ESSAYS OF A BIRD-WATCHER

by

Alexander F. Skutch

San Isidro del General
Costa Rica
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FOREWORD

The essays in the present volume have grown out of the experiences of many years devoted to the study of Nature in the wilder parts of tropical America. Some contain largely facts, others the interpretations, the point of view, to which long pondering over these experiences has led me. I think it will be found that a certain unity of thought and of sentiment runs through all of these essays and links them together. Some of the chapters are now printed for the first time, others have already appeared in the pages of The Scientific Monthly and Nature Magazine. For permission to use The Hummingbirds' Brook, The Naturalist's Dilemma, The Parental Devotion of Birds and its Limits, A Parable for Peacemakers, The Family Life of Central American Woodpeckers, and The Most Hospitable Tree, the author is indebted to the editors of The Scientific Monthly; for The Root of the Evil and parts of The Rewards of Bird-watching, to the editor of Nature Magazine.

A. F. S.

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THE REWARDS OF BIRD-WATCHING

As in every other pursuit of man, what we get out of our bird-watching depends largely upon what we put into it. The level of our reward is nicely adjusted to the degree of intelligence, zeal and understanding that we dedicate to the subject. The man who gives to the study of birds little more than his skill and cunning as a hunter gets exactly what he deserves - a cabinet-full of lifeless stuffed skins of birds about whose ways of life he knows next to nothing. Such specimens, gathered with moderation, are, unfortunately, essential to certain aspects of bird-study, just as his collection of skeletons and pickled brains, hearts and other organs are essential to a surgeon. But certainly the possession of such objects can not be considered the end or the reward of the practice of surgery. Its reward lies rather in the satisfaction of crippled bodies made sound and broken lives made whole. The highest rewards are always immaterial.

The first reward of the bird-watcher is the same that every other field-naturalist enjoys, no matter what the particular object of his pursuit: a wider familiarity with the planet on which he dwells, with all its rivers, mountains, valleys, plains, forests, meadows and dells. So he comes to love it more, and feels more at home upon it. Taken all in all, the field-naturalist knows his geography more thoroughly and intimately than the chemist, bacteriologist, physicist, or mathematician. He has seen more climates and countries, knows the ways of more strange peoples, has eaten a greater variety of foods and ridden in more diverse

conveyances. Or, if he confine himself to his 'Parish of Selborne' - where truly he can find enough to keep him occupied during a long and busy lifetime - he will know all its nooks and corners more intimately than the vast majority of his neighbors.

Biologists make increasing use of the concept of 'type locality'. The type locality of a species is that particular spot, as nearly as it can be designated, which provided the specimen from which the species was described. The range of the species may include a continent or two; its type locality is some particular hill, or plain, or valley, in a certain township or parish or canton, occupying some infinitesimal fraction of that vast range. The advantage of so designating the origin of the type is obvious. The species as understood by its describer may in fact be a group of closely allied species, in which event it will be necessary to invent names for the additional forms. The name applied to the species as originally understood belongs inalienably to that form inhabiting the area which had been designated as its type locality.

But every field-naturalist has his own type localities, the spots where he made the acquaintance of each form of life he knows: the old homestead where he first became aware of the robin and the blackbird; the woodland where he first gathered spring-beauty and the meadow which yielded his first buttercups; and, farther afield, the river where first he saw the kingfisher plunge. These spots become for him the type localities of the robin and the spring-beauty and the kingfisher. He will always associate one with the other. They will take on a peculiar importance for him - an importance not inferior, to himself as a naturalist, to that which the type locality of, let us say,

Turdus migratorius, bears for science as a whole. As he widens his travels in the pursuit of his hobby, so his type localities will become more numerous and varied, scattered perhaps through many countries in the most varied climates.

Thus to me the lofty, orchid-laden forest of a certain wild and abrupt mountain in northern Guatemala must always remain the type locality of the most glorious feathered creature of our hemisphere, the Quetzal; for it was here that I enjoyed my first all-too-fleeting glimpse of an unimaginably brilliant apparition in iridescent golden-green, crimson and white, with a long, slender train that rippled gracefully with every undulation of its flight. I had before seen pictures - how inadequate! - and stuffed specimens - how pitifully grotesque! - of the Quetzal; but my memory of them faded into nothingness with my first glimpse of the living bird. Years later, I studied the home-life of the Quetzal and became thoroughly familiar with it in another country far away; but this longer experience with the bird served to strengthen rather than to efface that first evanescent impression. El Cerro Putul, in the Guatemalan Department of El Quiché, remains my type locality for Guatemala's national bird.

So, too, the magnificent gorge of the Río Pastaza, as it plunges and foams down those abrupt, cloud-veiled, palm-shaded eastern slopes of the Ecuadorian Andes, is my type locality for that other gorgeous bird of our hemisphere, which some hold to rival the Quetzal in splendor - the Cock-of-the-Rock. And a dry watercourse winding between rounded gravelly hills, overgrown with scattered scrub-oaks and pines, in the middle of the Isthmus of Tehuantepec, is my type locality for that glorious songster, the Banded Wren;

while a grove of stately manacca palms in northern Honduras always seems to me the proper mental setting for the glittering, dainty Black-chinned Jacamar, for here, one unforgettable afternoon long ago, I first met this dashing little bird. So geography becomes vivid and alive to us: to the plant-hunter by the plants he finds, to the butterfly-collector by his new butterflies, and to the bird-watcher by the birds he meets. The bird, seen in any other setting, no matter how far distant from the spot where it was first met, calls up a vision of the original locality; and the locality recalls the bird. Our memory is the richer for these cross-references in the mind.

This growing feeling of intimacy with our planet and the things it contains, both living and inert, is one of the most important results of our studies. The dull, uneducated mind is scarcely interested in anything beyond the sensations of the body to which it is attached. As our spirit grows, it puts forth tendrils, which fasten themselves to the things without us, whether to impersonal objects or to other minds. According to our nature, the tendrils we send out are intellectual, or aesthetic, or both; some will fix themselves to surrounding things chiefly by knowing about them; others largely by bonds of feeling and sympathy. The greater our spiritual capacity, the more numerous are the tendrils we develop, the more varied the objects to which they cling.

Youth is the proud and jubilant period of our lives, for it is then that these spiritual tendrils burgeon forth with the greatest frequency and ease. We experience a sensation of growth, of expansion, as at no other stage of existence. Almost daily we

can point to some new acquisition of mind, to some new spiritual growth. Then we are rarely oppressed, and never for long, by that feeling of cessation of growth, of stagnation, which casts so dreary a shadow over all too many of our later days. Yet if we are wise, we will contrive that this process of growth continues through all the years of our life. If the studies we have hitherto pursued fail to yield us new truths - doubtless not because we have sounded them to the bottom, but rather because we have run out all our sounding-line - then we should look about for new subjects. If old enthusiasms grow stale, we must seek fresh interests. Perhaps it is a wise practice to acquire a fresh intellectual interest every couple of years, that we may never lose the sensation of growth, and our minds and spirits may never grow old.

The objects which stimulate the growth of tendrils are as diverse as the natures of men. Music, minerals, sculpture, snail-shells, paintings, ants, the stars, orchids, antiquities, mosses, butterflies, birds - the list is unending. Those pursuits are most to be preferred which - like bird-watching - favor the production of tendrils compounded of both feeling and knowledge, for when of such a duplex nature they are strongest and most enduring. Whatever class of objects produces these attachments - whether the stars that shine in the heavens or the mosses that form a green carpet over the face of a rock - should be treated with the utmost affection and respect, with reverence even, for it causes our spirit to grow out beyond ourselves, to send its tendrils groping through the vast mysteries of creation. Any study pursued with an earnest and enthusiastic mind, from love

rather than with gain or fame as a motive, is capable of producing this effect. The bird-watcher will claim these advantages in a high degree for his favorite pursuit.

These tendrils, these bonds of knowledge, of love and of sympathy between ourselves and what is beautiful, lovable and true in the universe without us, form indeed

A flowery band to bind us to the earth.

Or, more exactly, the bird-watcher may be said to weave a feathery band to bind him to the earth. It is a band in which feeling and knowledge are intertwined; for he wishes to understand the birds because he loves them; and the more he knows of the lives of these beautiful, happy-natured creatures, the deeper his affection for them. Or rather, loving birds, he wishes to attach them to himself by as many bonds as possible, and each secret of their lives that he uncovers becomes another bond.

It is the severance of these sweet and tender bands, far more than the separation of spirit and body, that makes death a gloomy and fearful thing to contemplate. We shall no more hear the sweet songs of birds, nor look upon the stars, nor probe into the mysterious lives of insects, nor admire the works of the old masters, nor pore over the secrets of the ancient rocks. But ought not the very length and strength of these tendrils, the intensity of feeling with which we cherish them, the horror with which we view their severance, fill us with hope rather than with fear? We have grown out beyond the narrow confines of our bodies with their five senses, and sent our tendrils groping for support through the great universe beyond. The farther they have stretched, the greater their number and the more varied the objects to which

they have become attached, the more nearly we have approached to the divine nature which reaches and embraces all. That the spirit has so far outgrown the quintal or two of earth and water in which it dwells, is perhaps the soundest reason for cherishing a hope that it may survive their dissolution, and continue to reach out through the vast, unending diversity of the universe, until in the end it attains the divine nature, and becomes one with it.

In the last century, a large and influential school of thought held that the chief end of the study of Nature was the demonstration of the wisdom and foresight of the Creator in the minutest details of His work. But this attitude has lost ground before the doctrine that we should seek truth for its own sake; that the value of discovering truth lies in the truth itself. The disinterested and detached frame of mind in the study of Nature, old as Thales of Miletus, has gained much impetus from the modern discovery - or rediscovery - that pure science pays dividends in the sphere of practical affairs. The investigation of the structure of the atom, of a chemical reaction, of the physiology of growth of a plant or the habits of an obscure insect, although pursued in the service of Truth alone, may lead to results of such importance to industry or to agriculture that the investigator himself is astounded by the unforseen consequences of his studies. Thus the modern cult of 'pure science' is not as selfless or as disinterested as it advertises itself to be. However single in purpose the scientists themselves, the endowments which make it possible to carry on their work come in large measure from those who are perfectly aware that practical benefits follow in the train of pure research, as misery pursues the footsteps of war. In the

long run, a material return is expected. Perhaps, in the ultimate analysis, those who in a past generation encouraged the study of Nature that it might demonstrate the wisdom of the Creator in His works, had the less selfish, as they certainly had the less material, motive.

But is it not to be expected that a man's studies, his patient efforts of a lifetime to inscribe a few faltering lines in the great volume of Truth, should, from whatever motives he pursues them, come at last to exert a profound influence upon his moral outlook, his philosophy of life, his religion? Should the student of Nature not hope that, in the course of discovering and recording a thousand small details of truth, he may be rewarded by at least a dim vision of some great, supernal Truth, whose investigation baffles his methods, and whose exposition confuses his careful pen - yet which tinctures all his views of life and of work?

The bird-watcher dedicates a large share of his attention to the study of the ways of life of birds. To him, these creatures of the air unite in themselves more distinct forms of beauty than are to be found in any other class of objects, whether living or lifeless. Theirs is beauty of form, grace of movement, splendor of coloration, sweetness of voice. Add to this that other Kind of beauty which is revealed only to long and patient study - the beauty of their lives together, of their attachment to their mates and nests and their devotion to their young. Plants delight our eyes by their grace and nobility of form, the bright colors and delicious scents of their flowers; but, less animate, they fail to reveal those amiable traits of conduct which we find only in sentient creatures.

And birds, by and large so attractive and so lovable, are, as we have seen, nearly everywhere, next to vegetation, the most conspicuous form of life. Ought not the widespread abundance of these most beautiful and amiable of creatures lead us to suspect the existence of some force which delights in the creation of such forms as are delightful to us? Ought not the fact that these beings so bright and sympathetic are far more in evidence than animals whose forms and ways are revolting to us - than scorpions and leeches and snakes and the huge-mawed creatures of the deep - convince us that the good and beautiful prevail over the wicked and ugly? As birds daily, by their sweet voices and pretty ways, exert upon us a cheering influence of which we are scarcely conscious; ought we not to take their existence into account in our philosophic speculations, that they may help bear against the dark and gloomy conclusions to which long pondering over certain aspects of human history is apt to lead? Is it not easier to hold faith in a beneficent and loving creative force, in a world where birds abound, than it would be to keep such faith in a birdless world?

In a matter so far beyond the range of positive demonstration as this, perhaps we can do no better than to express our gropings after truth in the form of a series of questions. My own inclination is to answer 'yes' to each of these questions. My own studies of birds, even more than my studies of plants and of inorganic nature, strengthen a feeling that there must be some beneficent, beauty-loving creative Force behind this bewildering complex of phenomena. This is one of the results of my studies - perhaps the most important - which I can not prove and demon-

strate as I can prove and demonstrate most of the others; which I find it far more difficult to explain, in terms which nicely keep the middle course between dogmatic assertion and skeptic negation. But it should be enough to know such a feeling in one's heart, and to guard it there.

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THE APPEAL OF BIRDS

To many persons, birds possess an appeal beyond all other living things. Their charm depends upon no single quality, for men have been drawn to give attention to them by the most diverse attractions. Some are led to the study of birds by the beauty of their plumage, so varied and brilliant in color, or else so softly and marvellously blended in shade. Thus the sharp, contrasting colors of the Red-headed Woodpecker first aroused the interest of Alexander Wilson , the 'Father of American Ornithology', in the birds of his adopted land. To others, more easily moved through the ear than through the eye, the charm of birds lies chiefly in their music. Yet others are attracted to birds by the thrill of finding their nests and eggs, so cunningly concealed, so curiously wrought, and so good to look upon. Not a few are interested chiefly by the long migratory flights of birds, which stir their imaginations after the peculiar fashion of great distances and far off lands, and the mystery of tiny creatures braving the perils of long journeys by land and sea, spurred on by some impulse no one understands, and guided by an instinct which ever baffles us. And many become bird-watchers chiefly because they love to wander through the woods and fields, by clear waterways and the shores of lake and ocean; ~~and~~ the pursuit of birds gives a definite objective to their excursions, a clearer memory to treasure when they are done.

For myself, I was led to devote increasing attention to birds by the discovery that the intimate study of their way of life

is so richly rewarding. Plants at first absorbed most of my attention; and I found beauty enough in them, and color; yet they lacked that spontaniety, that expression of eager sentient life, which at times one seeks in Nature. For this I looked to the animal kingdom, and especially to those animals more nearly approaching ourselves in senses and intelligence. Soon I found that birds, to one with patience to watch them, yield up the secrets of their lives more readily than any other class of animals with red blood in their veins. A hummingbird, who came to build her nest just outside the window before which I sat day after day poring over a microscope, opened ~~by~~ my eyes to this truth. To her I owe an inestimable debt of gratitude.

