



From the President

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NABT President – 2014

The Importance of Teaching Evolution

If you are like me, you may not remember the way you viewed the world before you understood evolution. While I may not know exactly when that change occurred for me, as a biology teacher now, I find myself wondering how I can help my students gain this worldview. I started using the term “evolution goggles” to encourage my students to engage this unifying theme in biology whenever we look at new problems in my courses (Figure 1). But I would suggest that an evolutionary lens is helpful beyond biology and should become part of the liberal-arts education experience. We all ask different questions when we view issues in terms of evolutionary concepts and processes. An evolutionary viewpoint is an important and relevant way for many of our students interested in healthcare, agriculture, psychology, and engineering to understand their disciplines, but we need to make the connection clear to them.

Take the issue of antibiotic resistance. We argue that future medical practitioners need an understanding of evolution to avoid overprescribing antibiotics. Research argues that agricultural practitioners are crucial partners in reducing the unnecessary use of antibiotics. If students in these areas are not using their evolution goggles, they may view antibiotics simply as a tool and may not consider the selection pressures being applied to the bacteria and the consequences for human health. As consumers we can all put on our evolution goggles when shopping, avoiding products that advertise unnecessary antibiotic ingredients like triclosan. This problem looms as one of our next healthcare crises, and we all need to understand evolution to determine best practices.



Figure 1. Evolution goggles.

Evolution goggles can also help students understand the strengths and limits of model organisms. In the 1990s, researchers made the stunning discovery that the body plans of flies and humans are governed by the same group of homeobox genes. From an evolutionary point of view this makes sense; the genetics underlying animal body plans reflect our common ancestry. However, not every discovery translates successfully between nematodes, mice, monkeys, and humans. Why do any discoveries translate at all? Evolutionary relationships can help us predict which discoveries are most likely to transfer to other areas of research.

Genetically modified organisms (GMOs) are of great concern to my students (present and past) and friends, gauging from social media. I occasionally turn my Facebook presence into a larger classroom in an attempt to get people to think more critically about this issue. Evolution goggles change the questions that we might ask about GMOs. For example, does inserting DNA from one organism into another organism inherently alter the receiving organism? A discussion about putting a growth gene that evolved in one species of salmon into another species of salmon takes on a different basis for discussion when using evolutionary concepts as arguments. Similarly, BT corn provides a rich space to explore the intersection of ecology and evolution with students, using the singular lens of their personal health to view GMOs.

Although climate change presents its own set of scientific literacy challenges, again evolution goggles can change the nature of the questions we ask. What are the evolutionary histories of the organisms in the areas predicted to change the most in future decades? Are their phenologies adaptable to their changing environment? Decisions for local conservationists are certainly affected by an understanding of evolution, and the tenor of the national debate might change if more people were viewing potential problems through evolution goggles.

Evolutionary psychology can help us understand our own adaptive (and maladaptive) behaviors. As we ask questions about mental illness, knowledge of genetic causes and the history of selection pressures help us better treat patients with depression, and lead to new research avenues for the increase in autism diagnoses.

Even engineers might find it useful to view problems through evolution goggles. A physics/engineering colleague suggested I read the book *The Evolution of Useful Things: How Everyday Artifacts – from Forks and Pins to Paper Clips and Zippers – Came to Be as They Are* by Henry Petroski. Having lived through the period of Intelligent Design, I am cautious of using manmade objects as analogies. But engineers themselves may not be considering the full breadth of solutions if they are taking limited pathways to get there.

In an interview on Salon.com (Tarico 2013), a computer engineer described how he had reexamined his personal belief system after using evolutionary computation to evolve code. I have added his book, *Evolving out of Eden*, to the list of resources that I recommend to students and colleagues who have questions about their faith after they put on evolution goggles.

As a central organizing theory, evolution goggles exemplify science's definition of a theory as a generalized explanation for why things happen the way they do. Dr. Dobzhansky wrote in our journal that "Nothing in biology makes sense except in the light of evolution." It is important for those of us using our evolution goggles daily to overtly share this perspective with others.

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