate ways imaginable.

The opposite side of the little lake now appeared immeasurably distant, and the outlines of the tree-masses were so softened that they looked like vague mountains rising out of a calm, dreamy sea, or like those floating scenes in a mirage on our Western plains.

Meantime the silence and the solitude had been intensified, so to say, until the effect was almost unbearable.

By one of those cerebral tricks for which there is no explanation, the impulse came upon me to break all that infinite, solemn silence by firing my gun. No sooner thought than acted. Right and left, boom, boom, I let go the two heavy charges, and the sounds seemed to shake the earth and jar the firmament above. They leaped away into the remotest distance and then came rattling and tumbling back upon my ears in a thousand echoes of every kind.

What followed was quite common and natural, but it appalled me for a moment, I do not know why. With a great clash of wings an enormous raft of ducks rushed into the air out of the water at the edge of the saw-grass and went away with a stormy roar into the convolutions of the fog.

After this the silence fell again, deeper, broader, more oppressive than ever. There was something awfully threatening, even menacing in it. I hurriedly reloaded my gun,

as if that could protect me from such an assailant. I remember that at this point I thought of my wanderings on Okechobee and recalled seeing a will-o-the-wisp play its pranks on a marsh of the Satilla.

But I might write volumes and yet not describe a Southern swamp. From the nature of things explorers of these awful mazes are few and timid. I have said nothing of the billions upon billions of musquitoes, nothing of the malaria, and I shall not because I was fortified against both, and they did not trouble me. I came out of the jungle impressed with only its grandeur of effect, and with the suggestions its strange features had engendered in my imagination.

No sky ever looked purer or sweeter, no sea brighter, no air ever filled me with such a sense of freshness. Indeed I came forth upon my white sand-bar as one might come out of a tomb into a blooming garden.

The boatmen were asleep upon a heap of grass covered with a sail, and the little smack was tossing at anchor not more than a stone's throw out from the surf line. Far out on the horizon a ship with all sails set was bowling along, and there was a melody in my ears like the low singing of a multitude of voices. I lay down upon the sand and slept.

IN THE MATTER OF SHAKESPEARE.

I HAVE sometimes found myself indulging the fancy that Shakespeare's genius has been greatly overrated—or rather overstated—even by the most cautious critics and commentators; but I should not like to be forced into a defence of the fancy. Monuments are sacred things, and few men will deny that the Bible and the body of Shakespeare's works are, to English-speaking people at least, the most venerated of all monuments.

How could any man, no matter how self-confident, go cheerfully about the attempt to prove that Shakespeare has been overrated as a genius? In the first place, he would have to be a most extraordinary genius himself, and distinguished as such in the world, before he could command even respectful attention as an iconoclast. In the next place, he would have to stem the tide of what has come to be hereditary popular opinion; and he would have to bear the taunts, jibes, kicks, and cuffs of all the Shakespeare-crankers in the whole world—to say nothing of the ire of all the publishers who get a big income off the old poet's books. Lastly, he would have no way of proving that the poorest verse in Shakespeare's poorest play is not better than the strongest that Tennyson or Emerson ever wrote.

Most of us are slow to learn that a Booth may do as much for Shakespeare as the great dramatist can do for a Booth, and that Mod-

jeska may put into Juliet a breath of life not known to Shakespeare's girl. Genius is genius, and asserts itself as superior, in its own particular way, to every other genius in the world. Shakespeare was a genius, and Victor Hugo was as near the right as any critic when he said that criticism cannot apply to genius. We may point out errors of methods, of judgment, of execution, in the works of a genius, but that part of those works which testifies of genius is always beyond our reach.

In Shakespeare's works this unreachable and therefore unassailable part is very large, and it is incomparably many-sided and many-colored. One reads Shakespeare with confidence, because one feels no lurking insincerity between his lines; there is no conscious art, in other words, padded and intercalated in the tissue and fibre of the work; no posing and attitudinizing of the author in the presence of his creations. We feel sometimes that we have been duped and made game of, but we never catch the trickster wagging his thumbs and puffing his cheeks at us. Indeed Shakespeare was the first humorist who did not laugh at his own jokes, and he so far remains the last. His simplicity sometimes borders close upon mere baldness and flatness, but his finish never suggests (as does most of our contemporary work) a laundry secret.

I should adore Shakespeare, if for nothing else, in recognition of his contempt for analytical realism. How he dashes on color, and with what divine steadfastness he sticks to heroic ideals, even when he appears to be dallying with infinitesimals! You never find him probing and picking at a ganglion of motive to trace it back to some obscure origin, as if

the whole of life depended upon the absolute accuracy to be attained in microscopic analysis. His characters are just as distinctly individual and just as mysterious as real flesh and blood men and women. He, himself, too is intensely human, weak and strong, silly and wise, careful and careless, neat and slipshod, clean and dirty, but he is never mean or vicious. We may find a good deal in Chaucer which is so obscene that we doubt that old poet's moral grain and fibre, but Shakespeare does not revel in the filth he sometimes handles. There is a severity, an immovable manner, a steadfastness of countenance, so to say, attending him in his dealings with the unclean, as if he felt no touch of any sentiment whatever in the matter.

Your modern artist, if he dared speak his feeling, would say that Shakespeare was not an artist. Well, he was not; he was something better; he was a genius whose power needed none of the factitious aids characteristic of modern literary and graphic art. He had a superb imagination and an infinitely flexible style of expression without any technical expertness or smartness whatever. Prettiness and exquisite finish of surface he never thought of. Even his sonnets have something of the swing and freedom of a young god's movement. I confess that I do not have any idea of what they mean, but I feel their value as I feel the value of the sky and the clouds—they are fire and smoke—passion and dimness. If we compare Shakespeare with some great writer of the present day, Victor Hugo, say, the first strong line of contrast is the self-consciousness of the latter. We cannot ignore Hugo's or Goethe's obvious attitudinizing in front of their subjects,

Even Tennyson uses the egotistic pronoun with an emphasis not to be misunderstood.

Shakespeare was lucky in many ways, as genius always is, and he has had better luck since he died than he had while living: another franchise of the children of glory. As the years have rolled by publishers have increased, and what publisher ever died without issuing his special edition of Shakespeare? As the leaves of the forests have authors increased; what scribbler ever goes hungry to his grave without having written his essay on the Bard of Avon? Readers have become as countless as the sands of the sea, and all have read or are just going to read Hamlet and the rest. We are born with an hereditary Shakespeare bias, and we go toward his works as the young snapping-turtle goes toward water, as if the act were an instinctive one.

There are men who, if they dared, would burn at the stake any human being who in his sincerity should admit that he found *As You Like It* a very dull affair. Once in the hospitable home of the late Paul H. Hayne I said that I did not regard some of Shakespeare's works as of any great value, when lo! the gracious and kindly Southern poet leaped to his feet and poured forth upon my devoted head a flood of eloquent and indignant protest the like of which I never have heard elsewhere. Indeed, one does not dare be independent in the matter of discussing the old master. Not worship Shakespeare! one might as well deny the attraction of gravitation, or suggest a new theory of politeness which would ignore the swallow-tailed coat. Some things are true because it is death to deny them. Snobbery is kept alive and fat all over

the world because it is safer to be a snob than to be a sincere and independent man. The lords and kings and princes have said that a swallow-tailed coat is just the thing, and even the hotel waiter cannot cheapen it. So the Moguls of criticism have said: "Shakespeare is incomparable," and how shall any clod gainsay it? They used to say something pretty about Homer, too, but Greek is no longer fashionable. It proves something, however, this firm hold that the old English bard keeps on the moulders of public opinion. It requires extraordinary genius to live up to the standard these intolerant worshippers have set for their god, and so far Shakespeare has lost little ground, if we may judge by the increased number of editions he is subjected to by enthusiastic editors and hopeful publishers every year.

This matter of editing Shakespeare, as it is called, has a broad tinge of humor as I view it. All this hair-splitting over doubtful readings is ludicrous, if one dared say so. In the old bard's own manner there is very little to set an example of carping or higgling about a word or the turn of a phrase. He put things forth with a direct stroke of his pen, as Turner after him did with the brush, giving not the slightest heed to the infinitesimals about which the wise little commentators pretend to know so much. A Shakespearian scholar reminds me always of an expert in fossil *bryozoans*—he is so dry and narrow, so fretful and pig-headed when he finds a man standing before him who dares to have a soul of his own that he would like to unburden. This reading, that edition, the other commentary, somebody's interpolation—what's the difference so that I get the broad wash of thought, the in-

comparable impressions—the kaleidoscopic views of life and manners. What do I care whether or no the celebrated Professor Nosemout has given his consent to the edition I am reading? *Nec te senserem.* It is Shakespeare I care for, not the little man with the eye-glasses and the many commentaries and editions. To be particularly sincere, I would not give a straw to be able to read the great cipher of Donnelly. Life is so short and wisdom is so broad.

Still, if a young person came to me asking how to get grounded in literary wisdom I should say: Go study Shakespeare, as you would study Nature, not as a specialist, but in a liberal and free way. What edition? Any edition. Whose notes? Nobody's. Make your own notes, insist upon your own interpretations, then go hear some good reader like Booth or Lawrence Barrett or Modjeska; but at last cling to your own private opinions. Of course these opinions will be modified and specialized as you grow, but you must not let them hybridize and lose the precious elements of your own originality, least of all must you let the little buzzing insects, self-styled commentators and editors, fertilize the fresh flowers of your mind. The pollen they carry is nothing but shelf-dust and book-mould; it will make your brain like an autumn puff-ball. Go into the open air and read your open-type copy of Shakespeare under a tree wherein the birds sing and the wind rustles. You will find his effects broad, like the sky and the sea; narrow, like the brook; tangled and fretted, like the vine-worried groves; earthy as the earth itself. As plays, all these works were made for the stage, therefore much of their stuff is

mere stuff indeed, but these people are people, these heroes are heroes, these villains are villains, and these lovers are genuine old-time sweet-kissing and hard-fighting ones that it does one's soul good to read about once more, after some dozens of modern novels.

Since Scott no English novelist has suggested a comparison with the great dramatist, unless we consider Bulwer at his very best. Hugo and Goethe, barring their miserable egotism, are Shakespeare's equals (at some points, his superiors); but they lack his equipoise, his constant suggestion of a reserve of power. Hugo now and again wallows and flounders, like a whale in shallow water, Goethe struts, scowls, smiles and laughs in turn, and always with the air of feeling his own superiority; but Shakespeare is steadfast, liberal-faced, never surprised by his own wit and never in need of extrinsic aid.

If any young writer of to-day could master himself so as to be as self-possessed as Shakespeare was, we might call him a thorough-bred author. Vulgar fussiness and anxiety about the fit of one's phrases is what one can scarcely avoid in this day of clever stylists and smart analysts; and yet this was just what all the truly great authors of the past really did. Read Shakespeare's plays and note how like the heavy blows of a laboring swain are the most telling of his lines. Even he loses when he turns back to polish a verse or remodel a phrase. It was little Horace, not big Homer, who set such high value on the details of verse-making. There are a great many little Horaces now, but where is our grand Homer?

The study of large models cannot fail to give some feeling of breadth, even to a small

mind; hence the reading of Shakespeare is of prime importance to one who dreams of making literature some day. Not that writing plays like Shakespeare's ever will be profitable again; the good will come in what is caught of Shakespeare's contempt of leading-strings and of his love of the ideal. Originality in his works means a Shakespearian use of whatever came to his hand. He employed no tricks, appealed to no mock-foam or stage-thunder to strengthen a weak passage. Men quarrel to-day over the question of Hamlet's mental condition; but Shakespeare saw no need for any foot-note. There are many very weak places in his plays, but each play makes a distinct and clear-cut impression. It is this impression which constitutes true value in every work of art. No mind can be unenlightened which is full of the spirit of Shakespeare's works; but one may become a mere book-louse by creeping too long among the words and phrases of them. Note well the difference. If you come to the reading of Shakespeare with the cringing soul of a snob in you, the reading will be in vain. Read him, just as you would read Mark Twain, with a feeling of democratic independence. He was no more a god than you are a god; he was nothing but a large-headed, open-eyed, self-reliant man who was gifted with a talent for writing good plays. He would not thank you for saying that the poorest of his sonnets are better than the best of Keats': for he would know that you were not sincere. Keats wrote one or two sonnets that are incomparably better than any of Shakespeare's.

I say this without blinking, for I am writing in a pine woods on the shore of the Mexi-

can Gulf, far out of any so-called Shakespearian scholar's reach. Beside me lies a volume of Alden's *Ideal Edition* of the works of William Shakespeare, the cheapest and clearest-typed edition I have yet seen. You may read it as you walk; I have read it as I walked, communing with the *Two Gentlemen of Verona* under the moaning pines and mossy live-oaks, while the lazy wash of the Gulf waves and the lazy touch of the Gulf breeze "filled in the symphonies between." Forgive me, but once in a while a mocking-bird makes me forget that there ever was a Shakespeare. Just a while ago I flung down the *Ideal* to run and peep at a shy songster flitting about in a cedar thicket. I like living things, and in spite of all that I can do a live titmouse is more to my taste than a dead poet. There are some wonderful fossils, but even a mammoth's jaw is not so interesting as a warm, buzzing, flaming humming bird bobbing at a flower.

A vast quantity of good breath has been wasted telling over and over and over the threadbare romance of how incomparable are the works of the old art-masters, a lie which has to be kept warm by the constant friction of telling. The romance of Shakespeare is of the same sort; but the truth about him is wonderful enough—the truth that makes him a great man, like Napoleon, Newton, Phidias, Homer, Dante and Hugo—greater in some ways than any of these and not half as great in other ways; a man whose glaring faults stand out in his works, and whose rare gifts those works do not half disclose—the truth in short, that he was, like any other genius, a curious bundle of greatness and commonness.

