



The Cambridge University Press, which has an American branch in New York City, issued in 1968 a second edition of "Bird Navigation" by G. V.T. Matthews of the Wildfowl Trust, Slimbridge. It is available in either cloth-bound or paperback, and royalties are being given to the Wildfowl Trust. This is one title in a series of Cambridge Monographs in Experimental Biology which also included "Bird-Song" by W. H. Thorpe, previously considered in this section.

The author states in an introductory note that "'navigation' is used to mean the ability to initiate and maintain directed movement independently of learned landmarks." He explains that he has "eschewed 'celestial navigation', which...would be better used in accounting for the movement of angels in pre-radar days."

A "List of References" follows the text, which lists the titles of articles or books to which the author has referred in the text. This list provides a formidable bibliography and would seem to cover the subject. "With so much interesting work being done with other animals, reference has perforce been made to them at various places.....However, no attempt has been made to review thoroughly the massive literature on the invertebrates." Banders should be aware of the work that is being done in an attempt to solve the migration puzzle.

The average bander obviously cannot engage in radar studies of migration, nor follow migrants by airplane. But his observations cannot help but be stimulated and clarified by a familiarity with the studies that have been made or that are in progress.

Take the controversy as to the method of migration, for instance. Some believed that migration took place in a general direction on a broad front. Others insisted that migration was restricted to narrow routes. A compromise theory "suggested that there was indeed, a directional trend to migration, the birds flying in a 'standard direction',...but in addition, there were 'leading-lines' formed by the boundaries between favourable and unfavourable terrain, between land and sea, hill and plain, forest and savannah, desert and fruitful land. When the birds encounter such a leading-line they tend to fly along it, forming a narrow and concentrated stream.... But when the obstacle is passed, or the urge to fly in the standard direction becomes paramount, the stream widens out into the broad front again."

The above observations are made in the first chapter which is a summary

of migration studies. Mention is made of the fact that "observations represent but a small and variable proportion of migratory streams. Thus, when they encounter head winds birds fly lower and are so more easily seen." There is mention of the "kills" at lighthouses with reference, among other examples, to the kill of 50,000 birds of fifty-three species in one night (Johnston & Haines, 1957: The Auk 74, 447-58).

One paragraph mentions the movement initiated by Kramer, of sweeping the sky with binoculars to detect migrating birds. This became widespread in North-west Europe. Except for an unpublished paper by Newman and Lowery (The study of the ultrahigh daytime migration with a spotting "scope" - Proc. XIII Int. Orn. Cong. Ithaca), there does not seem to have been much study of this sort in America.

There is then a discussion of radar studies noting that "radar has revealed quite substantial movements throughout the year....There follows the implication that navigational faculties cannot be rigidly seasonal." The first chapter, having reviewed the evidence of field observations concludes that on this basis, birds seem guided almost exclusively by visual stimuli. The rest of the book considers the experimental evidence.

Chapter 2 deals with "Experimental evidence for bearing-and-distance navigation". The author uses the term "nonsense orientation" to define avian movements "with no clear relevance to any biological need of the animal".

Chapter 3 considers "the physical bases of diurnal one-direction navigation" and gets fairly technical, but don't let this scare you. For one who plans to conduct migration experiments it is invaluable. For the bander who merely wishes to keep abreast of ornithological experiment and theory it is possible to skim, extracting the meat from the stew. A survey of experiments leads the author to such conclusions as "the clouds must be really dense for complete disorientation", "the sun itself is thus clearly the reference clue used", and "there is general agreement on the existence of intrinsic rhythmic time-keeping processes...which serve as the 'clocks.'" Normally "the rhythms are kept in step with the external rhythmic events.... Of these the light/dark succession of day and night is one of the most important."

Chapters on "the physical bases of nocturnal one-direction navigation," "homing orientation" and others follow. There is consideration of the possible effect of the Coriolis force and the possibility of influence by astronomical "grids". Those of you who feel no need to pore over diagrams will still find interest in the description of experiments.

Finally comes chapter 12 on "the anatomical and physiological limitations of the avian eye". "There are a number of features in the avian

eye that probably enhance its powers of movement detection....The net result of these...is that the bird can with one glance take in a picture which a man can only accumulate by laboriously scanning the whole field, piece by piece....There seems no doubt that we can allow that the birds can detect the movement of the sun....Extrapolation of the path of moving objects is essential in birds feeding on moving prey, such as a plunging gannet."

The final chapter "Motion, time and memory" states that "A central problem is the extent to which birds can determine the vertical when in flight, independently of vision, i.e. can they disentangle the effects of acceleration, rotation and other changes in posture from the downward effect of gravity?"

"In normal flight a bird's head is quite remarkably stable and does not reflect the violent oscillations undergone by the body in the wing section." This conclusion is reached by studying moving pictures of birds in flight frame by frame. Experiments with blindfolded birds show that 95% quickly adopted a normal flying position.

Then comes a consideration of biological clocks, leading to the question whether a bird has a chronometer...to measure displacement in longitude. "The existence of more than one time-keeper in an animal is now readily acceptable. Indeed the trend in theoretical thinking on the subject is toward a multiplicity of time-keepers, perhaps ultimately at the cellular level, which may or may not be coupled with one another."

Young migrants are apparently innately equipped with enough information to carry out bearing-and-distance navigation to the wintering grounds, possibly flying a series of courses rather than one....Older birds possess the full navigational ability and are able to correct for involuntary displacements! Such displacements "would occur sufficiently frequently to give the development of such an ability and a selective advantage."

Persual of this book has left this reviewer feeling that the more we learn about avian migration, or navigation as the author calls it, the greater the mystery becomes.

In EBBA News, Vol. 29, No. 3 (May-June 1966) Michael Thomas reviewed two books on Decoys, and made mention of articles in previous issues of this periodical by Raymond Bubb and Robert Yunick on the same subject. There is now available a Dover paperback volume by Joel Barber called "Wild Fowl Decoys."

The University of Oklahoma Press issued in 1961 "Iceland Summer Adventures of a Bird Painter" by George Miksch Sutton. The frontispiece shows the Gyrfalcon which is the national bird of Iceland.