from a low branch of a towering oak in Duke Forest, a cardinal belts out his signature cheer, cheer, cheer, tweee. There’s a twe-twe-cha, cha-cha-cha, twee-chaaa from a well-camouflaged song sparrow and the tu-a-wee-wu-we of a brown-breasted bluebird. The forest is alive with springtime conversation, and although it’s early morning, it feels a bit like a Saturday night at a bar. All the guys are puffing out their chests and rolling out their best pick-up lines.

For all its cacophony of chirps and trills, the dawn performance is really like one big chorus of “Hey, baby, come check me out,” according to Susan Peters, a behavioral biologist at Duke who studies animal communication. After studying songbirds for thirty years, Peters can hear the birds’ biographies in their melodies. A clear, consistent song is a male songbird’s way of saying he was fed well as a nestling and is now a strong, intelligent adult with superb genetic traits—in other words, a perfect mate. But there will soon be another bird with a story Peters finds even more interesting. As spring turns to summer in the woods and more male songbirds are born, somewhere in those branches a fledgling sparrow or finch will sit perfectly still in his nest. His black eyes blinking, he’ll silently wait. And then, with his beak virtually closed, he’ll whisper a note or two that he’s heard from the birds around him. At first, the sounds will not be quite in tune with the rest of the chorus and instead come out as raspy chirrups and cheeps. But with practice, the juvenile bird will catch on.

“It’s very sweet to watch a young male bird making its first attempts at song,” Peters says. A musician herself who plays the piano and other instruments, she can relate to the trial-and-error frustration of learning how to perform a new melody.

A sparrow’s song may seem a simple melody, but it’s actually the product of some pretty sophisticated brainwork. In fact, studying how birds sing may give us new insights about our own ability to speak, move, and think.

By Ashley Yeager

“Hey, baby, come check me out.”
As scientists have learned more about the regions of a bird’s brain involved in singing, they have made surprising connections to the mechanisms humans use to speak and move. There is now promise that birds might offer a model for figuring out human neurological diseases like Huntington’s and Parkinson’s.

The idea that there are parallels between birdsong and human speech began to emerge in the 1960s. Among the first scientists to make the connection was Peter Marler, a behavioral biologist who studied birdsongs first at the University of California at Berkeley and then at Rockefeller University in New York. By observing and recording sparrows as they learned to sing, Marler showed that songbirds picked up the unique melodies of their species at a critical stage early in life and that, like humans, they depended on hearing themselves sing to get better. Those features of bird communication, Marler wrote in a 1970 article for *American Scientist*, “may in turn serve to remind us that human language is a biological phenomenon with an evolutionary history.”

Marler and Peters pursued the birds’ song progression for nearly a decade, by which time a new biologist named Steve Nowicki had joined the lab. Peters and Nowicki began collaborating on birdsong studies and then married in 1986. The couple moved to Duke in 1989, and Nowicki is now a professor of biology, psychology, and neuroscience, as well as dean of undergraduate education. They also brought with them a collection of swamp and song sparrows they had captured in New York.

Today, Peters houses dozens of new sparrows in the Biological Sciences Building. The room where the birds live is painted white, with a long row of wire cages along one wall. Each cage holds a single sparrow, along with a perch, a bath, and a trough of seeds. The room is sealed so Peters can control light and temperature, precisely simulating the seasonal changes in daylight and climate. On a day this past winter, the space is strangely silent, except for a few chirps and squawks and the hum of a heater. There are no songs.

Songbirds typically don’t sing in the winter, Peters explains as she reaches into a cage and tries to trap a swamp sparrow, an adult male, in her hand. The bird dances just out of reach. She focuses on the bird for a moment and then gingerly closes it, closing her palm around his brown-feathered body. The bird cocks his head from side to side, surveying his situation. His black eyes blink quickly, but he remains calm. Like all males, his chest is plain gray, and he has a cap of head feathers that turn brownish red in spring—or, in this case, when Peters lengthens the days and warms the air in the room to simulate the season. The longer days, she says, initiate changes in the birds’ brains, which spur them to sing.

During her career Peters has logged thousands of hours listening to sparrows and other songbirds compose their melodies. These days most of the analysis is done with the aid of software programs that translate recorded birdsongs into sound spectrographs, which create a visual readout of the birds’ songs. Individual notes appear as tiny lines on a horizontal scale, with the length and height of the lines representing the duration and pitch of the note. It’s clear from looking at a few of these graphic representations that there’s a lot going on in a bird’s song that human ears often don’t appreciate. Even the shortest bit of sparrow song reveals multiple notes and precisely timed pauses.

But to a bird, those subtleties make all

Angry Birds

Angry Birds

While the idea that birds might offer a model for figuring out human neurological diseases like Huntington’s and Parkinson’s has promise, it is not the only thing birds can teach scientists about the brain. As a scientist, she sees the bird’s mind as a complex behavorial phenomenon. And it’s not just birds she’s interested in. Peters is one of a growing number of scientists, including several at Duke, who think studying birds can help them understand how the human brain directs complex tasks such as speech or movement.

For example, scientists have learned more about the regions of a bird’s brain involved in singing, they have made surprising connections to the mechanisms humans use to speak and move. There is now promise that birds might offer a model for figuring out human neurological diseases like Huntington’s and Parkinson’s.

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But to a bird, those subtleties make all
the difference. Swamp sparrows, for example, sing four times as many identical syllables, each with two between two and five notes. In 1989, Peter Marler and colleagues at the University of California-Berkeley found that the birds hear songs that sound different than what they have learned, they get defensive, identify regions of a songbird brain associated with learning and producing songs. Jarvis and his collaborators made a significant discovery that the brain regions that control movement when a bird hops or flaps its wings. The fact that the gene handles both duties suggests that the areas of a songbird's brain involved in singing evolved from areas controlling movement.

For Jarvis, a professionally trained dancer, the connection of song and motion is obvious, with the notes and tune becoming more coherent and consistent as the bird matures. The similarity to a human infant's language development—first babbling to words and phrases—isn't complete. Yet, as with a baby learning to walk, the developing motor behavior is driven by insightful learning, and when it is blocked, birds get defensive, much as when a bird hops or flaps its wings. The fact that the gene handles both duties suggests that the areas of a songbird's brain involved in singing evolved from areas controlling movement. Jarvis recently has identified other genes that have mutated to the song-producing regions of the birds' brains known as the high vocal center, or HVC.

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