When I was a boy they made me wash my face, comb my hair and put on a broad white collar before they would let me go to the book-shelves and take down the old leather-backed, heavy-ribbed book they called by the sacred name of Shakespeare. In those days I devoutly believed all they said about that man's perfectness and universality of genius. Indeed it was with a sense of profound guilt that one day I discovered a doubt. I had been reading Tennyson and my head and my heart were full of new and glorious sounds, colors, longings, and dreams. I know to the last pang how a Christian must feel who suddenly lapses into infidelity, for did I not fall from the grace of Shakespeare-worship? It was a final fall, too, for I never have got wholly back and never shall.

Still Shakespeare stands alone (so does Shelley) and he stands alone in the highest realm of art. Quantity as well as quality (when the quality is always high) goes to prove great genius. Many men have done one act of perfect creation, falling back to mere mediocrity afterward; but it is only the few who can keep up the ecstasy of the maker for many years together. We may count these on our fingers: Homer, Milton, Dante, Shakespeare, Goethe, Scott, and Hugo—the list would be short, but such a list! I am not quite sure that Emerson ought to be left out, for he was one of the calm and lofty ones who build for all time, and yet he suggested rather than created the best of his effects. All these great men impress us with the peculiar serenity of their bearing under the infinite white heat of poetic ecstasy. Carlyle fell short here and hence cannot be called great.

Naturalists tell us about highly specialized animal forms—those that have departed most from the prototype. There is a figure here with which great genius like Shakespeare's may be represented—the old, simple, universal human mind. Shakespeare was not a specialized man, he was a specimen left over from the ancient virile race long since worshipped as gods. Walt Whitman consciously and with great labor has tried to be such a specimen—he has tried to stand for mankind, but his great assumption of virility is *vox et preterea nihil* save in a few splendid exceptions.

At last it is Shakespeare's sincere and perfect love of his race, his brimming humanity, his commanding simplicity, his courage, his abounding sympathy, his liberality, that will always draw men to him. We speak of personal magnetism when we mean a man's power to influence his fellows. This magnetism of manhood exhales from all the works of genius, and especially from those of Shakespeare. Walt Whitman asserts for himself in rude and almost brutal phrasing what Shakespeare never claims, but always has to overflowing—the vigor and rugged self-sufficiency of the primitive man. I have noticed that all grand men assert themselves with irresistible force but always without noise or contortion or bluster. A steadfast eye, a calm face, a quiet manner, an even voice. The gods turned men to stone by a glance. The clouds and storms are always far below the serene blue sky in whose depth the empyrean fire steadily burns.

Coming to the study of Shakespeare without any taint of literary snobbery, and wholly free from mere hero-worship looking upon

him as quite subject to criticism and quite vulnerable to it, one should choose an edition without notes. A glossary is well enough; but one rarely uses it. The gist of the plays is not to be found in the obsolete words. Anybody can understand Shakespeare, provided the Shakespeare scholars are forbidden admission to the study during the reading.

THE MOTIF OF BIRD-SONG.

“And some are hearing, eagerly, the wild,
Thrilling liquidity of dewy piping.”—KEATS.

WHAT may be called the romance of bird-song has been the common property of poets and enthusiastic descriptive writers of prose from the time that the Cadmean contagion of letters slipped into the life of man. Indeed, ever since the old Hebrew lyrist heard the voice of the turtle in his land, there has been a human echo to every trill and warble flung out of bush and bough all round the vernal circle of the earth. It has been well said by one of our ablest ornithologists, Dr. Coues, that man and bird are the two animals that sing and enjoy song. This love of sweet sounds has formed between these widely different and extremely specialized beings a golden cord of sympathy, which has been kept sweetly vibrating for ages with interchange of melodious mouthings.

I have often thought that it would be a most welcome book, if some competent person should construct a carefully arranged anthology of the bird-lyrics worthy of note written in English since the days of Chaucer; or better still, of all the best bird-songs of every language from the beginning of time. Such a work would disclose a singular and beautiful phase of human history—a phase from which the literary student might gather rich treasure, and out of which the scientist might distil the essence of precious truths.

Doubtless there is a cause, deep set in the mystery of life, from which arises in accordance with some natural law, the instinctive interchange of affection between man and the song-birds. I say instinctive because I am not convinced that reason has anything to do with the matter. A man may be an ardent admirer of birds, and yet be an enthusiastic sportsman—ready to kill them for mere amusement, in which he is as irrational as is the jay that would pluck out the eyes of him who feeds it in the dead of winter, provided it chanced to imagine the eyes to be as luscious as the berries of the brier.

There is an impulse—a law—other than the instinctive movement toward food and protection, which causes the song-bird to get close to man. I could gather many facts together in proof of this. Indeed, all the lower animals are capable of loving man, and many of them have often and voluntarily sought to show such affection.

Mr. Huxley, in accordance with the inference enforced by a great number of anatomical facts, has grouped the birds and reptiles together under the name *sauropsida*; and it has come to be pretty generally admitted among scientists that, whether the avian race has or has not actually descended from a reptilian ancestor, there is certainly a likeness existing which justifies the inference of such an origin, especially in the absence of any tenable theory to the contrary based on scientific reasoning. In this connection it is a striking fact that no mammal, of its own accord, ever has sought the companionship of man as freely and sincerely, so to speak, as many of the birds and some of the reptiles have. I have seen toads, lizards, and even

snakes exhibit great satisfaction in finding a cosey nook for themselves in human habitations. I once had a toad friend who fattened to enormous size at my expense, and I had ample opportunity to note the growth (quite apace with his corporeal expansion) of his affection for me. He sought my acquaintance and cultivated my friendship of his own motion, evidently taking it for granted that I could not fail to feel highly honored by his attentions. Birds have made their love for man so well known that I need offer no instances. A few words in the way of suggestion, however, may not be amiss, with a view to leading up to a consideration of the origin of the song-impulse in birds. Genuine song, or, rather, music-making, is within the power of comparatively few of the avian family; but we may consider such birds as the meadow-lark, the bluebird, and the blue-jay, that can utter a bar of two or three sweet notes, song-birds for all the purposes we have in view, and from these lowly and slightly gifted ones we may pass up along the line to such musical prodigies as the nightingale and the mocking-bird.

Pious minds, influenced by the charm of spring, long ago came to the conclusion that song-birds were ecstatic worshippers of Deity, and that all their pipings were conscious praise-offerings. At the other extreme, the scientists have referred bird-song to erotic impulses when in the spring the wild-bird's fancy

“Lightly turns to thoughts of love.”

What shall we say of the caged bird that sings in a broken and sketchy way the whole year round? Does captivity engender per-

ennial piety? or does it make the tender passion unquenchably and constantly burn? I have heard the crested titmouse utter its slight song-sketch in mid-January on parallel 40° north when the thermometer indicated a heavy dip below zero. On the other hand, I have known fine male mocking-birds that refused to sing for two weeks together in the most golden period of a southern spring-time, when the felicity of the mating and nesting experience was at its highest height. I have watched a lonely blue-jay, a mile removed from his mate, sit on a bough and, with a peculiar rhythmic motion of the body, give forth a low, wheedling strain which could not be heard more than ten or twenty yards away. The indigo-bird has a very sweet, twittering song, which is scarcely loud enough to be distinguished two rods from where he sits, and yet he will pour it forth ecstatically in the midst of a prairie, with none of his species within the horizon. I have heard the meadow-lark and the bluebird pipe their dreamy scores in every month of the year, regardless of the season of love. The cardinal grossbeak does not wait for the time

“Whan that Aprille with her showres swoote
The drought of March hath pierced to the roote,”

in order to begin his loud and cheery fluting in the thickets, but will act as if December were

. . . “as pleasant as May.”

Still, the larger fact is that spring is the season when the volume of bird-song poured round the world is incomparably stronger, fuller, and sweeter than at any other; and that, too, is the season of mating and of nest-

ing. Our finest songsters, notable the mocking-bird, the cat-bird, and the brown thrush, rarely "tune their throats" before the earliest wild-flowers bloom. I have noticed that on the coast of the Gulf of Mexico the first song of the mocking-bird is a pretty safe announcement of the blowing of the pitcher-plant and the little white daisy in the sandy bogs of the pineries. And the further fact that these plants and the mocking-bird's voice vary in their coming between extremes reaching from the 10th of February to the 15th of March, according to the season, is significant of some fine sympathetic relationship between the vernal impulse and that of the bird's song. I was of the opinion until quite recently that the bird's vocal organs underwent a change, just before the mating season, which specially fitted them for melodious utterances; but many dissections have proved the contrary. There is no appreciable organic change in the syrinx, larynx, tongue, or mouth of the mocking-bird, the brown thrush, or the cat-bird, in the spring.

Nearly all the most charming of the singing-birds prefer the early morning and the evening twilight for their vocal performances, though some of them sing far in the night. The matin-song of our American robin will convince any one who observes closely that the witchery of the dewy, fragrant day-dawn is the bird's inspiration, and no person who has heard the mocking-bird's dreamy night-lay can doubt that it is a fine expression of the nocturnal influence. The Baltimore oriole comes to our Northern States in May, and he comes as if floating down the tide of his own rather monotonously sweet song. For a time he sings from dawn till dark, in a fitful,

wandering way, as he flits about all alone. His notes have an absent-minded ring, as if in his diligence in food-hunting he were forgetting to put expression into his lay. Indeed, all our birds use what we call their voices, just as we use ours, for the purposes of expression generally, and I am convinced that bird-song proper, though oftenest the expression of some phase of the tender passion, is not confined to such expression. In a limited way birds have their lyric and their dramatic moods, their serious and their comic songs, their recitative and their oratorical methods. They are conscious of any especial superiority of voice, just as they are keenly aware of any particular brilliancy of colors on their plumage. It may be noticed, in passing, that here again the birds and reptiles agree (many of the latter giving evidence of a taste for bright colors), while below man no other animals show much more than mere curiosity in this regard. A parrot having gay feathers in its wings and tail will display them to please your eye in return for the favor of a nut or a cracker, without ever having been taught to do it. It is conscious of the fact that brilliant colors are acceptable to the eye, and it instinctively seeks to thank you, so to say, by the delicate strut which uncovers all its hidden wealth of red, yellow, and blue. So the sweetest sounds at its command are instinctively flung out by the song-bird whenever it feels especially happy. The migratory song-birds, upon their spring arrival, are (no doubt) delighted at finding themselves once more in their breeding haunts, and immediately they begin to give free vent to their feelings through their melodious throats. It would be interesting to know whether or not they do the same

at the extreme southern end of their migration. I have noted that along the gulf-coast of Mississippi and Louisiana the non-resident mocking-birds, when they first come in from farther south, are noisily communicative of their ecstatic pleasure. For a few days they make the groves ring with their songs, then pass on farther north, many of them finally reaching Tennessee, some going over the mountains to Kentucky, and a few touching with a light spray of melody the southernmost knobs of Ohio and Indiana. I might easily mass a large sum of facts going to show that no one desire or instinctive emotion is the sole cause of bird-song. That the tender passion engenders lyrical fervor and makes a feathered troubadour of the gay sylvan lover there can be no doubt, but love is not always at the root of the lay. The song-bird is a gourmand of the most pronounced type, and we find him going into a rapture of sweet sounds over a feast of insects or fruit. He enjoys bright colors, too, so that he is always hilarious when he finds himself in the midst of green leaves and beautiful bloom-sprays. A haw-bush or wild apple-tree in full flower often is the inspiration of the brown thrush and the cat-bird. In a certain way, indeed, the birds are true poets, singing forth the influence of their environments—just as Burns sang his, just as Millet painted his. I do not mean to be fanciful in this regard. Call it instinct, as it is, and say that birds do not reason, which is true; but add, nevertheless, the indisputable fact that instinct is of kin to genius, in that it has its origin (as genius has its) in the simplest and purest elements of nature, and so you will get my meaning.

It is impossible to know, with any degree

of certainty, how clear or how dim may be the bird's conception of melody or of beauty; but we can know that its enjoyment of color and sweet sounds is most intense. The woodpecker, beating his unique call on a bit of hard, elastic wood, is making an effort, blind and crude enough, but still an effort, to express a musical mood vaguely floating in his nature. We may not laugh at him, so long as from the interior of Africa explorers bring forth the hideous caricatures of musical instruments that some tribes of our own genus delight themselves withal. Among the Southern negroes it was once common to see a dancer going through an intricate terpsichorean score to the music of a "pat," which was a rhythmical hand-clapping performed by a companion. I mention this in connection with the suggestion that the chief difference between the highest order of bird-music and the lowest order of man-music is expressed by the word rhythm. There is no such an element as the rhythmic beat in any bird-song that I have heard. Modulation and fine shades of "color," as the musical critic has it, together with melodious phrasing, take the place of rhythm. The meadow-lark, in its mellow fluting, comes very near to a measure of two rhythmic beats, and the mourning dove puts a throbbing cadence into its plaint; but the accent which the human ear demands is wholly wanting in each case. On the other hand, the mocking-bird, the cat-bird, and the brown thrush accentuate their songs, but not rhythmically; indeed, the cat-bird's utterance is an impetuous stream of glittering accents, as it were—irregular, tricky, flippant, and yet as symmetrical, in a certain sense, as the bird itself—and the mocking-bird's song

is like a flashing stream of water flowing over stones in the sunlight and flinging ariose bubbles and tinkling spray in every direction. I have watched birds at their singing under many and widely differing circumstances, and I am sure that they express joyous anticipation, present content and pleasant recollection, each as the mood moves, and all with equal ease. It is not so plain, however, that the avian nature is fitted to formulate hate, or sorrow, or anger in song, for any unpleasant mood seems to take expression in cries altogether unmusical. I have never heard one sweet note by any angry or, in any way, unhappy bird. The avian life is beset with every danger except, probably, that of epidemic disease, and yet so flexible and elastic is it that the moment any terrible ordeal is past the bird is quite ready for a new and energetic effort in song-singing.

