

Science Expounded From An Easy Chair

By Sir Ray Lankester, K.C.B., F.R.S.

It is very interesting matter for speculation as to how, on Darwinian principles, wings have come into existence in the different kinds of animals which possess them. It will be readily admitted that it must be in many cases a great advantage to an animal to be able to fly, and that even the imperfect approach to flying—which amounts to nothing more than a power of taking long leaps, or of descending with some buoyancy through the air, must have been an advantage, and so have led on to the gradual acquirement of more and more perfect powers of flight. Wings are of very different origin and construction in the different groups of flying animals. Take, for instance, the vertebrate animals—the fishes, reptiles, birds, and beasts (mammals). The wing is different in each of the flying groups of that great section of the animal series. In the birds it seems fairly certain that the ancestral condition was that of a creature walking on its hind legs, as the kangaroo does, and as the Iguanodon and some smaller extinct reptiles did. This reptile-like ancestor bird was largely aquatic in its habits, and swam by means of the fore limbs, the "hand" of which was firm and paddle-like. Feathers—the peculiar and very specially constructed outgrowths of the bird's skin—are intimately related to the conversion of the swimming paddle into a wing. To flap their fore-limbs and hurry over the surface of the water, is a common habit of water-fowl; the stroke of the paddle on the air, especially when its breadth was increased by an outgrowth of feathers, would lead, in ancestral birds, to a series of aerial leaps; and it is not difficult to imagine the conditions and steps by which "natural selection" could favor the survival of more and more powerful "flappers," and the eventual acquirement of the power of flight. The aquatic habit of the earlier forms would render the early steps in "aviation" free from injury to the incipient bird. It is important to note that it is by the broad, light, yet resisting, surface of great quill-feathers that the "wing" of the bird is developed as an organ of flight.

The bats, on the other hand, have a membranous expanse of the skin projecting from the side of the body, and connecting the fore limb and the hind limb. The membrane is also developed between the elongated fingers and between the hind legs and the tail. We cannot doubt that this wing took its origin in a parachute-like expansion of the skin of the sides of the body, such as we see in the flying squirrels, and that the tendency to membran-

ous expansions of the skin invaded the hand and the ears and the nose. But we have no immediate steps existing or as yet found in the fossil state between the passive parachute of the flying squirrel and the extraordinarily active and elaborately-developed wing of the bat, with its elongated, bony fingers as supports of the wing membrane—supports which are entirely absent in the flying squirrels, excepting so far as the unaltered arm, leg, and side of the body furnish a primary attachment. Quite independently, certain reptiles (the Pterodactyles) developed also a membranous wing in many respects like that of bats, but spreading from the outstretched arm and one enormously enlarged finger to the side of the body. The flying-fish have never got very far with their flying. Some of the gurnards, which all have very large front paired fins, have taken to using them as partial supports when they leap into the air, and quite independently, another kind of sea-fish, allied to the grey mullet, has taken to the same habit. In both cases the anterior paired fins are very greatly enlarged, so as to look like wings rather than fins.

The six-legged insects are the only invertebrate animals which have wings, and the question as to the origin of these wings has exercised the ingenuity of naturalists for many years. It is obviously a principle resulting from the general theory of the gradual evolution of organic forms by descent with slow modification—that no organ suddenly springs into existence. Every apparently new organ must be formed by the adaptation and modification (often in the long run very extreme) of a pre-existing organ. We have seen in the vertebrates that fins, paddles, legs become adapted as wings, membranes folds of skin and fibrillated scales (feathers) being also modified and adapted to the mechanism of flight. In the insects it seems that the wings have arisen by the enlargement and modification of flat, plate-like gills which existed right and left, in pairs, on as many as a dozen rings or segments of the body. We see such gills now in the aquatic larvae (or young stages) of insects like the day-flies, and gnats one pair only of these vibrating gill-plates have become enlarged and preserved as organs of flight in insects. Their muscular control and mechanical arrangements in general are very different from those of the wings of vertebrate.

