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1934

773RD ORDINARY GENERAL MEETING

HELD IN COMMITTEE ROOM B, THE CENTRAL HALL, WESTMINSTER, S.W.1, ON MONDAY, JANUARY 15TH, 1934, AT 4.30 P.M.

DOUGLAS DEWAR, Esq., B.A., F.Z.S., IN THE CHAIR.

The Minutes of the Meeting of June 12th, 1933, were read, confirmed, and signed, and the HON. SECRETARY announced the following elections since the last meeting:—As a Member: Sir Robert Armstrong-Jones, C.B.E., M.D., D.Sc., and Wing-Commander P. J. Wiseman, R.A.F., as Life Associates. The following were elected as Associates: The Very Rev. Dean W. L. Armitage, D.D., W. H. Boulton, Esq., Dr. Catharine C. Bushnell, F. D. Coggan, Esq., B.A., T. Martin Cuthbert, Esq., M.R.C.S., L.R.C.P., Mrs. Ada B. Frome, Miss M. E. Galloway, Miss Ethel F. Hart, the Rev. M. B. Lambdin, W. G. Marley, Esq., M.Sc., Rev. G. M. Maudsley, M.A., Rev. H. J. Murphy, M.A., Rev. George Tulloch, Zion Research Library, U.S.A.

The CHAIRMAN then called on Captain Bernard Acworth, D.S.O., R.N., to read his paper on "Bird Flight and its Bearing on Evolution."

BIRD FLIGHT AND ITS BEARING ON THE THEORY OF EVOLUTION.

By Captain B. ACWORTH, D.S.O., R.N.

FROM time immemorial birds have been regarded as emblems of the freedom for which man has ever yearned. The alleged ability of birds to come and go over land, mountains, deserts and seas at will, is contrasted with the former disabilities of man who, for lack of wings, was subject to restrictions in his movements about the world. Hence the world-wide enthusiasm for artificial flying which is believed, erroneously, to have conferred on man, at long last, the freedom of the birds.

To the uninitiated observer the power of flight must appear, almost inevitably, to confer freedom upon those equipped to employ it, but I hope, in the short time at my disposal, to be able to demonstrate that creatures, and airmen, dependent upon

flight for their movement, are in reality in a state of bondage which no earth-bound creature experiences.

Before considering the disabilities of birds, it is necessary to master what I have termed, in "This Bondage," the two Laws of Currents which regulate *absolutely* the motion of any body, natural or artificial, through the moving atmosphere.

The First Law of Currents.

No bird or machine can experience any pressure from the movement of the medium in which it is supported and operating.

This simple statement of fact may be amplified and expressed thus:

A bird, like any other air-borne body in flight, feels only a dead calm so far as wind-pressure is concerned. It feels neither the force nor the direction of the wind except possibly a momentary sensation, due to change of *inertia*, if, in the immediate region of the minute area it occupies, a sharp variation in speed or direction of the wind occurs. In the open and unobstructed atmosphere it is doubtful if such variations obtain.

From this it follows that a bird in flight is the only creature (with the exception of a submerged fish) which never *feels* a breath of wind.

This fundamental fact can be simply conceived by thinking of a fly flying in the enclosed calm of the saloon of an ocean-liner travelling over the sea at a speed of 20 knots, the air enclosed in the liner's saloon being to the fly what the wind is to birds and aircraft. The fly experiences a draught from right ahead equal to its flight-speed through the saloon, regardless of the fly's direction of flight and of the speed and course of the liner itself. Again, though the fly rises and falls with the roll or pitch of the ship it feels no pressure from the vertical movement of the enclosed air in which it is flying. As with the fly, so with ourselves in a vehicle which is itself moving and enclosed. In short, the dynamics of movement in a single all-embracing medium are totally unaffected whether the all-embracing medium is stationary or in motion.*

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* The phenomenon of movement within a movement is carefully examined in the analogy of an "Aerial Dome of Relativity" in pages 61–70 of "This Bondage."

Thus a bird flying in a strong adverse wind, even of gale force, feels nothing of the pressure of this wind, neither does it feel the pressure of a gale blowing in the same direction as the bird's direction of flight, nor yet of a wind at an angle to its own direction of progression. To a bird in flight there is no such thing as "wind," the bird being, in fact, in a dead calm so far as pressure is concerned. Air-borne bodies, whether giant airships, aeroplanes, albatrosses, tiny birds, insects, or a puff of smoke, become integral parts of the medium in which they are supported and operating, in precisely the same way as a submerged submarine in a current, a fish in a river, or an insect flying in an ocean-liner is at one with the movement of the water in which it is submerged, or with the enclosed air of the steamer's saloon in which the insect flies. The belief, common if not universal among biologists, that wind has a relation to the outspread wings of a bird analogous to the action of wind on the sails of a ship or a kite, or of steam on a turbine, is false. From this it follows that the biological conception of the evolution of a wing structure re-adapted to an environment which has changed from a watery or a reptilian environment in the past, to a more recent wind-swept one, is untenable.

The wings of birds are *oars*, not sails, with all that the distinction involves. The expressions "a following wind," "a head wind," or "a side wind," constantly employed in scientific treatises on birds, have no true meaning though they convey a false one. These so-called winds are in reality *currents*, and their movements *relative to air-borne birds* are non-existent.

But although the bird *feels* no wind pressure, the effect of these currents is overwhelming, as an example will show. Because birds assume the full speed and direction of the air in which they are borne, let us consider a swallow whose own proper flight speed through the air is 50 miles per hour; let us also assume three conditions of the atmosphere in which it is flying:

(*a*) A calm, that is to say, still air.
(*b*) A favourable current of 40 m.p.h.
(*c*) An adverse current of 40 m.p.h.

For the sake of simplicity assume the bird to fly for 24 hours on a course which renders the current, if flowing, to be directly favourable or adverse. With these assumptions, which can be varied infinitely to meet all cases of flight or migration, we arrive at some remarkable discrepancies as to the ground covered

in each case, *though the distance flown through the moving air, and the energy expended by the bird, are the same in all cases.*

In case (*a*) the bird covers $(50 + 0) \times 24 = 1{,}200$ miles over land or sea.

In case (*b*) the bird covers $(50 + 40) \times 24 = 2{,}160$ miles over land or sea.

In case (*c*) the bird covers $(50 - 40) \times 24 = 240$ miles over land or sea.

Thus in one day the direction of what we on land or sea *call* the wind, but what to air-borne bodies is *a moving calm*, affects the bird's translation by 1,920 miles.