It may not be out of the way to say, in parentheses, here, that the practice of studying domesticated or semi-domesticated birds, with a view to applying the results to forming a theory of wild-bird life, is by no means a safe one. Domestication deprives birds of their proper food, and tends to shorten their lives and to disintegrate their characters. A mocking-bird reared in captivity is very interesting, and it may sing loudly and well, but it is not to be compared with the free wild-bird that sings in a Southern grove, with its mate demurely hovering near. Domestication induces *departure from fixed habit*, and in the highly specialized song-bird fixed habit is developed to almost the last degree; in fact, is not the highest type of bird the completest animal, in point of physical equipoise and fitness for indefinite prolongation of individual

life, that the earth holds, man not excepted? I do not undertake to answer my interrogatory directly; but to me it is significant in this connection that of all the hundreds—nay, thousands—of wild-birds that I have killed, and have seen killed, and of all that I have dissected for one purpose or other, I have never found one that was diseased, so far as I could discover, save from wounds, unless the presence of intestinal worms in a perfectly strong and healthy appearing subject may have indicated disease. I have dissected and minutely examined the mouth, throat, larynx, syrinx, and lungs of a great number of song birds, and in every case those organs have been in a perfectly normal and healthy state, so far as I could by any means discover.

Among human beings a fine voice is the notable exception; among male mocking-birds in a wild state there is no exception—they all sing, and so nearly equally well that it requires close attention to discover any difference. So one wild bluebird's piping is practically identical, in volume, compass, and timbre, with that of every other wild male bluebird in the world. From this and a hundred kindred facts, it is safe to say that generation and the constant transmission of organic power and equipoise are very nearly perfect with birds of the highest order. Indeed, in song, as in so many other ways, the bird shows the operation of a nearly unerring heredity, and I have been forced to conclude, from all that I have been able to note in the lives and habits of song-birds, that a good part of bird-song is the mechanical response to what may be called hereditary memory. The mocking-bird, reared in captivity, far from the haunts of its ancestors, will repeat

the cries of birds it has never seen and whose voices it has never heard. I have heard it do this. Not only the power to mimic is hereditary, but there, lingering in the bird's nature, is the memory, so to call it, of the voices it is born to mimic—the voices its ancestors mimicked ten thousand years ago.

It has been the fashion for men of science to make light of the common legend of the power of birds and other animals to foretell rain and other meteorological phenomena; but I long ago learned to credit it in a large degree. Birds are not always right in their predictions, because weather-threats are not always carried out. The yellow-billed cuckoo is more vociferous when the barometer indicates rain, but often the barometer fails to fetch the shower. The tree-frog, another sort of song-bird, squeals and chirps at the first indication of a rain-atmosphere, but the rain may fail to come. Birds sing with emphasis after a shower, as if they felt as much refreshed as the violets, and the clover, and the maple-leaves, and no doubt they do thus express some sense of delight in their revived surroundings, just as they have sung or cackled in pleasant anticipation of the same before it came.

I have seen a mocking-bird eat the best part of a luscious pear or apricot, and then leap to the topmost spray of the tree and sing as if it would trill itself into fragments for very joy of the feast. The shrike cannot sing, but after impaling a grasshopper on a thorn he will make a hideous effort to be melodious over the deed. So the bluejay will utter its softest and sweetest "oodle-doo, oodle-doo," as soon as it has wiped its bill clear of the blood-stain received in murdering a

nest-full of young sparrows. Even the belted king-fisher cackles gleefully every time he swallows a minnow, as the barn-yard hen does when she has laid an egg.

Buffon, in his charming sketch of the mocking-bird, written over a hundred years ago, graphically describes its dramatic powers and the feeling it exhibits while singing: "It thrills to its own voice, and accompanies it with measured movements that are always suited to the inexhaustible variety of its phrases, natural and acquired. Its usual prelude is to lift itself at first little by little, its wings outspread, then to fall, head downward, to its place again; and, after going through this bizarre exercise for some time, it begins its time-keeping movements, or, if you please, its dance, according with the different parts of its song. If it utters bright and airy warblings, its wings at the same time describe a multitude of circles that cross themselves in the air; one sees it thread the ins and outs of a tortuous line, through which it ceaselessly ascends and descends. If its throat flings out a brilliant and sharply quavered cadence, it accompanies it with wing-strokes equally lively and smart." I suppose that Buffon described all this from hearsay, but it is quite as accurate as anything else I have found in his works. As a matter of fact, many of our song-birds are consummate actors, within narrow limits, and have a command of gesture that any opera-star might well covet. The comparison between the mocking-bird and any other oscine species must be cut short, however, when it comes to the *dénouement*—the final outcome of the song—for it is here that our American nightingale is incomparable. In

speaking of this, Buffon says: "When it gives full freedom to its voice in bursts wherein the sounds are at first full and brilliant, then softening down by degrees, and finally dying out and losing themselves altogether in a silence as charming as the rarest melody, then it is that one sees it hover gently above its perch, slowly slackening the motion of its wings, and resting quiet at last, as if suspended in mid-air." But I have seen it go far beyond even this extraordinary performance, and slowly fall to the ground, panting, and apparently exhausted from the effect of its ecstatic climax of exertion. During many visits to the coast of the Gulf of Mexico in the spring, I have availed myself of ample opportunity to study this Shakspeare of the birds, and I have concluded, from what I think sufficient proof, that the mocking-bird sings, consciously at times, for the purpose of gaining the favor of man. One thing is easily noted: Its song, sung close to human habitations—in the vines and orchards and gardens of man's planting—is not the same song it sings in the wild depths of the Southern woods. I was so struck with this that I put it to the test in every way I could, and I got so familiar with the difference that, while wandering in the lonely forests, I could know when I was nearing a settler's clearing or a negro's cabin by the peculiar notes of the mocking-birds. All along the charming gulf-coast from Mobile to Bay St. Louis, or, in the other direction, to St. Mark's and Tallahassee, there is not a cot, no matter how lonely or lowly, provided it has a fig-tree, that there is not a pair of mocking-birds to do it honor. The Scuppernong vineyards, too, are the concert-halls of this

famous singer. Near the home of Mr. Jefferson Davis, and, I believe, upon the estate of the ex-Confederate chieftain, I sat in the shade of a water-oak and heard a mocking-bird sing, over in a thrifty vineyard, the rare dropping-song of which naturalists appear to have taken no notice. It was a balmy day in March; the sky, the gulf, the air all hazy and shimmering, the whole world swimming in a purplish mist of dreams, and I felt that the song was the expression of some such sweet passionate longing as exhales from Keats' "Ode to a Nightingale." Under the low-hanging boughs, and over the level, daisy-sprinkled ground, I gazed upon the sheeny reach of water, half convinced that I was looking through

"Magic casements, opening on the foam
Of perilous seas, in faery lands forlorn,"

and the very tones of the bird's voice accorded with the feeling in which the day was steeped.

Genuine bird-song is simply the highest form of avian vocalization, by which instinctively, if not premeditatedly, the bird finds expression of pleasure. The absence of true rhythm probably is significant of a want of power to appreciate genuine music, the bird's comprehension compassing no more than the value of sweet sounds merely as such.

As to the origin of bird-song, it has come, it seems to me, in response to a growth of the natural desire for a means of expression. Language is the highest mode of expression, and bird-song is a beautiful and witching, but very imperfect, language. In this connection it is a striking fact that all the most gifted avian singers are small. The nightin-

gale and the mocking-bird are insignificant physically, when compared with the ostrich, the condor, and the crane. The entire skull of the mocking-bird is no larger than the end of one's thumb, and its brain will weigh about one-quarter of an ounce. No great scope of intelligence could be expected in such a case; but we must admit that, in a slender way, this brain is amazingly developed and balanced, and that, compared with man's, it is proportionately the more powerful and under far better control. If a quarter-ounce brain can shape a bird-voice so as to captivate the imagination of man throughout the ages, what ought a brain of ninety-two cubic inches do with an equal opportunity? Like the musician of old, it should set the very trees to dancing.

THE GENESIS OF BIRD-SONG.

BIRD-SONG is one of the most charming mysteries in nature; it has no counterpart in art. I have at times fancied there was some analogy between it and the art of poetry, but there is none, in fact. The genesis of poetry is intellectual and psychal; the genesis of bird-song is purely physical. Even the human voice, in song, oratory, and histrionic declamation, borrows much of its best value from the character, mental and psychal, of the individual vocalizer.

The song apparatus of the bird is, perhaps, no more a machine than that of the man; but the controlling force, the motor, of the former is mechanical, whilst that of the latter is intellectual to a large degree. Of course I do not mean to say that birds sing involuntarily or without emotion of a certain sort, nor would I be understood as representing the song organ of any oscine to be absolutely unadjustable, which would be contrary to the first law of evolution,—the natural impulse of progression from lower to higher expression. It would seem that conscious effort to improve, such as man is capable of, works both evil and good in the way of developing the vocal organs, whilst the unconscious practice indulged by the birds never injures the voice, and if it improves it, the result comes about by the slow process of hereditary accumulation. Thus, no doubt, the wonderful voice power of our song-birds

is the result of a long, steady evolutionary growth.

The theory that birds have descended from a remote reptilian ancestry has so many facts to support it that, until some convincing discoveries in paleontology shall be made to the contrary tending, we must accept it as probably true. Unfortunately, the study of comparative anatomy is both infinitely complicated and immeasurably dry to the layman, as contradistinguished from the scientist, wherefore much the greater number of even cultured people will probably always rest in ignorance of the startling details pertaining to evolution in nature. Few of us, indeed, have the time and the necessary self-devotion, even if the scarce and precious material furnished by nature were always at hand, to make the investigations necessary to a high knowledge of natural science. Large museums are far apart, scientific books are expensive, and the field of each science is as wide as the whole range of nature: consequently, none but the favored—or the self-devoted—few can afford the luxury of following, as Darwin and Huxley and Milne-Edwards and Owen and Marsh have done, the fitting spirit which beckons us back and back, over the silent, desolate grave-yards of the ages, to the beginnings of things. Still, we may all catch a light breath, so to speak, of the air from the oldest, or rather the youngest, period of organic life. Any one of us may choose a slight, narrow, but far-reaching current of inquiry, and float down it, from time to time, until at last the end is reached, away back in the chaos upon which moved the Spirit of Creation at the dawn of day.

Some years ago I was tramping and sketching in the beautiful hilly region of Western Florida. During the spring-time, especially, I spent a great deal of my leisure studying the song and habits of the mocking-bird. One morning, while a fine *moquer*, as the Creoles call our king of song-birds, was charming me with his wonderful vocalization, the question arose in my mind: When did a mocking-bird first sing? Of course the inquiry could not be answered; but it suggested a broad field of special research. Why not ask of Nature the general question, When did birds first sing? or: What is the genesis of bird-song? I lay in the shade of a wide-topped live-oak and brooded over the fascinating problem, while a sweet breeze from the Gulf stirred the sprays overhead, and rippled the silvery bosom of a little lake that lapped the sand at my feet. Gradually enough I formulated a plan of investigation which I have followed, as far as my ability to profit by my own discoveries and those of others has permitted.

At first thought it may seem trivial to propose an inquiry into the origin of bird-song; but a little reflection upon the subject will be sufficient to enlist the interest of almost any mind. All things have had a beginning, and so there was a time when no music of "swelling throats" filled the air of spring. Somewhere the first cat-bird sang in a brier-tangle, the first brown thrush flooded a thicket with its melody, the first mocking-bird filled the day and night with incomparable rhapsody; at least one imagines as much; and then the Garden of Eden appears in the distance, some six or seven thousand years away. There it was that birds and bird-song had their beginning, just in time to welcome

Adam and give Eve a brilliant wedding serenade.

Now I believe that, when they are read aright, science and revelation, so far as they pertain to material things, are mathematically equivalent to each other; they coincide in meaning, if not in form. They might be exactly superposable, were science reduced to the simplicity of revelation, that is to simple truth; but unfortunately we cannot begin at the beginning or go to the end of science. Revelation states a fact, whilst science merely collects evidence tending to establish a fact. Revelation emits simple truth; science strives to reach this same elementary verity by a process of reconstruction.

The inspired record declares that man was given dominion, which would imply that the earth and all things upon it and in it were made for his benefit. Science may profit by this view of creation, and take the serving of man's physical and mental needs as the end of evolution. In other words, we may assume that if the object of creation was to make a sphere for man's dominion while in the human state, then all the lines of creature development have been drawn towards a culmination, have been led to their highest point, in the age of man's creation; that the Creator perfected the animal, mineral, and vegetable kingdoms before he made man. But what has all this to do with the genesis of bird-song? you will ask. Perhaps much, perhaps little. Let us see.

Without resorting to the language of technical scientific literature, where it can be avoided, I will briefly review the records of geology touching the origin of birds, and by

this means we may get a clew to the origin of bird-song.

The first traces in the paleozoic rocks of anything resembling bird life are well-defined footprints; these, however, have been attributed to certain ancient reptiles having feet approaching those of some aquatic fowls in form. Next come organic remains—fragmentary skeletons, for the most part, of strange saurians and bat-like flying animals, having membranous wings and the beak of a toothed bird. No sign of a feather was observable, however, among all the fossil records, up to the discovery of an imperfect skeleton and partial cast of a strange creature named *Archæopteryx*, half bird, half reptile, in the lithographic slate of Solenhofen, Bavaria. A transition state between the bat-like, bird-billed reptiles above noted and our present ornithic forms could not be better expressed than by *Archæopteryx*, so far as anatomy and exterior structural points are concerned. This initial bird, so to call it, appears to have possessed a very oddly arranged suit of feathers, consisting of retrices (arranged regularly on the sides of a very long, twenty-jointed tail) and wing-feathers, its body having no plumage, probably, or at best mere rudimentary, down-like feathers. As to whether this rude bird had a voice, it is useless to inquire, since the head and sternum are wanting; but I think we may safely doubt the existence of more than the obscurest development of vocal organs in birds having toothed reptile jaws and by-concave vertebræ, as in the case of some of the *Odon-tornithes*, so ably studied and arranged by Professor Marsh. The fish-eating birds of our own time have not much voice, as a rule,

—a guttural squawk, or a metallic clanging scream, being the extent of their performance. Taking the skeleton of *Hesperornis regalis*, as restored by Marsh, we shall see at once, considering the toothed jaws and reptilian throat, that its vocal organs were probably far inferior to those of existing loons and grebes, if it had a voice at all.