It is a curious fact, yet not difficult to explain, that birds on the whole enlist our sympathies more than mammals, which are closer of kin. It would be unfair to include our horse and our dog in the comparison; they are bound to us by too many ties. Let us consider merely wild free birds and untamed mammals. Do we not endure the tribute that the birds exact from our orchards and gardens with far better grace than the depredations of rodents in granary and cupboard? In part, our toleration of the small thievery of birds is economic: we have been taught that they perform an inestimable service to the husbandman by ridding his plantations of noxious insects, and we know just where their depredations will end. The predatory rodents, on the contrary, make no recompense for what they take from us; and we are perpetually uneasy when they are about, lest they destroy some possession far more valuable than the food they eat. But it seems to me that there are other, less selfish reasons why we love the robin who pilfers our cherries, and abhor the rat that

gnaws into our cheese. Although, geneaologically and structurally, the least of the mammals is nearer to man than any bird, spiritually and psychologically, in our sense perceptions and way of life, we have closer affinity to birds than to the majority of our fellow suckling animals.

Birds live chiefly by the two senses which we ourselves regard as highest, sight and hearing; while the greater portion of the mammals depend principally upon scent and touch to guide them. Birds are sensitive to colors, and some at least delight, like ourselves, in bright hues; while mammals on the whole seem indifferent to color as such. It follows that birds are, in their overwhelming majority, creatures of the day, and as helpless by night as civilized man without his artificial illumination. A very large proportion of mammals are nocturnal, or go about the business of living indifferently by night or day. Hence we see much less of them, and they remain more strange to us. Birds, like men, beavers, wasps and a few other insects, are architects and builders; most suckling animals build nothing. Another common bond of sympathy between men and birds is music; insects chirp and buzz, furry animals howl and scream - only men and birds sing and compose.

Finally, taken all in all, men and birds are the two classes of animals - certain of the social insects only excluded - which make the greatest exertions in the care of their young. To bring its offspring into the world, the bird must toil to build its nest - its home - then patiently warm its eggs, tirelessly and methodically, for from ten days to almost as many weeks, depending largely upon their size. Few mammals build much of a

nest, and none takes a conscious part in the formation of its offspring up to the time of birth. To nourish her young, the female mammal needs only to eat well, then place herself in such a position that the little one can reach the lacteal secretion. Only a few furry animals, such as the fox and the wolf, bring food to their young after these are weaned. But the great majority of birds must during many weeks give food to their children out of their own mouths, often, no doubt, when they are themselves hungry. And with their own bodies, they must shield their nestlings from cold, heat, sun, wind and rain. In the defence of their young from animated enemies, birds are certainly no less valiant, within their means and strength, than the best of the mammals. So with laborious building, patient sitting and self-sacrificing feeding, young birds are launched into the world. There is no doubt that many of the noblest qualities of men have been developed by the necessity to provide for and defend those dependent upon them. Is it unreasonable to suppose that similar duties may tend to develop corresponding psychic traits in birds? Of the nature of a bird's mind we can only speculate; but let us not be blind to its potentialities.

Perhaps no other class of created objects stimulates the higher faculties of man in so many ways as these feathered creatures which are themselves so highly endowed. Their appeal is at once aesthetic, intellectual and moral. They delight our eyes with gorgeous colors, graceful forms, and swift, harmonious movement. They charm our ears with the most varied song, now light and joyous, now slow and pensive, now deep and melancholy, now shrill and martial - reaching in turn all the conflicting emotions which music is capable of arousing. They challenge our

minds with a thousand perplexing questions touching their origin, their lives and ways. Their display of courage, devotion and affection in their relations with their mates and young stirs us to deepest moral sympathy. Few who are attracted to the study of birds, by whatever aspect of their life, but end by being interested in the whole life of birds.

And the study of birds, if unstintingly pursued, demands the exercise of, and in turn develops, all that is best in us. The successful bird-watcher must be swift to see truly and clearly what passes in the fraction of a second; yet patient to wait many hours to witness the desired event. He should possess a true eye for color, shape and size, and a good ear for the discrimination of sounds. If he can draw, paint, or make musical notations, so much the better. He should be able to record in words, concisely, accurately and methodically, what he has witnessed. He must cultivate that rare faculty of being honest with himself, of not pretending to have seen more than he has seen, nor to have proved a point which remains doubtful. He should have physical hardihood to tramp long miles through forest or marshland, or to scale the mountain crag; the resourcefulness to overcome difficulties by himself in far places; and the moral stamina to live and work for long periods alone if need be. He must develop judgment of how close an approach a bird will allow, and how intimate a contact with its nest it will tolerate. And above all, he must develop a sympathy with the bright, sensitive beings he wishes to understand, and reverence for their marvelous faculties. Whatever his endowment with these so-varied faculties at the outset, if he follow his studies with earnestness

of purpose and zeal, he is almost certain to enlarge them as he proceeds.

It would be wrong to deduce from this that one must be exceptionally endowed in order to derive pleasure from the study of birds. To whatever degree Nature has perfected our faculties, the employment of those faculties in bird-watching will be richly rewarded. There are few other intellectual or aesthetic pursuits that offer so much to men of such varied conditions. To the woodsman or the herdsman in his lonely hut, the birds in the wilderness about him bring companionship and instruction. But one compelled to earn his bread in the crowded, restless city may find relaxation and amusement in watching the ~~feathered folk~~ birds that frequent park and vacant space and tower. The invalid confined to his bed and chair may owe his brightest hours to the pretty ways of the birds about him on the lawn; but the youth in all his vigor, eager for strenuous or even perilous adventure, may find his faculties taxed to their utmost, and more dangerous scrapes than he bargained for, in wresting the well-guarded secrets of bird-life from sea-girt crag or snowy mountain peak.

Birds stimulate our imagination and appeal to our fancy. In many lands and many ages, various among them have been held as symbols of peace, hope, love, freedom, piety, mother-love, and even wisdom. Creatures so light and aërial, so swift and free, so beautiful in form and way of life, seem to possess capacities for joyous living far exceeding our heavy, earth-bound selves. The dryads, fauns and nymphs, the elves, fairies and goblins, vanished from the earth with the coming of machines, and left a void in the hearts of men. But now we have filled it and have

ample compensation for the loss. Birds are still with us to take the place left vacant by the departed elfin folk of olden times.

And birds are nearly everywhere, next to vegetation, the most conspicuous form of life. First the forests and thickets and grasslands; next the ~~feathered creatures~~ birds that fill them with vivacious movement and fluid song. Journey through the interminable selva of the Tropics, far beyond the influence of man and his works: for hours and days together, you may listen in vain for the cry of a mammal; the voices of the birds alone punctuate the stillness, which the monotonous tintinabulation of insects seems to accentuate rather than to relieve; their flitting forms alone bring animation to the immobile majesty of the great trees. Voyage along the great rivers; there will be birds winging over the dark flood, and swimming on its surface, and plunging into its depths in pursuit of food. Wander through the sparse gray scrub of arid regions: the ringing voices of birds sound a welcome where cactus and spiny shrubs would repel with their inhospitable thorns. Ride over the great grasslands: there are birds with their color and song to relieve the oppressive monotony of grass and sky. Scale the mountain peak: there again are birds, to mock the frosts and biting winds of the summit, to proclaim that even in these unfinished extremities of our globe there is a warm spark in the heart of Nature. Sail over the illimitable expanses of the ocean: for whole days, birds, with an occasional whale or herd of porpoises or flock of flying fish, will be the only objects, living or dead, within the vast empty circle of the horizon. In the bleak arctic regions, as in the exuberant

Tropics, birds are the most obvious form of animal life. The bird-lover, wherever he be, will never fail to encounter the objects of his affection. [Winter and summer, birds are ever at hand to cheer us with their voice and presence, and unceasingly active to engage our attention in their pretty ways.] Cut last sentence? at least change "pretty ways" – see 2 pages back.

Nov. 3, 1942

A Bird-Watcher's Equipment

Not the least attractive feature of bird-watching is the smallness of the material equipment it requires. Serious studies of bird-life may be completed with less apparatus, whether measured by weight or by cost, than is commonly employed by the golfer, the angler or the mountaineer. A knapsack on his back, a bush-knife strapped to his waist, a ladder over his shoulder, the bird-watcher may easily carry on his person all that he needs for a full season devoted to life-history studies. If he add photography to observation, his material requirements will be somewhat increased, but still need be no more than he can carry all at once. Compared with those who pursue other branches of natural history afield, the bird-watcher is in this respect exceedingly fortunate. In weight and bulk, the plant collector requires at least ten times as much equipment as the bird-watcher - there are collectors who will not move without five hundred pounds of it. The geologist, armed with his hammer, soon acquires tons of rocks. The bird-watcher carries his collections in his memory and his note-books.

Still, in bird-watching as in other forms of scientific activity, results depend to a large degree upon the quality of the apparatus employed. Although the bird-watcher's equipment is so slight, it is not for that reason without importance. Chosen with thoughtful care, it will greatly augment both his harvest of knowledge and his pleasure in reaping it.

During years of bird-watching in the Tropics, I have gradually

developed an outfit to meet my particular requirements in life-history studies. Working in remote places, I have sometimes been obliged to devise a simple bit of apparatus to meet a newly arisen need, and afterward found it to have applications far wider than that for which it was originally intended, so that in after years I never travelled without it. Nothing that I have developed is elaborate or ingenious - for the most part my few instruments were put together hastily in the field as the need for them arose. Yet had I possessed these trifles of equipment at the outset, and known how to apply them, I might have avoided some errors that I have never ceased to lament, and made better use of opportunities for life-history studies that have never been repeated. In the belief that these simple tools, or certain of their applications, are not generally known to bird-watchers, I undertake to describe them here. All have withstood the test of many seasons' work.

Field-Glasses

The most important piece of equipment of the bird-watcher is his binocular field-glasses. It gives him a ten-fold increase in vision, and offsets to a large degree the shyness of birds in the presence of man. W. H. Hudson, who was at first reluctant to adopt a new-fangled apparatus, later declared that of all the inventions of man, this comes nearest to being a divine gift. Individuals vary in their preference as to make; but the consensus among bird-watchers seems to be that, for general use, the most serviceable is an eight-power prismatic binocular with central focusing-screw. This last feature is important for the rapid simultaneous focusing of both sides. An adjustable eye-piece on one side allows compensation to be made for individual peculiarities of

vision, and once the eye-piece has been set for a particular user, it rarely need be altered. For the study of tree-top birds, a glass that magnifies sixteen or even twenty-four diameters, mounted on a tripod in a strategic position, will reveal many secrets of bird-life otherwise unattainable - as witness, Dr. Frank M. Chapman's studies of tree-top birds presented in My Tropical Air-Castle.

A good glass need not be expensive. An eight-power "Fournier" glass of French manufacture, purchased in 1928 for $22.50, has with periodic cleanings given satisfactory service during all the intervening years.

It is far from my purpose here to discuss the qualities of the various makes of binoculars. But I believe that ornithologists in general, even some of long experience, have much to learn in regard to their care. Many a fine glass is giving inferior service because of the accumulation of dust and mould on the prisms and interior surfaces of the lenses. The best of field-glasses, like the most accurate watches, require a periodic cleaning if they are to continue to function perfectly. The bird-watcher, especially if he contemplate a long visit to a remote region and does not carry an extra glass, will do well to learn something about the construction and care of his binoculars. A sudden drenching, a fall into the water, a bump, or the gradual spread of mildew in a hot and humid climate, may so impair the efficiency of his field-glasses that a unique opportunity for bird-watching will be spoiled.

Many a field naturalist hesitates to take apart his binoculars for the cleaning they so greatly require, from fear that he may not be able to put them together again. For most binoculars, a small screw-driver is all that is really essential for the work.

A fine forceps or tweezers facilities the removement of the screws and clips, and prevents the soiling of the prisms by the fingers. No great mechanical ingenuity id required for the operation. The chief danger is that after the apparatus has been re-assembled, the images of the two sides will no longer coincide. The risk of the occurence of this inconvenience will be minimized if care is taken to replace every lens, prism and clip in its original position, not regarding as interchangeable pieces which appear to be identical. No prism and none of the clips that hold them in place should be turned through I80 degrees. It is a good plan, upon first taking the binoculars apart, to place on the frosted side of each prism initials indicating its position, as RF for right front, LB for left back, etc. If the letters are all placed on the inner sides of the prisms, they will serve for their proper orientation upon replacement. Each clip should be laid beside its respective prism, in an orderly fashion. The glass surfaces may be wiped with a clean cloth or, if need be, washed first with soap and water or with alcohol; and the inner surfaces of the metal casing and end-pieces should be thoroughly dusted with a fine brush, or the breath may be used to blow out the dust.

After the glasses have been put together again, they must be tested for the coincidence of the images. There is no better test than a small bird at a distance; if it appear clear and distinct, the adjustment is satisfactory. If two birds appear where only one was seen with the naked eye, the source of the trouble is not difficult to locate. First, focus the glasses upon a vertically elongate slender object such as an erect post or a hanging wire. If it appear double, the rear prisms, with their long axes horizontal,

must be adjusted. Closing one eye and then the other, learn whether the images of the right and left eyes appear on their respective sides, or whether they are crossed, the object viewed with the right eye appearing to lie to the left of that seen with the left eye. In the former case, move the prisms slightly closer together; in the latter, separate them slightly. When the vertically extended object no longer produces two images, perform the same test upon a horizontally stretched wire or the like, and by similar adjustments of the front pair of prisms, with their long axes vertical - moving one upward or the other down, as the need may be - bring the two images into coincidence. When this has been accomplished, the binoculars should no longer produce a companion for a lone bird.

Sometimes an object, when viewed through the binoculars, will appear single, then the images of it suddenly jump apart. The eyes have been overstrained in the effort to compensate for a slight lack of adjustment in the apparatus, and this should be remedied in order to save the vision.

In humid tropical climates, the troublesome growth of moulds on the prisms may be prevented by soaking them overnight in a solution of corrosive sublimate (bichloride of mercury) in alcohol, then wiping or washing them clean. A minute amount of the chemical remaining on the glass will retard the growth of fungi without impairing its optical qualities. It is dangerous to subject the front and rear lenses to this treatment, for they are compound, and the liquid may penetrate between their component parts and deatroy their optical homogeneity. The lenses are more readily removed for wiping than the prisms.

If, in old glasses, bubbles or cracks appear in the eye-piece or objective lenses, this is usually caused by the cracking of the cement which holds together the component lenses. This defect may be remedied by removing the lens from its casing, soaking it in xylene until the two components fall apart, cleaning them, then cementing them together with Canada balsam.

If the prisms of the binocular are cemented in the metal case, instead of held by clips, all of the preceding suggestions for cleaning will not apply. In this case, it will be less necessary to clean their inner surfaces. But because of the need of leaving sliding parts for adjusting the focus, no binoculars can be quite hermetically sealed, and dust and mildew will gradually accumulate on the prisms and the inner surfaces of the lenses.

The Blind

Bird-watching has been called the most sporting of sciences and the most scientific of sports. I need not here defend the claim of bird-watching, conscientiously, intelligently and methodically followed, with careful note-making, to a position among the sciences. That it is a sport in the best and truest sense is evident from the fact that while each contestant in the game - the watcher and the watched - tries to outwit and outmanoeuver the other, neither inflicts harm upon the opponent. The watcher endeavors to outwit the bird, that he may see it well and follow all its activities; the bird, if shy, does its best to baffle the watcher, that it may escape detection and go its way in peace; it wants only to be left alone. Usually the two teams are rather evenly matched, which makes the game more excitibg. The bird enjoys the

advantage of swift aërial locomotion; yet the watcher's binoculars compensate in large measure for his clumsy earth-bound movements. But when the watcher learns to conceal himself in a blind - or a hide, as the British prefer it - before a nest, he makes use of a stratagem to which his opponents are not quite equal; he outwits them and brings the odds for winning strongly in his own favor. Bird-watching, while no less a sport, becomes more a science, for now it is able to fulfil the conditions of systematic observation which science demands.