From the foregoing facts it is plain that birds are absolutely parasitical to the air in which they fly, which implies that under circumstances which regularly arise with the changing seasons they will be compelled to leave their homes without any intention on their part. Herein lies the secret of "migration" which will be further examined in due course. It should, however, be pointed out at once that the compulsion under which the bird lies to leave home constitutes a damaging criticism of the evolutionary theory that birds leave their homes as a result of a *biological* urge handed down from prehistoric times. As is always the case, conclusions reached through sound reasoning will bear the test of experiment. Mr. A. G. Butler, the author of "British Birds," has pointed out that red-starts and red-wings, for example, show no restlessness or "urge" to migrate during the migration season when confined in a large sheltered aviary.

Let us now turn to the second Law of Currents which is as follows:

The Second Law of Currents.

Air or water-borne bodies, heading through an intervening current for a fixed spot, must proceed on a curve, and must arrive at their destination, if at all, exactly head on to the current.

An analogy of a bird heading for a fixed spot through an air-current is furnished by an unreasoning person in a boat crossing a river.

A reasoning boatman, bound for a fixed destination in or across a river, steers a course which, though not apparently the direct course, becomes the direct course when the course and speed of the boat are superimposed upon the direction and

speed of the current. When the destination, as in a river, is visible, he so adjusts the course of his boat through the moving water that the bearing of the destination, the equivalent of the direct course over the ground, remains constant. Judgment, knowledge and close reasoning are thus needed, and employed.*

On the other hand, an unreasoning person whose mind is as complete a blank on the Laws of Currents as are the minds of many leading biologists, and of all birds, will steer straight for the spot he wishes to reach. He will thus row an unnecessarily long distance, and if he can reach the desired point before he is exhausted, he will reach it *exactly* bows on to the current.†

An admirable example in nature of the curve assumed by an unreasoning creature steering for a fixed spot through a current is provided by the water-rat. Here the speeds are reduced to speeds which the eye can follow, and an observer can watch the ever-varying angle which the course of the rat through the water makes with the direction of the stream itself. Furthermore, the current of water, unfelt and unperceived by the water-rat, can be *seen* by the observer. Those who have watched these little creatures crossing a stream will immediately recall the curve, and recollect how the rat, as it nears the other side, is heading progressively upstream, and how it eventually reaches the other side, if there is no impediment, exactly head on to the current. It may well happen that a spit of sand, or a tree-root, may jut out into the stream so that the rat's *homing curve* is interrupted. In this case it lands and proceeds overland to its destination, this last part of the journey being *straight* because the ground is stationary. But who has ever seen the water-rat *allow* for the current as a seaman allows for the current through which he is navigating his vessel? If it is true that the animal world learns wisdom by experience, and transmits this accumulated wisdom as "instinct" to succeeding generations, as evolutionists assume, it is curious that, as the ages roll by, no water-rat has discovered the saving of exertion possible if it made *allowance* for the current which separates it from its destination across the stream. Such a seemingly trifling, though in reality infinite, step forward in the mental "evolution" of rat "mind" continues to be conspicuous by its absence.

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* See Fig. 1 and explanation.

† See Fig. 2 and explanation.

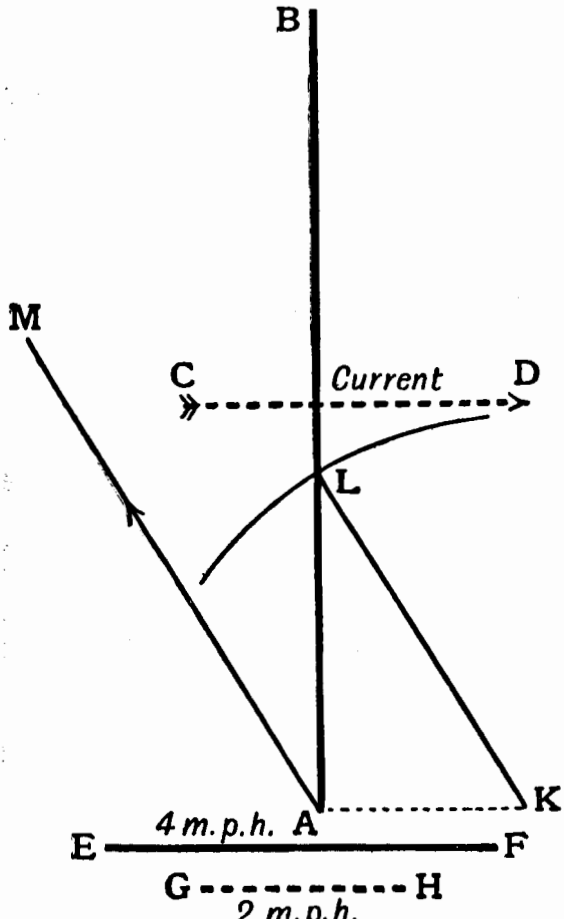

FIG. 1.—THE STRAIGHT LINE OF REASON.

Suppose a boatman wishes to row, or a seaman to steer, from A to B, across a current CD at right angles to AB, and flowing at, say, half his own speed. Problem: to get to B with least exertion, or expenditure of fuel, and in shortest time.

Let a length EF represent the rate of rowing or steaming, and GH, in proportion, the rate of current. Set off AK = GH at right angles to AB, and with centre K and radius EF describe an arc cutting AB at L. Now draw AM parallel to KL. If then the vessel be headed continuously on the bearing given by AM, it will automatically reach B along the direct line from A.

Similarly with regard to aviation.

