Stannington Library Tuesday Club

WINTER ONE - Nature Newsletter by Jan Flamank January 2022

Winter Reds: Foxes, Robins and Earth's magnetic field

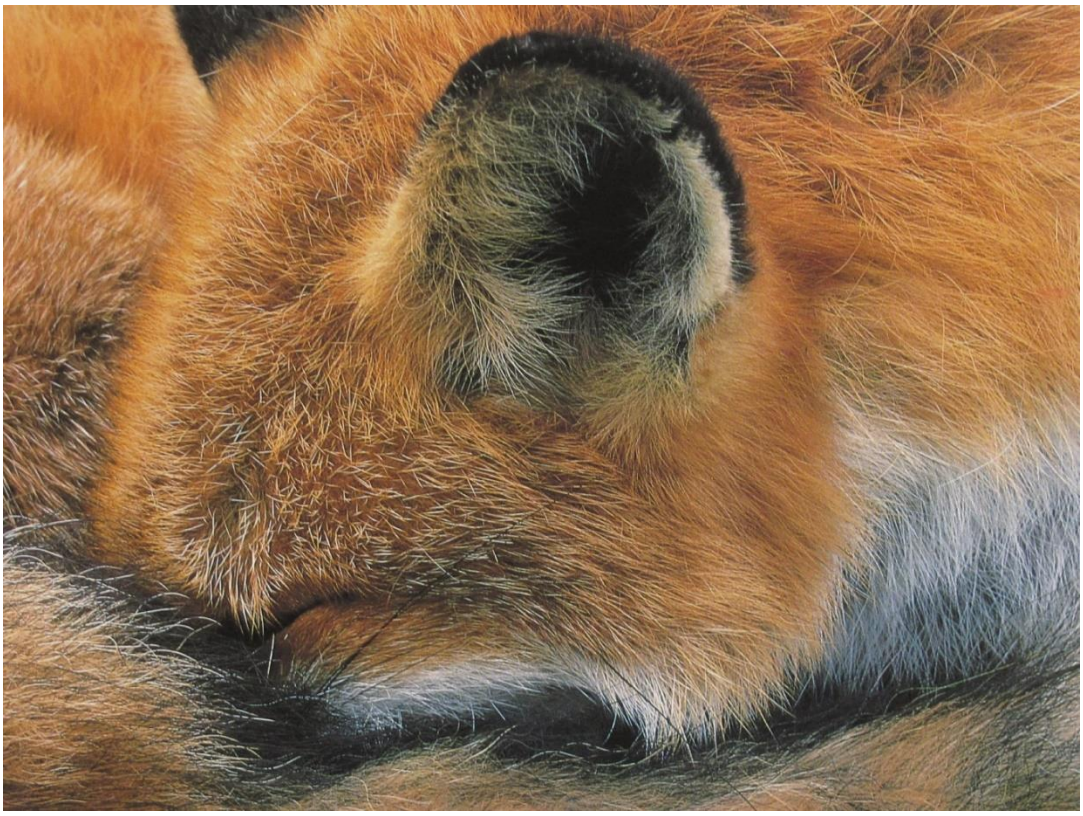
We are very familiar with foxes, and I see them regularly trotting round Heeley, mainly in the early mornings when I go to buy a newspaper. Foxes are active in the day, but are primarily nocturnal hunters. As the seasons and habitat change, they adapt their diet, but need about 60% of meat to thrive, especially in colder months.

Intelligent and beautiful mammals, they understand their prey, and have a range of fabulous adaptations to ensure they can survive.

They have vertical pupils, which open and close like curtains, to allow less light into the retina in daytime, then opening wide at night to let as much light in as possible.

They have a special layer of reflective cells behind their retina, called the tapetum lucidum. This acts like a mirror, reflecting light back into the eye, enhancing vision in low light. As with cats, who also have this, this causes their eyes to shine when illuminated at night by headlights etc. This was potentially one of the inspirations for the design of “cats’ eyes” on our roads, by the inventor Percy Shaw, a Yorkshireman.

Foxes have excellent hearing, which augments their good close-range vision. Their long vision is not so good, so they can miss stationary prey, but their alert, upright ears are particularly sensitive to low frequency sounds; and each ear can rotate 150% to help them pinpoint the source of a sound.



They have sensory whiskers, called vibrissae, on both their face and legs, which allow a fox to ‘feel’ its way in the dark by detecting airflow. These whiskers attach to nerve cells that are highly sensitive, relaying information as they hunt at night. Foxes also have an acute sense of smell, which helps them to seek out prey even if it is buried beneath 3 feet of snow.

