

Birds - Some completely unexpected features

Last time we noted how the puffin, having departed its hatching site about a week after its parents, heads out seaward, finds feeding sites, and, apart from parental presence, generally survives well in the open seas. Afterwards, that same bird will find its way, flying over-the-horizon, back to the same cliff where it had begun its life. How does this little creature, having a tablespoonful-size brain, navigate? While we humans can be glad for the assistance of road map or GPS, the ability to navigate is built into the DNA of the bird. Scientists have been investigating bird migration for a long time, and are beginning to find completely unexpected features in the physical and genetic structure of these birds. Some starlings were put in cages where they could not see anything but the sunlight. In the spring the birds faced the proper direction for their normal migration. But in the fall they faced the opposite and correct way. When the light was shifted 90° the birds also shifted their position 90°. It was also discovered that the starlings have not only a sun compass but also a precise biological clock that moves 15° per hour, very much as we noted previously with the honey bees. Some European warblers were put in cages where they could see only part of the night sky. And even when only some of the stars were visible the birds were oriented correctly. Then these same birds were taken into a planetarium to look at simulated star positions. The warblers then pointed in the direction that they would, as if the stars were actually where they were made to appear. An experiment with indigo Buntings shows that the ability to read the stars was an acquired ability and not inborn. Birds that matured under artificial sky learned the wrong axis and oriented them to the wrong direction.

For some time it was suspected that birds also use the earth's magnetic field. In a test, robins were placed in a cage where neither sun nor stars were visible. But it was found that when the magnetic field around them was altered, the birds changed their direction accordingly. And in a test with homing pigeons it was found that if they had a bar magnet on their back while flying in overcast skies they became confused.

Observation and testing indicate that the birds seem to sense the magnetic field, not like a compass, but may measure the angle between magnetic lines and the vertical direction of gravity. Scientists have also discovered that there are some bacteria that synthesize particles of magnetite (a strongly magnetic oxide of iron) and these organisms are found in the heads of pigeons and in the abdomens of bees. It appears that a cluster of cranial nerves, with these particles of magnetic material, work to tell the bird how the strength of the magnetic field varies as it flies through the latitudes. Researchers are coming to believe that the birds must have the ability to form mental maps, and then to recognize habitats. Nerve connections have been found between the eyes and an area in the front part of the brain which is active during the migration process, suggesting that birds may be able to "see" the earth's magnetic field.

Some recent research at UBC points to a genetic basis governing migratory behaviour. A small cluster of genes on one chromosome appears to play a part, not only in birds, but in butterflies and fish as well. Here is another indication that the navigational ability of birds is the result of design¹ - which is defined as "a plan or scheme conceived in the mind". This ability, then is believed to be programmed directly into the DNA which controls the construction of the "hardware" - growth of the brain and associated nerves in the young bird. Among these particular nerves, the DNA also ensures that the desired "micro-magnet" making bacteria are encouraged to colonize. And it would also be the "software" - written² in the DNA - which enables the bird to perceive the earth's magnetic field and construct and store a mental map, and on subsequent migratory flights be able to compare with that map what it detects from sun, stars and magnetic field.

1 Who is the Designer? - 2 Who wrote the code? - *"The Lord by wisdom founded the earth; by understanding He established the heavens; 20 by His knowledge the depths were broken up, and clouds drop down the dew" - Proverbs 3:19.*