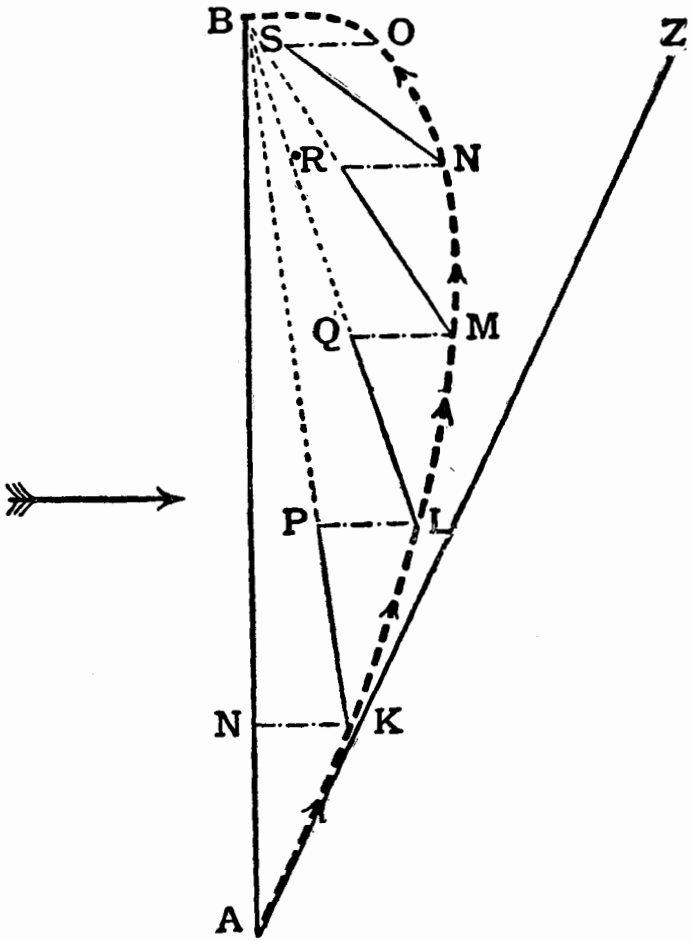

FIG. 2.—THE INSTINCTIVE CURVE OF NON-REASON.

An unskilled boatman at A heading direct for B, across a current flowing at half his own rate at right angles to AB, instead of proceeding from A to B direct will ultimately reach B by the curve AKLMNOB, and exactly head-on to the current.

Similarly with regard to bird flight.

Here is another fact which conflicts with the theory of Evolution.

Let us now bring into conjunction the two Laws of Currents to which birds must, from the beginning of time, have been obedient. From the first Law it is plain that birds are absolute parasites of the moving atmosphere and must thus be subject to the dominance of their aerial environment when the speed of the movement of this environment is high relatively to the bird's own speed. It shows, furthermore, that a bird is *compelled* to drift from its home without any *intention* of migrating.

From the second Law it is plain that, in the absence of an unerring sense of direction, a bird must be endowed with a reasoning mind capable of recognition, and of action based upon recognition, if it is to regain its home from the distant lands to which it has drifted.

But flight by recognition is impossible because the winds which carry away the birds in the Autumn vary in direction, though the general trend is constant. Birds must, therefore, be drifted to localities which they have not previously visited. How then is recognition possible? Furthermore, over great stretches of sea no leading marks exist. We are thus forced to the conclusion that birds have an unerring homing sense which orientates them to the exact spot in space at which they were born. That birds have this imponderable sense is, as a result of experiment, accepted by well-known biologists.

In the *Quarterly Review* of July, 1927, the late Sir J. Arthur Thomson said: "The experiment made with brooding terns removed in closed baskets from the Tortugas, and taken on board steamer for hundreds of miles into unknown waters, whence a variable percentage returned in safety,* seem to prove conclusively that there is a 'sense of direction' whose nature and location are quite unknown."

Again, on the same authority, a pigeon returning to its nest will fail to retrieve its eggs which have been removed from the nest to a distance of *two inches*, a fact which well illustrates the exactness of the mechanical sense of direction, but which reflects gravely on the "mind."

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* That some birds did not reach home was owing to the mean speed of the intervening air-current and the consequent failure in endurance of the bird: it was not attributable to a variable accuracy in the sense of direction.

What scientific experiment suggests, reason, in *this* instance, confirms. The fact that a water-rat, or a bird, reaches its destination exactly head to wind proves, by abstract reasoning, that it does in fact head for its destination as otherwise it would not arrive head to wind. It also follows that birds always fly on curves governed by the force and direction of the intervening air current. We need not, therefore, look further for the cause of the " variation of fly lines " to which biologists so frequently allude, though they wilfully, or blindly, disregard the conflict between the variation of fly-lines and their theory of flight by recognition, a theory by which they support their assumption of " mind " in birds. Owing to the variation in the winds, curves of flight must be infinitely variable, a fact which *quantitatively* disproves the use of recognition for which, as I have shown, there is no need. If the two unchanging Laws of Currents are now linked with the sense of direction, or " homing sense," the phenomenon of migration assumes a beautiful harmony bereft of every vestige of a reflecting mind in the birds themselves.

Let us now consider briefly the " migration," or as I prefer to call it, the *drift* of the swallow. Let us assume, as before, that its flight speed is 50 miles per hour. During the normally quiescent summer months it will leave its nest at daylight and hawk its food on the wing, its own flying speed enabling it to return at dusk to its home, the spot in space to which it tenaciously clings. When the equinox, with the accompanying instability of the atmosphere, arrives, we will assume that the mean speed of the wind rises to 30 miles per hour, a speed greatly increasing with height. The swallow leaves its nest at dawn and on the wing becomes unconscious of the wind which, to the bird, is a moving calm.

When hawking a fly *down wind*, it covers the ground at 80 miles per hour. When it turns to chase its food *up wind*, though still unconscious of wind pressure, it makes good 20 miles per hour over the ground. Multiply such evolutions through the day, and it is clear that the swallow will drift great distances away from its home and in the direction towards which the prevailing wind is blowing. At dusk, far from its nest, it will *perch*, if over land, while over the sea, if its endurance, an exact quantity, is exhausted it will drown.*

* See Fig. 3 and explanation.

Day by day the process of drift will continue, the bird striving for home when not engaged in its primary business of feeding. It thus "migrates" *backwards*: its drift is *resisted*, and in Southern climes it is a homeless vagrant, as confirmed by the late Mr. T. A. Coward. The bird is cut off from its Northern home by the winds of winter which, if turning southerly for a

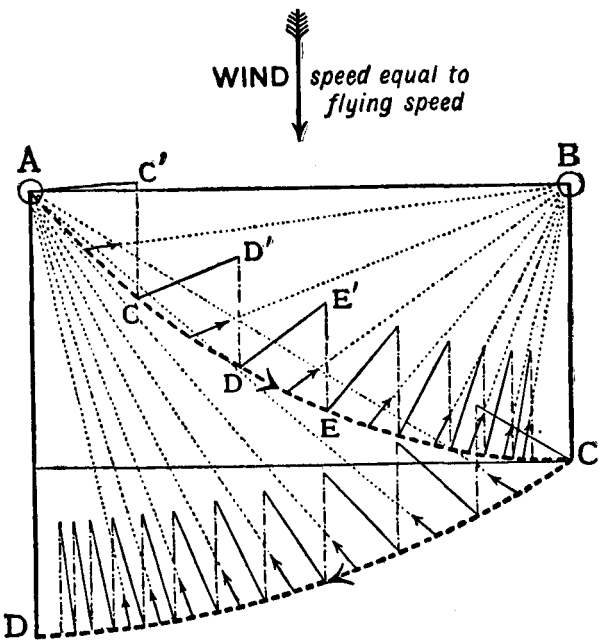

FIG. 3.—DRIFT CURVES.

