THE AUTHOR FILE

Alexei Vyssotski

An avian backpack for discerning individual zebra finches' songs and studying cognition comes to Switzerland via Novosibirsk, Russia.

Calling someone a 'bird brain' is not considered a compliment. But even though the bird's brain lacks a neocortex, birds are capable of complex problem-solving, says Alexei Vyssotski, a neurophysiologist at the Institute of Neuroinformatics, which is jointly run by the University of Zurich and ETH Zurich.

Daria Smirnova

Alexei Vyssotski

Birds communicate with one another and return to their homes from thousands of kilometers away—behavior that could help scientists address the cellular basis of cognition, he says. Vyssotski has worked on homing pigeons, ostriches, sandpipers and owls, but also walruses and sloths.

For his newest work, he expanded his previous recording system—the Neurologger—and built an avian backpack for zebra finches. The birds are quite the vocalizers, particularly the males: they sound off with sweeping 'tets' and more monotonous 'stacks', named after the shape of the recording spectrogram. He is happy that the birds quickly got used to the device, which non-invasively records song and calls and separates the vocal output from individual birds.

His backpack weighs 2 grams and holds a microphone and an accelerometer, which registers vibrations from the bird carrying the device and not its neighbor. Even if the microphone picks up the neighbor's song, the accelerometer allows the signals to be separated. The logger can store two and a half hours of recording.

To attract a female, males sing more loudly and slightly faster than when they are by themselves, says Vyssotski. Male zebra finches also sing along with other males. "The biological reason for this behavior should be investigated," he says, adding that some studies indicate that singing generates endogenous opioids. Vocal learning in birds happens gradually, which might help researchers study how old and new memories blend.

Birdsong researchers seek to correlate vocal output and auditory input with neuronal activity. But recording from several interacting birds in naturalistic, social settings has not previously been possible. "Our technology opens such perspectives," he says.

Previous Neurologger iterations have already helped field biologists. They have been used to explore, for the first time, how animals sleep in the wild, shedding light on sleep function and evolution, says Niels Rattenborg from the Max Planck Institute for Ornithology in Seewiesen, Germany, who has long collaborated with Vyssotski. As Rattenborg explains, the device helped them learn about the not-so-slothful sloths in a tropical rainforest, the similarities between the development of sleep in baby owls and baby humans in Switzerland, and adaptive sleeplessness in polygynous male sandpipers breeding under the Arctic summer's constant light. "Moving forward," says Rattenborg, "I strongly believe that Alexei's technological innovations will spark a renaissance in our understanding of sleep as more researchers think outside the box and go wild."

Vyssotski received his PhD in physiology from Anokhin Institute of Normal Physiology. As he was finishing, he added training at the University of Zurich, where he landed a postdoctoral fellowship. In 2007, he became a staff researcher at the Institute of Neuroinformatics. When he finds the time, he likes to swim, bike and hike. These pastimes enhance blood flow to the brain, and, he says, "when hands and legs move, the head relaxes."

Vyssotski is from Novosibirsk, where his parents, who are both mathematicians, teach at Novosibirsk State University. Growing up, he and his brother Mitja both loved physics and, together with their father, built many devices with construction sets. Vyssotski decided he wanted to be a pilot, like his grandfather. But his less-than-perfect eyesight prevented that dream from coming true.

In school, he and Mitja participated in a physics competition, which got them both into Moscow Institute of Physics and Technology without the obligatory entrance exams. Vyssotski went on to pursue his PhD in a lab working on mechanisms of memory formation. He developed a way to measure rodents' locomotor activity in their home cages. The device got him noticed and led to invitations from the University of Zurich.

Inventiveness has shaped his career. A PhD student's salary in the late 1990s was so meager, it could buy only a monthly subway pass in Moscow. Vyssotski became a part-time private cab driver there. One evening's earnings were enough to keep a student afloat. "Thus, it was possible to survive, but I wanted to improve my life," he says. He began exploring how he might go abroad, and he applied for summer school and training in Finland and then Switzerland, overcoming a number of administrative hurdles. "Then I landed in Zurich airport 19 November 1998, having 5 US$ in my pocket," he says.

Vivien Marx

Anisimov, V.N. *et al.* Reconstruction of vocal interactions in a group of small songbirds. *Nat. Methods* **11**, 1135–1137 (2014).