



Singing in the Rain

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WHAT DO SINGLE WOMEN AT A COCKTAIL PARTY AND FEMALE FROGS CRUISING AT NIGHT IN THE TROPICAL JUNGLE HAVE IN COMMON? EACH SUMMER, AN LSUHSC RESEARCHER TRAVELS TO A TINY TOWN ON THE EDGE OF THE PANAMANIAN RAIN FOREST TO FIND OUT. AND WHAT HE FINDS MAY BENEFIT PEOPLE WITH DYSLEXIA, SCHIZOPHRENIA, AUTISM AND ATTENTION DEFICIT HYPERACTIVITY DISORDER.

Auditory physiologist Hamilton Farris, PhD, an Assistant Professor in Research at the LSU Health Sciences Center New Orleans Neuroscience Center of Excellence, is funded by an NIH grant to Dr. Nicolas Bazan. Dr. Farris and collaborator Dr. Michael Ryan at the University of Texas-Austin, study the tungara frog (*Physaleamus pustulosus*), a tiny oddity of a frog who hears and sorts sounds the same way humans do.

“Unlike other frogs and toads which just make simple sounds, a single sound that is repeated over and over, this frog makes a very speech-like call; it’s a complex call with syntax. It sounds like the English word, yoke, slowed down,” explains Dr. Farris. “They have the analogous acoustic structure to our speech and they have the analogous acoustic context to the auditory processing problem, so this is why we study them.”

Most of the year, Dr. Farris works with frogs from a colony in Texas in his laboratory on the LSU Health Sciences Center New Orleans downtown campus, but the best way to get behavioral information about what is going on during this basic biological process is to go to the frog in its habitat and study what it does naturally.

So, like the previous eight summers, Dr. Farris spent two weeks during the rainy season when the frogs are really out at the Smithsonian Tropical Research Institute in Gamboa, Panama. Gamboa is about 20 miles north of Panama City. A small town, it’s on the bank of the Panama Canal and was constructed by the Panama Canal Company in the 1930s to house its Canal Maintenance (dredging) Division. There is no gas station, so visiting Smithsonian researchers are cautioned not to go with a nearly empty tank. And to get there you have to cross a single lane wooden bridge. It’s an old train bridge that has about 24 inches of asphalt laid over the top of it that you have to keep your wheels on to keep from falling 25 feet down into the Chagres River or the Panama Canal.



Hamilton Farris, PhD, frog hunting at the Smithsonian Tropical Research Institute in Gamboa, Panama

“One of the things that people with ADHD, dyslexia, schizophrenia and autism have a problem with is not the auditory problem, it’s the attention problem. Imagine not being able to stop yourself from paying equal attention to all the sounds you’d hear walking down the street – a garbage truck, footfalls, traffic noise, conversations, a police car. It would be chaos. That’s the pathology in these syndromes. It has a lot to do with dysregulation of dopamine and serotonin in the brain. It’s that simple, but it’s also that complex.”

– Dr. Hamilton Farris

But it's one bridge Dr. Farris can't wait to cross, eschewing television, radio, air conditioning, restaurants, and even a grocery store, to adjust his body to frog time and spend his nights in the rain forest scooping female tungara frogs out of puddles and ditches and running trials all night before returning them exactly where he found them in the morning.

The behavior Dr. Farris is studying is how female tungara frogs select their mates, because they do it by sorting through the mating songs of potential partners, grouping and ordering the sounds to assess male quality and then assigning them to a male so she can go to him. The auditory process is akin to humans filtering out chatter and noises at a cocktail party to identify and hone in on the most interesting conversation, and the conversationalist.

"You can't really put headphones on a frog very easily and put her in front of a keyboard and tell her to hit yes or no when she heard something like we do with human auditory tests, but you can put her in this arena and see what speaker she goes to."

After the late afternoon rains let up, Dr. Farris spends the first part of his night collecting his test subjects.

"Hundreds of males are singing, they're all out." But they're not the only ones. There are caiman crocodiles walking around, and then there are the vipers who are out looking for the frogs, too – for dinner. The Fer-de-lance and Bushmaster snakes are among the most deadly of Panama's 20 some odd poisonous snakes.

"You're out in the dark in ditches, sticking your hands in to grab things," says Dr. Farris. "At least I can see where I'm putting my hands, but when I squat down I'm afraid I'm going to get bitten on my butt. You can see the big ones, but the little guys you don't see. I watch for snakes, but it isn't so bad."

On a good night, Dr. Farris and his team can easily get the eight or nine females that comprise a night's work. Placing them one at a time in a darkened sound booth, just like those used for human hearing tests, Dr. Farris and his team play different sounds from an array of speakers and with infrared cameras, record what happens. Each frog will be tested for about an hour.

"If you put them on the ground and play them sounds from different places in the sound booth, these frogs don't hop, they walk. And they walk right to the speaker and they press themselves against the speaker; it's a male to them, there should be a male right there."

Dr. Farris also ran another set of experiments to manipulate the frogs' attention and learn more about how our brains shift when something we hear sparks our interest and we tune out everything else to give it our full attention. Or not. This is the next piece of the puzzle.

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A puzzle that this Smithsonian visiting scientist will go to the ends of the earth to solve. And that's no "yoke."



Single male Tungara frog, Smithsonian Tropical Research Institute in Gamboa, Panama



Dr. Farris' undergraduate research assistant.



Dr. Farris with a Tungara frog.