



The Joy of Exploration



GUEST EDITORIAL

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The ideal of “exploration” is rooted deeply in the human psyche. Romance and adventure lie inside the quest to go where no person has gone before or to see something that no one has ever encountered. And therein lies one of the chief joys of a life in science. Each scientist in every expedition or laboratory expands the frontier of human knowledge. To this end, the process of discovery is populated with people who have taken risks, made sacrifices, gotten lucky, been smart, or even blundered courageously yet naively into new discoveries. Look into the résumé of every researcher and you will find, somewhere in the midst of all the jargon, a passion for exploration coupled with these kinds of personal stories.

My approach to scientific communication has been to bring these narratives to students and teachers. We live in a time of unparalleled discovery in science: molecular, computational, and imaging tools are revolutionizing our understanding of biological disciplines from genetics to neuroscience. With finds that include the discovery in Canada of a jawed, worm-like animal from rocks over 500 million years old or a new insight into the genes that build the brain, this is an exciting time to work in the lab or field – or both!

Although technological revolutions are the fuel for much of what we do, we do not collect data in isolation from the powerful ideas that link data, give data context, and provide the ability to make predictions. Great scientific theories bring us to a deeper understanding of the world and serve as a framework for the expansion of knowledge itself. Evolution is a great example of the power of a great idea. What links our understanding of the spread of the virus that causes AIDS with the discovery of a fossil “fishapod” like *Tiktaalik*? The answer, of course, is evolution. Or more precisely, common descent. My colleagues and I went to the Arctic to find a flat-headed fish with arm bones because the theory of common descent, the stratigraphic record, and the local geology supported the prediction that such a fossil would be there. But the broad significance of the *Tiktaalik* discovery is just how utterly normal it is. The stories of the recovering of other intermediate fossils, such as feathered dinosaurs, legged primitive whales, or early hominids, follow the same dependence on evolution as a platform for discovery.

One of the challenges in science education is that we live in an age of a big social disconnect. On the one hand, our time is one of major scientific discovery, from the Higgs Boson to epigenetics. On the other, there are segments of our population that, for a variety of reasons, are uncomfortable with, intimidated by, or utterly opposed to scientific reasoning. A cohort of students who fly on advanced jet planes, use an iPhone, or take medicines derived from biotechnology – who experience the fruits of science in their daily lives – are missing the powerful scientific explanations that lie around them. So how to correct this disconnect?

For me, the approach is to go back to my own roots as a scientist. Science, at its best, is a vehicle for human curiosity about the world

around us. The joys of research become ever greater when we can ask questions about our world and go out to find answers. Moreover, the effort to satisfy our curiosity can offer deeply compelling human narratives. For example, Tim White, Berhane Asfaw, Owen Lovejoy, and their international colleagues spent over a decade meticulously collecting pea-sized fragments of bone from the badlands of Ethiopia to bring an ancient human relative to science. They overcame political and natural challenges that posed dangers to their scientific crew operating in remote locations. This work was fueled by a question: How did humanity arise? The tools to answer this question were theories of common descent, historical geology, and inquisitiveness: without the scientific framework and the human curiosity that fueled the search, *Ardipithecus ramidus* would still be lying in the ground.

For these reasons, my book *Your Inner Fish* focused on the stories of science, of how discoveries come about. What was the thinking that led scientists during a scientific venture? How did they learn from failure or leverage other people’s discoveries in their own work? My mantra in writing the book – and that of the team in making the PBS miniseries – was “Let the science drive the storytelling.” Our goal was to let the narrative flow from the process of scientific discovery. Whenever we hit a roadblock in our story, or a hitch in the filming, returning to this little phrase helped us find our way.

Talking heads on TV, the Internet, and editorial pages are filled with doom, gloom, or divisive rancor. But we science educators can’t follow this herd. Why? Because science is a quintessentially optimistic enterprise. Who launches a scientific quest thinking it will fail? What scientist believes that human understanding of the physical or living world decreases over time? And, of course, few things are better balm for pessimism than curious and engaged students. All children are born deeply inquisitive of the world around them. We science educators are uniquely positioned to fuel our students’ innate curiosity and channel it, and ultimately to help them enter their world as explorers.

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