Returning to Archæopteryx, we shall become more and more convinced, the more we study its remains in the light of all that is known of comparative anatomy, that it was scarcely more ornithic than our common bat, as regards similarity to the birds of to-day, notwithstanding its feathers. Indeed, it had a sort of bat claw at the end of the wing, and its wing feathers and retrices were a very little remove from the leathery, bat vans of the flying reptiles in so far as efficiency was concerned; but its impression in the rocks registers a definite effort of nature in the direction of evolving a true bird. Thenceforward we may look for *feathered* forms gradually growing toward the high type of to-day. The reptile prototype has somehow exchanged his scales for feathers; the generation of the true bird has begun with Archæopteryx. A long, dreary blank here appears in the record of the rocks, after which we find the toothed birds of Professor Marsh, probably full-fledged, in the sense of being coated with feathers. It is to be doubted whether any of these were good flyers,—some of them certainly could not fly at all,—though they were mostly excellent swimmers, and possibly capable of living a long time under water, if not really amphibious. What Professor Marsh says of the anatomy of Archæopteryx may be applied generally to the toothed birds: “The bones

of the reptile are indeed there, but they have already received the stamp of the bird:" and I may add that, as regards *Odontornithes* collectively, the feathers are indeed there, and the stamp of the bird, but the old reptile character is still present, scarcely more than dominated by the ornithic features. I have said that it may be doubted whether any of the *Odontornithes* were *good* flyers. By good flyers I mean not merely strong flyers (like the teals), nor sailers (like the hawks and buzzards), but flyers whose movements in the air are almost instantaneous, like the highest type of oscines, say the mocking-bird, or the cardinal grossbeak, a facility of flight absolutely necessary to arboreal life, where so many thorns, spikes, branches, twigs, vines, and sprays have to be suddenly avoided in the midst of the swiftest motion. Some of the toothed birds of Marsh's smaller group may have been as good flyers as our gulls, strong and tireless; but they could not dodge a dozen twigs in a second, as I have seen a sparrow do in full flight.

The discovery of *Palæospiza bella*, a well-preserved, almost complete skeleton of a sparrow-like bird in the insectivorous shale of Colorado, has given us the nearest approach to a song-bird yet found in the old rocks; but the bill is lacking. Most probably *Palæospiza* was an oscine, in the ornithological sense, but I think we may well doubt whether it could sing, in the true meaning of the word. Its position in the insect-bearing shale further favors our classing it as insectivorous, another characteristic of the true song-birds; but this would not give it a song, for many of the existing oscines have no song to sing, chirp and pipe and squeak as they may.

From this slight sketch of what the old rocks tell about birds, we see that, so far as fossil remains teach anything, they teach us that the oscine *form* was the last to appear in the succession of structural changes in the bird's general physique. This is as far as we can go in the direction of mere development of *form*, by the light of anatomy, considering fossil skeletons merely as such.

Let us turn now and take a quick glance over the evidence of voice development discoverable in the kinship between birds and reptiles.

Professor Huxley, in one of the most admirable of his great contributions to scientific taxonomy, has classed the birds and the reptiles together, or rather grouped them under one head, as constituting a primary division of the vertebrates. He has based this classification on many points in which, on one hand, birds and reptiles agree anatomically and physiologically, and on their variance from mammals in as many points on the other hand. Indeed, the kinship between birds and reptiles is still very strong, even after the immense development of the bird form and the comparatively slight modification of most reptile forms which have come about since the time of Archæopteryx and the dinosaurian animals of the triassic rocks.

We may assume, then, that the development of the vocal organs in birds has been, in some measure, apace with or dependent upon the departure of the bird form from that of the reptile.

Our present existing reptiles are almost devoid of voice proper. Some of them can make certain dismal, guttural groans or croaks, others can utter shrill, discordant sounds;

but at best the reptilian vocal apparatus is rudimentary in the extreme. Hence in those days when the bird was just struggling away from the clumsiest and worst hindering characteristics of the reptile, it certainly possessed no vocal organs of any great power. It would appear doubtful whether it had any at all, since so few birds, even now, have a singing voice, and since, after all these ages of development, the reptile's voice is scarcely a voice at best. It is a curious fact that frogs and toads, amphibians, have the best developed vocal organs of all the reptiles, and that they are not properly scale-bearing; and yet it is from the scale-bearing reptiles that our birds have sprung. Perhaps the common toad comes nearer than any known reptile to the possession of a singing voice, though the tree-frogs have a peculiar chirp or squeak not unlike certain notes of the woodpeckers. One might stop here and indulge the pretty impression that the toad in the summer grass and the tree-frog among the green branches register the highest possibilities of reptilian song genius, whilst the mocking-bird, the brown thrush, and the nightingale assert the triumph of the race which long ago departed from the groove of that lower estate, by changing scales to feathers, legs to wings, and that rudimentary vocal apparatus into the syrinx, with which to charm the poets of all time!

The crocodiles, including our alligator, have the tongue attached all round in the mouth, so that it cannot be much used, and it is at this point, so far as the power of vocalization is concerned, that song-birds have departed farthest from the scale-bearing reptiles; for the tongues of our musical oscines are thor-

oughly liberated, and do good service in the complicated gymnastics of song production. The tongue of the frog is, as a rule, attached at the front of the mouth and free behind, so that, in catching insects, this organ is "curled over itself," and thrust out rear end foremost. Curiously enough, the "singing" tree-frogs are the males, the females not possessing the vocal power to any great degree; thus resembling our oscines, whose males are the music-makers. Moreover, the frog, as a fossil, dates back to the time when the birds were fairly beginning to separate themselves from reptile life. Add to this the fact that there is a flying tree-frog in Borneo, and it will be seen that here is a strange, belated effort of nature to urge the scaleless reptiles up to arboreal, aerial, and song-singing life, by the side of their more fortunate avian kinsmen, who early chose a better method of development!

Turning now to rapidly sketch the really wonderful vocal organs of our oscine birds, I need not enter into any technical anatomical discussion, but, taking the mocking-bird as the highest type of singer, it will be sufficient, for the purposes of this paper, to explain the salient features of the song-producing throat in birds. First, then, all bird-song is generated in a lower larynx called the syrinx, a complicated little machine situated, in fact, at the lower end of the trachea, where it divides into two bronchial tubes, and consisting in chief of an enlargement and rearrangement of the compound lower ring of the windpipe, a bony cross-bar, or *pessulus*, and a membranous plate which forms a partition between the tubes, and whose upper margin is one of the vibrating vocal cords,

the other cord being a membrane developed on the inside of the bronchial rings, or rather half-rings, opposite the *septum* or partition above mentioned. Thus a column of air passing from the lungs to escape through the trachea sets these membranes to vibrating, whilst by means of five or six pairs of delicately adjusted muscles the air space is changed with wonderful facility, the column shortened or lengthened, as is done by the flute-player, and indeed the whole lower throat becomes a generator of sweet sounds, which, passing up to the bird's mouth, are broken into melodious bits, so to speak, and scattered to the winds; for the highest vocalization, although generated in the syrinx, is made into song, in a large degree, by the bird's tongue, its posterior mouth walls, and the upper extremity of the trachea, all of which taken together constitute a complicated and perfectly adjusted governor of the quantity, the accent, and, in a measure, the quality of the notes.

Every observer has remarked that nearly all the superior songsters among birds have rather long and slender bills, whilst the talkers have short, stout ones. I have tried to discover, and think I have discovered, the relation that width, length, and curvature of bill have to the quality or style of voice. It is sufficient to remark here that birds having extremely short, thick beaks, like that of the cardinal grossbeak or that of the blue-jay, have not the power, apparently, of trilling, shaking, or quavering the voice (which is the distinguishing gift of the thrush and many other slender-billed birds), though the grossbeak and the jay have excellent vocal powers. Reduced to a rule, the comparison will

be, The short-bills twitter and whistle, the long-bills sing. The blue-jay is the most melodious of the whistlers, whilst the quail (bob-white) and the cardinal grossbeak are the most powerful whistlers of all our birds.

It has been somewhat taken for granted by our ornithologists that all the birds belonging to the subdivision named oscines, or singers, have the vocal organs necessary to song. Even Dr. Coues remarks that the rook, though "a corvine croaker," has a "syrinx in good order, though he has never learned to play" on it. Now, I have never had the opportunity of dissecting a rook's vocal organs; but I am able to say that such corvine croakers as I have examined are not possessed of a song-making apparatus to be at all compared with that of the cat-bird, the brown thrush, or the mocking-bird. Macgillivray's figures will have to be greatly modified when applied to the best of our American songsters. Professor Müller's researches in the comparative anatomy of vocal organs in birds, and Professor Huxley's admirably clear description, have failed fully to recognize the office of the tongue and posterior walls of the mouth in differentiating and modifying the notes of a bird's song. It appears to me that the oversight, or partial oversight, has arisen from taking it for granted that the bronchi-tracheal syrinx is the absolute and sole song organ in birds, instead of being merely the voice generator in song-birds. For example, the parrot has no septum in his syrinx, and but three pairs of intrinsic muscles, and yet his voice is a wonder of flexibility and elasticity. Melody is lacking, because one of the vocal cords (the septum with its membrane) is gone; but high

vocal performance is possible, because the lower mouth space and the tongue are singularly adapted to modifying and breaking up the voice into fragments surprisingly articulate, though the voice itself is inferior in *timbre* and range.

Long before I began my dissections, I had noted that the sweetest of the flute notes uttered by the mocking-bird and the blue-jay appeared to be blown out through a rigidly distended throat, whilst the delicately quavered passages of the mocking-bird's song were, seemingly, manufactured at the root of the tongue. To get evidence of this, carefully watch your caged mocker when he is delivering a labored *staccato* combination, and you will see the convulsive shake of the mouth muscles and the peculiar management of the lower mouth space, by which he differentiates the notes. On the other hand, he will whistle, and when he has ended you can scarcely say whether or not he opened or moved his mouth at all during the performance.

There is an interesting ventriloquial effect produced by the purely syringeal or laryngeal notes of a bird's voice. This is very pronounced in the call of the quail, and especially in the piping of young wild turkeys; but it is most noteworthy in some of the night-cries of the mocking-bird. True song, however, has nothing of this peculiarity in it; even the careless shadow lay of the indigo-bird has its definite expression of place and distance, no matter how sketchy its outline.

From all we can gather it appears most probable that in its present form our song-bird proper—our bird with a song to sing—is not much older than man; that he found his

song just in time to gladden the ears of God's last and greatest creation; that he struggled through countless ages and awful changes in order to fit himself for our entertainment. Think what the avian race has endured since first Archæopteryx felt the feathers begin to bud in his arms! What a long, slow, hesitating, faltering current of development, from a scaly amphibian of the paleozoic time, up, up, to the glorious state of the nightingale and the mocking-bird! I never see a brown thrush flashing his brilliant song from the highest spray of a tree without letting a thought go back over the way he has come to us, and I always feel that to protect and defend the song-bird is one of man's clearest duties. Indeed, nothing is better indicated by the records of the ages than that beautiful colors, rich fragrance, and bird-song were made especially for us. There were no flowers, properly so called, in paleozoic times. Amidst all the luxuriant vegetation of the coal measures, not a fossil blossom is found, nor do the rocks give up a single butterfly or other insect which was probably highly or delicately colored. The ancient birds (reasoning from analogy) were not gay-feathered, and, as I have shown, were not able to sing. But when man appeared the world was ready for him; the hills and the valleys and the broad plains were covered with verdure and bloom, and the air was rich with perfume and resonant with bird-song. He might have looked around scarcely able to know whether the butterflies were winged flowers, or the flowers vegetable butterflies. All this great, *riant*, blooming, perfumed, music-filled world was for him and his beautiful companion. Well might it be said that

they were in a garden, an Eden. Well might the gush of song from a myriad swelling throats, around, above, everywhere, suggest that the very stars of morning were singing together.

I am inclined to the belief, from my own observation, that many of our birds are still in a transition state as regards the development of their vocal organs. Take the woodpeckers, a very unmusical family, and we shall find the golden-wing giving some evidence of acquiring a song, apace with his departure from the true woodpecker habit. The wood-thrush appears to lack a million years or so of practice and hereditary development to make him sing as well as the mocking-bird, though his voice is as sweet as a silver bell. The meadow-lark is very nearly a singer, so is the bluebird, whilst the blue-jay does at rare intervals render a low, mellow, incomparably pure flute passage, as if whistling a snatch from a future score of its own. The tufted tit-mouse stops just short of what one fancies would be a fine, clear lay, and the cardinal grossbeak puts on all the airs of an accomplished musician, without being quite able to find a tune.

Comparative anatomy bears out these suggestions, showing that development of voice in birds runs quite along with the development of the syrinx, whilst development of song power keeps well up with and is dependent on the correlative efficiency of the syrinx and mouth arrangement. No crow, or black-bird (American), or other songless oscine is capable of learning to sing, nor can it be, until a change shall have taken place, not in its larynx or syrinx, but in the shape of the posterior part of its mouth with relation to its

tongue and the opening of the trachea. In every case where a bird approaches the margin of song-making it will be found to possess a mouth arrangement superior to that of birds which have no tendency toward song. Even the mouth and tongue of the golden-winged woodpecker are verging in the direction of the true development; its bill is growing slender and weak, is taking on the song-bird curve, and the posterior part of the tongue is being modified. Indeed, *Colaptes auratus* is much nearer the true singing bird's estate than any rook, no matter how beautifully developed its syrinx, but it is not nearer the possession of the greatest vocal power, the power of articulate expression.