I have studied birds in remote, scarcely populated, mountainous regions where the majority were so fearless of me that I rarely found it necessary to conceal myself while watching their nests. But in most regions with a human population, sad experience has taught the birds that it is unsafe to approach their nests in the presence of man. Even when they will, after a longer or shorter period of hesitation, go about the activities of the nest under the eyes of an unconcealed observer, most probably they are still nervous and ill at ease, and so will not exhibit their normal, unconstrained behavior. The careful student of bird behavior keeps his person as little as possible in evidence.

The bird-watcher of short experience usually relies upon natural objects, such as the foliage, to screen himself from view while studying nest-life, or builds a hide of leafy boughs. The disadvantage of foliage of any kind as a screen is soon apparent; usually it obstructs the object to be viewed almost as much as it hides the watcher. This derives from the simple optical principle that, when looking through a small aperture, the farther the eye from the plane of the aperture, the narrower the range of vision

it allows. Since the concealing foliage never lies all in a plane, either the gap through which one looks must be large, leaving uncovered much of the observer's body, or the range of vision is inconveniently narrow. In a properly constructed blind, the opaque material is thin and lies all in a plane; and the eye, brought close, enjoys a wide outlook through a small aperture. An opening a few inches wide should permit unobstructed vision through nearly 180 degrees.

After making trial of various rude affairs of burlap supported on poles, I procured an umbrella blind, as described by Chapman. It soon became evident that this possessed certain serious disadvantages. Even when the lower edge of the cloth was pegged down, it flapped much in a breeze.; it was bigger and more conspicuous than need be, and there was much waste space within; one was likely to strike against the central pole that supported the umbrella, thereby shaking the whole blind and frightening the bird in front of it. The advantage of the umbrella blind, over most other types, was its ease of carriage and the rapidity with which it could be set up.

Leaving the umbrella at home and carrying only the cloth which draped around it, I stretched this over three poles tied together at their upper ends, and so gradually developed the wigwam blind. Later, I enlisted the services of a skilled seamstress to make a more carefully designed model, which at once proved so satisfactory that for ten years I have scarcely ever used anything else for the same purpose. It is even more portable than the umbrella blind, for the three poles can usually be found where they are needed, and only the cloth, weighing a few pounds, need be carried.

It is quite stable in the wind, for it is stretched over a rigid frame. It provides plenty of space at the bottom, where it is most needed, allowing the watcher to stretch out his legs - important during a long vigil - and store his lunch and equipment around him, while the inwardly sloping sides bring the apertures close to his eyes. There is little waste space; and the blind is no larger nor more conspicuous than need be.

The frame of the wigwam blind consists of three slender poles, such as saplings or canes, from nine to ten feet in length, tied firmly together at the top. The poles are set with their lower ends six feet apart, forming the apices of an equilateral triangle, and pushed a few inches into the ground, to ensure rigidity and prevent the blind's blowing over in a wind. On sloping ground, one or two of the poles must be made correspondingly longer. The construction of the blind allows a certain amount of flexibility in the length and setting of the poles, to compensate for inequalities in the terrain.

The cloth is shaped so as to fit snugly around this framework of poles, completely covering the sides up to a height of about six feet, leaving a small rectangular opening at the top. My own blind is of khaki drill. Green may also be used; but green dyes seem more susceptible to fading in the sunlight than brown. It is important that the cloth be sufficiently heavy that the shadow or outline of the person within can not be seen through it. When cut and sewed as in the accompanying diagram, yards will be sufficient for one blind, with very little waste of material. A draw-cord goes around the top, for drawing it tight upon the poles. At the back, the edges of the blind are

fastened together by stout dressmaker's clamps, or with buttons and button-holes. The front is provided with two little windows, one above the other in the center, to provide for ready adjustment of the blind to high and low nests. Each side has a single window in the center. The height at which these windows are placed will vary with the stature of the user; they should be situated at the level of his eyes, as he sits within on a folding camp-stool. Each window is approximately 6 inches in width by 2 I/2 in height, a size which permits the use of binoculars when desired. A cloth flap attached above closes each window, and is provided with clamps so that it can be raised to the desired height; or it may be fastened up with a pin. For very shy birds at close range, a mere slit is left in the front of the blind; for less suspicious birds, a larger opening is employed. For high nests, the upper front window may usually be opened wide, and the birds watched through the binoculars.

I have said nothing of the details of the hems and bindings of the blind, to which careful attention must be given if it is to last through many seasons. But the skilled needlewoman will know how to handle these finishing touches; and the male bird-watcher will only reveal his lamentable ignorance of the technicalities of her art if he attempt to instruct her.

In bright, dry weather, the triangular opening at the top may be covered loosely with leafy twigs, which screen the watcher from the sun's rays and the gaze of birds passing overhead, yet permit the free passage of air. In rainy weather, the top may be covered with a hood. A piece of stout green or brown cloth, about

four [illegible]

four feet square, tied in the center with a string that is in turn attached to the poles at the top, drapes down over the sides and sheds the rain. The cloth walls of the wigwam itself are so nearly vertical that they will turn a hard rain without waterproofing them. Thus we may sit dry and comfortable through a shower, watching the activities of the birds, clad in their oiled plumage that sheds the glistening drops as well as any raincoat.

The brown wigwam will be promptly accepted by most nesting birds, without camouflage or concealment by surrounding foliage. Indeed, at times the bird has returned to its nest,only a few yards away, before I have completed my arrangements inside the tent. Birds of several kinds have sat bravely over their eggs while I cleared a space amid the vegetation and set up the blind near their nests. Such steadfast sitting is no indication that it is unnecessary for the watcher to conceal himself in order to study their ways. Some birds cling to their nests until a man comes within reach of them, hoping by their immobility to avoid revealing their treasures; but if absent, they will not return while the same person watches from a few yards away, for such conduct would only draw attention to that which they wish to remain unnoticed.

If, as usually happens, the owner of the nest has departed while the wigwam was being set up before it, it is interesting to enter at once and watch what follows. Most often the bird will return after flitting about in the neighboring bushes for a few minutes, casting suspicious glances at the strange object that has so suddenly sprung up in its vicinity. But if the wigwam is set very close to the nest, the owner may approach, then retreat, then draw nigh once more, then go off a short way, and so on, oscillating back and forth as the urge to return to the eggs draws it forward,

while as it approaches, fear of the strange object grows stronger and drives it back. But with each return it draws nearer, until finally, dominating its fear, it settles in the nest, timidly at first, keeping an eye on the unfamiliar object and ready to flee with its slightest movement, but with gradually growing confidence sinking more deeply into the nest, until at length it sits at ease a few feet from the unseen stranger watching silently within the wigwam.

One of the very few birds that proved to be insuperably shy of this brown tent was a female Cherrie's Tanager (Ramphocelus costaricensis) that I wished to study some years ago. Finding that she would not return to her newly hatched nestlings in the presence of the wigwam, I set it first a good distance away, and after an interval moved it closer, concealing it as well as might be by surrounding vegetation. But all to no avail; she neglected her newly hatched offspring, allowing them to die of hunger and exposure. This case is unique in my experience.

When I have wished to make a continuous record of what happens at a nest during a twenty-four hour period, I have usually begun at about noon, watched until it became too dark to see the bird, then stolen away - assuming, in the case of diurnal birds, that there would be no activity during the hours of darkness - to return with the first light of the new day and continue my vigil until noon. This division of time spares the watcher the fatigue of an unbroken stretch of twelve or more hours in the blind, and also allows him the opportunity to make his daily visits to other nests he is studying, and perform whatever other of his duties must be attended to by day. In order to make records with the

minimum of disturbance of the normal routine of the nest, the wigwam should be set in such a position that, using it as a screen, the watcher may enter and depart without coming within the range of vision of the sitting bird.

One might imagine that these long, unbroken periods of sitting motionless in a confined space before a birds' nest would become tedious, especially if the bird is incubating, and does nothing for hours at a time save sit quietly over its eggs. But such protracted vigils are rewarded by a sense of intimacy with the bird, and a feeling of painstaking completeness in our study of its ways, that no amount of casual watching can develop. They reveal details of the economy of the nest that intermittent visits, no matter how frequent, will fail to discover. And in addition to the bird he studies through the front window of the blind, the watcher will behold much of the life of other kinds of birds - and of mammals and other creatures, too - that haunt the vicinity. When activity lags at the front, the side windows of the wigwam open the way for these revealing and unforgettable by-studies. Sitting quietly during a long morning in the undergrowth of the forest, or in a thicket where birds abound, seeing yet unseeable, I have frequently felt that I passed a more eventful time, and learned more about the local wild-life - all aside from the species I am chiefly interested in watching - than on my longest walk. Through the side windows of my blind, I have picked up a great volume of bird-lore that could probably not have been gained in any other fashion.

Thus recently, while devoting a morning to studying the nest-

life of a pair of Ruddy Quail Doves from my wigwam blind, set in the undergrowth of the forest, I watched an ~~Hoffmann's~~ Ant-thrush (Formicarius hoffmannii) struggle with a small brown snake. These pedestrian antbirds, to judge by their voices, are not rare in the forest that begins fifty yards from my dwelling, but so shy that months pass without my glimpsing one. This unique observation of their dietary habits was alone worth the morning's vigil; but in addition, I watched a pair of Swainson's Toucans take an aërial bath in the rain-filled crotch of a tall tree; heard the song and finally caught sight of my only Scarlet Tanager of the season, a male in the most brilliant plumage migrating northward; listened to the liquid spirals of song of departing Russet-backed Thrushes among the surrounding trees; saw other birds too numerous to mention here; watched a squirrel build its leafy nest amid the foliage of an aroid growing attached to a neighboring trunk - all in addition to discovering what I wished to learn about the nest-life of the shy Quail Doves, the swish of whose wing-strokes advised me of their comings and goings when my eyes chanced to be otherwise engaged. What side-dishes and garnishings to a feast of bird-study!

Mirrors and Light

When I first began the serious study of woodpeckers, I opened two nest holes by removing with saw and chisel a segment of the trunk at the front of the cavity. After examining the contents and measuring the eggs, I closed the cavities by fitting in the cut-out segment of trunk and tying it in place. Both nests soon came to grief, for ants invaded one through the chinks surrounding the door I had provided, while one day the loose piece of wood

fell from the other, and the eggs were thereupon deserted.

Since that day long ago, I have opened no more occupied woodpecker holes, but contented myself with viewing their contents with a mirror. Although by this purely visual examination one can not handle or measure the eggs, nor weigh the nestlings, yet he may learn as much about the contents of the hole as it is essential to know in a life-history study, without the greatly increased risk of loss which opening a nest entails. It is most satisfying to peep into a woodpeckers' nest with a mirror, and see the eggs, gleaming like the finest white porcelain, lying upon their clean bed of wood-chips at the bottom, or to watch the nestlings, all undisturbed and unafraid, drowsing in safety in their snug, tight nursery.

The mirror used in the examination of woodpecker holes should be adapted to the size of their natural doorway. For big woodpeckers like the Ivory-bill (Scapaneus guatemalensis) or the Pileated (Ceophlöeus) a round mirror two inches or even more in diameter may be employed. Round mirrors of about this size are generally to be had at the most remote backwoods trading-station. For woodpeckers about the size of a Centurus, a Piculus, or a Dryobates, I have generally used a mirror about I I/4 inches square - round mirrors sufficiently small being hard to procure. These mirrors are attached by adhesive tape to a thin piece of wood of corresponding size, the wooden backing being in turn attached by a screw to the end of a piece of wood about nine inches in length by 3/4 in width, which serves as handle. The screw allows it to be pivoted about and turned at the angle most convenient for reflecting the contents of the nest; it should be sufficiently

tight to hold the mirror by friction at whatever angle it is set.

For the nests of tiny woodpeckers like the Piculets (Picumnus), whose doorway is somewhat under an inch in diameter, a mirror about 7/8 inch square, or better, in the form of a rectangle 7/8 by I I/8 inches, may be used. This can be cut from a small trade mirror, scratching it with the edge of some tool of hard steel. Since in normal times such mirrors cost only a cent or two, if one shatters a few before obtaining a piece of the desired size, it is no great loss. The thin piece of looking-glass should be backed and edged with adhesive tape, by a strip of which it is attached to a piece of stiff wire about six inches long, bent into the form of an L. The long arm of the L serves as handle, the short arm (about 3/4 inch long) to attach and pivot the mirror.

To see anything clearly in the smaller woodpecker holes, it is essential to illuminate the interior, and with all, it is more satisfactory to do so. The power-station of my illuminating device is an electric-torch, from which the glass and bulb have been removed. Into the bulb-socket I screw a plug to which a forty-inch length of flexible lighting wire is attached. At the other end of the wire is a bulb with a small reflector. I push this through the doorway of the woodpeckers' nest until it hangs an inch or so above the eggs or nestlings, push the switch-button of the electric-torch - and woodpeckers in the midst of the wilderness have an electrically lighted nest chamber. When I need a hand for clinging to the trunk, I hang the torch by the ring at its end to some projecting stub or piece of bark, or, this failing, stick it in a shirt pocket, leaving the other hand free for holding the mirror.

To manufacture such an apparatus, one needs a soldering set, a knife, a small reflector from an old discarded electric torch, and the wire. For the plug to which the wire is attached, one removes the threaded metal base from a burnt-out bulb. Into this, fit snugly a cylindrical piece of soft wood about an inch long; this had best be fastened with glue or liquid cement. Through the center of the wood drive an I I/2 inch wire nail. The head of this nail should project about I/I6 inch beyond the metal casing, and serves to make contact with the metal terminal in the torchlight socket. Now one of the wires of the 40-inch cord is soldered to the pointed end of the nail, the other to the rim of the metal casing. At the far end of the cord, one wire is soldered to the reflector, the other to the metal contact-point in the center of the plug of the bulb. All connections are then protected by wrapping with adhesive or electrician's tape. Since the bulb is permanently attached to the wire by the solder, it must be chosen to correspond in voltage with the torch with which it will be used. A two-cell torch (2.4 volts) is satisfactory for most nests; but occasionally more powerful illumination will be found desirable.

