A Frog's Ear View of the Cocktail Party Problem

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In large social groups, listeners experience increased difficulty with speech perception due to energetic and informational masking and impaired source segregation. We humans call this the "cocktail party problem," but it is really a human problem in name only. Many nonhuman animals – from cicadas to cetaceans – communicate acoustically in noisy social groups, but few studies have investigated how they may be evolutionarily adapted to solve their own cocktail-party-like problems. As a result, we have a limited understanding about the potential diversity of evolved strategies nature has discovered to solve various problems associated with communicating vocally in noisy social groups. This talk will describe recent and ongoing work aimed at testing hypotheses about signal processing strategies that enable frogs to communicate vocally in noisy "breeding choruses." After outlining functional constraints on communication, I will report results from recent studies of auditory masking and sound source perception aimed at uncovering how treefrog listeners may be adapted to cope with such constraints. The talk aims to illustrate how broad-scale, comparative studies of carefully considered animal models may ultimately uncover evolutionary diversity in signal processing strategies for solving cocktail-party-like problems in communication.

Mark Bee is an associate professor in the Department of Ecology, Evolution, and Behavior at the University of Minnesota, where he is also a faculty member in the Graduate Program for Neuroscience and the Center for Applied and Translational Sensory Science. He earned his PhD in 2001 from the University of Missouri working with Carl Gerhardt on acoustic communication in frogs. He was a postdoc from 2001 to 2005 at the Universität Oldenburg, where he worked with Georg Klump on the neural mechanisms of auditory processing in songbirds. His research program investigates the mechanisms, function, and evolution of hearing and sound communication in nonhuman animals. A major objective of his research is to discover the signal processing strategies by which nonhuman animals solve analogs of the human cocktail party problem that require extracting biologically critical information from vocal signals under the adverse listening conditions found in noisy social environments.