

Lesson 1 The Wonders of Nature

Reading 1

Winged Wonders: Amazing Facts about Migratory Birds

Geese flying south in a V shape is perhaps the classic picture of bird migration. But this image only represents a fraction of the real picture. The reality is that humans know less about bird migration than they think they do.

How Much Do We Really Know about Migratory Birds?

Many believe that, like humans, birds migrate during the day. But most birds migrate at night. Every year, billions of birds fly through the darkness over us while we are asleep. If we stripped away the darkness, we could see what would probably be the largest natural spectacle on the Earth.

Roughly half of the world's nearly 10,000 known bird species migrate. You might think migratory birds fly long distances only, but many migrants make shorter journeys. Some even migrate from a higher part to a lower part of the same mountain.

Migratory birds contribute much to our ecosystem.

For example, they pollinate crops and help plants grow by scattering seeds and eating insects. Some resident birds do these things as well. In addition, certain areas, such as the Arctic, heavily rely on migratory birds to maintain their ecosystems.

While scientists have made meaningful progress in the study of migratory birds, questions about their incredible abilities remain largely unanswered. Despite our familiarity with bird migration, it remains one of the great puzzles of the natural world.

How Do Birds Prepare for Migration?

As migratory birds prepare for a long journey, some undergo incredible physical changes. Bar-tailed godwits, for example, eat all the time and double their weight before their 12,000-kilometer journey from Alaska to New Zealand. They look like water balloons because they have accumulated so much fat under their skin. At this point their digestive organs shrink dramatically, but their heart, lungs, and leg muscles double in mass. They bulk up without even exercising!

The godwits then fly all the way across the Pacific Ocean without a break. They have no place to land during this journey, so they must constantly flap their wings for more than a week. After landing in New Zealand or Australia, they regrow their digestive organs, feed again, and regain their weight. They then fly up to the Yellow Sea located between Korea and China. There, they go through the same process of bulking up before flying back to Alaska.

How Do Birds Navigate?

Migratory birds can cover thousands of kilometers on their seasonal travels, often traveling the same course with little deviation. The secrets of their amazing navigational skills are not fully understood. This is because birds are believed to combine different types of senses when they navigate. Researchers think that birds get navigational information from the sun's position, the patterns of the stars, and landmarks seen during the day. Sensing the Earth's magnetic field is believed to be another navigational tool. Researchers suspect that a specific protein in the birds' eyes is sensitive to magnetism. All of these, however, are hypotheses that have yet to be proven.

How Do Birds Fly without Stopping?

In 2013, researchers presented the first evidence that migratory birds like Alpine swifts can fly without a break for over six months. They captured six Alpine swifts, put monitoring devices on them, let them go, and recaptured three of them after a year. To the researchers' surprise, the data gathered by the equipment indicated that the birds had most likely flown without landing for 200 days. Alpine swifts feed on aerial plankton so they need not land for food. But what about sleep? The data implied that the birds had slept during flight but that this was not full recovery sleep. They may have been in a state where half of their brain slept while the other half remained alert. Some birds have this special ability, and it enables them to sleep and navigate at the same time!

What Hazards Do Migrating Birds Encounter?

Migratory birds are facing a growing threat from humans. Many species migrate at night and are attracted to the lights of tall buildings. As a result, millions die after colliding with such structures. Many are also killed by wind farms.

Especially problematic is the destruction of mudflats by humans. Mudflats are important stop-off locations that provide food supplies critical to birds' survival. The largest tidal mudflats on the Earth are the Yellow Sea mudflats in Korea and China. However, these mudflats are fast disappearing as humans turn them into land. This has become one of the world's greatest conservation concerns for migratory birds.

We have done much harm to migratory birds. But despite everything we have thrown at them, these birds have taken it all and are still obeying the ancient rhythms and doing the things that they were always meant to do. Such wonders of nature deserve respect. We need to show that by doing what we can to protect birds.

Reading 2

Plants Can Speak

Communication means exchanging information through signals. We know that many animals constantly communicate with each other. In contrast, plants are often regarded as silent, unmoving organisms incapable of such signaling. However, plants do communicate — with other plants as well as with animals. They do this primarily by using chemicals and sound. All plants emit signaling chemicals called volatile organic compounds (VOCs), which are everywhere around us. For example, the smell of freshly cut grass is caused by a VOC. Some of these plant VOCs are chemically similar to the pheromones used by animals like mice and ants. Therefore, these VOCs can attract insects for pollination and seed scattering.

Plant VOCs also function as warning signals in stressful situations. If a plant is attacked by predators or suffers a drought, it emits VOCs to warn nearby plants and animals. A plant also produces VOCs to activate its internal defense systems in a situation where it is attacked by insects or fungi.

The chemical moves through the air to neighboring plants, and they respond by preparing to defend themselves even before they are attacked. Within seconds, plants that detect VOCs will start producing compounds that combat fungi or toxins harmful to insects.

Recently, a team of scientists discovered that plants under stress also emit ultrasonic sounds that other organisms can perceive. In their experiment, the scientists divided tomato plants into three groups and subjected each to different treatment. The first group had its stems cut off, the second group was deprived of water for several days, and the third group, serving as a control group, experienced no stress. To capture the ultrasonic sounds, the scientists installed microphones and recorded the sounds the plants produced.

The plants in the three groups all emitted sounds. In particular, stressed plants — both cut and drought-stressed plants — emitted significantly more sounds than those in the control group. These sounds were in the ultrasonic range, which many mammals and insects can detect 3-5 meters away.

The scientists analyzed and classified these sounds.

By doing so, they were able to identify the condition of the plants, including their levels of dehydration and injury. The scientists thus concluded that the sounds emitted by plants carry information about their physiological states. These findings could let farmers know when their crops need to be watered or whether diseases are spreading. This is crucially important information for agriculture.

The scientists' findings about plant sounds show that the world of plants is a much noisier place than we imagined. Plants are constantly releasing lots of useful information into the environment by using chemicals and sounds. We are only just beginning to understand how this information is produced and how other plants and animals perceive it. So the next time you walk on some grass, remember that the poor injured plant might be screaming out to its neighbors, but we humans just cannot hear it!