Such is a hasty glimpse of the genesis of bird-song, a subject which might well have a volume devoted to it; for so long as Keat's ode to a nightingale and Shelley's to a sky-lark shall exist, no one dare say that bird-song is not worthy of the highest attention.

THE ANATOMY OF BIRD-SONG.

I.

THE vocal organs of the birds have received much attention from the comparative anatomists, and have been the subject of many theories, accompanied with more or less figuring and minute description. Macgillivray has been followed pretty closely by all the bird anatomists since he wrote his *British Birds*, and especially has his exposition of the office and *modus operandi* of the so-called *syrinx* been accepted as if without question. Perhaps the best work yet done in this field so far as it goes (and outside of Macgillivray's) is Müller's *Researches*, Berlin Ac. 1845, though Owen and Parker and Huxley, not to mention a great many others, have touched the subject with deft hands in passing by. As a rule, however, and naturally enough, the attention of all these competent scientists has been directed more particularly to the anatomical side of the subject, to the neglect, in some degree at least, of the physiological side. The syrinx, a peculiar valve-box attached to and forming a specialized part of the oscine larynx, has been described over and over again, and song-making assigned as its function. Curiously enough, Macgillivray's famous drawings—the figures upon which everybody has been content to rely for so many years—were made from a rook, a bird without a singing voice, though possessed of what is called the typical oscine syrinx.

Some years ago, while dissecting, a meadow-lark I became sceptical upon the subject of the

bird-voice being formed or originated in the syrinx. I admit that my doubt had no scientific basis at first, for it was suggested by the feeble and insignificant appearance of the organ, but it bore upon my mind with sufficient weight to send me back to the books for a re-study of the subject. There were Macgillivray's figures again, drawn from the larynx and syrinx of the rook, a typical oscine, and there was Professor Huxley's singularly clear description, accepted by everybody. But the doubt had got into my mind unbidden and it would not obey when I ordered it out. So I set about making original investigations, which have taken much time and covered a great deal more ground than I intended, and which, nevertheless, are yet far from complete. I began by making first a thorough study of the construction of the oscine larynx from specimens collected by myself. In doing this I took from various species the larynx and syrinx with the tongue attached, and compared them in every way, making minutely copious notes and sketches as I went along. Next I dissected these members with a view to becoming certainly familiar with their structure and with their mode of action independently and correlatively. At the same time every anatomical feature of the bird's mouth was studied and experimented upon with full sketches and notes. As an aid to my investigations with knife, needle, and microscope, I patiently and closely watched caged birds while singing, and with a powerful field-glass gave wild birds the same attention during their lyrical performances.

It may not be out of place to state that in the course of all these studies I made journeys which, taken together, have covered a large part of the territory east of the Mississippi River and west of the Alleghany Mountains

and between Lake Superior and the Gulf of Mexico. My work has been prosecuted every month of the year, and my birds have been of every age from nestlings up, and while I have taken the syrinx and other members of the vocal organ from the male rather than from the female, still I have not neglected the latter.

Finally, as a part of my self-appointed task, I have examined by every method I could command, the voice qualities possessed by our song-birds. This last I consider of importance in view of the fact that a difference in voice quality naturally suggests a difference of some degree in the development of the vocal organs. The *timbre*, or, for that matter, any quality of bird-voice varies as much between species as does the appearance of any notable physical feature, whilst among the true singers there is no appreciable difference of syrinx-development, so far as my examinations have disclosed, but of this in the proper place.

If the question arise, and I must answer why I have made this study, I shall deem it enough for me to say that I had to do it. The subject took hold of me and would not be shaken off. The birds, singly, in wisps, and in clamorous mobs, assaulted me with their melodious missiles, and taunted me with the mystery of their song-power. In the dark woods of the Middle West, along the shores of the Northern lakes, in the blooming thickets of the Florida peninsula, in the swamps of the creole country, and all through the picturesque hill region of Alabama, Georgia, the Carolinas, and Tennessee, they had jeered at me, laughed at me, scolded me, and whistled me to scorn, and then, to complete my perplexity, they had sung me to sleep and sung me awake with delicate and

delicious phrases as new and fresh as dew, and yet as old as the sea. I could not get rid of them, even when I shut myself in my study. If I turned to the poets, there were the nightingale and the dove, the mavis, the sky-lark and the oriole singing away for dear life; from the preludes to Greek folk-songs and from the ballads of the love-sick Provençal tramp, or from the roundel of the steel-clad knight as he rode along the dusty highway with the Rhone on one hand and the vineyards on the other, I heard the bird-notes bubble out to mingle with the tinkle of cithern and the quaver of hautbois. The orators, the essayists, the preachers, and all the tribes of romancers brought me echoes of sylvan fluting. Then if I turned to the pages of science and rushed to the extreme of "solid reading," I fared no better; for even the records of geology eulogized the birds, and I heard strange twitterings of avian voices trickling like spring-streams out of the ancient rocks. Not less in the books than in the woods and fields was bird-song tantalizing, for at every point some subtle and elusive suggestion arose, only to escape final analysis. Keats, in his *Ode to a Nightingale* blows through his words something inexpressible which haunts and taunts the understanding like a half-forgotten strain of dream music, and the same mysterious challenge to one's soul exhales from the strange inscriptions sketched in the deep-buried stones of æons ago, where the fragments of vanished bird-forms hint of unknowable life-forces dried up long before man felt the breath of God. One must say this reverently and with no question of a clash between Nature and the inspired record arising in one's mind, for the Bible is not a natural-history book, nor is geology a scheme of salvation. There is no

clash between the two. But to the bird-voices that have charmed all manner of men and women, let us turn in the spirit of the truth-seeker, and leave the fools biting the iron spikes of vain contention. There shall be neither vagary nor agnosticism in our performances; we will simply look into the birds' mouths, and inquire about their tender flutings, and examine their melodious throats.

Nor will we indulge in the precious jargon of the sciences, any further than to borrow a few of its most necessary technical words and phrases in case we are hard pressed for a means of lucid expression.

Study in the fields and woods is so different from study in the library and laboratory, that in writing of it one is apt to forget to respect that dusty, musty air and that skeleton-like stiffness of style so dear to the heart of the closet scientist. After all, however, it is quite probable that there really is nothing in truth which demands or deserves the ill treatment implied by harsh words and unmelodious phrasing. Indeed I sometimes wonder that comparative anatomists are not all poets, like Goethe, or seers, like Emerson. The truths of biology are so perfectly outlined, and yet so dim, so near, and yet so unreachable, so set in an atmosphere of fascinating mystery, so suggestive of inexpressible things hovering just beyond the reach of thought, that the imagination strikes at them, as a bird might strike at its own shining reflection in a shimmering summer pool. I dare say that one manifestation of life is just as mysterious as any other; but the mystery of song, having the charm we all know yet cannot explain, is a double mystery. Emerson understood it well when he exclaimed:

" Aloft, in secret veins of air,
Blows the sweet breath of song!"

II.

In his description of the syrinx, Huxley, taking it for granted that bird-song is generated in that organ, declares: "The voice of birds is not formed in the larynx, but in the syrinx."

To understand what is meant by this statement, let us examine the anatomy of a typical bird-syrinx. If for this purpose we kill a rook, as did Macgillivray, and proceed to cut out its tongue with the entire tracheal column attached, we shall find that the opening of the trachea is just posterior to the root of the tongue. From this opening, down to where it is divided into two bronchial tubes, the trachea of most song-birds slightly decreases in diameter. At the point of division, however, a peculiar modification of structure takes place. This modification of the trachea is the syrinx, which, viewed exteriorly, is a roundish bundle of muscular fiber covering the bony and cartilaginous frame of the organ, whilst its interior is a delicate but firmly adjusted system of valves. The main body of the tracheal column is an elastic tube of long rings held together by a tough and flexible covering, and furnished with muscles by which it may be shortened or elongated at the will of the bird.

The *glottis*, as the opening of the trachea is called, is a slit somewhat elliptical in its general form, set between the barb-like prongs of the hyoid bone. This opening is furnished with a rim of muscle and membrane and can be opened, closed, or made to assume a great variety of forms at the bird's will. Immediately over the glottis, in the roof of the bird's mouth is a narrow longitudinal groove that in its anterior extremity is exactly formed to receive the bony tip of

the tongue, which in true song-birds thins down to a very delicate degree. All the movements of the glottis are intimately connected with those of the tongue, so that the latter organ, as will be seen presently, has much to do with bird-song; indeed it has much more to do with it than has the syrinx.

Sound, as exemplified in the avian voice, is the vibration of a column of air by an expulsion of breath from the lungs through the glottis into the mouth cavity. Properly speaking, there is no such thing as a bird *voice* in the popular meaning of the word italicised. A bird whistles, chirrups, twitters, clucks, croaks, quacks etc.; but every sound it utters is a wind-note as pure and simple, so far as its origin is concerned, as any note of a flute. There is no such thing as a bird's vocal cord. No sound ever had its origin in a bird's so-called syrinx. The vibration of a membrane has nothing whatever to do with creating the sounds uttered by birds, but it may modify and vary the form of those sounds.

Without appealing to the anatomical evidence, which, however, I shall not neglect to do in the proper place, I might suggest some general objections to the syrinx theory. For instance, some of the pure, clear notes uttered by a mocking-bird may be heard, on a favorable morning, at a distance of nearly or quite half a mile. The so-called vocal cords of this bird's syrinx are less than the sixteenth of an inch in length, and are stowed in a thickening of the trachea some two inches below its opening. Now how can it be possible for so strong, clear, and pure a sound to be generated by so short and feeble a cord, and at the bottom of so long and slender a tube? Let me ask the reader to pause just here and whistle, carefully noting that the sound is created in

the oval orifice formed for the purpose by the lips, and that the pitch and tone quality are governed by the cavity of the whistler's mouth and throat. In other words, the notes in whistling are *caused* by the breath from the lungs passing through the opening between the lips, and they are *given character* by the volume and length of the vibratory column of air in the mouth and trachea of the whistler. Now make a deep cup of your hand and hold it over your mouth while you whistle. You find by careful experiment that any interference with the column of air in front of the mouth-orifice also curiously modifies the sounds.

The bird's glottis is the whistling orifice; there the sounds are generated, and their character is controlled by the vibrations of two columns of air, one in the trachea, the other in the cavity of the bird's mouth and throat. The glottis is set in the midst of a tangle of muscles, fibrous tendons, and elastic membranes belonging to itself, the tongue, the mouth, and the throat of the bird. Any movement of the tongue, the throat, or the mandibles of the bird affects the glottis in some degree, so that in the case of the best songsters some of the vocal movements are intricately compound, and consequently the sounds produced are likewise compound, but not in origin, simply in modification. For instance, in the croaking of a yellow-billed cuckoo, the sounds are begun at the glottis and would be clear whistle-notes but for the form assumed by the bird's mouth and throat, and the vibratory reflection caused by the action of the elastic membranes against which the bird's breath impinges as it leaps from the trachea. The fact that the sounds uttered by the crows, the cuckoos, and many other oscines are guttural in effect has led to

gross error in the conclusions arrived at by writers upon the subject of bird-song. The harsh croaking notes, when closely observed, are found actually to begin as if the bird were going to whistle; but the sounds are arrested by the tongue and mouth-roof, and flung back into the throat, so to speak, where they are distorted, broken, and specialized into a characteristic rasping gurgle-phrase, which at a distance is taken for a genuine voice-effect, because of the peculiar jar or vibration of the throat and mouth membranes communicated to the reflected air-column above and posterior to the glottis.

It is quite the habit of ornithologists to allege that a rook or a shrike has just as good a vocal organ as a mocking-bird or a wood-thrush, and, viewing the syrinx as such organ, doubtless they are right; the error resides in the point of view. The very fact that a logger-head shrike with its preposterous rasp-voice has a really larger and better syrinx than the robin, or the mocking-bird, or any other sweet singer, ought of itself to give rise to some doubt as to whether the voice-organ of the birds has been rightly located by the anatomists. Prof. Huxley's description of the bird-syrinx is admirable in every way; no one can find fault with it from the anatomical point of view; but he assumes the physiological part of the problem, or rather takes the function of the so-called organ as granted without proof. It is clear to my mind that he was led to do this by Macgillivray's brilliant treatment of the subject, and Parker all but admits that he has submitted to the same influence. Dr. Elliot Coues simply adopts the reasoning and presents the plates of Macgillivray's work. Indeed it appears, so far as I know, that no biologist since Macgillivray

has given the subject thorough analysis at first hand.

Let us now examine the avian syrinx with a view to settling the question whether or not it is a song-making organ. In doing this we will choose the syrinx of an accomplished singer, so that there may be no doubt in the matter.

In making my dissections and other studies I began with the mocking-bird and ended with the wood-thrush, branching out between these to take in many birds not singers at all.

The syrinx of the mocking-bird will serve our purpose just now.

III.

The syrinx of the mocking-bird is situated in the cavity of the bird's breast near the upper part of the lungs and it is made up of the following parts: A slight enlargement of the lower rings of the trachea, forming a drum divided internally at its posterior extremity by a bony cross-piece called the *pessulus*, a membranous cartilage rising above the pessulus a little way into the trachea proper, dividing the hollow thereof into halves, and a wisp of delicate muscles. The trachea forks at the lower part of the syrinx into two bronchial tubes that pass directly to the lungs right and left.