The admirable imagination of Mr. H. G. Wells presented to us in the book called "When the Sleeper Wakes" a view of the world some 300 years hence, when flying machines are supposed by him to have become the ordinary instruments of locomotion. Mr. Wells described two kinds of these machines. The one kind is a vast aeroplane, carrying some

hundreds of passengers, the other is a small, very active aerial "top," carrying but one or two persons, and buzzing about like a fly. The present development of human attempts at flight seems to have left the second out of account. That machine was suggested, no doubt, by the drawing-room toy of many years ago—a central body with four obliquely-sloping vanes or blades radiating from it. The body was inserted into a handle and a string wound round it, as one does when spinning a humming top. The string was pulled, and the aerial top mounted to the ceiling or high into the open as its blades beat the air in rapid revolution. Later we had a toy made like a large fly some pin long, with a couple of wings and an indiarubber band, which one twisted to nearly breaking point. The indiarubber "spring" was so fixed to the wings that, on being released after twisting, it set the wings revolving, and the mimic insect flew away. In both these toys rapid and powerful rotation of a blade-propeller, without any special provision of an aeroplane for gliding movement, was the method in use. And the same is the case in Mr. Wells' imaginary smaller flying machine of 300 years hence. No doubt the flying-men of the present day are right in making use of the aeroplane, as the only form of flying machine at present possible. But could sufficient power be developed in a machine of small size, the pattern which Mr. Wells describes as contrasted with the gliding aeroplane—the small, dashing, buzzing apparatus like a bluebottle fly or a wasp in its movement and mechanism—would be the effective and really dominating thing. There is, it seems, no prospect of such power being obtained.

The final consideration, in which our knowledge of animals may help us, is as to the adjustment of a flying-machine so as to maintain its balance, to turn, stop, and reverse, in all sorts of wind and weather. It is a very remarkable fact that the sense of balance is developed to a very high degree in animals and man, and that, as we see in our movements in skating and cycling, this sense can be called upon to set the muscular movements at work necessary for maintaining "balance" in what are novel positions and efforts, without the participation of the reasoning faculty. The sea-lions (as in the case with all rapidly-moving animals) have this elaborate sense of balance deeply implanted in their nervous mechanism, and habitually are guided by it in their swimming under and over the sea. But just as easily and unconsciously as it guides their swimming movements, it enables tame performing sea-lions to catch and to balance a large ball on the end of the snout, and to knock the ball into the air and catch it and balance it again and again—a feat which has

no resemblance whatever to any action undertaken by these creatures in their natural conditions of life. There is no more astonishing "show" of performing animals than this of sea-lions which occasionally is to be seen at a circus or music-hall. The important point is that the animals are not taught or trained to acquire what we may call the "balance perception"; they already have that naturally developed to an astonishing degree. They are merely trained to apply this perception, and the muscular movements guided by it, in a novel and previously untried set of conditions. A delightful feature in the performance is that the animals are proud of their own skill, and as happy as though they were at home in the sea. It is probable that this wonderful sense of proportion in pressures and counter-pressures which we call the sense of balance is of man which suddenly makes itself manifest in boys and young men, without training, instruction, or parental transmission as such.

If man is ever really to fly it seems that he must avail himself of his instinctive sense of balance, as he has done in the use of the bicycle, and that no really satisfactory control of a flying-machine can be obtained by the conscious straining of observation as to lurching and pitching, and reasoned application of countervailing movements by means of levers "thoughtfully" selected and consciously set at work in the proper order. At present the flying-man is in the position of the centipede of whom it is related that, when asked to say which leg moved after which, "she fell exhausted in the ditch, Not knowing how to run." Flying animals, from insects upwards, give no conscious attention to the movements by which their presiding sense of balance is satisfied, any more than do walking men or their anxious attempts to control the balance of the aeroplane, are like the baby learning to walk, excepting that there seems to be no chance of their acquiring an unconscious, instinctive series of responses to dangerous displacements of balance (as the baby eventually does), whilst they continue to use the present artificial series of levers instead of applying the natural balancing movements of the body through an appropriate mechanism.

I have mentioned above the exhibition of performing "eared seals," or "sea-lions," as they are called. They are among the very few exhibitions of performing animals which are, in my opinion, good and enjoyable. Certain social animals which not only live in companies, but are also very eager in taking food—such as these seals, most dogs, some monkeys, and also the elephant—can be readily trained without cruelty, by making use of their inor-