For bird-study in the Tropics, this combination of mirrors and electric light is useful for a great variety of nests in addition to those of woodpeckers. I have found it quite indispensable in my field-work. The nests of all those birds which carve their chambers in trunks like woodpeckers - barbets, Quetzals and Baird's Trogons, for example, - and of all those that occupy abandoned woodpecker holes - certain toucans, cotingas, swallows, wrens, flycatchers, ovenbirds, parrots, etc. - would of course be examined

in the same fashion. A number of trogons, puffbirds and parrots excavate a nest cavity in the heart of a termitary, and their eggs and nestlings can be seen in the dark chamber - without destroying the nest - only by means of mirror and light. I first made use of this combination in studying nests of the Black-headed Trogon carved into termitaries. Then, too, the mirrors and light are useful in viewing a great variety of nests placed in narrow natural cavities in trees, chinks in walls, crannies about buildings, and the like: nests of woodhewers, ovenbirds, wrens, swallows, etc. Sometimes the light alone, sometimes the mirror alone, sometimes both together, can be most advantageously employed for viewing such nests. I once made a study of the nest-life of a pair of Blue-and-White Swallows who built upon the ridge-pole of a house, so far from the end, and in such a narrow cranny, that I could view the eggs only by using my Piculet mirror (as I call the smallest of the set) fastened to the end of a long, slender rod.

Nests in burrows, such as those of jacamars and certain ovenbirds and swallows, are best examined by means of the light and a mirror, attached to a rod of appropriate length. Usually the only alternative to the use of this optical arrangement is to reach the nest by digging a hole at the back of the burrow, which is closed off and should also be filled in with earth at the conclusion of each visit. But the opening of burrows, despite the greatest care the bird-watcher can exercise, greatly increases the chance of loss of the nest through desertion, or the action of some predatory creature. The burrows of kingfishers and motmots are usually too curving or crooked to permit the sight of their eggs by reflection;

and one who would study them must perforce dig them open at the rear, prepared to lose a large proportion through desertion or other causes. I hope that before long some ornithologist with a flair for the invention of optical apparatus will construct a "seeing-tube", some ingenious arrangement of mirrors and prisms which, pushed through the mouth of a crooked burrow such as motmots so often dig, will enable the user to view the contents from the front.

In addition to nests in holes, crannies and burrows, many birds of the Tropics build in the open nests so complex in form that their contents can hardly be seen without the use of a mirror, and often of artificial illumination as well. The nests of a number of flycatchers, becards, ovenbirds and wrens fall into this category. The Gray-headed Flycatcher (Rhynchocyclus cinereiceps), for example, fashions of black fibrous material a nest shaped very much like a chemist's retort. This is hung from a slender twig or vine, in a thicket or above a stream, with its spout-like entrance directed downward, so that to go in the bird must fly vertically upward. Without inverting the nest, its contents can be viewed only by the use of a small mirror and artificial illumination. The Thick-billed Flycatchers (Craspedoprion) build nests of much the same shape, but of distinct materials. Although the conformation of these flycatcher nests is such that their contents can not be reached by the fingers without tearing their fabric, the interiors of other closed nests, while they can not be viewed directly, may be explored with the finger-tips. But, unless the bird has flown out in your presence, it is unwise to

thrust in your fingers without a previous visual examination, effected by means of mirror and light, for small snakes, little sharp-toothed mammals, and a variety of stinging creatures sometimes take possession of these snug bird nests. Along the Rio Napo, I stuck mirror and light into the lowest clay nest of the Ovenbird par excellence (Furnarius) that I found in South America and saw - two frogs!

Finally, a mirror pivoted on the end of a short handle is a great aid in the study of simple open nests, like those of thrushes and tanagers, placed in trees or bushes above the bird-watcher's head. Holding the mirror above the nest, tied to the end of a pole if need be, he may view the contents without climbing to it. Or the mirror will bring within reach a nest placed among vines, or branches so slender or so armed with thorns, that it could not be examined by any other means. For many studies, one or two examinations of the nest at close range will be considered sufficient; while on routine visits to determine when the eggs are laid, when they hatch, and when the young depart, the use of the mirror will save the bird-watcher much weary ladder-toting, and much of the wear on clothes and hands which climbing causes. Then, too, the mirror disturbs the immediate surroundings of the nest much less than a closer approach by the watcher, thereby diminishing the chances of desertion, of betraying it to enemies, and of frightening the fledglings prematurely to depart. The mirror has made it possible to determine quite a number of incubation periods that I should not otherwise have obtained.

Ladders and Climbing

Since so many nests can not be reached while standing upon the ground, a few words about ladders and climbing may not come amiss. I have found it most useful to have available a three-legged ladder eight or ten feet long, for reaching nests placed far out on slender branches, in bushes too weak to support a simple ladder, or in cavities in tottering trunks. The three-legged ladder is far more practicable for field-work than the conventional stepladder with four points of support, because it is more readily accomodated to inequalities in the surface of the ground. At the same time, it is considerably lighter. The third leg, or prop, of the same length and material as the uprights of the ladder itself, is attached by a stout hinge to the center of the topmost step. Using a strong, light wood, it is possible to construct of strips 3 x 7/8 inches a safe three-legged ladder, ten feet high, that can be carried long distances on the shoulder without fatigue.

Far afield, simple ladders may be constructed by tying or nailing rungs across notched poles, all cut in the immediate vicinity. If nails are not easily available, the ladder may be made entirely of woodland materials, lashing the rungs in place with slender, flexible woody vines, or strips of fibrous bark, such as that of the burío (Heliocarpus), the juco (Trema), or some other tree of similar qualities. The only factor limiting the length of such rustic ladders is the height of slender young trees of manageable weight which the locality affords. Twenty-three feet is the longest I have ever succeeded in constructing - this ladder was nailed. In setting such a long, heavy ladder against a rotting trunk of questionable strength, as to examine

a woodpeckers' or a trogons' nest, it is well to keep in mind that the more nearly upright the ladder is set, the less strain the trunk is called upon to bear. Soon after the last sentence was written, I forgot this caution in the excitement of trying to reach a woodhewer's nest in a hollow palm trunk that presented peculiar difficulties, upset trunk, ladder and myself, and suffered a most painful fall. The ladder may be tied to the trunk to prevent falling over backward. For the safety of the nest, the ladder should be removed from the nest-tree after each inspection. If tied rather than nailed together, the lashings of the ladder should be frequently tested.

Ropes are of great service in climbing. Those who are sufficiently athletic may throw a rope over a branch and swarm up, sailor fashion, beside a trunk too thick to be clasped by arms and legs. Once, while collecting specimens of lofty forest trees in Guatemala, I enjoyed the services of a wiry Indian who boasted that he could climb any tree. Although I was at first skeptical, he proved almost as good as his word. He worked entirely with cordage, throwing a light line over a branch, using this to draw a heavier rope across it, then swarming up the doubled rope. To reach the crown of a particularly lofty tree, he would sometimes climb to the top of a neighboring smaller tree, then pass across to the tall one over a bridge of rope.

To reach a nest far out on a branch not sufficiently strong to support my weight, I have sometimes overcome the difficulty by running a stout rope from near the end of the bough that I wished to support me to some higher, sturdier branch, or else obliquely upward to the central trunk. Strengthened in this

wise, a branch of no great thickness, if of some dependable wood, may be made to support the weight of a man.

The Machete

A most serviceable tool for the bird-watcher is a stout machete or bush-knife, carried in a leathern sheath strapped about the waist. Perhaps no other tool has quite so many and so varied uses as a straight knife of this description. For felling saplings and trees up to a foot in thickness, and chopping firewood, it is at least as effective as a short-handled axe such as Boy Scouts carry; and it has scores of other uses to which an axe does not lend itself. Nothing can equal such a knife for cutting a path through tangled undergrowth. Considering only the special requirements of the bird-watcher, it is the most convenient tool for cutting the poles for the blind, for clearing of vegetation the space where this is to be set, and for cutting and notching the poles for a ladder. Since the blade is long, the tip may be used for digging without sacrificing the sharpness of the central portion, most effective in cutting. Thus, if the blind must be set on a steep slope, the machete may be employed for leveling off a shelf where the watcher will ~~set~~ place his camp-stool; and it serves well for digging to reach the nests of kingfishers and other birds that raise their families in burrows.

A straight blade from sixteen to twenty inches long is recommended. Longer than this, it is troublesome to carry because the end strikes against the leg when borne in a sheath. On the shorter side, it soon loses its usefulness for such purposes as cutting a path, clearing ground, chopping wood, and a hundred

other offices for which the longer knife is adapted. Scarcely anyone who has become accustomed to the slender machete of the Tropics will be content to carry again the fat, stubby sheath-knife of the far North.

The Protection of Nests

A life-history study is a coöperative enterprise. Its successful termination depends upon close coöperation between the bird-watcher and the bird - or pair of birds - whose nest he studies. This is true, although the coöperation on the part of the birds is unconsciously given. If the bird watcher is lax in his attention or careless while visiting the nest, the study will be a failure, just as it will surely be incomplete if the birds desert, or some mishap befall eggs or nestlings. The success of the birds is the success of their watcher; their failure his failure. Accordingly, it behooves the bird-watcher to do all in his power to protect the nests he keeps under observation.

Unfortunately, losses of nests average from forty to fifty per cent in temperate regions to as high as ninety per cent in lowland tropical forests. On this last point, it is of interest that Moreau's figures from an area in Tropical East Africa argee rather closely with some data of my own from Panamá. In most instances, the bird-watcher can do little to increase the chances of success of his nests. Yet there are a few measures he may take for their safety. I do not hesitate to destroy the larger snakes in the areas where I study birds. If such an insatiable serpent as the mica (Spilotes pullatus) is about, no accessible nest is likely to escape its devastating visit. If the tree in which the

nest is built stand apart from others and have a fairly smooth bark, the access of snakes to its crown may be prevented, or at least made more difficult, by cutting away any vines or aërial roots which drape it.

At times a nest which threatens to fall may be saved by tying or sewing it to its support.

Some years ago, I enjoyed excellent opportunities to study the nest-life of such rare birds as the Blue-throated Toucanet and the Prong-billed Barbet, for they nested in decaying trunks in a pasture occupying a recently made clearing in the forest. But the tall grass in the pasture was infested by weasels, to which I attribute the loss of the earlier nests of these birds that I endeavored to follow through. At all events, I took a hint from the usual tropical chicken roost, and choosing two low stubs that contained toucanets' nests, surrounded each by a band of metal fourteen inches wide - a flattened-out, five-gallon kerosene tin. This, placed at a height above which weasels could not jump, prevented their climbing the trunks. One of the nests so protected was successful, despite its low, exposed position; the other was lost through flooding in a violent rainstorm. Nests in holes are, in my experience, immune from the attacks of hawks and most other predatory birds - save toucans, which can pillage only those with wide entrances - and if the access of flightless creatures is prevented by such metal guards, their chances of success are very good.

Except perhaps in a protected dooryard innocent of cats, it is a good rule not to visit nests more often than essential for the purposes of the study. For example, if special effort is

ected toward the determination of the incubation period of a species of tanager - a family in which incubation periods are usually twelve or thirteen days - once the dates of laying have been recorded, it is unnecessary to resume daily visits until ten or eleven days have passed. Too frequent visits to a nest are not only a pointless loss of time, but they reduce the probability of success. The premature loss of a nest which was difficult to find, and to whose study one has devoted much time and patience and many high hopes, is a most disheartening occurence.

Marking birds, paint, Tanager

July - Nov. 1942

IV

THE CATBIRD AT HOME AND ABROAD

~~by Alexander F. Skutch~~

Why did the Catbird receive this name? The obvious, and correct, answer is "Because of its mewing call." But those who know the gray, black-capped Catbird intimately in both its summer and ~~its~~ winter home can think of another reason why the name is appropriate. The Catbird, like the cat, leads a double life. While still a small boy, I had a black-and-white cat which in the house demonstrated deep affection for her master in the usual effusive feline manner, rubbing against his legs, purring, and curling up beside him while he read. But one day I chanced to meet Tabby in the woods some distance from ~~the house~~ home. Instead of coming to my call, as my dog would have done, she bounded away like a wild creature - she was one sort of animal by the fireside, and quite another sort when abroad in the fields or woods. Incidentally, this was my last cat; after this revealing glimpse into deceitful feline nature, I wanted no more of the breed. So, too, the Catbird that I met in its winter home, amid the huge-leafed herbs and riotous tangles of vines and bushes at the edge of a Panamanian banana plantation, seemed quite a different creature from those which in the summer dwelt tamely in our suburban garden in the North.

Of Catbirds at home, I knew none more intimately than a pair which nested one May in the barberry hedge beside my parents' home in the suburbs of a great city on the Atlantic seaboard. The female ~~of this pair~~ had a slightly deformed bill

that would not close tightly, and which made it easy to distinguish her from her mate. In normal pairs, it is hardly possible to distinguish the male from the female except by voice, for both wear the same modest attire. Hence I had an unusual opportunity to learn the rôle of each sex in domestic affairs.

When found in mid-May, the nest, placed three and a half feet above the ground amid the slender, thorny shoots of a barberry bush, was a framework of small sticks already partly lined with dead leaves and scraps of paper. Later, some long pieces of string were coiled into the interior. Next morning, I watched the female bring twenty-two billfuls of material to the nest, chiefly more dead leaves and fragments of paper that she gathered on the ground. Her mate accompanied her on some of her short expeditions to collect material, and thrice came close enough to look into the nest, but he never brought anything. He sang very little, for the morning was cold and cloudy. Later in the day, the nest was completed with a lining of fibrous rootlets.

Early next morning, the first of the pretty greenish-blue eggs was laid. Two more followed on consecutive days. Although catbirds usually lay four and sometimes even five or six eggs, this bird considered three a nestful. After she had been incubating a week, I set up close in front of the nest a little wigwam of brown cloth, whence I could watch the birds without disturbing their routine. I kept vigil all of one morning from dawn to noon, and all of another afternoon from one to seven o'clock - thirteen hours in all. With watch and notebook, I

made a record of all the comings and goings of the catbird pair. The female with the crooked bill alone sat on the eggs. She first left the nest for breakfast at 4:32 A. M., while her mate sang in the shrubbery close by; she settled down to keep the eggs warm through the night at 6:29 P. M. During the thirteen hours of activity that I recorded, she sat in the nest twenty-four times. Her shortest session, lasting only five minutes, was taken in the early morning; her longest was made in the early afternoon - she was sitting when I resumed my watch at one o'clock and continued on the nest for sixty-one minutes longer. Her twenty-five recesses for the purpose of seeking food varied from three to twelve minutes in length. Her average period on the eggs was 23.8 minutes, her average absence lasted 6.9 minutes. From these averages it is not difficult to compute that she sat in the nest 77.5 per cent of the day. Twice when her mate approached the nest, singing, she tried to answer him with a few weak notes of song; otherwise she incubated in silence.

This Catbird kept her eggs warm in much the same fashion as other small birds. A close relative of the Catbird, a White-breasted Blue Mockingbird, ~~Melanotis hypoleucus~~, that I watched in the high mountains of Guatemala, sat on her two blue eggs for 74.6 per cent of the day, coming and going with much the same rhythm as the Catbird in the barberry hedge. Small flycatchers often sit for shorter periods and take more frequent recesses, covering their eggs only fifty or sixty per cent of the sunny hours; bigger birds, such as thrushes and jays, may sit for

longer periods. How different is the mode of incubation of song-birds from that of the mechanical incubator with its constantly applied heat! How different, too, from that of quails, domestic hens, and other gallinaceous birds of which the female alone incubates and takes just one long recess from her eggs each day; or from that of woodpeckers, pigeons, kingfishers, trogons and a host of birds of other families of which male and female sit alternately on the eggs, and keep them almost constantly incubated!

