sweet ginger wine Trivers set out. Trivers even records the poem he wrote to the lizard, which goes in part:

We are just friends, man
Blue Lizard and me

We meet in the afternoon

You on your perch
Me in my chair

We are just friends, man
Afternoon friends

You like ants
I like sardines

I should warn readers that some of Trivers' description of interactions with women do not comport with contemporary ideas about political correctness. On the other hand, he rails against Jamaican treatment of homosexuals and has been an outspoken proponent of gay rights on the island.

Robert Trivers is a complex individual who, as the book reveals, has lived a much more turbulent life than most scientists. Whether this tumult has been responsible for the great contributions he has made is a point for debate, though he certainly argues for the connection. Regardless, the book is aptly titled and is an entertaining and heartfelt entrée into the life of this major figure in the field.

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Q & A

John M. Archibald

Born in Quebec and raised in Nova Scotia, Canada, John Archibald is a Professor of Biochemistry & Molecular Biology at Dalhousie University in the province's capital city of Halifax. After a Ph.D. in 2001 in the laboratory of Dalhousie molecular evolutionist W. Ford Doolittle, he carried out postdoctoral studies with Patrick Keeling at the University of British Columbia. He returned to his alma mater *as a faculty member in 2003. Archibald's research has focused on the evolutionary history of eukaryotic cells and their organelles, with particular emphasis on the origin and spread of chloroplasts by endosymbiosis. He is a Senior Fellow of the Canadian Institute for Advanced Research (Integrated Microbial Biodiversity Program) and a Fellow of the American Academy of Microbiology. In 2012 he was a Visiting By-Fellow at Churchill College, University of Cambridge. He is the author of* One Plus One Equals One: Symbiosis and the Evolution of Complex Life *(Oxford University Press, 2014), which chronicles the transformation of endosymbiotic theory by molecular biology.*

If you hadn't made it as a scientist, what would you have become? I'd like to think I could have become a full-time writer, but I doubt this would ever have occurred to me had I not been a scientist first. I hated writing as a kid and didn't really become interested in books until the age of 20 or so. My first serious goal in life had nothing to do with science. I wanted to be a professional cyclist.

Cycling? Yes, but having spent time road racing in Belgium — one of the meccas of the sport — I learned that I was nowhere near talented enough to make it as a pro. It was a bitter pill to swallow at the time, but I don't regret trying and my experiences taught me a lot about life.

Such as? The idea that you can do anything you want if you just try hard enough? Rubbish! I quit racing cold turkey in 1992 and drifted around for a bit, struggling to figure out what to do next. I had promised my parents that I'd go back to school if and when the bike-racing gig fell flat. At the time I had no intention of keeping that promise, but in the end university seemed like the only reasonable thing to do, even if I didn't know quite where it would lead. I put my heart into it, just as I had done with cycling, and good things happened.

So what led you to biology? Other than being class clown, it was the only subject I found interesting in high school. I don't remember much, but I do recall dissecting a fetal pig and learning about heredity. Don't get me wrong, I wasn't *that* interested, but I guess I have always been curious about the world and my place in it. I also have a long-standing fascination with organized religion. As a young teenager I remember discussing the nature of the universe with a friend whose family was religious. I said "but if the universe is expanding, what is it expanding *into*?" He covered his ears and told me to shut up — he couldn't stand to even think about it! I later read Richard Dawkins' *The Blind Watchmaker*, and it was like flicking a switch. The world suddenly made a lot more sense to me. As time went on I realized that I had a passion for big questions in evolution, and became smitten with the idea that DNA could be used as a tracker of history— this led me to molecular biology and genomics. I could easily have been drawn to other 'big picture' disciplines such as cosmology were it not for the fact that I was lousy at math. I still am.

You recently published a trade book on symbiosis and cell evolution.

How did that come about? In 2008 I realized that, like many scientists, I knew very little about the history of my field. I planned a sabbatical to rectify the situation and at the same time branch out from the dry, technical scientific writing I do day-to-day. The goal was to write a book that was accessible to anyone curious about biology, microorganisms, evolution, and the role that DNA sequencing has played in pushing the boundaries of knowledge. I would like to think it also appeals to those with an interest in science as a process. I'm a sucker for discovery stories.