Wind speed—at right angles to AB—assumed equal to bird's flying speed. Thus a bird starting from its nest at A and hawking food in any direction, as towards B, for instance, will be carried to C (BC = ½ AB).

Trying now to return to its nest at A, it will be carried to D; and so on, with infinite variety, throughout the day, the case being at its worst when hawking down wind.

few days in a mild winter, will bring swallows unexpectedly to England while unusual mildness lasts.

Having considered the effect on the birds of Autumn and Winter let us turn to Spring. Spring, as we know, is accompanied by southerly and south-easterly winds within which the

swallows, though unconscious of the winds, are still hawking their food and orienting themselves, when not feeding, for home. Their autumnal drift backwards is thus reversed into a northerly drift home, the speed of this drift, broadly speaking, being the sum of the bird's speed and wind speed instead of the difference. We should therefore expect the return to be very much more rapidly executed than the departure. This reasonable expectation has recently been confirmed in *The Times*, where a correspondent showed that the return of the storks *from* the south occupied approximately half the time of the drift from their homes *to* the south.

As already shown, the swallow's track for home is on curves. Because, in the course of its wanderings, it will experience gales from directions which differ from the main direction of the permanent winds, these curves of flight will sometimes take them over oceans in which they will be drowned in myriads when their flight capacity, an exact quantity, is exhausted. The comparative stability of the numbers of the bird world reveals how enormous the annual loss must be through flight failure.

Lack of space prohibits further consideration of "migration," common to *any* bird of *any* species that becomes subject to the great air currents of Autumn, Winter and Spring. But, as I have shown in "This Bondage," all bird phenomena which introduce the flight factor become explicable through the operation of the Laws which I have explained. By these Laws we can safely anticipate the desertion of nests in exposed sites; the drift of fledglings to the south before their parents; the premature appearance of young passage-migrants across England; the separation of the sexes of a species in which the size, and therefore the weight, and thus the *flying speeds* of the male and female differ, and hence *the drift*, a phenomenon also occurring with butterflies; the earlier re-appearance in the nesting season of the heavier, and therefore faster, bird of a pair (generally the male). In the case of the red-legged phalarope the female is the heavier bird which thus arrives home before the male. During the southern winter drift, flocks of female birds will tend to develop without a male in the flock. These and other phenomena are all in harmony with the Laws of Currents regulated by the "homing" sense.

The sequence of events is determined, not by any gleam of memory or reflecting capacity in the bird, but by the changeless

laws of physics and dynamics. If, therefore, birds are mindless, there can have been no "evolution" of mind in birds; neither can there be any common denominator between the brain of bird and man, as evolutionists claim.*

* * * *

Up to this point I have offered *quantitative* disproof of bird "mind." I have also shown that the structure of a bird's wing cannot have adapted itself to meet wind pressure which, to a bird on the wing, does not exist, though assumed to exist by eminent biologists with little or no knowledge of the laws of physics and dynamics. I will now turn to a demonstration that birds cannot have evolved from a common origin or to suit changing environments.

"The Law of Dispersal" is said to be an evolutionary "law" based upon the assumption that bird life underwent wholesale extermination in pre-Glacial, inter-Glacial, Pliocene, or Pleistocene Ages. Arising out of this alleged disaster present migrations are attributed to "the constant endeavour" of what we are invited to regard as the relics of such exiled life, to regain and "re-people" the area that it once occupied during pre-Glacial times.

"Extension of range" is treated as an indication of the gradual success of this "constant endeavour," while the trend of birds northwards at the breeding season is advanced by biologists as a proof of inherited memory passed on to succeeding generations in the form of "instinct," "sexual urge"—that bee for ever buzzing in the biological bonnet—being invoked as the "trigger" which sets this train of inherited memory in motion. The main routes of migration are alleged to provide proof of long vanished land-masses over which, without a shred of evidence, hundreds of fathoms of sea now roll.

In evolutionary works on ornithology† we find the assumption that there was "a cradle of the bird world" in which bird life

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* In her recent book, "Animal Mind," Miss Frances Pitt says: "I firmly believe that the mind of *Homo sapiens* differs in degree, but not in kind, from that of his fellow-inhabitants in the world."

† Writing in the British Association number of *Discovery* of September, 1927, Professor C. J. Patten, M.A., M.D., D.Sc., Professor of Anatomy in Sheffield University, says: "In no department of biological study is the evolutionary factor brought out more strongly than in bird movement."

first evolved out of reptiles, from which progenitors the various species, in their turn, are said to have "evolved" to meet new environments introduced, so far as an ordinary person can understand, by migration from the "cradle," or "specific centre" as it is sometimes called, to the outlying parts of the world. The "specific centre" theory thus seems to be a necessity of the evolutionary hypothesis.

Darwin admitted the difficulty, if not the impossibility, of reconciling the geography of the world with a "specific centre," extended by migration, so far as mammals were concerned. He and his disciples, however, felt themselves on surer ground when they applied their theory of migration from a primitive "cradle" to the bird world, for, as they erroneously have supposed, birds are *free*, and can fly where they like and evolve and change their nature to suit new environments.

I have already shown that the Laws of Currents, and these alone, are responsible for the dispersal of birds. Subject to these laws bird life ebbs and flows about the world in harmony with the great seasonal winds. In addition to the seasonal winds, however, there are the *permanent* winds which impose impassable barriers, and which confine the birds of the various species to localities agreeable to their specific needs. May I direct your attention more particularly to the two great belts of permanent wind round the world. These two winds are north-easterly, north of the Equator, and south-easterly, south of the Equator. The tropics are dominated by these two great permanent winds which are in reality rapid equatorial air currents flowing inwards from the outlying world. It is plain, therefore, that the bulk of tropical birds inhabiting the regions upon which these in-flowing currents converge must be physically prevented from leaving them so long as they prevail.