And what did the male Catbird do while his mate sat on the nest in the hedge? While she covered the eggs he sang, chiefly in an ash tree some yards away, whence he could overlook the nest and its surroundings. His song was subdued but very sweet, and although the usual Catbird's medley, it was seldom marred by cat-calls and other harsh or grating notes, which many Catbirds mix indiscriminately with their well-turned and truly musical verses, to the great detriment of the whole performance. But when he saw his mate fly from the eggs to seek food, he left his ash tree and advanced to a hawthorn growing so close to the nest that some of its longer branches overshadowed it. Here he kept faithful guard over the eggs until she returned. While performing this duty, he did not strike a rigid, sentry-like pose, as some birds do, but hopped restlessly from branch to branch and continually turned his head from side to side, looking keenly around with bright black eyes. While keeping guard he usually remained about five or six feet from the nest and never came nearer than a yard from it, and he rarely sang. As soon as the female, her hunger satisfied, returned to the eggs, he flew to

a more distant perch and resumed his singing. He seldom came into the hawthorn or anywhere near the nest while she was sitting in it, but he rarely failed to arrive and keep guard while she was away.

If I touched the nest while the male Catbird was on guard, he approached as close to me as he dared, and with spread tail and drooping, quivering wings hopped excitedly about and uttered loud mews. The female was bolder. If I held my hand over the nest, she struck it with her feet, the while voicing loud, whining notes of distress.

After thirteen days of this routine, the eggs hatched. The dark skins of the three blind nestlings bore a few tufts of gray down, quite inadequate to cover their nakedness. When hungry, they stretched up their scrawny necks and opened wide their mouths, revealing a yellow interior. The color of the mouths of birds is a family characteristic; it is yellow or orange among mockingbirds, wood warblers, vireos, American flycatchers, swallows and many others; red among finches, tanagers, honeycreepers and orioles. Now the male Catbird joined his mate in toiling to accomplish the impossible - to keep those three yellow mouths filled with caterpillars, spiders, miscellaneous insects and berries.

After the nestlings hatched, the parents became bolder. If I touched them, the mother pecked vigorously at my hand in addition to striking it with her feet. Her mate would fly against the back of my head as I bent over the nest. Three days after the babies were born, I received such a mauling as no other bird has ever given me, before or since. To see what the Catbirds

would do, I held a hand over the nest. The female came up and pecked it fiercely, finally alighting upon the back of it, where she stood and showered blows upon me with all her might. These pecks were slightly painful and one drew a little blood. When I turned the palm upward, she would not alight upon my hand, but pecked it from the side. She seemed to understand how the human hand operates, and in which position it is most swiftly dangerous. And while the mother Catbird punished my trespassing hand, her mate fluttered about my head and once struck it. A Slaty-Spotted Antshrike in the tropical forest once pecked the hand that I had dared to place upon his nest, and a male Groove-billed Ani repeatedly struck the back of my head when I visited his nestlings. But on no other occasion have both parents attacked me at once. To be hit on the head at the same time that I was pecked on the hand was an experience unique in all my adventures with birds. Had these Catbirds been as big and powerful as jays, I should not have dared to approach their treasures without a helmet and a pair of heavy gloves. Many Catbird parents complain so earnestly when their nest is approached, and show such unmistakable signs of distress, that one with a feeling heart is inclined to run away at once and relieve them of anxiety; but I have known no others to take such active measures of defense as this brave pair.

When the nestlings were a week old, I gave their parents some "intelligence tests". Covering over the nest with a big dock leaf so as to conceal the nestlings, I disappeared into my little wigwam to watch results. When the Catbirds came with

food and could not see their youngsters, they hopped all around, completely baffled. The female once gave a tug at the leaf, moving it perhaps an inch and exposing a small portion of the nest, but neither she nor her mate made a real attempt to remove it. The nestlings were now strong enough to push up an edge of their green coverlet, and eventually their meal was passed to them beneath it. Similarly, a handkerchief that I used to cover over the nest was left there without any attempt being made to take it away; but the mother managed to slip a raspberry to a nestling beneath its uplifted edge.

The White-breasted Blue Mockingbirds to which I gave the same tests in the Guatemalan highlands made a far better record, completely removing both a leaf and a handkerchief which covered over their two nestlings. Yet quite in contrast to the Catbirds, the mockingbird parents were so shy that they never came near while I was at the nest. I admired the mockingbirds' heads and the Catbirds' hearts. The latter, although they have been called one of the most intelligent birds of North America, were far more zealous than wise; for had I been what they took me for, a man who robs birds' nests, I might easily have caught or killed them. Then, even if I had spared their nestlings, who would have taken care of these? In attacking me the Catbirds made a heroic but futile gesture, entirely out of keeping with the grim realism which must regulate the actions of most wild creatures, if they are to survive and reproduce their kind.

The mother Catbird brooded her nestlings every night until the youngest was eight days old and fairly well clothed with plumage. During their last two nights in the nest, the young

birds slept without a coverlet. They left the nest when the two oldest were eleven days of age and the youngest ten days. They could still hardly fly.

Their parental duties done, the Catbirds spread over the countryside, lurking in thickets, hedgerows and the borders of woods, frequently uttering their mewing notes and sometimes singing sweetly in an undertone. When the leaves begin to fall, they begin their southward journey; only here and there an erratic individual elects to remain in the north and face long months of snow, ice and scant fare. Most wing away to seek a warmer climate in the Southern States, the Bahamas, Cuba, eastern México, and Central America as far south as Panamá. In Central America, they are among the last of the smaller birds to arrive, not appearing in Guatemala and Honduras until late in October - more than two months after Yellow Warblers, Redstarts, Orchard Orioles and other early migrants arrive from the north. Soon they spread over all the Caribbean lowlands, but are more abundant in Guatemala and Honduras than farther to the south. They appear never to cross the Cordillera to the Pacific coast. They settle down for a long sojourn of nearly six months, some remaining until the end of the following April.

Here, amid the most luxuriant tropical vegetation, the Catbirds lead the more obscure half of their double lives. A few, it is true, encounter agreeable conditions in some of the Caribbean ports, such as Cristobal, Puerto Castilla and Tela, where they find cottages set among lawns and shrubbery, providing an environment in some respects not greatly different

from that
of the villages and the suburbs of the big cities in ~~the~~ North
America
where they nest. Only here, instead of barberry hedges, lilacs, bridal-wreath, dogwood and holly, they dwell amid hibiscus bushes with huge red blossoms, golden-flowered allamanda, bougainvillea, palm trees, and the multihued foliage of codiaeum. But the settlements in this wild region are few and far between, and most of the wintering Catbirds now reside in country with few human inhabitants, among the riotous growths, scarcely penetrable by man, that overrun abandoned plantations of banana or cacao, or amid the riverside thickets. Now, family bonds quite dissevered, the Catbird becomes an unsociable creature, never flocking like Cedar Waxwings, Dickcissels or Myrtle Warblers while in Central America, but leading a solitary life amid its rank tangles of vegetation.

When they first arrive in ~~Central America~~ their winter home, the Catbirds are as loquacious as they ~~were~~ are in the United States in September, while preparing for their long southward flight. ~~And~~ They call and mew all day long. But as soon as they are well settled, each in his chosen winter retreat amid the second-growth thickets, they become taciturn and seem to be less numerous. But even now the Catbird preserves a trait which often leads to his detection - he is almost as inquisitive as the prying ornithologist who would discover how he spends his time in an environment so different from that in which he was hatched and reared. He will often respond to the squeaking noise that the bird-watcher knows how to make by drawing in his breath with his lips pressed against the back of his hand. In fact, he is about the only

winter visitant in Central America who takes an interest in this sound that sometimes draws nesting birds like a charm. Alert and full of curiosity, the Catbird, when he hears the squeak, flits nearer and nearer through the tangle, until at length he comes within sight of its edge, where he vibrates his wings, flirts his tail, and twisting from side to side on his perch, peers out with bright, dark eyes. At length, his curiosity about the strange performance satisfied, he retires once more into the depths of the thicket, to keep company with snakes, lizards, armadillos, antbirds — and himself.

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The Morality of Birds

Is there right or wrong in anything? That is a point which the intensive watching of birds often raises. Established and unestablished - is it really more than that? - Edmund Selous

The moral being of man, however, stands outside and apart from the wild life of Nature. It is just because this wild life is amoral, not troubled by questions of right and wrong, that we find it so refreshing and restful. - Viscount Grey of Fallodon

The fact that man can realize, as the birds cannot, the havoc wrought by the infantile impulses of the cuckoo, brings home to us more poignantly the loneliness of our status as the only beings on earth who enjoy the blessings and suffer the penalties of a knowledge of good and evil. - Edward A. Armstrong

These quotations, from the pens of three unusually sympathetic students of the ways of birds, bear unanimous testimony to their seeming lack of anything corresponding to the moral sense in man. If no question of right or wrong ever enters into their conduct, then we may expect that they will do anything which suits their convenience of the moment - if they can 'get away with it.' My own impression, derived from long and intimate watching of the ways of birds, is somewhat different. Hence I am tempted, even in the face of such weighty testimony to the contrary, to re-examine the whole matter.

Much confusion in our thinking about the right and wrong in the behavior of birds, and other non-human creatures, has resulted from our failure to distinguish clearly between their conduct toward individuals of their own kind, and toward beings of other kinds. By 'their own kind' we must understand 'of the same biologic species'. It would lead us as far astray to consider the

behavior of any single bird toward all other birds, of whatever species or family, as to judge a man's morality - in the conventional implications of the word - by his treatment of other kinds of mammals, as dogs, foxes and pigs. Broadly speaking, a robin bears the same relation to a woodpecker as a fox or a squirrel to a man. We must distinguish an intraspecific from an interspecific morality. The second is, in fact, nearly non-existent, even among ourselves. Traces of it may be found, however, as far back as the days of the Hebrew prophets, who insisted upon a certain degree of justice and consideration in the treatment of domestic animals, enjoining, for example, that they have the benefit of the sabbath rest along with their masters, and forbidding that unlike animals, as the ox and the ass, be yoked together to pull the plow. From those far-off times, the interspecific morality of man has advanced exceedingly little. An almost negligibly small proportion of the population of the more cultured countries has begun to feel a broader sentiment of humanity toward wild creatures; but these are overwhelmingly outnumbered by those of their fellow citizens who, from no other motive than their transient pleasure, slaughter them outright or, what is worse, leave them to the slow agony of death from wounds.

In passing judgment upon the actions of birds, we must never forget how greatly our own standards of conduct differ according to whether we are dealing with members of our own or of another species. Indeed, from the dawn of history to the present day, much of human morality has failed to apply even so widely as to the human species as a whole. There has been one code for our

dealings with others of our own race, country or tribe, and quite another law for our treatment of outsiders.

That Viscount Grey recognized this distinction clearly is proved by his story of the Great Tit who had entered a cage trap set in the garden for rats and other small nuisances. In the same trap a Dunnock had also been caught; and the tit, most probably entering second, had killed the other small prisoner and eaten its brain. When visited, the trap contained the mangled remains of the Dunnock and the live Great Tit, 'a patent and thriving murderer'.

"What did you do with the horrible tit?" the Viscount was asked.

"Madam, I set him free, not feeling competent to assess his moral responsibility in the matter".

The tit was certainly neither more nor less a cannibal than the man who eats the flesh of a cow or a sheep.

In deciding which actions are right and wrong among birds, we are of necessity limited to purely objective criteria. We must judge them by what they do, not by what they say. It is as though we were to visit a country whose inhabitants spoke a language quite unintelligible to us. We could not read their legal code nor understand them as they recited their decalogue; but by prolonged onservation, patient and discerning, we might acquire a fairly clear notion of what was looked upon as right and wrong among this people. If we saw that property, when left unguarded, remained in place until the owner returned to claim it, we should be led to conclude that theft was considered wrong among them.

Should we chance to surprise one in the act of thievery, his furtive manner would strengthen our confidence in our conclusions rather than lead us to suspect their accuracy; if we saw him caught in the act and set upon with indignation by the bystanders, or led away to punishment, we could no longer doubt that stealing was considered wrong in this country. On the contrary, if our observations showed that it was common for one person to enter the house of another and carry off whatever took his fancy, we would conclude either that there was no individual property, or that robbery was not looked upon as a serious misdemeanor.

The purely objective method of inquiry to which we are limited will not permit us to judge whether among birds there is so great a divergence between what they profess and what they actually do as with ourselves. But I wish to avoid even the implication that birds possess a formal code, either handed down by oral tradition or impressed upon their minds in some mystic way we can not understand. For them there are no stone tablets of the law guarded in the sacred ark. For them - or at least in our judgment of them - action and code of action must be one and the same. Some will maintain that without a code there can be no morality. But Maeterlinck wrote of the 'Morality of the Termitary'; and if termites have morals, why not birds? Let us not prejudge this question, but rather pass first to consider the behavior of birds in situations where, among ourselves, we would say that moral considerations were involved.

Right and wrong conduct, in most human codes, center about property, the relations of the sexes, the performance of obligations, and the truth or falsehood of the written or spoken

word. We might add also moderation and its opposite, excess, in personal habits; and kindness or cruelty in dealing with other creatures. Systems of ethics are multitudionous and diverse; a much more detailed classification might be made; but this rough division of moral questions will be most convenient for our purposes. Birds are in many respects simpler than ourselves, and act in a more direct fashion. Besides, without a common language, it would be difficult to sort questions of right and wrong into their finer shades.

Truth and Falsehood

We do not generally think of animals as capable of lying; but they can and do transfer ideas from one to another; and wherever this faculty exists, the possibility of prevarication must be admitted. A very large share of the utterances of birds serve for the expression of emotions rather than for the communication of ideas. So far as we know, they are never guilty of dissimulation; although, as with ourselves, their passions may flame and cool, subject to gustful changes. Thus in the spring a female bird may show inclination toward two or more males alternately, before she definitely settles down to rear a family with one of them - certainly very human-like behavior! Of specific information which birds convey to each other by voice, the most usual is probably the presence of food and the approach of danger. The cries of alarm of many birds are understood not only by their own but by other species; a hush passes over the countryside at the sound of the sharp call that proclaims the appearance of a hawk; other birds take up the warning

cry as the bird of prey passes rapidly overhead. Were birds like humans, they would doubtless raise an occasional alarm for no other reason than to laugh at their neighbors as they scurry into cover, or to frighten them away from coveted food. But we have no evidence that this actually occurs in the feathered world - motives are so difficult to interpret.

The oropéndolas of tropical America weave their long, gourd-shaped nests among the terminal twigs of some lofty tree standing solitary. Sometimes a hundred or more of the yard-long pouches swing from the same tree-top. The size and abundance of the nests, coupled with the number and loquacity of the big birds that attend them, make their colony conspicuous for a long distance around. The hen birds, intent upon their domestic duties, might be an easy prey for the more powerful hawks, but for the vigilance of the male oropéndolas, who, far less numerous than the other sex, take no active part in building the nest or attending the young. Upon the appearance of danger, real or supposed, the male oropéndola utters a stentorian cack, which may send the whole flock, along with visiting birds of other kinds, diving headlong into the densest cover in the vicinity of the nest-tree. But at times, a male oropéndola will sound the cry of alarm when no cause for it is visible to the human watcher, and apparently not to the other members of his flock. And the alarm-note, which usually produces instant, unquestioning action by all the birds, is sometimes simply disregarded. Does the oropéndola at times deliberately lie? And do his companions know when he is telling a falsehood?