minate love of food and of a certain kind of love of display which is natural to them in their relations of performance with one another. But all those exhibitions of performing animals in which the whip or the iron club are used to terrorize a beautiful wild animal should be recognized as the disgusting cruelties which they are, and prohibited. I lately saw an exhibition in London of performing lions which filled me with indignation. It is, no doubt, a wonderful thing that man, a weakling in muscle, but a demon in the power of inflicting pain and terror, should be able to bully and drive a couple of dozen of these splendid cats—making a mock and an abject thing of the king of beasts. But it is a vile passion in human nature which is gratified by the spectacle of the degradation of the mighty and makes it a joy to witness the terrorizing of the beast which stands for all men as the emblem of majesty and strength. The lions in the show to which I allude were made to perform ridiculous antics on a saw-saw, and were, by the proud confession of one trainer (with the interesting exception of one individual), in a state of suppressed revolt, coerced by the memory of intolerable pain. I once saw a bear in a London circus coerced by a screw fixed to its nose. The trainer turned the screw, and the bear gave a cry which was to be irresistible. I appealed at once to the spectators not to permit this abomination, and the performance was stopped. An interesting fact about the training of wild animals was told to me by a man (I forget his name) who exhibited some performing Russian wolves at the Westminster Aquarium. He said that about one wolf in eight could be trained. His method did not consist in bullying and hurting the wolves, but in rewarding them by food. He said that on the average seven out of eight showed no capacity for learning, and were rejected (killed) by him after sufficient testing. The teachable dog is the result of a selection by primitive man of the one in eight. Those who delight in the distorting antics of performing animals do not appreciate the supreme beauty and grace of the natural movements of animals in their natural surroundings. Our brother animals have been bred to those perfect poses, to that fineness of shape and precision of action, by a greater "fancier" than any among us—inexorable Nature. Is there anyone who would not rather see a beautiful horse walk, trot, gallop, and roll at his pleasure on a spacious sward than look on whilst he, splendid great fellow, dances in and out some zigzag barriers or stands uncomfortably and disgracefully on his hind legs at the bidding of the spur and whip of an unpleasant stable-woman, whom he might kick into the middle of next week but tolerate out of sheer goodness of heart? His attitude is that of amiable condescension to one who seems to him a foolish but perhaps well-intentioned menial.

Beauty of the Back

Backs, as a few lovely women have revealed them in evening dress, when beautiful are very beautiful, writes a well known artist. They are lovelier to my mind than the back of the Venus de Medici, which is shapely but heavy. The modern back, as we have had glimpses of it, has less weight and more expression.

I use the word expression because that is precisely what I mean. Backs are like faces. They reflect thoughts and emotions, and in proportion to their power of expression are they beautiful. Now a heavy back is like a veiled face. It merely suggests. It does not express.

A fat back is simply a blanket of adipose tissue. To follow this argument to its end we must conclude that the thin back is the most expressive. And so it is, but it is not the most beautiful.

A back may be sufficiently expressive, and yet hide its spine. The backbone must not show. It should be well covered, but the covering of the shoulder blades should be light. For the chief beauty of the back is in the movements of the shoulders. A beautiful back, like the sea, should be in motion.

It must also be in proper proportion to the size of the body. No rule of mere dimensions can be laid down, but the eye instantly makes its relative measurements and the taste accepts the back as in proportion, or rejects it as out of proportion.

The shoulders should be wider than the hips. This will be denied, for it is not the canon of the Greeks or the later Romans, who admired huge hips. But it is the new figure, the elegant figure, the figure of the day.

The flesh of the back should be soft, but firm. Flabbiness, whether in an eyelid, the chin, the cheeks or the back is always ugly. The skin should be of fine, smooth texture. Its color should be white, but not of a dead white. I should rather describe it as peachy, for there would be an underlying tint of pink showing through the white.

There is no doubt at all that a back reveals character. Round shoulders spell laziness. A straight, firm back proclaims energy and self-reliance. A heavy back is a lazy back. The back is as expressive as the face. Perhaps more so. For its expression is natural, and can be changed with difficulty.

Women who have beautiful backs know how to dress them. They surround them, as a rule, with black, which is wise, for white or colors detract somewhat from their color.

Black is like a dark frame, throwing what it surrounds into exquisite relief.

I have always said, and more than ever believe, that black velvet is the most beautiful thing a woman can wear.

To show the back seems to me to be absolutely modest. That the graceful line from the neck to the waist should be revealed seems to me to be in the interest of art and beauty. On the grounds of both beauty and modesty, it would be well if we saw more undraped backs and fewer undraped fronts in the grand tier of the opera house.

RAVENS IN CAPTIVITY

For several years two ravens have occupied a roomy cage in the stable yard of the Star hotel at Kingussie. They seem wonderfully contented with their lot, writes one who knows them perfectly, and their glossy plumage, as well as their sprightly behaviour, indicate that captivity has neither broken their spirit nor interfered much with their health. Although their ordinary diet consists of raw flesh, both birds are fond of an occasional change, and they never refuse the offer of a chocolate or other sweetmeat. I have watched them frequently when such little dainties were presented, and generally noticed the same amusing programme. When a chocolate was held within reach of the wire-netting surrounding their home, the nearest bird hopped along its perch, and after a side-long look, a curious blend of suspicion and desire, grabbed the offering in its powerful beak, and, pretending to swallow it, looked up for a further gift. If forthcoming, that was similarly disposed of, and a fresh gleam of expectation shone in the glossy ones eyes. When nothing more was tendered, the bird retired and promptly disgorged what it seemed to have gulped down, and with its claws firmly gripping the sweet morsel, proceeded at leisure to break it down with its bill and eat it in detail. Sometimes, on receipt of the first offering, the bird hopped up to the highest perch and laid its tit-bit down, only to return at once for another. Both ravens appeared to take sweetmeats l'heureux fashion, in small portions and with relish. When tit-bits were wanting, the birds applied themselves industriously to the lumps of raw meat on the floor of their abode, at times suggested comfortable resignation, if not actual satisfaction.