Conversely, if these mighty currents, for some cataclysmic reason, reversed their directions, the tropical bird world would be dispersed over temperate lands, their dead bodies being recovered in myriads, for they clearly could not sustain life below a certain mean temperature. Now inward-flowing air-currents must have prevailed since the world existed, and for the following reason. The earth has always, from the nature of things, been subject to a variation of that temperature which is derived from the sun, so that relatively to the temperate and arctic regions there must always have been a tropics. When the superficial heat of the cooling earth was greater, as it once

undoubtedly was, this added temperature was common to the world as a whole and was merely superimposed upon the permanently differentiated temperature due to latitude. But because differences in temperature, in conjunction with great land-masses and water-masses, are the direct cause of wind; and because the rotation of the earth, which is constant, superimposes a constant trend upon these temperature-created wind currents, there must, therefore, always have been *permanent* winds in the furthest ages of the past which would then, as now, present as impassable barriers to birds of limited flight power as must *seasonal* winds have always ensured their translation to parts of the world agreeable to the essential needs of appropriate species.

From the foregoing facts it follows that the species of birds found in particular temperature zones must have had separate origins. These facts seem, therefore, to demolish the "cradle of life" theory and thus the theory of Evolution as it affects the common origin of birds.

It is of interest to contrast the curious lack of knowledge of biologists, anatomists and embryologists, on the laws of Physics and Dynamics, as shown in "This Bondage," with the very exact knowledge of the writer of the Book of Exodus. In Exod. x, 13, we read:

> "And the Lord brought an east wind upon the land all that day, and all that night; and when it was morning, the east wind brought the locusts."

And again in verse 19:

> "And the Lord turned a mighty strong west wind, which took away the locusts, and cast them into the Red Sea."

The story of the locusts, as of the quails, exemplifies not only the remarkable accuracy of Biblical narrative, but the employment, and not the transgression, of natural laws in miracles of Divine interference with the ordinary affairs of man.

In my recent book, "This Bondage," I have, by means of quotation, exposed the remarkable ignorance of the "biological" world of the physical laws which govern, *absolutely*, the environment in which birds and insects on the wing operate. This ignorance reveals the extraordinary danger of the over-specialized study, and therefore prejudice, of what is called the science of biology. In this connection, I should like to associate myself

with the protest of the late Lord Halsbury who, as President of the Victoria Institute, on June 21st, 1915, said :—

> " I wish to make a general protest against the notion that a gentleman who calls himself a ' Professor,' without any sufficient qualifications, is thereby placed in a position of authority, and can make statements without a particle of evidence to prove them. I may be prejudiced in my view by my experience as a lawyer, but in court we are expected to give full proof in support of every assertion, and if we do not, it is naturally assumed that it is because we cannot do so. A ' Professor,' on the other hand, appears to consider himself relieved from any such anxiety. He seems to think that all he has to do is to say that such and such is the case, and as he is a ' professor ' he cannot be contradicted or brought to book. If anyone brings forward an argument on the other side, the ' professor ' says that his opponent has made a mistake ; but being a ' professor ' he does not consider himself obliged to substantiate even this assertion."

As I have challenged, a little sharply, the evolutionary theories of " biology "—the word of life—I cannot do better than quote the very candid admission of Sir Arthur Keith who, in the *Evening Standard* of October 15th, 1928, said :—

> " To confess the truth, we are a team of tipsters rather than serious students of the book of life."

Discussion.

The Chairman (Mr. Douglas Dewar) said : Our Society is greatly indebted to Captain Acworth for his admirable paper. I hope that those of you who have not already done so, will read his volume " This Bondage," which I deem to be the most valuable contribution to the subject of bird migration, which has been made since the appearance, some twenty years ago, of Howard's " Territory in Bird Life." Captain Acworth's book has received scant recognition by ornithologists, because, being an attack on their fetish, evolution, it is to them anathema !

As Captain Acworth points out, ornithologists, owing to their erroneous views of bird flight, and their belief that birds have complete mastery of the air, have paid little attention to the effect

of wings on migration. Obviously the migrations of those birds whose powers of flight are comparatively poor must be largely regulated by the prevailing winds. As long ago as 1603 George Owen wrote of woodcock in Pembrokeshire: "Yf ainie Easterly winde be alofte, we shalbe sure to have him a fortnight and sometimes three weekes before Michaelmas." But it seems to me that, in the case of powerful fliers, the southern migration in autumn is something more than a mere drift more or less against the will of the birds.

Take the case of the swift, probably the most powerful flier of the birds that visit England. It is, after the cuckoo, the first bird to go south. Observations of Blackwell, extending over 14 years, show that August 17th is the average date on which swifts disappear from the neighbourhood of Manchester, while that of the great majority of migrants falls in the second or third week of September. Thus the bird best able to fly against the wind is one of the first to leave this country in the late summer. The swift departs at a time when the temperature is high, as a rule some 8 degrees higher than at the time of the bird's arrival. Apparently it is not lack of suitable food that causes the swift to leave us, because a few swifts remain after the great bulk have disappeared; individuals have been observed in England as late as October 25th. It seems to me, then, that there must be an urge to the southward migration just as there is to the northward one.

Possibly the birds that periodically migrate may fall into two classes, those which migrate because instinct urges them to do so, and those that have no such urge, but drift under the action of the wind, southward in the autumn and northward in the spring. Should further observation show that this is the case, the discovery will be the direct result of Captain Acworth's work. His remarks about winds being a barrier to the dispersal of birds are most suggestive. I think that the prevailing winds of the earth must prevent all weak fliers from spreading from the northern to the southern hemisphere, and *vice versa*.

Further, if the evolution theory be true, the earliest birds to evolve must have been indifferent fliers, and the various wind currents would have completely controlled the range of these. It is significant that the great majority of our northern migratory birds seem never to migrate beyond the equator. On the other hand, there are

perhaps forty species that breed in northerly regions but spread as far south as Cape Colony in winter; the swift, swallow, red-backed shrike, spotted flycatcher, willow warbler, white stork, several of the terns and sandpipers, and others.

My views on evolution are entirely in accord with those of Captain Acworth. There are signs that the general public are beginning to see that the hypothesis is not supported by adequate evidence. Last spring, in the course of a lecture on Indian birds given before the Midland Institute, I made the following remarks which were received with applause: "Evolutionists assert that birds evolved from some reptile. I don't believe this. There is no fossil evidence in support of the hypothesis. The Jurassic bird *Archæopteryx* is no more evidence that birds evolved from reptiles than the duck-billed platypus (an Australian bird that lays eggs and has a duck-like bill) is evidence that mammals evolved from a bird. When some one will show me a series of fossils linking an undoubted reptile to an undoubted bird, I will take off my hat to the evolutionists. Until this happens, I beg leave to assert that evolution is an unproved hypothesis. I am prepared to argue the matter out in public with any evolutionist who cares to accept the challenge." This challenge has not been accepted, and is not likely to be. Lord Halsbury's remarks quoted by Captain Acworth, are fully justified. A man would be non-suited in a Court of Law who based his claim to an estate or a title on his descent from an ape or other animal, because he could not adduce a shred of evidence in support of his claim. It would be a good thing if every biologist were made to study the Laws of Evidence in order to learn how properly to weigh evidence.