In this connection, some observations made by Dr. Tinbergen on the Herring Gull are illuminating. These birds recognize their neighbors individually. Each gull is responsive to the notes of alarm of all other members of the flock; but while the call of one will cause sudden flight, the similar utterance of a neighbor results only in a slight increase in alertness. Apparently individual gulls differ, if not in veracity, at least in soundness of judgment; and each establishes a reputation among its compeers.

Moderation and Excess

Our human excesses take so many forms that it would be tedious to detail them. We eat to excess, pursue pleasures beyond all moderation, strive for excessive wealth and power. Some at least of these tendencies may be found among birds. The males of territory-holding species may in spring 'stake a claim' to more land than they actually need for rearing their families. A portion of an unnecessarily large domain is often yielded up by the original claimant to a determined newcomer, with only a relatively feeble attempt at defense. He will not fight for the unneeded land with nearly so much zeal as he displays in the defense of that irreducible minimum without which his chances of winning a mate and rearing a family would be slight. So far as we know, birds have not yet produced an Alexander or a Genghis Khan.

Gluttony is eating far more than is actually needed. Compared with ourselves on a basis of weight, birds eat enormously. Some of the smaller kinds consume more than their own weight of food each day; no human gourmand has ever performed such a feat.

Studies of metabolism show that the actual requirements of warm-blooded animals are more nearly proportional to the superficial area of their bodies than to their weight; while from geometry we learn that the smaller a solid object, the greater the ratio of its surface to its volume. Thus on the basis of size alone, birds would need, weight for weight, far more food than men. The temperature of most avian species is substantially higher than our own, and they live more actively, hence will require greater amounts of nourishment for fuel and energy. We should remember also that the foods of many wild creatures are far inferior as sources of nourishment to our own concentrated diet, and they must pass relatively enormous amounts through their digestive apparatus to extract the minimum of nutriment that they require. This is particularly true of herbivorous and frugivorous animals and birds, whose digestive processes operate with great rapidity. A cherry passes through the entire alimentary tract of a Cedar Waxwing in about twenty minutes. Considering all these factors, we may be surprised, not that birds eat so much food, but that they get along with so little. To me it is quite amazing that a feathered mite, like a titmouse or kinglet, can put away enough food during the course of a short, bleak day, to maintain its tiny body, during all the long winter night, at a temperature of a hundred degrees Fahrenheit, more or less, above that of the surrounding air.

Wild creatures rarely devote themselves to a course of gluttony. Habitual overeating leads to loss of physical fitness, which in a state of nature has usually fatal results. The birds that come to my feeding table eat just a certain amount of ban-

ana, and after feasting for considerably less than a minute fly away, although plenty of the fruit remains. The wild coatimundi that Dr. Frank M. Chapman trained to take food from his hand on Barro Colorado Island would go off the moment he was satisfied, sometimes leaving half a banana uneaten. My horse is very fond of the solidified brown sugar we make locally. One evening he discovered that he could reach the sugar that we had just brought up from the mill and placed on the porch to cool. He started off on a package weighing about nine pounds, devoured about a quarter of it, and abandoned the rest. For a big horse, he had not eaten much and did not make himself sick. I wondered whether under corresponding circumstances a small boy would have been equally abstemious. These creatures seem never to have heard of the Jamaican proverb 'Better belly burst than good food spile'. W. H. Hudson tells of Song Thrushes in Hampshire that stuffed themselves to repletion with the red fruits of the yew, then regurgitated the contents of their crops that they might eat more. Despite the ease with which many kinds of birds appear to be able to reverse the direction of the movement of food through their oesophagus, such Roman feasting is certainly very rare among them. Although the red aril of the yew is said to be harmless, the seed is a well known poison; and I suspect that certain physiological reactions, rather than mere hedonism, might have been responsible for the conduct of these thrushes.

Some of the more social birds, when they are full, offer morsels to their neighbors. Cedar Waxwings have been seen to perch in a row, passing a berry from bill to bill until one of the birds found room for it inside.

Kindness and Cruelty

The roots of altruistic action are the same in birds as in ourselves. Kindness and helpfulness to others appear to have originated in the necessity to provide food, shelter and protection for helpless offspring. The old maxim 'Charity begins at home' expresses one of the great truths of evolution no less than a policy of practical common-sense. And chiefly, with birds as with men, charity stays at home. A large proportion of our gratuitous acts of helpfulness toward those outside our own family are performed with the thought that some day we may find ourselves in the plight of the person we assist; we are motivated not so much by unselfish kindness as by a far-seeing prudence. Since birds, so far as we are aware, have no coward fears of the future, one of the great incentives to charitable acts among humans is lacking to them. Yet sometimes their helpfulness to other individuals extends beyond the biological necessities of their own offspring, or even of their own species. Birds of quite a number of kinds have been known to feed young not their own, and rarely to shade or brood them as well.[1] Blue Jays will sometimes give food to infirm adults of their kind. We may say that such feeding is not comparable to acts of human charity, but is performed because the cries or attitudes of the hungry bird 'release' a certain sequence of instinctive actions in the feeder. Such distinctions between the behavior of other creatures and of man are for the greater part tenuous and unreal; the hungry child not our own, or the beggar, doubtless 'releases' certain instincts in ourselves.

Cruelty in its widest sense is the infliction of pain or injury upon other living creatures. We may recognize three stages of cruelty. The first is inseparable from all living: we can not eat without tearing and mangling living tissues; we can not walk without crushing the ant and the worm. The second is the unnecessary infliction of pain in the pursuit of business or pleasure. The average sportsman does not hunt because he derives satisfaction from the slow death-agony of a wounded animal; yet such suffering is inseparable from a pursuit which is by no means necessary for the huntsman's continued prosperity. He displays a lamentable lack of imaginative sympathy. I would place in the same category the driver who brutally mauls a horse or an ox struggling with too heavy a load; possibly he takes no pleasure in the animal's suffering, but he is too stupid even to look after his own material interest. Perhaps also the majority of the spectators of a bull-fight are in this class; they come to watch the skill of the <u>toreadores</u>, overlooking the intrinsic brutality of the spectacle. The lowest form of cruelty is sadism, the infliction of torture for the pleasure it affords the tormentor.

Birds are rarely needlessly cruel, even in feeding. The swift, unexpected onslaught of a hawk, killing its victim rapidly and surely, is mercy itself compared with most human modes of slaughter, whether gunnery with its large proportion of wounded animals that die in long-drawn anguish, or the abattoir with its slow preparations and terrifying scents. Cruelty of the second and third classes are practically unknown among birds.

Shrikes at times kill and impale upon thorns more small birds and insects than they can eat; but such is their habitual mode of feeding; and apparently they capture an excess of victims not because they find pleasure in dispatching them, but rather as the result of the overweight of an instinct. Some birds, such as kingbirds, seem unduly aggressive; their attacks are directed chiefly toward trespassers in the vicinity of the nest, birds af prey, and strange wanderers that they have rarely seen, whose capacities for mischief are largely unknown to them. The highest forms of compassion, as the vilest forms of cruelty, spring from an imaginative sympathy that is hardly likely to be developed in creatures whose life span is generally so short, and capacities for the communication of ideas so limited, as among birds. The former is the flowering of sympathy, the latter its loathsome disease.

Respect for Property and Stealing

Birds, like ourselves, may possess property of two kinds, real and personal. Their real property consists of the breeding areas or 'territories' which they defend from others of their own species, and their nest-sites or dormitories, when these are in holes in trees, burrows in banks, crevices in rocks, and of other immobile forms. The personal or movable property of most kinds of birds is limited to the straws, sticks, feathers or other materials which compose their nests. A very few species, notably some of the bower birds of Australia and New Guinea, and certain individuals at least among crows, jays and magpies, own what we might call articles of luxury, such as shells, frag-

ments of chinaware, small metal objects, flowers, fruits and other bright or glittering baubles, which they arrange artistically in their bowers, place in their nests, or hide away in some secret cache. A few woodpeckers, jays, and other birds possess reserves of food that they have stored away.

A single parcel of land may belong to a man, a thrush, a sparrow, a warbler and other birds, to say nothing of the four-footed animals and insects which may likewise claim it. The man's ownership is guaranteed by a deed registered among the public archives; the bird's patent of possession is the song he pours forth from some conspicuous point in his dominions. Doubtless the claim of each is equally valid, save as brute force makes one stronger than the other. Each of the several owners may, in fact, exercise all the prerogatives of dominion without infringing upon the rights of another. The Blue Tanager that nests in my yard neither recognizes nor rejects the claims of the wren, the flycatcher and the seedeater to the same property; he simply ignores them and is in turn ignored by them. Likewise, he generally ignores me when, in the exercise of my rights of ownership, I pick the oranges or cut the grass. But he can not afford to ignore other tanagers of the same species, because neither by the laws of men nor of birds can the same parcel of land have two simultaneous owners of the same kind. To each truly territorial bird, the sole possession of an adequate area of land is of the utmost importance in winning a mate and rearing a family.

As Eliot Howard and others have amply demonstrated, each

male bird of such species as the Yellow Bunting, the Song Sparrow, the Robin Redbreast, the Prairie Horned Lark, the Wren-tit and numerous others, knows the boundaries which separate his own from neighboring estates and tends to respect them. Trespassing is relatively rare, for if discovered the trespasser will be chased, and if he resists will have to fight. In the conflicts that arise over violations of territorial boundaries, the bird on his own land nearly always has the advantage over the intruder. If he in turn becomes the invader of the second bird's domain, the apparent relative strength of the two is reversed. Were we to place ourselves in the birds' position, we should say that when our rights were violated our sense of rectitude lent us force, while when we trespassed, our feeling of guilt made us cowards. Dr. Pickwell observed this sort of behavior during his intensive studies of the Horned Lark. As soon as the male larks have established well-defined territories, they fight each other only on the boundaries which separate them. At the boundary line, two males "frequently strut before each other and often peck the ground furiously, like barnyard cocks, but all fighting is in the air.....Up they go, dash against each other, tumble over and over, an animated bundle of struggling feathers. Having indulged in wing to wing combat for a moment, they finish off with a most curious game of tit for tat; one chases the other for a few feet in the air, invades thus the flying one's territory; the pursued promptly turns pursuer and gets into his neighbor's territory, when the game is again reversed." The superiority of each combatant depends not so much upon his intrinsic prowess, as whether he is on his own

or the other's side of an imaginary line. On the snowy tundras of Greenland, Dr. Tinbergen watched very similar pendulum-like duels between male Snow Buntings, as they settled down on their breeding grounds in spring. Sometimes the battle would swing back and forth over the boundary line for nearly an hour without pause.

Another manifestation of this law was discovered by Miss Erickson in her study of the territorial behavior of Wren-tits in California. She found that "in all disputes observed, the one in possession has been the victor. Since it is highly improbable that the one in possession was invariably the physically stronger individual, some other, non-physical force must come into play here." It is sometimes said that a bird on his own land is invincible by others of his species.

Birds certainly appear to have a sense of right and wrong in matters of land tenure. Possibly some will hold that this is no more than fear of the dreadful consequences of transgression. When we recall the frightful punishments that our remote ancestors were liable to suffer for violations of tribal rules, and at a relatively recent date, the very severe penalties prescribed by the laws of the most enlightened countries for what are now looked upon as minor offenses, we may well suspect that much of our own morality had similar origins. Be this as it may, it is highly probable that many birds respect their neighbors' rights without ever having felt, in their own persons, the penalties of wrong-doing. Among the tiny Mexican Grassquits of tropical America, fighting seems never to occur. Yet each male

insists upon the inviolability of a small area surrounding his nest, and invites trespassers of his own kind to leave merely by flying toward them. They need no stronger notice that their departure would be appreciated. Other birds settle territorial differences by voice alone - we shall have more to say about this a little later.

But if real or landed property is on the whole respected by birds, the situation is quite distinct with what we have called personal or mobile property. The stealing of the materials that make up the nest is so widespread among birds, done so openly, and all without loss of caste by the thief, that we may feel certain that in the majority of avian species it is not looked upon as wrong-doing - hence we are probably not justified in employing the terms 'stealing' and 'thief'. This sort of pilfering is least likely to occur between members of the same species of territory-holding birds, for the simple reason that before one can steal from another's nest it must trespass on the other's land by, and will be set upon as a trespasser before it can become a thief. But since the same area may belong at one time to a number of pairs of birds of diverse kinds, the territorial system is in itself no safeguard against the loss of nest-material to other birds.

I believe that the majority of nest-building birds are more or less guilty of this petty larceny; but some species are more addicted to it than others. A still unfinished nest is far more apt to suffer the depredations of a neighboring builder than

one that has been completed and contains eggs, because it is less systematically guarded, and even more because its materials, still loose and readily detached, are more easily removed than those which have been carefully worked into the finished edifice. Whether or not the presence of eggs in a neighboring nest ever in itself causes the would-be pilferer to desist from her intended depredations, I can not say; but I know for a fact that Rieffer's Hummingbirds, when for some reason the females build more than ordinarily close to each other, will pull apart the unguarded nests of others of their kind even when there are eggs within.

Birds of many kinds, when they have lost eggs or nestlings from their first nest, build another near by rather than make another attempt to rear a family in the despoiled structure, although they often draw liberally upon it for the necessary materials. They also take advantage of old, deserted nests of other species which yield ingredients suitable for their own. From this practice to making use of the materials in a nest that a neighbor is actually engaged in building, is only a short step. The birds do not appear to distinguish between property actually in use and that which has been abandoned. But as a rule the builder of a nest, if she or her mate take the trouble to guard their handiwork, finds no difficulty in driving away the covetous neighbor, even if it be superior in size and strength.

Not long ago, I watched a Gray-capped Flycatcher build her bulky roofed nest almost wholly of materials that other

birds had first gathered. Nearby, recently abandoned nests of a Boat-billed Flycatcher and a Blue Tanager supplied a considerable amount; and she also drew upon an earlier structure of her own. But the loose ingredients of the nest a Chipsacheery Flycatcher was building in a neighboring lemon tree were not only fresher but far more easily carried off. While the Chipsacheery rested from her labors, she lost a good share of her morning's harvest to her gray-capped cousin. Since this Chipsacheery had earlier been guilty of pilfering from the tiny cup that a Blue Honeycreeper was building near by, she did not claim my unalloyed sympathy. All too often the bird-watcher's hopes, rising high as some rare bird begins her nest close to home where its history could be conveniently followed, are dashed to the ground when a member of a common species carries off the nest-material, for incorporation into a structure that he has seen a hundred times over.