A correspondent of the Autocar says he timed a hare running along a road in front of

his motor car, and found it reached a speed of thirty-two miles an hour.

A COLOR SHOWER

Something new in the way of showers for the bride is one in which a single note of color is carried out in all the gifts. The hostess first finds out what is the bride's favorite color,—as a shower is usually given by some intimate friend, she likely knows the color. Suppose pale blue is the favorite color. The hostess will send her invitations as informal little notes, asking a dozen or so of the bride's friends to a "pale blue" shower. If she can contrive to get a piece of narrow ribbon in the exact shade the bride likes best, and enclose a fragment in each note all the better. The invitations will explain that the guest may bring anything she likes, so long as it is pale blue or has a note of that color, and the hostess may ask that the gifts be sent the day before the party, to give her time to complete the arrangements.

The "shower" itself can be conducted in one of the ordinary ways. All the parcels should be wrapped in white tissue paper and tied with pale blue ribbon. One effective method of carrying out the scheme is to have a paper parasol of the chosen color, in which the packages are placed, hung from the ceiling of the room, with streamers of pale blue ribbon from each package. It adds to the merriment to have a verse of original poetry or an apt line, suggesting, but not naming the article, on a slip of paper on each streamer. This is read before the bride pulls the ribbon, and is designed to have the effect of stimulating curiosity rather than satisfying it. The articles may include sachets, a handkerchief case, a fine white chafing-dish apron run with pale blue ribbon through the beading, a pin-cushion cover of eyelet embroidery over blue, and so on through a variety of dainty things for personal use or for the dressing-room.

The prevailing color will, of course, appear on the luncheon or tea table. Pale blue is more difficult in a decorative scheme than pink, yellow or violet. Garlands and sprays of artificial forget-me-nots have been used effectively, failing the natural flowers.

"But, darling," murmured the lovelorn youth, "every night for two weeks I have been on my bended knees before you. Have you no pity?"

"I certainly have, Horace," spoke up the pretty flirt, as she reached for her hangbag; "here's a whole quarter. Go have your trousers pressed. After so much bending they must be baggy at the knees."—Wasp.

Odd Marriage Customs

In Siberia a bride, on entering her husband's house, must be prepared to show her skill in cooking. She is expected to give a dinner prepared with her own hands, as a test of the education she has received. If she pleases her guests it is taken not only as a proof that she is well qualified for her new position, but that her parents have trained their daughter so successfully.

In Norway, however, things are not quite so promising. The Norwegians are always trying to put the best foot forward, and they do it in reference to marriage as well as in reference to other matters.

It is said that a young man went out to seek a wife, and came to a farmhouse where there was more wit than money. The only thing of which the farmer could boast was one new sleeve to his coat. This must be made the most of. "Pray take a seat," he said, hospitably. "But this room is shockingly dusty," and, so saying, he went about wiping tables and benches with his new sleeve, while he kept the old one behind him.

His wife possessed one new shoe, and one only, but she made the most of it by pushing the furniture in place with it and keeping the other hidden beneath her skirts. "It is very untidy here," she said, "everything is out of place."

Then they called to the daughter to come and put things to rights. But the only new thing she possessed was a cap. So she kept putting her head in at the door, and nodding and nodding.

"For my part," she said, "I can't be everywhere at once." Thus they all tried to make the young man believe that the household was well-to-do.

A wedding among the Poles may certainly be said to hold its own among the more entertaining of marriage customs. There fun and profit are strangely mingled in the marriage festivities, for the bride depends upon the wedding festival for her dowry, and rarely fails to get enough to enable her to begin housekeeping with comfort.

After the wedding feast a dance is in order, and at that dance every man who would distinguish himself must, once in the evening at least, claim the bride for a partner. The honor of dancing with her, however, is not to be obtained lightly. The aspirant must win the privilege, and pay for it.