The reader may get an excellent idea of a mocking-bird's trachea and syrinx by imagining for the trachea a hollow large-sized broom-straw an inch and a half in length, one end of which is the glottis, and the other end, slightly enlarged, the syrinx, out of which the bronchial tubes pass at an angle with each other of some fifty degrees. Further, imagine this bifurcated lower end of the broom-straw to be furnished with a valve-like division-wall rising a little way up its hollow, just

above the point of bifurcation. In other words, imagine the hollow of the syrinx (lower end of the straw) divided into two equal apartments by a thin vertical wall, whilst from each apartment passes a smaller tube just like the trachea (the straw). Such is a general description of what has heretofore been considered the song-organ of the highest kind of bird. I cannot do better, however, than to add here a condensation of the detailed description prepared by Prof. Huxley: 1st, The trachea is a hollow cylinder formed by bony rings. 2nd, "The hindermost (lowest) rings of the trachea coalesce and form a peculiarly arranged chamber immediately beyond (below) which the *bronchi* diverge, and from their posterior wall, where one bronchus passes into the other, a vertical fold of the lining membrane rises in the middle towards the *tympanum* (syrinx chamber) and forms a vertical *septum* between the anterior apertures of the two bronchi. The anterior edge of this septum is a free and thin *membrana semilunaris*, but in its interior a cartilaginous or osseous frame is developed and becomes united with the tympanum. The base of this frame sends out two cornua, one along the dorsal, the other along the ventral edge of the inner wall of the bronchus of its side, which in this part of its extent is membranous and elastic, and named the *membrana tympaniformis interna*. Opposite this the bronchial rings are incomplete, and have the form of arches embracing the outer moiety of the bronchus. The second and third of these bronchial arcs are freely movable, and elastic tissue accumulated upon their inner surfaces gives rise to a fold of the mucous membrane which forms the outer boundary of a cleft, bounded on the inner side by the *membrana semilunaris*. The air forced through these

two clefts from the lungs sets these elastic margins vibrating, and thus gives rise to a musical note, the character of which is chiefly determined by the tension of the elastic margins and the length of the tracheal column of air. The muscles by the contraction of which these two factors of the voice are modified, are extrinsic and intrinsic."

In the case of every true song bird that I have examined there are six pairs of intrinsic muscles controlling the tympanum and bronchial arcs. By the contraction of these muscles, the arcs and the tympanum are moved in a variety of ways. The mocking-bird, however, has much weaker syrinx muscles than the shrike, the cuckoo, or the bluejay, though if Prof. Huxley's theory of song-generation is correct, the mocking-bird's organ should be much the more powerful in every respect.

The "fold" of membrane described by Prof. Huxley as occupying the inner surface of the free arcs of each bronchus and the membranous edge of the frame of the pessulus are really delicate valves whose function or office is quite different from that assigned to them by the anatomists.

The minute intrinsic muscles controlling the mocking-bird's syringeal membranous projections are so arranged that the mouths of the bronchial tubes may be almost, if not quite, closed by the extension of the "folds," or elastic margins, and by this means the bird is enabled to measure in the nicest manner the amount of air thrown from the lungs into the trachea. Thus when it is whistling a rapid staccato, the delicately modulated notes following one another like raindrops in a shower, these valves in the syrinx are doling out the air in precisely the right quantities

and at exactly the proper intervals for the purpose in view.

The so-called vocal cords in the syrinx of a blue-bird (*Sialia sialis*) are less than the twentieth of an inch in greatest extent. Indeed the free membrane of the septum is scarcely discoverable with the naked eye, and yet the fife-notes of that beautiful bird may be heard far across the summer fields, sweet, clear, mellow as the softest quaver of the *flute d'amour*, all owing, as the great anatomists would have it, to the vibrations of those deep-set infinitesimal membranous margins!

The chief stumbling-block of all the investigators has been that they have taken it for granted that birds have voices like those of the mammals, and that consequently each singer must have a set of vibrating vocal cords somewhere in his breathing tube; when in fact the avian musician's syrinx has no more need for vocal cords than had the famous syrinx or Pan-pipe of the ancient god.

Let us again consider the act of whistling. Note the fact that you can run the gamut without perceptible change of the size or shape of the mouth orifice, the sounds being graded by controlling the size of the air column behind the orifice. Now, the bird in whistling controls both the size of the orifice and the extent of the air columns above and below the glottis. This gives him a range and power of expression not to be approached by the human whistler. He can open wide his mouth and whistle, as does the quail, with almost deafening shrillness and penetration, or, closing his bill until a mere slit is seen between the mandibles, he can blow a dreamy hautbois note, slender and refined as ever

stirred the air of Arcady, or trembled in the vineyards of old Provence.

But bird-song cannot have its mystery wholly solved by dissection. The parts of the organs are so extremely minute and so obscure in their connection and correlation that we must turn to extrinsic and general observations for assistance in interpreting their functions. With this view, let us go watch a mocking-bird while he sings.

IV.

Everybody has noticed how a singing bird expands and compresses its throat just below and between the prongs of the lower mandible during the utterance of its musical phrases. When the notes are keen and shrill, the throat is drawn close, and when a grave passage is blown, the throat is puffed out like that of a toad. This puffing process is not merely a lengthening of the trachea (or tracheal column of air), as Prof. Huxley would have us believe it is; it is more. The posterior cavity of the mouth is greatly expanded laterally, vertically, and longitudinally, so as to form a hollow drum behind the glottis. Into this chamber (lined with tightly drawn membranes) the breath from the glottis is reflected by the tongue and the anterior part of the roof of the mouth; there its vibrations are communicated to the largest possible column of air, sounding the gravest notes of the bird's voice. When the throat is compressed, this drum or chamber is reduced to the minimum, and the vibrant column of air gives forth the sharpest sounds possible to the organ.

Observe the mocking-bird or the brown thrush, as it sings

“Of summer in full-throated ease,”

and you will see that the lengthening or shortening of the tracheal column has but little to

do with the relative values of the notes. I have seen a mocking-bird with its chin resting upon its breast run the full compass of its voice; whilst, on the other hand, it is not uncommon for it to utter every note it has mastered, with its neck at full stretch. Such feats are possible on account of the exceeding elasticity of the walls of the posterior mouth-cavity and the anterior throat-cavity. The shortening of the trachea really does this: it gives the lungs greater power to act directly upon the glottis, thus adding volume to the notes. For instance, if you watch a quail as it whistles "Bob White," you will note that its head moves up and down with the lengthening and shortening of the trachea necessary to the extremes of power required. The yellow-billed cuckoo, in uttering its well-known croak, slightly elevates its beak, and you can see its upper throat palpitating in accord with the rattling notes. Indeed, it appears to be sucking the sounds back from the glottis into the hollow of the mouth and throat, where they are shaken about like peas in a box! All the common song-birds have a way of uttering falsetto notes occasionally. The most notable example of this is the nocturn of the mocking-bird, in which falsetto phrases are used with singularly plaintive and touching effect. After careful study, I have concluded that the notes above described are produced by a division of the vibrating air-column in the mouth, caused by the bird drawing its tongue back nearly over the glottis, while the mandibles are kept as nearly closed as possible. The brown thrush is expert in rendering very delicate falsetto sketches, and watching him with a strong field-glass has convinced me that I have correctly described his method. The caged mocking-bird rarely indulges in this delicious music—and therefore is hard to

study, since his falsetto in his wild state is mostly a nocturnal performance.

The sparrows, the thrushes, the meadow-lark, and some of the warblers elevate their heads (with their beaks at an angle of at least forty-five degrees with the horizon) in singing. It is by this attitude that they can give greatest freedom to their throats. Other songsters, including the orioles, the blue-bird, and most of the smaller fry, utter their notes while in any position, even on the wing.

I have called attention to these extrinsic features of the song-habit in birds because I deem them of great value in determining the voice functions of the trachea and syrinx of the oscines.

V.

The most difficult question in our investigation arises out of the unmusical notes—the quacks, croaks, jarring cries, and cackling noises made by the birds when not inclined to whistle. If, on one hand, a pure flute note cannot be made by the vibration of the minute syringeal membranes of a mocking-bird, it would appear, on the other hand, that a hoarse, guttural, rasping snarl could not be originated by a whistling orifice, or, in other words, by the glottis of a mocking-bird, a crow, or a meadow-lark; but a little attention will clear up the trouble. When we are very near the crow, for instance, his voice divides itself into two distinct sounds, one a clear, steady wind-note, the other a jarring noise, harsh and disagreeable. The effect is the well-known caw, sometimes successfully imitated by a boy making a nasal sound in his hollowed hands. The jarring or rasping element of the crow's voice is really caused by the vibration of a membrane, but it is not a syringeal membrane. The note first made by

the breath from the glottis is reflected back by the bird's lifted tongue, and the element of harshness is caught from the strained and vibratory membranes of the mouth and the nasal and throat cavities. The peculiar part played by the syrinx in this case is that by a rocking, quivering, or gyratory motion it imparts to the tracheal column of air sent out through the glottis a spiral or palpitant current. This current would blow a quavering flute-note of some sort were it not interrupted at the glottis by the bird's uplifted tongue, and broken and flung back into the throat and nasal cavities, where it is further disintegrated by the elastic membranes, as already mentioned.

The parrot is a strong instance of a bird who has a wonderful voice, but whose syrinx is weak and imperfect, viewed from Prof. Huxley's ground. There is no *septum* or median membrane in the parrot's organ, and therefore one "vocal cord" is missing, and yet how clear is his whistle, how pure his reed-note calls, how deep and how incomparably rich his throat cries! Surely all these are not made in that poor little half-equipped syrinx! The thick, heavy, fleshy tongue of the parrot, and the spacious throat-cavity behind it, are the special means by which its voice is controlled and enriched. The so-called speaking voice of this and other birds is a lingual and throat modification of the glottis notes. Again, the large, pad-like tongue of the parrot, perfectly reflecting the breath from the glottis back into the throat-cavity, gives the best proof of what I have claimed, by producing the closest parody of a genuine voice ever uttered by a bird. Just here is the place to say that all of the flute-voiced birds have very slender and delicate tongues. I have before me as I write the tongue of a mocking-bird and that

of a loggerhead shrike, each attached to the trachea and syrinx of the bird, and upon comparison the shrike's tongue is found much the thicker and clumsier, though without any tendency to fleshiness. The tongues of the wood-thrush and the mocking-bird are almost exactly alike, whilst those of the orchard-oriole and the bluebird are very closely similar.

The whole arrangement of the lower mandible (with the tongue and the muscles and membranes clustered about it), in the case of the real songsters, appears to be modified with reference to music-making. In executing a rapid score, the mocking-bird's tongue moves like a vibrating piece of steel, and the same is true of all the twitterers and brilliant voice-shakers. Pure flute-warbling, however, is performed with the syrinx, though not generated in it, the muscular movements at the bottom of the tracheal column letting the air out of the lungs in palpitations (like those from the human mouth in flute or fife playing), and imparting to it various degrees of volume and velocity.

The tongue-notes of most birds are easily distinguishable by the "t" sound with which they begin—the syllables "tee" and "tit" often recurring. The meadow-lark utters a cry which sounds like "*tith-h-h-t.*" It is made by breaking a prolonged note up between the tongue and the roof of the mouth. The red-winged blackbird renders a curious phrase composed of a "shake" and a tongue-note combined. A friend of mine characterizes the performance as something "between a snort and a giggle." The belted kingfisher has a way of chattering through a chink between his tongue and the roof of his mouth; his voice is a very keen and clear one, despite the primitive condition of his voice-organs, and to my ear it is not without a cer-

tain touch of picturesque melody. Even the woodpeckers, notably *Erythrocephalus* and *Colaptes*, have very pure fife-notes.

But let us now turn and examine the true mouth of the avian flute.

VI.

The upper end of a song-bird's trachea is peculiarly modified, terminating in a chink or slit just at the root of the tongue. This slit, the glottis, is surrounded by a bundle of muscles, and has two heavy lips by which it is closed at the bird's will. The anterior portion of the glottis aperture is nearly circular, but it terminates posteriorly in a thin angle, like a keen knife-cut. Out of this little chink has been blown the rapturous sylvan fluting about which the poets have raved since the days of Homer and Sappho.

Just in front of the glottidian fissure there is a valve-like fold of mucous membrane which, when the tongue is raised, is drawn across the anterior line of the circular part of the opening. This modified upper end of the trachea, the so-called larynx, is connected with the tongue-bone by slender muscles, and the lips of the fissure are moved by nicely adjusted intrinsic muscles, of which the mocking-bird has five pairs. The contractor muscles of the trachea are connected with the larynx, and when they are drawn taut the glottis is depressed between the horns of the hyoid bone, which helps to form a resonant cavity in the bird's mouth, and at the same time the anterior fold of mucous membrane is erected as a sort of sounding-board in front of the orifice, while the tongue acts as a reflector or vibrator, as the need may be. In the mocking-bird and, indeed, in nearly all the true song-birds that I have dissected, the air cells, "membranous pneumatic sacs," are

largely and peculiarly developed, and serve a good turn in the matter of song-making, each inflated membrane, especially those of the anterior part of the thorax, acting as a drum-head or sounding-board. In a word, the whole bird is pneumatic, and often in the ecstasy of great song-bursts, it vibrates throughout from tip to tip, as if shaking the sound in a spray of melody from its shining feathers. The peculiar swaying and palpitating motions with which most birds accompany their singing are attendant upon the respiratory exertions necessary to keep the pneumatic sacs full of air. Here again that semi-automatic action, peculiar to the avian structure, comes into play, for each one of these respiratory movements affects the trachea, larynx, and glottis by muscular interference, if I may so call it. That is, muscles called into action for one purpose affect other muscles, and cause them to contract, thus bringing about an involuntary double movement. Thus when the barn-yard cock stretches his neck at full length to crow, the movement depresses the glottis, lifts the tongue, and forms a sound-chamber in the posterior mouth-cavity, all at once.

