

TESTS PROVE PIGEONS NAVIGATE BY THE SUN

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The ability of birds to navigate—to set a course for home when released in a strange place hundreds of miles away—has for a long time puzzled both scientists and amateur ornithologists.

A step forward was made when it was realized that the domestic racing pigeon is capable of this feat within the first few minutes after release and over the past 20 years scientists have started to unravel the mystery of homing by simply releasing pigeons and watching them with binoculars.

One of the important discoveries was that birds released under a thick overcast were disoriented; but if the sun was visible they headed for home.

Height of the Sun

As a result the suggestion was made that pigeons use the sun to navigate in much the same way as a human navigator. Latitude would be determined by estimating the height of the sun if, for example, at noon the bird found the sun higher than it remembered it at home it should fly away from the sun.

It could determine its longitude by estimating if the sun were too far along its path or not far enough for that time of day and obviously it would need a “chronometer” for this.

We now know that birds do have a “clock” in their heads which tells them the time of day.

This “sun navigation” theory is not easy to test using free flying birds because it is obviously difficult to alter the apparent path of the sun to see if the bird’s orientation is affected.

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Placed in Box

Therefore I tried to develop a method which did not involve actually releasing the bird. Instead it was located on the ground and trained to tell me where it estimated home to be.

To do this the pigeon was placed in a box which could be rotated in any direction. Its head stuck out of one end of the box so that it could see all around and in front of it was a button which it could peck to receive a food reward.

The first part of my experiments consisted of training two pigeons so that when they were pointing towards home they could peck the button for a reward. When they were pointed in the opposite direction pecking was not rewarded.

This training was carried out at three locations; at Ombersley, 58 miles north of the Bristol University loft; at Oxford, 60 miles east-north-east, and at Bradnich, 60 miles south-west.

On Clear Days

Training was done only on sunny days, between 11.30 a.m. and 1.30 p.m., and the birds were taken to a different site each day. The birds could see the sun but not the local surroundings as the apparatus was circled by a screen 24 in. in diameter and 8 in. high.

After training on several successive days the pigeons began to show some measure of discrimination, pecking the button to obtain food only when facing Bristol. At the end of a week their performance was so good I decided to investigate what cues they might be using.

To do this I arranged a periscope-like system of mirrors in front of the bird's head to alter the apparent path of the sun; the real sun was hidden by a screen around the periscope.

This arrangement could be used at Bradnich to produce a sun path appropriate to a point north of Bristol and at Ombersley one appropriate to a point south of Bristol.

They were Fooled

The results of these tests showed that the pigeons pecked more in the false home direction than in the true direction. In other words they had been fooled into thinking they were in the opposite direction to their true position.

Obviously they were deciding whether they were north or south of Bristol on the basis of the height of the sun path.

To check this I carried out further tests in my laboratory at Bristol University where an artificial sun can be generated by a special projector lamp. The birds again paid special attention to the height of the sun.

These results show that pigeons are capable of using the sun's altitude to tell them if they are north or south of home.

This is certainly not the full story, for recent research in the United States of America has shown that experienced birds can orient under overcast if they are used to flying round the loft in bad weather and magnets have been shown to have a deleterious effect on homing orientation.

Lost Sense of Direction

I found that when it was overcast or when the sun went down behind the screen in the evening the pigeon lost all sense of direction, even though in the latter case the direction of the sun could have been estimated from shadows on the wall of the screen.

No measure of training could produce any sign that the birds could orientate under complete overcast.

I also placed a small bar magnet over the pigeon's back so that it would reverse the direction of the magnetic field in the region of the bird's head but this had no effect at all on the way the bird responded.

These findings do not contradict those of the U.S. researchers because magnets usually have an effect only under overcast, rather than in sunny conditions. It may be that the bird must be flying before it can orientate under overcast or respond to magnetic fields.

The bird in its box. The pecking keys under its beak produce food from the hopper, operated by the solenoid switch beneath it. The remote control on the right of the picture operates the ring contacts and brushes on the left.