In one corner of the room the mother of the bride has taken up her position, with a plate

in her lap. The wise woman has chosen that plate carefully. It is made after the plan of an eating-house coffee-cup, and would not justly be described as frail.

The gallant who wishes to dance with the bride—and, as has been said, all are in honor bound to do so—must pull out a piece of silver and throw it into the plate. Not until he has succeeded in breaking or chipping that almost invincible piece of crockery has he won the honor he seeks. Few succeed in making an impression upon the plate for less than a sum equal to fifty cents of our money.

The money thus accumulated goes to the bride, and not unusually amounts to seventy-five or one hundred dollars, even where the bride is apparently as poor as it can well be. This sum, in a rural district of Poland, is enough to start the young couple fairly in housekeeping.

HOW THEY MARRY IN CHINA

Mrs. Archibald Little tells the story of love, courtship and marriage in China in the Lady's Realm. She says there is theoretically no love-making in China. In all classes of life marriages are arranged by middle-men or middle-women, and the young people do not even see each other's face till the wedding day. Marriage is regarded as a necessary duty in China, and the man who does not marry is called "a crooked stick." The bride becomes virtually the unpaid servant or lady-help of her mother-in-law, to pacify whom the husband affects dislike or indifference, even if he does not feel it. The marriage customs in Canton, she says, are particularly indelicate, but perhaps worse still in the wild west, on the Kweichow border. But all through China the Christian Chinese are trying to modify the wedding observances so as to make them a little more modest. When bride and bridegroom "sit down together on the bridal bed, each tries to sit on the other's dress, as the one who does so is supposed to have a Chinese wedding. Mrs. Little says that in place after place one hears of societies of girls pledged to one another not to marry, even in Yunnan, "where fathers breed pretty daughters as possible future articles of commerce." The writer bears witness to a change coming over the Chinese life. Young men are beginning to wish to see their brides before they marry. "Also young Chinese gentlemen have told me, 'Even amongst us we have husbands who are never happy unless they are with their wives.'"

F. I. T.

BAIT—BITES—AN

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Confession is good for a time, many years ago trout, and I wanted them with bait. I was checked usual mistakes of the young ing out to Canada to make way of outfit; for instance, of my last remaining some my ticket from Liverpool purchasing what the gun Road had assured me was weapons to take into the great unexplored West, at the same time careful my rods and fishing ta

Stopping off at Nelson I had a somewhat lighter than the half-inch shoe have been more suitable head of the blue grouse was all the use I found for distance of the Kootenay je to realize that I had not bringing out the of

It was in the spring of had prevented me from the usual mistakes of the man, and bringing out a of money with which to purchase tangible than experience an knowledge of human nature myself within a very short the country being initiated of prospecting for minerals who, for a grubstake, had of the part of initiator.

To break me in easily, the foxiness of his kind, short trip down the Kootenay for the riverside would be I discovery of mines rivaling richness, which would ena turn to the Old Country a tinction.

Truth to tell, I was not on this point or so intoxic air treatment as he, appear agine, but the open-air life always hankered for, and fo was gloriously content.

There was just one crum What man who ever was a hoped to be, could look on t may and not be itching to w man was careful to explain not do to go at the prospe hard at first, and so, when enquires as to the fishing river, and had peered over bank into the depths of a tra seen the beauties swimmi he had no objections to in tion that I should take a d town and get some fishing to try for some of those tro and wanted very badly.

When, however, I began best kind of flies to get, I upon myself the full force Flies were not what was were alright for the "dude sport, they could fool with f to, but what we wanted wa should not get with flies, bu edly would get, and all we So I was enjoined to get a hooks, and he would guar pole cut from the bush and a rotten log, I would be a trout I wanted. It was aga but he knew the country fish, and I was anxious to le teach me in other matters, a offend him; also for financial want to buy a new fly-rod, a "pole" seemed to my min sible; therefore I was obed

The Nelson stores in tho full and up-to-date lines th do in these days, and in the I tried I could only buy hal the size I wanted tied on store I obtained another half these sufficient, started mile tie-counting walk to ca gully next morning as I s pool where I had seen the swimming in the clear wa heavy pole and a tight lin more gut than that tied to a liberal supply of fine fat of the old man had dug out of was away in town after the bait fisherman; it was a but it was a fall which a chastening of spirit. first grub and dropped, and hopefully seized him and a second or two, when a through the water, and b struck, and the line tighten strong, the pole was ditto, a were to "yank" him up onto to play around with him and promised on the "yank" B steady pull, and the fish wer hook came mine; my first K been hooked and lost. The out criticism of a lurid and while I took the hook in my to pick out a fresh juicy gr tion was at once obvious an the aforesaid criticism; the