The lips of the mocking-bird's glottis are extremely elastic, and may be so drawn as to give any shape to the glottidian fissure that may be desired in forming a note. So when the tongue is drawn back with the barbs or prongs of its bony tip close above the glottis, and by muscular action is set quivering, the purest flute notes are disintegrated and sent forth in a shower of sounds, pleasing or harsh according to the correlation of the other factors of modification.

I take the mocking-bird (*mimus polyglottis*) as the highest example, in my discussion of

“song anatomy,” and it must be admitted that it is the highest type of song-bird from every point of view, though its syrinx is absolutely insignificant. The anatomy of its larynx is, on the other hand, quite wonderful. For several reasons I have chosen to make a comparison between the shrike and the mocking-bird, mainly, however, on account of the general resemblance borne by the loggerhead and the mocker in size and coloring, and of the great difference in their voice powers.

The trachea of the shrike tapers very rapidly from glottis to syrinx, while that of *Mimus* is nearly uniform from just in front of the syrinx to where it suddenly expands near the glottidean fissure. The shrike has but three pairs of intrinsic laryngeal muscles, the lips of the glottis are thick and clumsy, as compared with those of the mocking-bird, and the fissure is larger and more obtusely angular, whilst the tongue is broader and far less delicate than the songster's.

The laryngeal enlargement of the mocking-bird's trachea is slightly egg-shaped, or keg-shaped; that of the shrike is simply a continuation of the tracheal expansion beginning at the syrinx. The shrike has a well-developed septum; indeed, in every particular its syrinx is far superior to that of the mocking-bird, and the contractor muscles of its trachea are much more powerful. Its defect, as in the case of the crow, the cuckoo, and many other birds, lies in the formation of the glottis, the mouth-cavity, and the larynx, the shape of the tongue, and the lack of a sufficient number of intrinsic laryngeal muscles with which to control the shape and action of the glottidean fissure.

Viewing the larynx and glottis as the mouth-piece of the avian song-organ or flute,

the difference between this mouth-piece in true singers and in oscines that cannot sing is easy to distinguish. The shrike tries to sing with his throat wide open—that is, he tries to whistle without “puckering” his lips! The mocking-bird knows better.

VII.

In summing up the facts, or the more important ones, connected with the “anatomy of bird-song,” I would emphasize the following :

1. The *syrinx* of the true singing birds is invariably smaller, weaker, and more obscurely developed than that of the songless oscines.

2. The laryngeal and glottidean membranes and muscles are far more highly developed and specialized in the true singers than they are in the oscines that cannot sing.

3. The so-called “vocal cords” in the syrinx of the most musical birds are utterly devoid of the structure of true vocal cords, and serve merely as valves or stops at the openings of the bronchial tubes.

4. The intrinsic muscles of the syrinx in true singers are more delicate, more numerous, and more specialized than those of the songless oscines, giving greater control over the management of the breath blown from the lungs into the trachea.

5. The form of the trachea, just below the glottis, in other words, the form of the *larynx*, in all the accomplished songsters is very different from that in the other oscines, being somewhat like the “egg-choke” in the muzzle of the shot-gun barrel.

6. The tongue of the true singer is slenderer and thinner than that of the whistler, or that of any other songless oscine.

There are many facts, connected with the philosophy of the vibration of air-columns,

which controvert the theory of syringeal song-generation. This theory makes the flute upside down, and gives it a jarring tongue, like that of a jew's-harp. A vibratory, sound-producing membrane in the mocking-bird's syrinx would destroy utterly the purity of its rich flute-notes, just as a harp-tongue in a flute would send a harsh jar through every strain blown from it. Above all, a "vocal cord" less than the twentieth of an inch in length, and but little more than half as wide as it is long, is not the origin of the vigorous, far-sent whistling, twittering, and chirruping that we hear in all the leafy groves of spring. Syrinx is a good name, suggestive of the avian pipe, but it should be given to the larynx, of which the glottis is the mouth-piece, not to the obscure little pump-valve box at the hinder end of the trachea.

If I have succeeded in showing that the mocking-bird is a flute-player, instead of being a French-harp blower, I shall not regret my work. Indeed, I do not regret it in any event, for the scattered spaces of time that I have filled with it are among the charming episodes of a varied out-door experience, brimming now with all manner of melodious memories.



SOME HYOID HINTS.

I.

ONE of the unaccountable prejudices harbored for centuries in the human mind is that against certain harmless reptiles, birds, and other animals. It would be easy to fill many pages with a catalogue of the victims suffering from this curious obliquity of judgment on the part of intelligent and even cultured people. The feeling against non-venomous reptiles may be attributed, with some stretch of the truth, to the disgust engendered by ugliness; but there would appear to be no intelligible foundation whatever for the prejudice against certain birds. The cat-bird, for instance, a beautiful, useful, and charmingly musical little creature, naturally inclined to love man and to serve him, has been almost universally despised by those who ought to love it and defend it. The yellow-billed cuckoo is another singularly unfortunate bird in this regard. In the Southern States especially it is the subject of great slander. But there is, perhaps, no other family of birds which, in America at least, has been subjected to such unmitigated, baseless persecution as that to which the family of woodpeckers has submitted within the present century, and falling, too, from the hands of the most enlightened populace on the globe. So deep-rooted is this popular prejudice against the woodpecker that one may be sure of eliciting an expression of surprise, if not of contempt, from almost any audience, by remarking upon the beauty of any species of the bird. Ornithologists have often noted this, and no part of the prejudice has originated with them. Indeed no bird has been studied more

enthusiastically or praised more cordially by intelligent students of natural history than *Picus* has been, unless we must except the kingfisher. The American ornithologists, especially, have been generous in the time and labor given to a loving study of the life, habits, and specific traits of our many and beautiful woodpeckers. If Wilson's and Audubon's noble works could have gone early into the hands of the people, they would have been of incalculable benefit in uprooting and destroying much of the popular, quasi-legendary prejudice of which I have spoken, but those works were necessarily expensive and beyond the reach of all but the rich few. It is only within the last twenty years that popular science has been serving its true purpose by taking the cheapest and farthest-reaching channels of self-distribution, and this great factor in the progress of common intelligence and universal culture has, perhaps, come too late to do its whole work. Still the time has arrived, no doubt, when one may put into popular form even a study of woodpecker life, and be sure of a wide and sympathetic audience. Possibly a mere guarded and technically severe sketch of some anatomical and physiological facts of woodpecker biology would hardly be so secure of popular attention, and yet the number of persons who would greedily go through many pages of the driest and most abstruse phraseology to get one grain of new knowledge in any field of science is by no means small. In fact, the strongest trend of the world's forces to-day is toward the popularization and the simplification of scientific methods of acquiring knowledge in every field of inquiry. It is this trend which is fast bringing us to see that no knowledge (no matter of how apparently trivial facts in nature) is unprofitable or without its place in the

great chain of wisdom. Art is not the whole of life, nor is material progress the only good. The pleasure of knowledge, never embodied in painting, sculpture, or poem, nor applied to any economic purpose, is of itself a mighty factor in the operations of human life. These may be trite sentences, but I fear they yet are not sufficiently axiomatic to shield me wholly when I come to disclose the subject of this paper, to wit: *The Tongue of a Woodpecker*. If I should say, the tongue of a nightingale, instead, or the tongue of a mocking-bird, or even the tongue of a blue-bird, I might hope for a gracious audience, but the tongue of a woodpecker has not been embalmed in melody by a Shelley, a Keats, a Tennyson, or a Sappho, nor has it been set in romance by the genius of all ages, nor ever has it endeared itself to the popular heart by amorous carols in all the orchards and groves of the land. Still I might make bold to claim for my woodpecker's tongue some pleasing notes heard in the wild woods when the mornings are sweet and still.

Buffon, giving rein to the Latin hobby of romance, described the woodpecker's life as one of singular and terrible barrenness and misery. Indeed if Buffon, viewed in the light of to-day, may be called an ornithologist, I may as well modify what I said a while ago, and admit that one great bird-student has slandered my subject in a mild way. "Its movements are brusque," says he, "it has a restless air, harsh traits and features, a savage and wild disposition, fleeing all society, even of its own kind, and when the stress of passion forces it to seek a mate, it is without any of those graces with which the feeling charges the movements of other beings who experience it with a tender heart." But my observations, extending throughout some

years and over a wide scope of country, go directly to the contrary. There are no happier, brighter, or more loving birds than our woodpeckers. True they are noisy, restless, bellicose, and self-assertive to a degree, but what strong, healthy, wide-awake bird is not? Even Buffon, in giving the French phonetic rendering of the green woodpecker's voice, *tio, tio, tio*, contradicts himself, for that note is by no means disagreeable to the ear, being very like the *quee-o, quee-o, quee-o* of our golden-wing and our red-head (*Melanerpes*). There is a martial fire and force in the vigorous call of the ivory-billed woodpecker, and a rather savage strain in the voice of the log-cock, but both these great birds are bright, happy, companion-loving, and far from evil-disposed in any way.

All the smaller woodpeckers have a rather pleasing cackle, heard mostly in the spring, varying from *gip, gip, gip*, through several shades, to *pip, pip, pip*, uttered often with ecstatic rapidity. Two or three species, notably the golden-wing and the red-head, repeat the phrase, *pee-to, pee-to*, as they climb a tree bole, or gallop through the air. Indeed in the West and South a large part of the life and cheer of the woods, fields, and orchards is due to the activity and loquacity of the woodpeckers, whose whisking wings and gay colors constantly attract attention.

But it was not of the vocal habit of the woodpecker's tongue that I set myself to write, pleasing as the task might be.

If you will cast aside all prejudice, and agree to forego the pleasure of putting your tongue in your cheek and twirling your thumbs in derision of my subject, I will proceed.

II.

Any ornithologist will tell you that a woodpecker's tongue is the most peculiar organ he ever examined, strangely complicated in its mechanism and singularly striking in the variations of its special development in different species, and that no organic feature of any bird has been more minutely studied by comparative anatomists. From Borelli and Aldrovande and Méry and Olaüs Jacobeus on down to Owen, Macgillivray and Parker, there has been no end to the study and literature of the peculiarities observable in the hyoid bone of the Pucidæ. By all these writers the European green woodpecker has been taken as the type, unless Parker's use of *Picus minor* in his general anatomical studies may be called an exception.

The anatomy of the green woodpecker, so far as the tongue is concerned, is almost identical with that of our American red-headed woodpecker (*Melanerpes erythrocephalus*), saving that our bird's skull has no decided groove in its crown. We have two extremely specialized genera, *Picus* and *Colaptes*, whose tongue peculiarities are extreme. These may be taken as types for the purposes of this paper. Those who are not ornithologists, however, cannot be supposed to know anything about bird-anatomy, therefore it will be necessary to sketch here an outline of the woodpecker's lingual peculiarities.

The tongue proper is a slender flattish shaft lying between the mandibles, and flat upon the lower one when not in use. Thus disposed, it lacks somewhat of reaching to the end of the bill. Its fore-end is of a hard horny substance, and is armed with barbs not unlike those of a fish-hook. Back of this the tongue-bone (hyoid) is encased in a sheath of muscu-

lar, membranous, and nervous tissues, and it divides into two horns, which passing backward and upward, reach forward over the top of the skull, and down to the base of the upper mandible, or into the nostril, or curl under the right eye and rest almost, or quite, against the front of the quadrate bone. In making this circuitous passage the forks of the tongue-bone go on either side of the neck and come together, without coalescing, on the back of the skull, whence they remain touching each other and parallel, to the end of their course.

In the genus *Picus*, of which I take the hairy woodpecker as the typical species, the hyoid cornua (forks of the tongue-bone) end their peculiar journey below and rather posterior to the bird's right eye.

In the genus *Melanerpes*, of which our white-and-black red-head is typical, the terminus is on the central front of the skull, just above the base of the upper mandible, whilst the genus *Colaptes*, to which our flicker belongs, has its hyoid cornua prolonged into its nasal cavity by way of a nostril.

In each case, throughout its entire course, this peculiar hyoidean process is sheathed in a curiously-woven wisp of muscles and nerves, which is modified and prolonged beyond the bony parts, most peculiarly in the instances of *Picus* and *Colaptes*.

The most obvious function of this strangely specialized hyoid process is to give a great thrust to the tongue, so that it may be projected far beyond the end of the bill. The longer the hyoid cornua the farther the tongue can be thrust out of the mouth. So that it has been taken for granted, so far as I know, that the curling of the cornua over the skull between the skin and the bone, was merely the most handy and economical way of dis-

posing of them, in order to get the best results from them in controlling the tongue movements. Does it not appear curious, however, when one comes to note that *Colaptes* has its tongue-bones thrust into its nostril, while those of *Picus* are curled around under the eye to near the ear?

Although I had previously dissected many woodpeckers, and had studied for years with care their tongue-anatomy, it was not until quite recently that I began to suspect that another function than that of projecting the tongue belonged to this peculiar specialization of the hyoidean apparatus.

During an out-door meeting of the Indiana Academy of Science, I went into a dense wood to kill a wood-thrush for dissection. While I was watching for my bird a hairy woodpecker came and lit near me on a small dead branch of a beech tree, where it began to tap the wood with its bill, meantime slowly hopping backwards down the stem. It was not more than eight feet from me, and while watching it I saw that it would strike two or three smart blows, and then appear to be listening, with the tip of its bill resting against the wood. This hearkening attitude was never preserved for longer than the merest instant of time, but its purpose could not be misunderstood. The bird was listening to hear any movements made by worm or larvæ within the branch. The bill-taps were meant to startle the victims and to make them move, so that they could be heard. I became interested and watched closely until the bird successfully located its prey, and by a few deft chisel-strokes cut in and took it. When I returned to where the Academy had assembled, I told President David S. Jordan, the well-known ichthyologist, that I believed I had just made an interesting discovery, and sug-

gested to him that the hyoid cornua might aid *Picus* in hearing. We discussed the matter for a moment, and the subject passed, but it came again and again to my mind, till at length I set about making a systematic study of it.

