

MIGRATIONAL NAVIGATION BY BIRDS - SKETCH

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Twice a year certain groups of birds make relatively long flights from one part of the world to another. Sometimes these flights can be a just few hundred kilometres but, particularly in the Pacific Ocean, flights can be thousands of kilometres in length and terminate on small islands far from large landmasses. There is often little room for error and the birds simply must know what they are doing.

The most up to date book to read in English is *Bird Migration A General Survey* Author Peter Berthold Published in 1993 by Oxford University Press ISBN 0 19 058786 0.

The current state of knowledge is that there is no generally accepted theory as to how the birds navigate. It is generally accepted that some birds can detect the earth's magnetic field. It is generally accepted that some birds attach significance to the orientation of stars in the night sky. It is generally accepted that some species of bird learn from their travel experience, young birds setting off trustingly in a fixed direction while older birds can correct their flights to overcome biases introduced by experimenting biologists. It is also generally accepted that birds can use compasses derived from astronomical bodies; typically they can allow for the movement of the sun to allow them to follow a rough heading during daytime flying.

However, if we were able to construct an artificial mechanical bird of arbitrary computational complexity, we should not know how to program it so that it could replicate the flight of a swallow from South Africa to a particular barn in Hampshire, UK.

A striking feature of long distance navigation is that birds can find destinations very precisely. They will often return to one building. I have mentioned in my paper on "Line Following" that every year two Spotted Flycatchers fly from southern Africa to my house in Lancashire. The birds weigh about 15 grams. What's more, after ten years, they are unlikely be the same two birds, they are almost certainly descendants of the earlier birds. Somehow they know where to go.

There is a further complication with homing pigeons. These birds are typically taken a few hundred kilometres from their home loft and allowed to fly back home. It is not known how they do this and it is not known whether they use a method in common with the longer distance migrants.

If theory is absent, then experimental work has continued steadily. In recent times an upsurge in data has started to appear. Experimenters are able to fix logging devices of various types to birds and follow them directly with the aid of satellite technology. In this way details of flight paths are becoming known. They have not always been those paths which had previously been assumed.

Tuesday, 20 January 2009