I do not follow Captain Acworth when he denies that a bird has a mind; but, as he does not define the term, it may be that we agree on this matter. I cordially endorse his protest against the anthropomorphism that characterizes the writings of Miss Frances Pitt and many other naturalists. May I repeat what I have said elsewhere: "Whatever they may be, the fowls of the air are not feathered human beings, of limited intelligence and devoid of learning."

No matter what views we hold, I am sure we agree that Captain Acworth has given us a most stimulating paper, and so I call on you to accord to him a hearty vote of thanks.

Sir Ambrose FLEMING (President) said: This paper by Captain Acworth contains much interesting matter for discussion. The author has made plain some difficult points in relation to the motion of animals through moving air or water, and shown that some assumptions regarding such motion are erroneous. The same was formerly the case with regard to the motion of ships through water. These assumptions were only corrected by careful experiments and observations.

The question on which there is still some room for debate is on the theory of the migration of birds. The author grants that birds have "an unerring homing sense" and can return from great distances to their nests or domiciles. This power, however, is exhibited by many other animals, such as dogs and cats. Whether it comes of sight, hearing, or scent, it does seem to indicate the operation of *mind* of some kind—the outcome of memory of places or stored-up visual impressions.

As regards the theory of bird-migration which the author has given to us, I venture (only with diffidence) to comment on it, on account of ignorance of my ornithology. Is it not a fact, however, that this migrating power is very different in various species? Some birds journey thousands of miles and some hardly any distance at all. Again, if it is due primarily to the action of wind on the bird, how is that reconciled with the great irregularity in the direction and force of the wind at any one place?

Even though birds may have no feeling of pressure of the air on flight yet when trees are blown violently about by wind and drenched with rain, and when food is difficult to obtain and the hours of darkness are long, the bird must find life more difficult, and realize by experience that flight to the south or toward the sun, renders conditions more pleasant. These experiences may be stored up in memory and transmitted from one generation to another by habit. I cannot agree with the view that birds have no "mind," although their intelligence is different, not only in degree but in kind from the conscious reasoning intelligence of the human being. The migration of birds must be based on some experience of the species in the far past, that advantages are gained by having, as it were, a double domicile, and avoidance of privations due to winter weather conditions by the annual shift of residence. The true nature of animal

instinct and the continual performance of useful actions, in identically the same manner generation after generation is, however, a very large and yet incompletely solved problem.

Mr. G. A. LEVETT-YEATS, C.I.E., F.Z.S., said: I wish to thank Captain Acworth for his paper, which has very aptly been described by the Chairman as "stimulating." It does, indeed, give food for thought, but there are one or two points which do not appear to have been dealt with, and on which I would ask for further information.

The President of the Institute has already asked a question that also came to my mind, namely, why are not all birds forced to migrate by the winds that cause the migration of some species? This question, which is very pertinent, I would like to amplify somewhat, by asking why it is that these winds exert their power over only some members of a migratory species and not on all the members? Thus some robins migrate, while others remain resident.

The same may be said of other birds, such as blackbirds, rooks, etc. All the members of these species should come under the influence of these winds, but as a fact, they do not. Also in regard to the intelligence of birds, I do not feel that the evidence supports the view that they have no intelligence, and cannot learn. Doubtless their range of intelligence is limited, but their brain, the organ of intelligence, is modelled on the same plan as the human brain, though it is not so highly developed.

I would mention as an instance of intelligence and observation, that some starlings that frequent my garden have now learnt to feed on a piece of fat that I hung up on a tree for the benefit of the tits. Last year the starlings did not attack the fat except on one occasion, when one bird did so for a brief period. This year they have noticed the fat, and now regularly feed on it, perching on it, and hanging on to it much as the tits do. This seems to show that they have learnt something new, and have some mental powers, though limited.

Mr. R. DUNCAN, while welcoming the lecturer's opposition to evolutionary theories, said he found difficulty in accepting any idea that migration was involuntary on the part of the birds, and

was, in effect, due to their being carried alternately north and south by seasonal winds. His own impression, from recollections of swallows congregating together before migration, was that, when they disappeared the general trend of the winds was not such as would compel (or even assist) southerly flight. He had read, moreover, of a pathetic instance of endeavour to migrate along the ground. It came under notice on the pampas of South America, a pair of wild geese being concerned. The female had a broken wing and the male, instead of departing with the main flock, had loyally remained with her. She, poor thing, when seen, was trying to negotiate the long, long trail southward on foot, while her mate, at brief intervals, flew a little ahead to encourage her, waiting then till she came up.

As to the existence of mind in birds, it seemed to him indisputable. Consider only the amount of circumspection they showed in the choice of nesting-places. They always took care to build, either where the nest was well hidden, or where enemies could not easily get at it. And is it not reasonable to infer that, as in the case of humans preparing to set up house, the pair concerned would have to do a lot of preliminary hunting round and mutual consultation before deciding finally where to make their home ?

Pastor G. J. Cooke said : It is an observed fact that migratory birds on the E. coast usually arrive against the wind during the autumn migration, and travel along the North Norfolk coast in an E. to W. direction, *i.e.*, continue in a direction against the prevailing winds at that season. The general trend of migration is from Siberia across Europe, and *via* Jutland, to the east coast of England, then passing southwards and south-west to France and southern Europe. I should like to ask the lecturer how that agrees, especially in the case of the swallow, with his theory of " drift," seeing that swallows congregate in flocks, and " take-off " in September in a direction contrary to the usually prevailing winds ?

Dr. R. B. Riviere, in " A History of Birds of Norfolk," says : " Only brief intervals exist during the year when migration is not in progress . . . autumn migration begins last week in June or early in July with the return of the waders. In this group the spring and autumn migrations nearly overlap, for hardly have the last of such species

as Grey Plover and Dunlin left for their northern breeding quarters, than the first young birds of more northerly breeding Dunlin arrive." I ask then, how can these migrations be due to wind direction ?

J. H. Gurney, F.Z.S., a well-known ornithologist in his day, said, in a pamphlet entitled " Bird migration on the East coast of England " : " This preference for a head-wind may be the deciding factor in determining the direction in which they move."