But it is among birds that nest in crowded colonies that the pilfering of nest-materials assumes the grandest proportions. Almost everyone who has watched colonial-nesting birds, from penguins, herons and terns to oropéndolas, grackles and rooks, has commented upon the habit. One might suppose that such wholesale larceny would have so deleterious effect upon the reproductive efficiency of the colony that it would long ago have been eliminated through natural selection; its very widespread persistence and prevalence among colony-nesters lead to the conclusion that, by and large, the practice can not be so harmful as at first sight it appears. Among Montezuma Oropéndolas, weaving their long pouches in crowded clusters in some lofty tree-top, it is

a common thing to see one hen attempt to pull away a strip of palm leaf or a fiber that dangles loosely beneath the unfinished nest of a neighbor. Sometimes, grasping the free end firmly in her sharp bill, she closes her wings and throws all her weight upon it in an effort to detach it. At times even, as a bird newly returned to the tree from a material-gathering expedition rests with her hard-earned fibers hanging from her bill, a lazy neighbor will seize the end of one and try to snatch it away. This creates a ludicrous situation: the rightful owner can not even open her mouth to protest the outrageous behavior, for at the moment of doing so she would lose everything!

This sort of neighborly banditry never leads to direct retaliations; although doubtless most members of the colony are by turns robbers and robbed. No permanent animosity between neighbors appears to result from it; and the thief does not lose her standing in the community. The habit of pilfering even has certain beneficial results. It is no easy matter to detach a strong fiber that has been properly woven into the fabric of an oropéndola's nest; this is attested by the fact that oropéndolas, unlike so many other birds, do not often use abandoned nests as quarries for material to build new ones. They find it easier to fly far off to strip fibers from green palm fronds and banana leaves. Hence it is only the strand that has been carelessly attached that is likely to be stolen; and the slovenly builder will chiefly suffer. The system discourages slipshop work and places a premium upon careful finish - just as, no doubt, the existence of thieves has made ourselves more orderly and

methodical in caring for our property. Rarely an oropéndola, especially an inexperienced or unskillful weaver, is greatly impeded in her efforts to complete a nest by the thievery of her neighbors. Among colonial-nesting birds whose cruder nests of sticks or straws are not all woven into a single piece in the manner of the oropéndolas, the necessity for one member of the pair to keep constant guard, from the time the nest is begun, to prevent the loss of material, may have a positive advantage in that it results in the early establishment of a system of sentry-duty, which later will be of the utmost importance in safeguarding eggs and nestlings from the crows, gulls or other marauders which lurk about most nesting-colonies.

Very much akin to the pilfering of nest-material among birds that breed in colonies is the stealing of food. Edmund Selous records that as an Arctic Tern returns from the sea bearing a fish for its nestlings, another of its kind may swoop down and snatch it from the parent's bill, often succeeding in getting away with the prize, despite angry protests. "Yet", he adds, "they get along, are happy, nor is there any real crime - no wickedness." This kind of thievery is rarer than that of material and has never, to my knowledge, been detected among land birds that nest in colonies, as oropéndolas, caciques and grackles. Possibly this may be merely because food is as a rule brought to the nest in particles smaller and less easy to snatch away than a fish.

The Relations between the Sexes

Day after day, five little Yellow-thighed Manakins were to

be found in a certain spot amid the lowland forests of Panama, each upon his customary perch. With their scarlet heads and vivid yellow eyes contrasting with the velvety-black plumage of their bodies, they were conspicuous out of all proportion to their minute size; but by brisk calls, loud snapping sounds that they made by beating together their stiffened wing plumes, and the most bizarre antics, they did their best to make their presence more obvious still. Much of their dancing and posturing was such that it displayed their bright yellow thighs, scarcely visible as the manakins perched in repose. They seemed never to have heard the dictum of the closet-naturalists, who declare with weighty authority that amid the tropical forests, with their thousand perils, small birds must be demure and self-effacing. Quite the contrary, their whole purpose in life was to render themselves obvious by the fullest use of the various tricks and adornments with which Nature had endowed them, to the end that they might be readily found by the modest olive-green females of their kind. For manakins, unlike most birds, never pair; to the neutrally colored female alone falls the whole duty of fashioning the nest, incubating the eggs and rearing the young. The one reproductive function of the male is to fecundate her eggs at the proper moment, and meanwhile so to advertise himself that he may be easily located by the female when she needs him.

Then, one afternoon in March, I had the good fortune to be at hand at the exciting moment when a female arrived at the spot where the male manakins displayed. She alighted unobtrusively upon the slender horizontal branch where one of the five was wont to perform, and stirred him to frenzied exertions.

Stationed close beside her, he executed an amazing series of rapid about-faces. At each swift turn he gave his wings a loud flap, and all the time he kept his lemon-colored thighs very much in evidence. After this acrobatic exhibition, he moved off a way and then began, with mincing dance-step, to slide along the branch toward his visitor, tail foremost, with his body bent forward and his legs straightened to expose those yellow pantaloons, of which he appeared to be very proud. The female sidled away at his approach; whereupon he flew out, looped about in the air, approached her flying with a loud flourish of wings, alighted upon her back uttering a high, shrill eeeee - and in a trice accomplished the biological purpose of so much pageantry.

And what were the rivals doing while the favored one enjoyed the fruits of his conquest? Did they rush in and try to wrest the prize from him? Nothing of the sort. Each was on his own perch, obviously greatly excited, calling and performing for all he was worth, but abiding rigidly by the 'rules of the game' and keeping out of the fortunate rival's way. The female had made her choice between the several claimants to her favor, and that choice was final. Among wild, free birds, it is nearly always the female who decides these matters - despite the contrary statements of certain watchers of cage-birds who, attributing to all the feathered kingdom the abnormal behavior of their unbalanced prisoners, claim that she is brow-beaten into submission by the aggressive male.

As I walked home that afternoon, I wondered how many men, placed in similar circumstances, would have kept control over

themselves and done the proper thing as well as the manakins. A number of other birds have essentially similar systems of courtship, among them numerous other species of manakins, the Prairie Chicken and the Sage Grouse of North America, the Ruff and the Blackcock of Europe. The nuptial exercises of the male Ruffs, once considered to be wild and desperate struggles, were shown by Selous to be in fact well regulated tournaments, in which the males display, meet each other momentarily in dashing but innocent encounters, and abide meekly by the choice of the Reeves at the end. All those who have carefully watched the behavior of the birds in these courtship gatherings, whether of the little Gould's Manakins with their bare dancing courts beneath the undergrowth of the tropical forest, or the big Sage Grouse performing several hundred together on the arid western plains of North America, agree that with rare exceptions the most decorous order prevails, each rival acting his part in the conventional fashion. Indeed, without strict adherence to the rules, such assemblages must degenerate into mad scrimmages which would defeat their own purpose. The matings of Rooks - a species generally considered to have a highly evolved social organization - are by comparison riotous procedures; for, as Selous has described, the Rooks, performing their nuptial embraces on the nest, are commonly mobbed by their neighbors.

Dr. Frank M. Chapman told of the terrible punishment that awaits the male Gould's Manakin who violates the laws of his kind by intruding upon the court where another dances and displays. The mounted 'skin' of a male manakin, set on a perch above

a court, is at times attacked with such fury by the outraged owner that if not promptly removed it would soon be torn to pieces. But to demonstrate such conduct, Dr. Chapman was obliged to resort to the stratagem of the stuffed effigy. He never saw a live bird commit so unpardonable a breach of manakin etiquette. Since it is likely that the decencies to be observed at these courtship gatherings grew up simultaneously with the ritual thereof, perhaps no manakin has ever received such fearful castigation. But the demonstration provided by the stuffed bird tells us how strictly the rules will be enforced.

At first glimpse, we are impressed by the strangeness of these systems of courtship so different from our own and from those of the more familiar birds. More worthy of our wonder and admiration is the rigid self-control which they entail. They presuppose a very long period of development, an ancient culture. They would not be possible without a corresponding morality - or if not morality, what name shall we apply to it?

Monogamy is the matrimonial system most prevalent among birds. Migratory birds may mate for a single nesting, as the North American House Wren, or apparently more commonly, for the duration of a single breeding season, in which several broods may be reared. Then the pair is, as a rule, dissevered by the migratory journeys, in which the male commonly precedes the female. The same two House Wrens often re-mate for a second brood during the same season - their behavior suggests second nuptials rather than a continuous wedded state - while occasionally birds which in the interval make long migrations find the same

partners in subsequent years. A great many kinds of non-migratory birds of the Tropics, and a few of extra-tropical regions, are found in pairs at all seasons. To all appearances, they mate for life - although this lacks direct confirmation by observations on marked individuals. Thus the matrimonial behavior of the majority of birds closely approximates, where it does not actually attain, the monogamous constancy which in Western lands is regarded as ideal.

Bigamy occasionally crops up in species normally monogamous. Mrs. Nice found that when a female Song Sparrow loses her mate while she has a nest, she will sometimes attach herself to the already mated male on a neighboring territory, rather than desert her eggs or nestlings to go in search of a partner at a greater distance. The male may under such circumstances feed not only his own offspring, but those of his later spouse orphaned of their father - truly a noble bigamist!

Monogamous birds, of certain kinds at least, are guilty of occasional lapses from matrimonial fidelity. Among birds which guard special nesting territories, the female, wandering beyond the boundaries of her lord's estate - at times she does not know their exact position - may engage in an illicit affair with his neighbor and rival. 'Stolen matings' these have been called. Apparently, statistics of the frequency of this sort of thing are not available - statistics of this nature never are. Among many tropical finches, tanagers, warblers and other birds, of which the mated pair are almost inseparable at all seasons, I should not expect these lapses to be at all common.

'Stolen matings' appear never in themselves to be the causes of the disruption of families. The jealousy of birds is not retroactive; it concerns itself with the present moment. The temporarily unfaithful partner does not acquire a moral stain which makes him or her undesirable as a mate. Paradoxical as it appears, the 'rules' regulating the relations between the sexes may be, in a certain sense, more strict among manakins and others of similar courtship systems we would call 'promiscuous', than in many species normally monogamous. In comparing birds with ourselves, we should keep in mind that in man the primary facts of the sexual relationship are complicated by many social and legal considerations which do not obtain in the feathered world. Aside from all questions of affection and aesthetics, a man will not wish to bestow a long and costly education upon a pseudo-son who springs from a stock that he deems inferior to his own; nor will the representative of an honored name and ancient estates pass them on to one whose hereditary qualities may make him unworthy of them. Among birds, individual differences do not appear to be so great as among ourselves; and the male bird appears to be equally content feeding the nestlings in his mate's nest, no matter who their father - he is doubtless, as has been claimed of primitive man, ignorant of the facts of fatherhood. Some birds are so eager for the responsibilities of parenthood that they find nestlings to feed before they have mated or even before they reach maturity, sometimes actually bestowing parental attentions upon nestlings of another species.

The Sense of Duty

Lying is universally condemned by civilized man; our procedure with respect to property is in all countries minutely prescribed by law; the relations between the sexes are governed by more or less rigid conventions, and often by law as well; we may not always agree with the laws and the conventions, but follow them if only because it is the path of least resistance. But duty is a vast and incompletely charted sea, often agitated by violent storms; and as we voyage timidly over its heaving surface, we are guided by no compass more reliable than our own fallible conscience. Yet duty, whether in the abstract or in specific examples, has probably received more attention from moralists and philosophers than any of the more circumscribed phases of ethics. Most of us are rarely troubled by whether we ought or ought not tell a lie, or steal money, or elope with a friend's wife; but the determination of our duty in a hundred issues, great and small, is a source of endless perplexity. What can we know about the sense of duty in birds?

Duties are of two sorts, those inherent in our situation and those acquired by contract. Our duties toward our parents and our country are of the former kind; for no man chose his parents, or elected to be born in one country rather than another. Contractual duties range from the promise we made to bring a spool of thread to a neighbor from the distant village, to an engineer's formal, long negotiated agreement to provide a supply of water for a city. Our obligations toward wife and children are, originally at least, of the contractual sort; they are im-

plicit in the marriage vow, since we enter upon matrimony with full foreknowledge of at least the general nature of its responsibilities. But unless we believe that birds mate and begin their nests with prevision of all the consequences of these acts, we must conclude that their obligations to their offspring are inherent in their relationship, rather than ~~of the~~ contractual. ~~sent~~.

For one who has watched many birds build their nests, it is difficult to doubt that on the whole this is a pleasurable activity. The male often - and rarely the female also - sings joyously as he works. In the Tropics, where year-round residents can afford to devote a month or more to nest-building, many kinds make their structures far larger and more elaborate than appears essential for the accomplishment of their primary purpose, then continue to add to them through the whole period of incubation, until the eggs hatch. Why should they make the nest bigger than necessary if they found building a disagreeable task? Incubation of the eggs would appear to be a less enjoyable occupation - for creatures so active and aërial as birds, these periods of motionless inactivity in the nest might become burdensome - yet on the whole I suppose they find it not unpleasant. Male birds of a few species sing while sitting on the eggs; and at times the bird on duty is reluctant to yield up the nest to its mate who has come to relieve it. Bringing food to the young, up to a certain point, and when it can be found in abundance, also seems to be an agreeable activity. Thus male birds are at time so impatient to begin feeding that they bring morsels to

the eggs before they hatch, or proffer to their sitting mates delicacies that are rejected.

So long as actions are in themselves wholly pleasurable, they may be performed without calling into play any sense of duty or obligation. No element of morality enters into their execution. I wonder whether, within historic times, any man has ever lived so perfectly in tune with the conditions of his existence that every act he was called upon to perform was immediately agreeable to him, so that he knew nothing of the stern voice of duty, and was at once righteous yet amoral. I wonder likewise whether the activities of nesting birds are always pleasurable. I take the period of reproduction for our consideration of the sense of duty in birds, for it is chiefly at this time that the welfare of other individuals is dependent upon them.

While nest-building normally appears to be a happy occupation, at times, when one nest has been lost and the bird must hurriedly construct a second ~~one~~ to receive eggs soon due to appear, she seems to labor with a grim determination that must be the reverse of enjoyable. While studying Brown Jays, I often felt that the female, who cries loudly and, to human ears, complainingly as she incubates, was bewailing the disagreeable necessity to which Nature had condemned her. Doubtless so active a bird would rather be disporting with her fellows than sitting in dull immobility upon her eggs. Sometimes, too, incubating birds continue at their posts while hungry, and even when they would appear to be suffering acutely from a long-continued fast. Dr. Levick, studying the Adélie Penguins that

nest near the shores of the Antarctic Continent, found that both male and female might sit for as long as thirteen days without intermission and with no opportunity to receive nourishment, while the mate made the slow foot journey to the water's edge and found its food in the sea. Must not birds experience gnawing pangs of hunger under such circumstances? And while in times of plenty the feeding of the nestlings seems to be an enjoyable occupation, during storms and in periods of scarcity parent birds deliver food to their offspring when we have every reason to suppose that they are themselves hungry; their actions, such as swallowing the excrement-sac of the nestlings instead of simply carrying it off, often strongly suggest hunger. ¶ If a bird, or any other creature, spontaneously follows one activity when another would yield it greater immediate pleasure, or surcease of actual pain, then the pleasure-pain hypothesis which we so largely call upon to account for the activities of animals becomes insufficient as an explanation. When we ourselves act in disregard of our immediate inclinations, we say that we follow the path of duty, or that we forsee an ultimate reward that will outweigh present discomforts. These two explanations are fundamentally the same.