Although a member of Canidae, the dog family, foxes exhibit many feline characteristics. They share vertical pupils, good climbing skills, arching of their back when threatened, curling their tail around their body to keep warm, and the ability to fish out of ponds with their front paws. But most impressive of all is the 'mouse pounce'

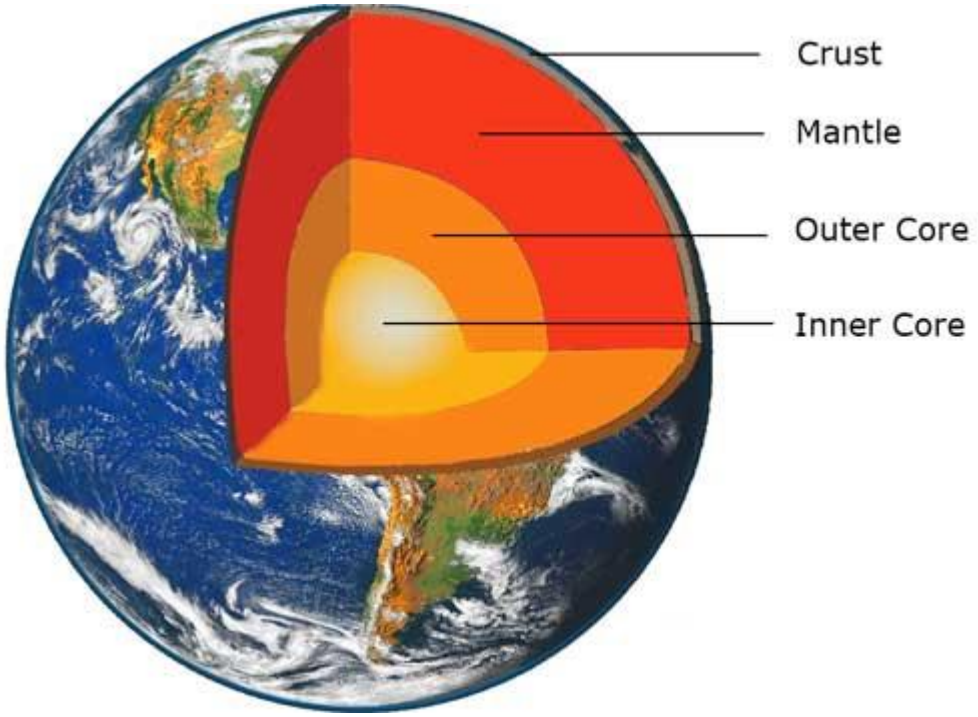
The 'mouse pounce' is an amazingly accurate and specialised strike to capture small, hidden rodents. Prey are located initially by sound and scent, then the fox freezes to pinpoint where the hidden prey is. It rears on its hind legs and launches itself into the air, usually at an angle of 40%. Steering mid-air with its tail, it then lands front feet first on the prey.

Some recent research has shown that they mostly pounce in a North East direction, and may be using the earth's magnetic field as a 'rangefinder' to accurately asses how far to jump to land on the hidden prey. If this is correct, it makes the fox unique in using the magnetic field to estimate distance, rather than direction, which is how migratory birds use it.

Let me explain a bit about our earth's magnetic field. We may all have encountered some people who have a 'magnetic personality', used magnets to attach wacky images to fridges, use compasses to find our way, use electricity to boil a kettle and turn lights on, or even got shocks from nylon sheets/carpets or jumpers – but our earth's magnetic field is something far more magnificent!

There are 4 main layers of our planet:

- The Crust, where we live, is on average, 19 miles deep on land and approximately 3 miles deep at the bottom of the ocean.
- The Mantle is the next layer down. It is a thick mixture of molten rock, about 1,800 miles deep.
- The Outer Core is the next layer, consisting of molten iron and nickel. It is about 1 ,400 miles deep and is the liquid core of our planet.
- The Inner Core is a solid sphere of iron and nickel metals, and is approximately 760 miles thick. It has about the same heat as the surface of the sun. So, very hot indeed!



The earth's magnetic field is powered by the cooling and subsequent solidification of the liquid core within our planet. The cooling and crystallisations within the liquid core cause movement of the liquid iron which surrounds the innermost, solid core at the very centre. This constantly churning movement within the liquid core causes very powerful electric currents, which are 1,000's of miles wide and flow at 1,000's of miles per hour as our earth rotates. These in turn generate a magnetic field around the currents.

This 'field' stretches far out into space, and acts as a shield against powerful solar winds, deflecting them away from earth. This protects our atmosphere from the damaging particles that would otherwise strip away the ozone layer and make us burn up from the sun's ultra violet radiation. The magnetic field, in our Northern Hemisphere, tilts downwards at an angle of 60 to 70% below the horizon. So, it slopes over the curved surface of our planet.

We are still discovering how birds may use the magnetic field to navigate migratory routes. Some birds, like the European Robin, have a special molecule in their retina, called the Cryptochrome, which acts like an internal compass to detect the direction of the magnetic field, aiding their correct flightpath over huge distances.

As a fox slinks quietly towards its prey, it uses acute hearing, and now possibly, a similar ‘internal compass’ to find the spot where the angle of the sound from the prey matches the angle/ slope of the magnetic field. At that precise point of a match, the fox will then know it is at a fixed distance to the hidden prey, so can accurate asses how far to jump to land on it! Incredible.

More research is needed, both for migratory birds and the fox, but if this latest research is confirmed, it means the fox is unique so far in using the magnetic field to estimate distance, rather than for direction, as birds do. Wow.

We learn all the time about the complexities and adaptations within the natural world, and knowing a bit more about it can only enhance our delight in it I reckon. And spur us all on to do whatever we can to protect it.

I hope you have enjoyed this first winter nature newsletter, and l will write two more.

Warmest wishes and keep cosy and well. Jan xxx