W. Eagle Clarke, " Studies in Bird Migration "—says : " The deciding factor in undertaking the sea-passage would appear to be, the presence of anticyclonic conditions . . . *perhaps rather the cessation of a tail-wind.*" Anyone knowing the East coast from which I happen to come, or near it, will know that the prevailing wind for long periods in the spring months, during which the spring migration takes place, is north-easterly, or at least from between north and east, or exactly opposite to the direction of the migration trend. The whole of the above evidence tends to show a purposive movement in migration, often carried out against great obstacles.

Written Communication.

Dr. A. Landsborough Thomson, C.B., author of " Problems of Bird Migration " (1926) wrote : Captain Acworth begins by expatiating upon some elementary physical facts about wind and flight, to which he gives a false appearance of novelty and alleges ignorance of those facts on the part of biologists. Everyone will admit the truth of his statement that a bird or any other flying thing is in effect part of the body of air in which it flies, that its own movement is relative to this body, and that it is therefore incapable—once it has left the ground—of feeling either the strength or the direction of any wind there may be ; it feels, indeed, only the head-on draught caused by its own passage through an apparent calm. This fact is very well known, and the suggestion that a contrary belief is " common if not universal among biologists " is absurd.

This " law," with its implications of *air speed* and *ground speed*, is correctly stated—or taken for granted as an obvious truism—in serious modern works dealing with aspects of ornithology to which it is relevant. Such terms as " head wind " and " side wind," condemned by Captain Acworth, have a perfectly proper meaning when the movement of the flying bird *relative to the earth's surface* is

under consideration. Captain Acworth insists that " the wings of birds are *oars*, not sails," but this distinction is familiar ; it can be found expressed in ornithological works of the present and past centuries—not to mention that the simile was used by Virgil !

Captain Acworth's second " law " is scarcely less a truism. It is that air-borne bodies *heading continuously for a fixed point* through an air-current must proceed on a curve, and must arrive at the destination exactly head to wind. His further assumption that birds have the power of heading continuously across wide seas toward an *unseen* fixed point, however, is purely speculative, and there are alternative theories of orientation that have at least equal plausibility. As a speculation it is of some interest, but Captain Acworth is not entitled to regard it as proven fact upon which further argument can be securely based.

Captain Acworth has still more completely abandoned knowledge for speculation when he argues that, because wind has its admitted effect upon flight, it must therefore be the sole cause of migration, and he is thus led to a conclusion which is at variance with another well-established body of facts. He has drawn a fanciful picture of autumnal migration as a mere " drift " forced upon birds by prevailing winds, and in doing so he ignores the observational evidence which shows that the reality is something quite different. (Curiously, the " biological urge " which in this case he scorns as a figment of evolutionist theory, is retained by himself to explain the return journey ; the bird, it appears, is striving to return home even in autumn, but it is not until spring that the winds permit !) Captain Acworth's attempt to reconcile his description with the ascertained facts of ornithology consists of ingenious special pleading, in which he mentions only such of these facts as seem convenient to his theory. He also celebrates an imaginary triumph over ideas which are not actually held by biologists, such as that migration over the sea follows the now sunken land-bridges of a former geological age.

Migration flight, like all flight, is of course affected by the wind. It may be helped or hindered by it, and at times diverted or prevented. But there is a great body of evidence on record to show that migration is not mainly determined by this factor. For instance, much migration takes place against the wind, despite the

greater labour involved in the journey; and simultaneous streams of migration often proceed in quite different directions. Captain Acworth is content, on purely theoretical grounds, to imagine swallows as being driven backwards by the wind each autumn, apparently for the whole six thousand miles from Great Britain to South Africa; on the other hand, many have shared my own experience of watching for hours a stream of migrant swallows flying steadily southwards in the teeth of a gale.

Other points may be briefly cited. Many birds that are as much exposed to wind as some of our typical migrants, do in fact remain stationary throughout the year; conversely, some species which otherwise scarcely fly at all are regular migrants. Migration is also commonly performed at night even by birds which are not for any other purpose apt to be on the wing after dark. The adult cuckoo leaves us in July and the swift in August—well before the "equinox, with the accompanying instability of the atmosphere," which Captain Acworth considers to be so significant in the case of the swallow. Again, migrating birds are on occasion *observed* to fly by recognition—which he says they cannot do—quite obviously changing direction to follow some bend in the coastline or other geographical feature. Birds, indeed, simply do not behave as Captain Acworth's theory demands they must.

Lt.-Col. T. C. SKINNER writes:—I had not intended to comment on the paper, but, having witnessed two days later what certainly seemed a definite confirmation of the theory of involuntary migration, it seems of interest to record the fact. At Reigate, on January 17th, where a strong westerly wind had been blowing for a week or more, I noticed (about 4 p.m.) a very large flight of birds of differing sorts and sizes, all flying high, coming up from the west. They were being borne along by the current, apparaently dead against instinct or inclination, as every two or three seconds individual birds, noticeably the larger ones, would turn westward and head up wind in apparent effort to fly back to the locality from whence they had drifted, the brief intervals between successive efforts being occupied in flying hither and thither, rallying young birds (apparently), and generally maintaining their height. I watched them for eight or nine minutes from first view in the west till they passed

out of sight towards the eastern horizon. During the whole time the most obvious thing about the flight was the continually recurring westward orientation in effort to overcome the eastward drift. There was every appearance of the flight having been long continued, yet no hint of the birds coming down for rest or shelter till the wind might change; only evidence of blind struggle to get back; and one wondered what may have happened to them ultimately, whether they came down in England, or in the North Sea, or were carried across to Belgium or beyond.

Lecturer's Reply.

Mr. Dewar admits that weaker fliers must *necessarily* migrate, but he thinks that stronger fliers do so *voluntarily*. But stronger fliers, like birds of the swallow type which live on the wing, will be perpetually instead of occasionally subject to the atmospheric currents. It is true that a 30 m.p.h. current to a 50 m.p.h. bird is not overwhelming if the bird is *aware* of the current and *keeps to windward* by the use of reason. If, however, the bird flies indiscriminately, and is unconscious of the air currents, its drift will be irrevocable.

A study of the meteorological charts will show that, with an increase of height, the winds increase in strength and change their direction. At high altitudes westerly winds in the autumn turn southerly in Western Europe while flowing Eastward at lower altitudes. In July and August swifts are found to be flying, and presumably feeding, at tremendous heights. The not infrequent return of the swifts (like the swallows), in the late autumn will always be found to synchronize with unusual southerly or south-easterly winds. With reference to the *mind* of birds, I am of course referring to an objective and reasoning mind, and not to that mechanical operation of the senses by the physical brain which is common to all things that live, not excluding man.

