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LIVING

September journeys

Migrating birds carry genes with all necessary instructions to successfully navigate

Earlier this week, just after darkness had fallen, a three-month-old rose-breasted grosbeak departed its summer home in the Kawarthas and set its sights on Costa Rica.

Although it has never made the trip before, it carries in its genes all of the necessary instructions to successfully navigate over such a huge distance. It will use senses and faculties that are almost more unbelievable than some of the ancient theories used to explain the exodus of birds in the fall such as the idea that birds hibernated beneath the mud like turtles.

Drew Monkman
OUR CHANGING SEASONS

Rose-breasted grosbeak Karl Egressy photo

Bobolink Karl Egressy photo

Karl Egressy photo

Swain's trush

The grosbeak's almond-sized brain is able to make sense of crucial information coming from the stars, the sun, polarized light patterns, and even the Earth's magnetic fields. In fact, its two-ounce body includes a built-in magnet compass. When one set of directional cues is obscured, as the sun and stars may be by cloud cover, more reliance is placed on alternate cues.

Every year in September, huge numbers of warblers, vireos, thrushes, flycatchers, and other songbirds fly south over the Kawarthas as they make their way to their tropical winter homes in southern Mexico, Central America, South America, and the Caribbean Islands.

Migration continues into October when this tropical group is gradually replaced by shorter-distance migrants such as sparrows, juncos and several members of the blackbird family. Most of these birds will spend the winter months in the southern U.S. The number of fall migrants may be as much as double the spring migration numbers, since autumn's birds are augmented by the millions of young birds that were born only three or four months earlier.

In the fall, songbirds prepare for migration by undergoing important physiological changes. As summer days shorten, photoreceptors in the brain respond to the decreasing amount of daylight by triggering hormonal changes. They cause the birds to eat voraciously, molt their feathers, and become increasingly restless.

Many songbirds abandon an insect diet and start to gorge themselves on fruit which is more easily converted to energy-rich fat to fuel the flight southward. They also grow fresh plumage that is sometimes radically different from their breeding plumage.

Even caged songbirds often become restless in the fall and will begin flitting against their cages just after sunset. Scientists also know that caged birds orient themselves in relation to the stars and in the same direction they would have taken if they had been migrating. Experiments done in the 1960s showed that birds cue in to the stars that rotate around the North Star and that during their first spring and summer of life, they appear to memorize the position of these key stars in the northern sky.

The researchers showed that when indigo buntings were prevented from seeing the night sky during a critical stage of development, they were unable to properly orient for migration.

To navigate by stars, birds require a clear view of the sky. However, birds often migrate below cloud level which begs the question of how they find the proper direction. Researchers now have conclusive evidence that at least some migratory songbirds are able to orient themselves using the Earth's magnetic field.

The Earth is like a gigantic magnet. The North Pole of the magnet is close to the geographic North Pole, and the South Pole is near the geographic South Pole. Magnetic field lines extend from these poles. In 1984, it was discovered that the nasal tissues of bobolinks contain magnetite. This magnetic mineral acts almost like a miniature compass needle. However, a detailed understanding of exactly how the birds use the magnetic field is still unclear.

There is some evidence that birds may actually be able to see the magnetic field as a visual pattern or a specific colour. Maybe, for example, the rose-breasted grosbeak sees north and south as a shade of blue but perceives no colour at all when facing east or west.

When songbirds cannot rely on stars or the magnetic field for direction, they may turn to information from the position of the setting sun on the western horizon and/or the band of polarized light which extends perpendicular to the setting point of the sun. Invisible to humans, polarized light is created when sunlight scatters as it passes through the atmosphere. Just as the sun location changes with latitude and the time of year, so does the position of the band of polarized light. These cues can therefore be used by birds in choosing their bearings. Polarized light is visible to birds even when the sky is completely overcast.

Other directional signals may exist as well. They include infrasounds – sounds whose frequency is below the normal limit of human hearing - such as the roar of the ocean surf or the sounds of winds across the mountains. Wind-carried odours such as the smell of certain types of vegetation may also provide useful information to migrants. So, it may be that there is something in the rose-breasted grosbeaks genes that attracts it to the smell of Central American lowland rainforest.

Unfortunately, fall migration does not receive the attention bestowed upon spring migration. One reason may be that immature birds and even some adults head south in relatively drab plumage and can be difficult to identify. There is also no song associated with fall migration. The only sounds the birds make are contact calls. Birds use contact calls to keep in touch with each other as they feed by day and fly by night. Although the notes are short and often high-pitched, you can often hear them emanating from the night sky.

The first fall bird movement actually occurs in mid-August and is initiated by the arrival of cooler weather with northerly winds. This blast of air provides tailwinds that can accelerate a bird's flight speed and allow it to save energy. I often find migrants at this time of year along the margins of lakes, along shrubby fencerows and roadsides, and even in well-treed city backyards. The migrants, most of which are warblers, are almost always in loose flocks of mixed species that usually include black-capped chickadees. When you hear chickadees calling, try pishing for several minutes and the chances are good that both the chickadees and warblers will come in close to investigate what's making the strange sounds.

Unlike the spring, fall songbird migration is a much more drawn-out process, with many species moving through the Kawarthas over a period of a month or more. The red-eyed vireo, for example, is a common migrant from late August until early October.

No matter where you live in the Kawarthas, migrating songbirds will be passing over your house this month. About an hour after darkness falls, go outside and listen. By cupping your ears and listening intently for several minutes, you should be able to hear the calls of the invisible stream of migrants overhead. Each species makes a slightly different sound.

Swainson's thrushes, for example, sound like scattered spring peepers calling from the sky. A whistled "puwi" means that a rose-breasted grosbeak has flown over. As you listen, you never know what call you might hear next. The sheer number of calls some nights is amazing, too.

Until recently, the flight calls of only a small number of species were known. Now, after more than a decade of effort, the calls of 211 species of migratory landbirds from eastern North America have been recorded and identified. A multi-media CD-ROM reference guide is now available from oldbird.org that contains audio recordings, spectrograms (time-frequency pictures of the sounds), and information on migration calling and behaviour.

So, with practice, it is now possible to identify birds simply on the basis of these short, simple vocalizations emanating from the darkness above.

Researchers, too, use this information to monitor the numbers and kinds of birds that pass overhead during migration. They do this by installing rooftop microphones on a network of buildings spread out over a large area. Each microphone is connected to a computer inside the building that automatically turns on each night and records the sounds of the night sky until dawn. Special software automatically detects and extracts the flight calls, separating them from other noises.

The software copies the detected sounds to files on the computer's hard drive. These files can then be quickly browsed and sorted using another software program that creates spectrograms of the calls. The spectrograms allow for visual inspection of the bird calls and, given that the spectrogram for each species is different, identification of the birds is possible. In this way, the researchers will have a record of what birds fly over each night. This information can aid in decisions such as where to place a wind farm so that harm to migrating birds is minimized.

Finally, you might wonder why birds bother with migration at all. Well, it's all about food. The inevitable shortage of food in late fall and winter is the main reason birds have evolved to migrate. By spending the winter in the tropics and the late spring and summer in northern climes, they are able to take advantage of a bonanza of insects thousands of kilometres apart. Compared to the day length in the tropics, our much longer summer days provide birds with more time to forage and feed their young. By flying north in the spring, they also free themselves from competition for food from tropical resident birds.

In many ways, migrant songbirds represent a bridge between North and South America. Hearing the birds' calls in the night sky not only evokes the vastness of migration but also the crucial importance of a healthy environment in both continents. Their future depends upon it.

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