Brain, Behavior and Evolution

Brain Behav Evol 2015;86:5
DOI: 10.1159/000438833

Published online: September 24, 2015

Preface

Though coined after Darwin's time, the concept of an arms race has served as an obvious and useful analogy for framing many evolutionary questions. Dawkins used this analogy to describe the symmetries or asymmetries in selective pressure on interacting species, recalling Aesop's fable – that the 'the rabbit runs faster than the fox, because the rabbit is running for his life while the fox is only running for his dinner'. Of course, selection acts continually on many different facets of life history. Though less dramatic than a fox's attack, fitness is equally reduced by disheveled plumage that leaves a male last in the lek, or the missed turn in a migratory route that lands an animal on barren shores. Still, the stakes are high when predators strike. There may be no time to change course, no second chance to woo a mate, tomorrow is not another day if you fail to escape. In this sense, predator-prey interactions hold a special place in the study of biology and evolution. If not in the strength of their final effects, at least in the overtness of variables that may be investigated and the time course of the interactions. Often we may easily watch and study the entire contest and outcome in minutes, seconds, or even milliseconds. This convenience recalls Krogh's Principle 'for such a large number of problems there will be some animal of choice, or a few such animals, on which it can be most conveniently studied'. Although a predator-prey arms race is on a different biological scale than envisioned by Krogh, the concept is the same. There are some systems that are particularly convenient for making discoveries and interpreting them in a larger context. Many of the products of evolutionary arms races fall into this category.

A less formal motivation for choosing a study system was articulated by Walter Heiligenberg to explain his research on electric fish to first-year graduate students. After describing basic principles of sensory-motor integration that could be conveniently explored, he would confess 'also – it's fun'. We could not agree more, which is why we chose this topic when we organized the 26th Annual Karger Workshop for Evolutionary Neuroscience, held in Washington, D.C., USA, in 2014. We are excited to be able to share a collection of the papers from that meeting in this special issue. The scientists that presented at the Workshop offered fascinating stories about specializations resulting from predator-prey interactions that spanned a diversity of species, a wide range of brains and behaviors, and scientific approaches from molecular biology to ethology. How could you not be intrigued with beautiful cone snails that have cabals of deadly neurotoxins, pairs of bats dueling for the same prey, alligators and owls localizing sounds using microsecond time delays, tiny killer flies that might try to catch a 747, eels that remotely control fish and garter snakes that can eat enough tetrodotoxin to kill 20 humans. Science is better than fiction. Not only because the stories are true, but also because the studies yield important general principles about nervous system function, sensory system organization, behavior and evolution. What begins with curiosity may end with a new understanding of visual system filters, the neural circuitry underlying auditory localization or the modifications to ion channels that confer toxin resistance. And sometimes parts of the predator's vast toolkit can be usurped for clinical applications, as is the case for conotoxins. We hope you experience both sides of this coin while reading about each of the systems covered in this special issue.

Elizabeth H. Catania, Nashville, Tenn.
Kenneth C. Catania, Nashville, Tenn.

0006–8977/15/0861–0005$39.50/0

E-Mail karger@karger.com
www.karger.com/bbe