Jim Reed, a clarinetist and retired engineer intrigued by NJIT Professor David Rothenberg's research, has explored musical interac-

Technology and the Music of Birds

FOR MANY YEARS, I HAVE INVESTIGATED THE WAYS TECHNOLOGY CAN BRING US CLOSER TO NATURE, RATHER THAN PULLING US AWAY. ONE FINE EXAMPLE OF THIS IS HOW, IN THE PAST CENTURY, HUMAN BEINGS HAVE COME MUCH CLOSER TO UNDERSTANDING WHAT BIRDS SING.

Before recording technology, listeners to bird song had to trust their own ears. You could try to transcribe a song musically, but so many of the sounds birds make aren't on the staff or in the scale. People tried all kinds of mnemonic phrases and diagrams, but everyone heard the sounds differently. There was no way to be objective about sounds that seemed so different to each listener. One person's *zwee* could be another's *sree*. The white-throated sparrows in Maine could sing "Peabody, Peabody, Peabody" and be heard as "Canada, Canada, Canada" just over the border. And, of course, one person's music is another's noise. Could machines bring us beyond personal opinion?

In the 1940s, researchers at Bell Telephone Laboratories invented the sonograph, at first for the purpose of identifying possible criminals by their voiceprints, which are as distinctive as fingerprints. A result of secret technology developed during World War II, the device prints a sonogram on paper, a graph of the two most important variables of sound: frequency versus time. At last, the precise details of the song could be rendered on the page, and we could approach an exactness far beyond mnemonic musings and quirky squiggles.

With sound now printed on the page in an objective manner, scientists were ready to take the structure of individual bird songs seriously. At Cambridge University in the 1950s, W. H. Thorpe and Peter Marler began to comprehend the details of how birds learned their songs during a sensitive period that for most species lasts

PHOTOS: LESLIE KIM, BILL WITTKOP (OPPOSITE PAGE)

only a few months during their first year of life. Other species, particularly those with especially complex songs like the starling and the mockingbird (especially common on the NJIT campus), continue to pick up and develop new phrases over their entire lives.

Making well-formed music

On paper, it is easy to see and to measure how bird songs have pattern and form, with beginnings, middles and ends much like well-formed pieces of music. The function of song in birds is generally for males to attract mates, and sometimes to defend their territories. But the song works much more like music than language. While a song may be long and complex, or short and sweet, the performance must always be correct if the music is to have the desired effect.

Today, sonograms can be spit up by shareware programs on any notebook computer, and we too can marvel at the precise complexity of what evolution has produced. But why does one species make do with a single *cheep* when another may require a long, involved performance of imitations and variations that can take up to six years to learn to sing? Natural selection teaches the mechanism of random mutation and preference to explain nature's diversity, but does not directly explain the beauty that is out there. To investigate this I decided to make music with birds, to jam along with their world view.

Musical instruments are also a form of technology — indeed, some of the most advanced technologies human culture has produced. They enable us to express things we cannot explain, that well up from within the musician and out into the world, serving as a direct extension of our bodies and minds. Through music, we can communicate in ways that are difficult to explain. The message in music is emotional, beyond logic and information.

Communication without boundaries

A jazz musician from Newark has no problem jamming with another from Osaka, even if they might be unable to speak. The open traditions of music allow one player to join with another, even if they come from different cultures. Why not expand that approach beyond species' lines? I brought my clarinet at dawn into the National Aviary in Pittsburgh, playing a few riffs here and there, noticing which birds seemed to respond.

In front of one thicket, I play a few notes, and all of a sudden a strong, rhythmic outburst comes out. *Brr du du du.* I play something like it back: *Br du du du.* And then as I weave a melody the bird joins in above me: *Be pu be pu be pu beep*! Who calls in there? Hmm…he's gray, black and white, robin-sized, hopping, dancing around like mad. I keep playing; he's responding. At first he comes back at me with rising arpeggios, strong and tough. I play back. He cocks his head, leaps to join in. My notes change. His notes change. We're making music, a kind of music I never heard before. (You can hear it for yourself at www.whybirdssing.com.)

Hear bird sound as music and there is always some mystique to enjoy. Hear the whole *world* as music and you'll find we live inside a plethora of beautiful sounds. How many other creatures out there are waiting for the chance to jam?

When asked "Why do birds sing?", most scientists would answer that birds let out their melodies to establish territories and to make themselves attractive to potential mates. Evolution is not supposed to produce beauty for the sake of loveliness alone. Yet through technology, from sound recording to computer sonograms and even old-fashioned clarinets, humanity can find ways into the mystery of bird song. And when we get there, even science finds little evidence to dispute what many of us felt at the start: birds may burst into song first and foremost out of pure joy. ■

Visit the Department of Humanities on the Web at http://humanities.njit.edu.

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