Dalhousie scientists helped to prove the endosymbiont hypothesis for the origins of mitochondria and chloroplasts, right? Indeed — some of the very first molecular sequence data suggesting that these organelles were of endosymbiotic origin came from the labs of Ford Doolittle and Michael Gray in the 1970s. Dalhousie has been a hotbed of cell evolution research ever since. It was Linda Bonen, now a Professor of Biology at the University of Ottawa, who brought the 'RNA oligonucleotide cataloguing' technique of Carl Woese from the University of Illinois (she was Woese's technician) to the Doolittle lab, where she applied it to chloroplasts and the cyanobacteria from which they evolved. Complementary data of diverse sorts were collected by scientists the world over, and the rest is history. I was taken aback by just how controversial endosymbiosis was before the advent of molecular phylogeny.

Symbiotic thinking in biology has deep roots in late 19th and early 20th century Germany and Russia. But prior to the arrival of the American Lynn Margulis on the scene in the mid-1960s, the idea that mitochondria and chloroplasts might be of prokaryotic ancestry was largely unknown in the West, and most biologists who *had* heard of it dismissed it outright. It just didn't fit. Even with a wealth of molecular and biochemical data in hand, the endosymbiont hypothesis remained controversial well into the 1980s. Of course, it eventually became textbook fact — which is why it is so easy for those of us educated in the genomic era to assume it had always been so. Writing *One Plus One Equals One* helped me appreciate the value of looking at scientific data through different lenses, from this angle and that, backwards and forwards. It helps us to identify inconsistencies in our logic and thought-making processes, and allows us to get comfortable with the idea that we might be wrong! The ability to change one's mind is a virtue I admire.

Will you write another book? I am currently writing a book on genomics for the lay reader: what it is, what it is used for, and where it is going. I am also incubating several other ideas for books that explore molecular biology and genomics, past, present and future. Those will have to wait.

Which aspect of science do you wish the general public knew more about? The scientific method. To a certain extent we all *do science*, regardless of our occupation — it's how we figure out why the toilet won't flush or why the dog got sick; it's how we decide whether to change a light bulb or call the power company. One of the biggest challenges facing science today is credibility, which I think stems from a general lack of appreciation of how science really works. We take two steps forward, one step back. It's the nature of science, and the bigger the question the longer it takes to make real progress. But in today's society, there is immense pressure to 'Twitterize' our results to match our ever-shrinking attention spans. I feel that the scientific method has become too far removed from the process of disseminating science. This inevitably leads to confusion and mistrust on the part of non-scientists, and there are big issues at stake: climate change, GMOs, vaccines, etc. There are no easy fixes but I think it would help if the process of science were to somehow become more explicitly 'human'. We are all born scientists, but we are generally bad at applying logic and reason consistently across the various facets of our daily lives.

I also think that the importance of basic, curiosity-driven research is vastly underappreciated in modern society. Here too the history of science has a lot to teach us, if only we can find the time to study it.

Do you have any advice for fledgling scientists? Learn how to 'unplug'. Internet distraction is a huge problem—we are all just one click away from being able to avoid the task at hand. Unplug your network connection, install anti-distraction software, do whatever it takes to get in the habit of being able to focus on *one thing* for at least an hour at a time. As a scientist I have always loved flying because it puts me incommunicado. Screaming babies aside, I used to relish the thought of having a flight to focus deeply on a writing project. But wi-fi is now often available on airplanes. Noooo! I endeavor to resist the temptation to connect at 30,000 feet for as long as possible. I recently rekindled my passion for cycling, a time-consuming hobby but one that gives me a chance to engage in uninterrupted thought. We need more of that.

What is the best career advice you've received? Don't take the advice of any one person too seriously. Forging a successful and rewarding career in science is complicated — there are a lot of variables to consider, and the optimal formula for person X may not work for person Y. I have also been encouraged not to spread myself too thin. Modern research increasingly involves collaboration and interdisciplinarity, which is great but only if it happens organically. Don't be tempted to sign on to a grant or project that you aren't truly interested in just because someone else thinks it's a good idea. It's ok to say no.

If you could ask an omniscient higher being one scientific question, what would it be and why? Just one? I guess it would be 'how can I be sure you are real'? If granted a bonus question, I would ask whether or not there is/was life elsewhere in the universe. A detailed answer would be great, but I suppose even a simple 'yes' or 'no' could have a significant impact on science and society. Of course, I'd first have to convince people that my encounter with this 'higher being' was not a figment of my imagination.

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