The final cause of all our actions is the pursuit of happiness and the avoidance of misery. We claim that we act in accordance with duty, justice, or the dictates of religion; but if we analyze our motives, we shall find, if we are honest with ourselves, that we act in pursuit of happiness. When we elect to perform some distasteful task that we conceive to be our duty, rather than follow some immediate pleasure, it is

because we believe that faithfulness to duty will make us happiest at the end. The religious devotee who leads a life of austerities and privations, who perhaps joyfully undergoes martyrdom, does so in anticipation of future bliss far exceeding any to be found in the world of woe that he is eager to depart. And conscience is such an inexplicably capricious fellow that he leaves us happier when we suffer as he dictates, than when we follow our pleasure in his despite - hence we learn by experience that we shall be better off in the long run if we heed him.

Thus all our actions are traceable, in the ultimate analysis, to those feelings of pleasure and pain which Nature aeons ago implanted in her children to ensure their self-preservation and the reproduction of their kind. Man, with all his religion and all his philosophy, has never invented any spring of action that does not flow from the antediluvian waters of pleasure and pain, no matter how cunningly he contrive to conceal their source. And indeed, how can any sane man choose the course which he expects will weigh against him when the final reckoning is cast? The good and the wicked alike pursue happiness; they differ in what makes them happy. At bottom man and the beast are one - or at most, differ in degree of foresight rather than in motives. These thoughts should make us humble.

Thence we arrive at a new definition of duty. Duty is the bridge that spans the river of pain, with disagreeable tasks as we cross it, and happiness on the farther bank. The briefer the interval between the performance of our obligations and the attainment of happiness, the shorter the bridge. If it be true

that non-human creatures act only as influenced by immediate pleasure or pain, then for them the bridge does not exist; they can not see across the river to the farther shore, and can have no incentive to cross it. But let us once admit that a bird remains faithfully covering her eggs when she would find it more agreeable to fly off with her companions, or gives a single morsel of food to a nestling when she would derive greater pleasure from swallowing it to assuage her own hunger, and we can not deny the logical conclusion that she acts from a sense of duty. Those who in their human arrogance and pride will not admit the existence in other living beings of certain attributes that they have always been taught ~~to believe~~ belong peculiarly to mankind, will at once suggest the need of a new term. But let us not quibble over words.

The sense of duty is the very keystone of the moral arch. Without it, morality could scarcely be said to exist - we should have only more or less variable patterns of behavior, of a reflex type, or influenced by immediate pleasure and pain. If we recognize that the sense of duty is to any degree a motive force in the activities of any creature, we must admit that it is to that extent a moral being. We have no reason to suppose that the bridge of duty is as long with birds as with ourselves, if only because, their individual experience in life being far less, their foresight must be shorter. But if we deny the existence of this force, I think we shall be hard put to it to explain many of their actions.

My own surmise is that we differ from other warm-blooded

animals more in our intelligence - as in our ability to forsee consequences and to view the same subject from many sides - than in the possession of any God-given moral sense or intuitive ability to distinguish right from wrong. It is to the quality of our imagination, our capacity to project our sensations beyond our own bodies, that we owe what little interspecific morality we have developed. We may ask whence comes the sense of duty in wild creatures. Doubtless from the same source as in ourselves. Those who like to explain all biological phenomena according to the principles of Natural Selection, may say that as animals grew more complex and the young became increasingly dependent upon their parents for support, pain and pleasure as the sole springs of action were found inadequate to ensure the preservation of the species, and to supplement the deficiencies in this system a new principle of conduct came slowly into existence. Others may attribute it to some more mystic source - yet neither will wholly explain it.

Or perhaps the foundation of all morality lies in that feeling of inward calm and integrity which we enjoy when we follow our deepest instincts, as opposed to the sense of frustration and unrest that most of us have at some time or other known as the result of having permitted the gratification of sense, or the fulfilment of some transitory desire, to interfere with the performance of our obligations. I see no reason to doubt that a bird, or any other creature with impulses at once so complex and so conflicting, should not experience the same feeling. Perhaps it was through the development of this feeling of in-

ward harmony that Nature achieved her triumph of the creation of the conscience, causing frail mortal creatures to live for more than the gratification of the senses, and to strive toward life beyond life.

Birds, no less than ourselves, are guilty of more or less frequent lapses from what we take to be the strict path of duty. Certainly erring man will not dare to deny, on this account, the existence of morality in birds. One of the sins most often laid to their account is the desertion of nestlings. Almost everyone who has given much attention to their ways has from time to time found their babies lying dead in the cradle, with no obvious cause for their decease save cold and starvation. At times we can assure ourselves that the parents still survive. Unfortunately, we are rarely in possession of sufficient details to be able to pass sentence upon the seeming delinquents. The mother may have been frightened from the nest early on a cold, wet night; and before she could find her way back in the morning light, the nestlings, deprived of the parental coverlet, succumbed to exposure. Desertions of nestlings have been attributed to the waning of the reproductive instincts at the end of the breeding season. In Great Britain, swallows have been known to set forth on their journey to Africa, leaving their young of the latest brood to die in the nest. W. H. Hudson, who investigated this behavior, found that the parents stayed on until they could no longer find sufficient food during the cold autumnal days.

Some moralists will hold that these swallows should have remained in spite of cold and dearth to starve with their little ones. But as I have pointed out elsewhere, the causes of the

loss of eggs and nestlings are so numerous, the enemies of birds on the whole so much more powerful than themselves, the conditions of their environment so little subject to their control, that if parent birds were habitually to jeopardize their own lives in behalf of their offspring, their species would be in danger of extinction. With a social system no more highly developed than that of the overwhelming majority of birds, the death of the parents must inevitably be followed by that of the young dependent upon them. Hence parental sacrifice, if frequent, would result in a loss of life, and of reproductive capacity, that few species could long withstand. We must admit the possibility that species have become extinct through excess of parental devotion, no less than through its waning.

As seems proper to us and is doubtless biologically sound, parent birds will risk far more in behalf of their young than to attend their eggs. Considering all the dangers they run, my own impression is that the parental devotion of birds, taken all in all, is about as strong as is consistent with the preservation of the species. When feathered parents, frenzied by the peril of their nestlings, attack a man or a large snake, they exceed all the bounds of prudence, and by endangering themselves jeopardize the existence of their kind. Yet despite the strength of their solicitude, birds will at times allow their nestlings to die in what seems to us either a most stupid or a most callous manner. Once, as an experiment, I placed two unfeathered nestlings of the White-breasted Blue Mockingbird in my inverted cap, a few feet distant from the nest. The parents

soon found and fed them; but the mother failed to brood them in their strange position, and apparently would have allowed them to die of exposure if I had not in time returned them to their proper cradle. Before passing judgment upon the birds' behavior in situations where we or natural accidents have disturbed their normal routine, we must take into consideration both their hereditary experience and the limitations of their physical powers: the facts, for example, that when unfledged young vanish from the nest, they are in the overwhelming majority of instances irretrievably lost; and that most birds are unable to lift or carry their nestlings without injuring them. When parent birds fail in their duty, in situations where we see clearly what they should do, it is usually their intelligence rather than their integrity which is at fault. With them, as with creatures of loftier stature,

> The good how can we trust,
> Only the wise are just.

The Settlement of Disputes by Voice

Different species of birds vary in their cultural development no less than the races of man. Many are still in that primitive stage, exemplified by man in the twentieth century, where they settle their differences by brute force. Among these are several kinds of thrushes, finches and wrens. But others have learned to compose their quarrels by voice alone - by arbitration, we might say. Edwin V. Miller decided from his studies of the Bewick Wren in California that their conflicts over territorial boundaries were vocal battles into which violence

did not enter. Selous thought that with the Oyster Catcher actual fighting might be giving way to vocal duets as a means of settling differences. The birds I have most often seen debating in this fashion are antwrens and honeycreepers. With the Blue Honeycreeper of tropical America, the contending parties appear to be always of the same sex, either two of the exquisite azure-crowned males, or more often two of the modest greenish females. If other individuals are present in addition to the two contestants, they are merely interested auditors, taking no active share in the proceedings. The causes of the disputes have not always been clear to me - either mates or nesting areas, I surmise - but they seem very important to the diminutive protagonists. Facing each other at no great distance, they repeat over and over again their nasal notes, sometimes varying them with clear monosyllables. They turn rapidly from side to side, flit their wings and twitch their tails. Their arguments, like most of our own, appear to consist largely in the monotonous reiteration of the same theme. Finally, one of the twain weakens and retreats; the other may then lunge at the vanquished or pursue it as it flies away; but I have never seen any actual physical violence. The last contest of this sort that I witnessed was between two female Blue Honeycreepers, who faced each other for an hour. Toward the end, it was plain to see that the one who said the least was weakening; and although the outcome of this contest was not as clear as it often is, my impression was that the more voluble one had the best of it.

What fascinating glimpses into the psyche of a bird these

purely verbal disputes give us! Monotonous they at times undeniably are; but then human peace-conferences are the same, with the slightly varied repetition ad nauseam of the demands of either side; and they have not, like these avian conferences, the redeeming virtue that they have obviated slaughter in the past, or will prevent it in the future. Since a victory is won without there ever having been a test of physical force, we must call it a moral victory, or something very closely akin to this.

It is certain that a long-protracted discussion, such as I witnessed between the female honeycreepers, may demonstrate the relative merits of the contestants in a number of qualities, without physical conflict. It was clear even to a human observer that the bird who seemed to win the victory displayed energy and endurance superior to her opponent; she called more frequently, and continued her calling and posturing with greater persistence than her adversary. Energy and endurance are qualities of no small importance in rearing a family of young birds, as in the struggle for existence in all its aspects. One advantage of a merely vocal and demonstrative contest over actual fighting is that the contestant who happens to be slightly the weaker comes off uninjured, fit to reproduce its kind. Although it may be somewhat inferior to the victor in certain points, it may none the less possess many qualities worthy of perpetuation in the species. Thus even from the purely physical consideration of the survival of the species, the formal contests so widespread among birds are superior to brutal fighting. Few species are so firmly entrenched upon the earth that they can afford a

needless sacrifice of individuals. Will man ever learn this?

Among mammals, the Howling Monkeys of the tropical forests settle their disputes by conversation, in this respect having advanced considerably beyond their fellow primates who wear clothes and read newspapers. In the male Howler, the larynx is enormously developed; scarcely any other existing animal can produce so loud a vocal sound. Apparently in the whole group of primates, volume of noise in itself adds to the cogency of an argument; while among birds, sweetness of tone and musical excellence bear greater weight. Even in those species that do not compose their differences by voice alone, much of the so-called fighting is merely formal; they fence with foils. Or posturing and attitudinizing take the place of actual conflict. There is far more formality than ferocity in most of the contests between birds; and the reign of blind force seems in a fair way to terminate in their world sooner than in our own.

Final Considerations

I think we may fairly conclude that in the bird world there is right and wrong, although this may not be the same for all species, or the same as with ourselves. When we recall that in man, a single biologic species, there is scarcely anything which has not, as the ethnologist can tell us, at one time and place been considered right, and at another, wrong, we need not be surprised to find divergences in this respect among some thirteen thousand kinds of birds. The invasion of another's post at a courtship assembly, or of another's breeding territory,

is in many species wrong. Either it is not done at all, or the individual guilty of the transgression is furtive in manner and easily put to flight by the aggrieved party, even if the latter be physically weaker. The stealing of the materials which compose the nest is in most species not wrong; many birds, even among those that nest in colonies, do it quite openly, excite no enmity that endures beyond the act, and do not lose caste among their fellows. The relations between the sexes vary enormously from species to species; but even in monogamous species occasional lapses from fidelity do not appear to be wrong in the human sense; they do not in themselves disrupt the pair, or interfere with the successful termination of the nesting-operations. Definite proof that birds lie is lacking; but among some of the social species, the word of certain individuals carries greater authority than that of others: this may be merely because they have greater experience and better judgment. Although birds require, weight for weight, an enormously greater amount of food than man, they are not gluttonous and do not habitually overeat. Although with them, as with all other creatures, the struggle for existence is cruel, there is no evidence that they find pleasure in inflicting pain on other individuals of their own or of other species. The habit of numerous species of birds of feeding nestlings not their own seems to me to be fundamentally the same as human charity. There are good ressons to believe that birds possess a sense of duty of the same nature as our own, although it can not look so far ahead. Birds do not punish offenders save when caught in the act; the contrary has been

claimed for Rooks, but the evidence is not conclusive.

If moral problems do not perplex birds as men, it is doubtless because the proper responses to the usual situations in their lives have been settled by long generations of practice; while the circumstances of our own restless existence are so constantly changing, that we are at every turn faced with novel conditions in which our duties are not clear.

The wild life of Nature, regarded simply as woodland glades, babbling brooks and the tranquil emptiness of the sea, is undeniably refreshing and restful as an escape from the clangor and turmoil of human existence in crowded centers of population. Its myriad shapes and colors divert the fevered mind from its own too-absorbing little problems. But regarded with a more analytic and philosophic eye, what spectacle could be more hideously revolting than that of a thousand thousand living creatures each engaged with all its might in stuffing its maw with as many of the others as it will hold? Were this all we could discover beneath the tranquil surface of Nature, many who are now Nature-lovers would be driven to find solace in the coldly impersonal realms of pure mathematics, atomic physics, or astronomy.

What redeems Nature, looked upon with the philosophic rather than the purely sensuous eye, is the effort each living creature makes to create something beyond its puny self, to project life beyond its own ephemeral glob of clay. It is not the ravening bird nor the voracious beast which inspire us; there is little in such spectacles to uplift dejected spirits or bolster wavering courage. It is the ant beneath the up-

turned stone, forgetful of its own peril, dragging its offspring to safety; the beaver toiling to build the dam that will protect its home; the inch-long fish darting at the devourers of its small fry; the weak and fearful birdling valiantly defying the serpent that would engulf her nestlings. Despite ourselves, we acknowledge the true magnificence of these paltry and mostly ineffectual displays of devotion. We learn that effort and strife, struggle against overwhelming odds, are not the portion of ourselves alone, but as widespread as life itself. And on every side we behold living creatures, weak and transitory, for the most part mere mechanisms possessed by an insatiable appetite for flesh, spurred on by some mysterious force to risk and wear out their little all of life in the pursuit of something without and beyond themselves. Instinctively, we recognize in this effort something akin to the moral nature in ourselves - for what is morality but the impulse to dedicate our momentary span of existence to some good that will outlast it?

But if our sense of values has been tramelled by poring too long over the subtleties of comparative psychology or theology, we will prate learnedly of instinct, of consciousness, or of divinely implanted moral law, forgetting that no one has yet given us a satisfactory definition of instinct, that no man can demonstrate the existence of consciousness anywhere save in his own individual self, and that man and the worm were fashioned by the same Creator: we will discourse learnedly - and become blind to the truth we recognized as unlettered children. Perhaps it was because Robert Louis Stevenson was neither a biologist

nor a theologist, had never blunted his intuition by the effort to grasp piecemeal what we must apprehend in its entirety or miss altogether, that he was able to write that 'Darwinian Sermon' which would have done honor to the pen of a naturalist. In Pulvis et Umbra he pointed out clearly the grandest and most inspiring lesson which man, as a living creature whose burden is heavy and strength frail, can learn from the contemplation of his brethren of the dust.

Los Cusingos,
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