In the case of the hairy woodpecker the tongue muscles are so arranged that by a very simple action the tongue may be drawn far back into the mouth-cavity, near the throat. This is true in a greater or less degree of all the woodpeckers having the specialized hyoid-ean process, but in the hairy species it is extremely marked.

The true woodpeckers, from the great ivory-bill down to the little downy species (*Pubescens*), have poor ears, and are forced to depend upon their excellent eyes for detecting the approach of an enemy, hence the continual motion of the head, which has given color to the statements of Buffon. The log-cock, which a few years ago was one of the commonest birds of the Western "deadenings," makes its great scarlet head-tuft fantastically conspicuous by tossing it this way and that in its vigilant watchfulness.

Nearly all the species have the habit of making a vibrating noise by striking an elastic piece of wood with the bill. This singular call serves the woodpecker in the place of a song. To his heavy, dull ears the sound doubtless is very pleasing. To understand this, take a string of the size of a guitar string, and a foot long, place one end between your teeth and the other between the thumb and index finger of the left hand, draw it taut, and strike it lightly with the right thumb. You will hear a sound quite inaudible to another person, though close to you. This auditory phenomenon is caused by the vibrations of the string being imparted to the lower jaw-

bone, whose articulations are close to the ears, and whose muscular, ligamentous, and nervous connections with the ear-bones are very intimate.

A moment's reflection will convince anyone that the woodpecker's brain must be fortified against the effect of concussion, for if any other bird's head were dashed with such violence against hard wood, as the woodpecker's head habitually is, death would quickly result. Indeed no person, after examination of the picidæan habits, can doubt that the woodpecker is *hard of hearing*. Connect with this the singular fact that those species which are forced to depend upon hearing to locate their prey, have the hyoid cornua reaching to the immediate vicinity of the ear, whilst the species not so necessitated show a modification of those bones, and we have a curious suggestion at the least.

Upon dissecting a hairy woodpecker we discover that the central shaft of the tongue-bone is simpler than that of most birds, and that it forks directly, without definite articulations, thus making the entire hyoidean apparatus a continuous and singularly elastic bone, peculiarly suited to conducting vibrations throughout its length.

Now when the bird's tongue is drawn far back in the mouth, the posterior end of the hyoid bones is thrust against a cushion of membrane, muscle, and ligament lying immediately in front of the quadrate bone, which is the anterior ear-wall, and if at the same time the lower mandible is let fall a little, so that the mouth is slightly open, the posterior process of the *jugal* bone, called the *quadrate jugal*, is made to press upon the lower part of the quadrate bone, which, being slight and having air-chambers around it, becomes a sort

of tympanum for conducting vibrations to the auditory nerves.

The upper mandible of the woodpecker is longer than the lower, and so it receives the force of every blow made in pecking hard wood. But this mandible is not movable.

Now, if with a good opera-glass you will carefully watch a hairy woodpecker when it is trying to locate a wood-worm in a dead limb, you will soon note that by marvelous slight he first strikes the hard outer crust of the wood a smart blow or two, making a dent therein. Then into this dent he thrusts his *upper* mandible, and allows his lower one's point to rest against the wood; at the same time his tongue is drawn in to the utmost, and the whole attitude of the bird is a *listening* one. It is a swift movement, and will not be noticed except by the most careful observer. Now when the bird's tongue is drawn far in, it rests between the prongs of the lower mandible, and, pressing upon them, forms a perfect connection for receiving the vibrations imparted thereto.

I was at first of the opinion that in the listening attitude *Picus* thrust his tongue against the wood, but this was error, as I soon discovered.

III.

Turning from the true woodpecker to the modified species *Melanerpes erythrocephalus*, we find some curious facts.

The hairy woodpecker (*Picus villosus*) is a much smaller bird than the red-headed species (*Melanerpes erythrocephalus*), yet the former has the more powerfully fluted bill and a brain thrown much farther back in its skull, which is the heavier. The upper mandible of the red-head is less pronounced in its superiority over the lower, than in the case

of *Picus*, and it is not so sharply triangular as that of the genuine woodpecker.

In all of its habits the red-head is intermediate between *Picus* and *Colaptes*—that is, between the genuine woodpecker and the flicker, but, curiously enough, *Colaptes* has the hyoid cornua produced till they enter the nostril! Why is this?

The red-head is an expert fly-catcher, a great fruit-eater, and much given to picking insects up from the surface of the ground, but he does not take his food, as a rule, by pecking into wood.

Colaptes, however, although he does not peck much in wood, pecks holes in the ground, and takes therefrom, in the form of grubs, worms and larvæ, the greater part of his food. In this his habit is much like that of the woodcock or the snipe. His bill, however, is not soft, flexible, and sensitive, like the snipe's, though it is decurved and very little like that of *Picus*.

Now it is well known that the olfactory powers are weak in most birds, and they are perhaps weakest in the woodpeckers. It is also known that the gustatory powers of birds are dull and weak. Add to these facts that the sense of smell assists that of taste, and another suggestion arises. *Colaptes* may have his hyoid cornua and their attendant wisp of muscles and nerves thrust into his nostril to aid him in determining by taste and smell, or by a modified and specialized sense of touch, the quality of the food found in the ground!

The dissections required to settle such a question are of a very minute and difficult sort, and need not be described.

The sap-sucker (*Sphyrapicus*) is not by habit an insectivorous bird; his chief food is the sap and viscous matter lying between the bark and the wood of living trees, and so his hyoid

cornua are elongated very little, if any, beyond the base of the skull. His food is selected by sight, and he has no need for a specialized hyoidean apparatus. Indeed all of the species of woodpeckers that are not dependent upon boring into wood or into the ground, and that therefore do not have to *locate their food or test its quality* without seeing it, have the hyoid bones less developed than in *Picus*.

The protrusion of the tongue is the more obvious function of this hyoidean peculiarity, but the more obscure function of aid to the dull senses of taste and hearing is not therefore less important.

It would not be of particular interest in this connection to go into the minutiae of the many slight variations of the tongue-peculiarity observable in different species. I have given the extremes, the mean and, in the instance of *Colaptes*, a case of curious intermediat specialization (where an extreme might have been expected like that of *Spheropicus*) for meeting the exigency of a singular habit.

It is impossible, in a paper addressed to the popular understanding, to make minute comparisons in anatomy, but the facts upon which I insist may be formulated as follows:

1st. The picidæan development of the hyoid cornua in the genus *Picus* has for its secondary function a mechanical and perhaps sensory aid to hearing.

2d. Such development in the genus *Colaptes* is in aid of the sense of taste.

So minute and obscure are the nerve lines of the hyoid sheath, and so complicated are the wisps of motor nerves controlling the tongue of the woodpecker, that one may not speak with perfect knowledge as to where mere motor action leaves off, and the telegraphy of sense begins, but it appears to me that to

the ear of *Picus* the tongue conveys aid, and from the olfactory organ of *Colaptes* the tongue receives aid—that in each case the hyoid cornua are auxiliary to an organ otherwise powerless to perform the task required of it by a narrow and exacting habit of life. In other words, if *Picus* could have heard the worm stir in the wood, we should not have found his tongue-bones seeking his ear, and if *Colaptes* had been blessed with a fine sense of taste, his nostrils would not have been invaded by his hyoid cornua in quest of aid.

The sheath or nerve-wisp in which the tongue-bones (hyoid cornua) of *Colaptes* are inclosed, runs to near the anterior extremity of the upper mandible, after passing into the right nostril. Each movement of the bird's tongue must be felt in its nasal cavity, therefore, and to what extent the gustatory sense may thereby be aided is not altogether inference. The extremity of the sheath is nerve-tissue and muscular fiber, and is obscurely connected with the tissue lining the nasal cavity, and this, taken along with the facts already given, makes it clear to my mind that the intrusion of the tongue-bones and tongue-nerves into the olfactory space is not accidental any more than their projection around the right eye to the ear of *Picus* is accidental.

To a degree, atrophy and hypertrophy of the limbs and organs of animals are the outcome of what may be called hereditary desire arising out of a need, negative or positive. A negative need induces atrophy, as where the need of losing a useless limb slowly withers it by non-use. A positive need induces hypertrophy, as where the over-development of a limb is caused by a continuing demand upon its strength and action.

In all birds the motor nerves of the tongue pass directly to the brain, and in the wood-

peckers there is a spray of fine nerves passing from the hyoid sheath all along its course, and disappearing in the adjoining tissues.

A minute dissection of the head of *Picus villosus* shows that an obscure flat band of fibrous tissue passes over the quadrate bone, from the end of the hyoid sheath, but not from the ends of the cornua.

Thus it will be seen that Nature has not stultified herself in the discrimination between *Picus* and *Colaptes*, in the matter of giving direction to the posterior wanderings of the tongue-attachments, but has answered, in the only safe way, the insistent demand of a great need in each case. *Picus* must be able to hear his prey, and yet if his ears were sufficiently sensitive, *of themselves*, for this purpose, the wood-pounding the bird has to do would kill him. So *Colaptes* must take his food from the ground; but his bill is not soft and filled with nerves, like the snipe's, therefore he must depend upon his tongue, which in turn is, alas! a woodpecker's tongue, and cannot be trusted until it has formed a connection with the olfactory cavity!

The woodpecker's eyes are immense, in comparison with the size of the skull, and have a power of vision not surpassed by that of the hawk's or the kingfisher's. Whenever his chosen food can be selected by his eyes, he has no need for any extraordinary disposition of the tongue-bones.

In treating the case of *Colaptes*, I have used the idea of gustatory aid derived from the nostril, but I doubt if the actual sense of taste is really aided directly, though this is far from impossible. The chief effect of the nostril and tongue connection may be the registration (by vibration) of the movements of prey when caught. Thus when the bird, with its beak deep in the ground, draws a worm up into its

mouth with its tongue, the worm's slightest movement is telegraphed through the tongue to the sensitive membrane of the nasal cavity, and so to the brain.

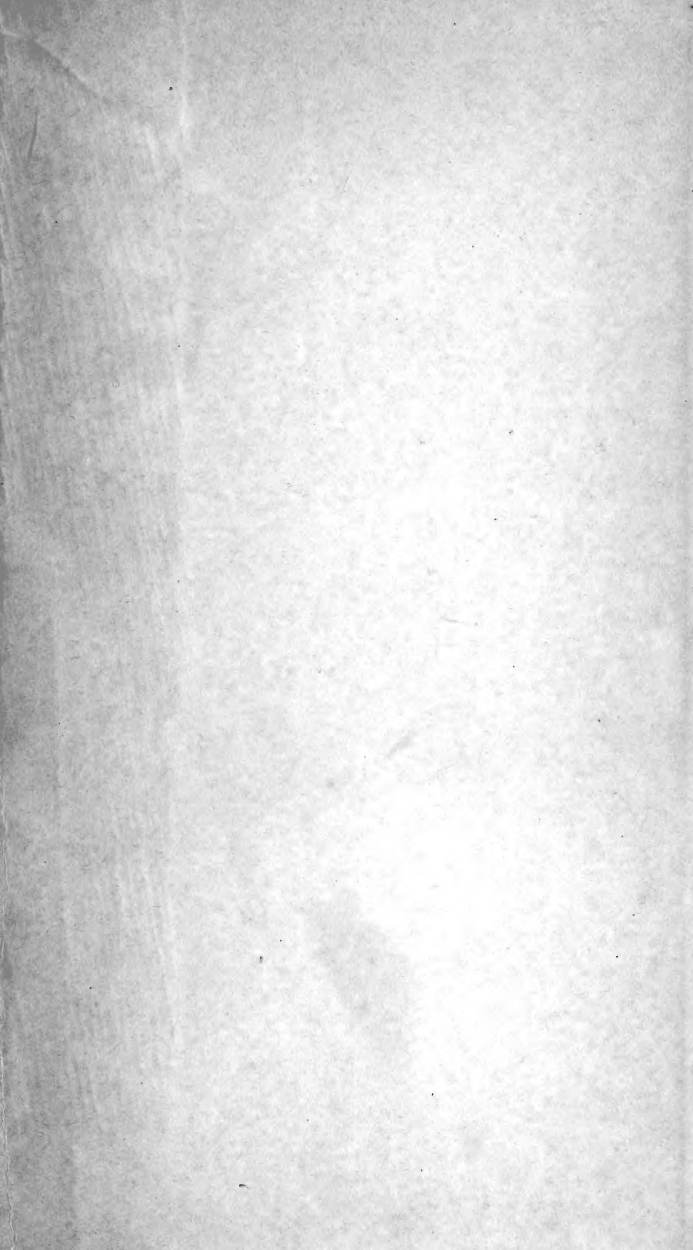
In this connection it may be interesting to note that *Colaptes*, in taking food by pecking in the ground, rarely needs to thrust its tongue out very far, as from the nature of the case the prey must be reached by the bill before it is captured. Indeed careful observation has led me to feel quite sure that it is by the touch of the tongue, and the consequent impression conveyed to the brain through the hyoid apparatus, that *Colaptes* distinguishes a grub from a plant-bulb, or a worm from a soft root, as he delves in the soil for his daily food. By an almost precisely similar, though less roundabout way, the woodcock and the snipe, the duck and the goose, distinguish edible from inedible substances buried under mud and water, where neither sight nor the sense of smell, as commonly defined, can be trusted.

The hyoid cornua of the humming-bird curls up over the back of the skull, but the tongue is hollow and sensitive, so that the gustatory power is probably fairly well developed, and there is no need of any secondary connection of the organ with the brain; besides, the humming-bird doubtless uses its eyes in selecting its food.











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