Sir Ambrose Fleming attributes a "mind" to birds because of their proved "homing sense." But this homing sense is not upset when sight or hearing are impossible, as in the case of the terns quoted in my address, or, for example, of the American Golden Plover in its great Odyssey south across the Atlantic. Sir Ambrose refers to the varying migration of various species. But this surely is confirmation of my case, because the liability of the various

species to become subject to the movement of the atmosphere, depends upon their natural habits and habitats. A robin in a sheltered garden may remain there whereas another robin, perhaps of the same brood, may leave shelter to feed and thus inevitably drift. That many birds remain stationary, while others of the same species, and in the same district, " migrate," seems in itself to deny any migratory *instinct*, unless we are to assume that robins have individuality and individual tastes just as we have. Unless I am mistaken, Sir Ambrose assumes that the decision to migrate has now become an " instinct " as a result of experience and calculation in the past. If this were so, it would seem to reverse the theory of the evolution of mind, unless we are to regard " instinct " as superior to those prehistoric calculations of which it is alleged to be an outcome.

Mr. Levett-Yeats raises the same point with regard to *variability* of migrations as is raised by Sir Ambrose Fleming and my answer is necessarily the same. He argues a reasoning capacity in birds because their brains are modelled, physically, on the same lines as our own. But the physical brain is a keyboard, which controls the operations of our bodies. Damage to a limb puts a portion of the brain out of action, or *vice versa*, but it in no way impairs the reasoning powers of man, a fact which seems to demonstrate the complete divorce between reason and the senses which the physical brain actuates.

Mr. Duncan refers to the *congregation* of swallows before migration and he thinks that the swallows have so congregated *with a view* to migration ; but the packing of swallows, and their habit of perching at such times, are the necessary outcome of the drift to which I have alluded. For example, a strong wind from the N.W. brings the birds in the N.W. down upon birds which will experience this wind *later*. Hence packing. Perching in the autumn is the outcome of weariness with the effort to remain at home, coupled with the absence of the homes from which they have drifted. Mr. Duncan regards nest building as a sign of reasoning intelligence, a view which Mr. Dewar has convincingly exploded in his remarkable book *Birds at the Nest*. Indeed, the ability of a chaffinch to build a perfect nest in its first season, and a nest similar to the nests of its species, seems sufficient answer to Mr. Duncan's contention.

Pastor Cooke repeats the frequent statement that birds on the East coast usually arrive against the wind. He will admit, however, that a bird with a flying capacity of 30 m.p.h., stemming an air current of 25 m.p.h. could only make 5 m.p.h. over the ground. Under such conditions a distance over the North Sea of 900 miles would be increased to a distance of 5,400 miles. Surely the explanation is this: The birds which he has witnessed stemming the westerly air current are not in reality *migrating*, but birds which have drifted from England, and which are still endeavouring to remain at home, or to return there. My conclusion seems to be confirmed by Mr. Riviere, who appears to be unaware that birds cannot *dislike* a tail wind which they cannot feel. Pastor Cooke seems to dispute that birds are physically unconscious of the air currents in which they fly, but he can obtain confirmation of the truth of what I say from any physicist, mathematician or airman, or from Dr. Landsborough Thomson.

Dr. Landsborough Thomson confirms the accuracy of the laws of currents as enunciated in my paper, thereby supporting my reply to Pastor Cooke. He reproves me, however, for emphasizing such well-known laws, and appears to resent my suggestion that ignorance of these laws is common among biologists. How common is this ignorance I have shown in *This Bondage* and in *This Progress*. But like the scientific Journal, *Nature*, Dr. Thomson does me an injustice. I have never claimed to have discovered the laws of currents. On the contrary, I have expressed astonishment that world-famed biologists, such as the late Sir J. Arthur Thomson, should have been in ignorance of these elementary laws of dynamics, and that those who do know them, as apparently does Dr. Landsborough Thomson, should have failed to draw the clear conclusions which demolish their own cherished theories.

If I may say so, he finds himself in a quandary. He admits the inevitability of drift, but in order to support conclusions based upon deceptive physical observations, he refuses to face the consequences of laws which he acknowledges to be correct. In disputing the ability of a bird to head continuously across wide seas toward an unseen fixed point, he disputes the experiment and the conclusions of the late Sir J. Arthur Thomson in the case of terns, unless he seriously wishes his readers to believe that a tern can see a fixed

point many hundreds of miles away, which implies the ability to see through the earth. His objection to the proved "sense of direction" seems to be its disproof of flight by *recognition*, involving *mind*.

By the term "biological urge," I am referring to that sexual urge which biologists seem to regard as the mainspring of animate nature, whether of human beings or brutes. What Sir Herbert Maxwell calls "the invincible habit of returning to its birthplace" is always operative, thus ensuring that the bird will leave home and return home when, and only when, the conditions are agreeable to its needs. Dr. Landsborough Thomson repeats the assertion that much migration takes place against the wind. He says that "he has watched for hours a stream of migrating swallows flying steadily southwards in the teeth of a gale." But what are his grounds for assuming that these swallows are *migrating* swallows? Has it not occurred to him that the southerly gale against which he observes the swallows flying, has been responsible for the drift of the swallows to the *north* of their homes, and that he is merely witnessing the bird's "invincible habit of returning to its birthplace"? He mentions migration by night when birds are not normally on the wing. Here again is confirmation of my case. Birds drifted *from* home, and striving *for* home, will from time to time inevitably be overtaken on the way by darkness when no perches are available.

Dr. Landsborough Thomson states that: "Migrating birds are, on occasion, *observed* to fly by recognition." But what grounds has he for assuming that a bird is using landmarks as a guide to navigation? When we consider the millions of birds on the wing, the orientation of some of them to particular spots which no observer can determine must necessarily cause some of them to fly, for example, along a coast line. Dr. Landsborough Thomson is, of course, aware, as he admits by the use of the words "on occasion," that flocks of "migrating" birds frequently maintain a course across great stretches of sea, and disregard the coast line and other land-marks, to the often expressed surprise of ornithologists. Human beings, we know, adjust their route by recognition, but when so engaged can it be maintained that their method of finding their way could be *observed* by an onlooker if the onlooker was not *assuming* the power of recognition in the person observed?

On Colonel Skinner's remarks I have no comment to make beyond expressing satisfaction at his remarkable corroboration of my simple explanation of that involuntary and resisted drift popularly known as "migration." If his observation on January 17th be compared with my short account of the drift of the swallow, it will be found to harmonize exactly, especially when it is realized that the birds which Colonel Skinner observed were as unconscious of wind pressure as are swallows on the wing.