Q & A

Victor Ambros

Victor Ambros grew up in Vermont and graduated from MIT in 1975. He did his graduate research (1976–1979) with David Baltimore at MIT, studying poliovirus genome structure and replication. He began to study the genetic pathways controlling developmental timing in the nematode Caenorhabditis elegans *as a postdoc in Robert Horvitz's lab at MIT, and continued those studies while on the faculty of Harvard (1984–1992) and Dartmouth (1992–present). In 1993, members of the Ambros lab identified the first microRNA, the product of the heterochronic* lin-4 *gene in* C. elegans*. Since then, the role of microRNAs in development has been the major focus of his research.*

What turned you on to science in the first place? I can't recall not wanting to be a scientist, even as a child. My dad was constantly designing and building gadgets to repair or adapt machinery on our farm. He taught me the satisfaction of building things with my own hands, and even today that's the part of doing science that I love most. When I was nine, I found a book about amateur astronomy and telescope making. I loved the idea that ordinary people could do real science in their backyard with instruments made with their own hands. Also, like so many other kids during the 1960s, I was inspired by the Apollo moon flights; it seemed like almost anything was possible through concerted scientific effort.

What steered you to biology and* C. elegans *in particular? I started at MIT in 1971, intent on becoming an astronomer, but soon learned that I did not have the mathematical chops for physics. Luckily, a few late-night bull sessions listening to my roommates holding forth about the delights of molecular genetics reeled me in. Here was a branch of science that relied mostly on logic and common sense, and where beautifully simple experiments could yield profound insights about the tiny parts of living cells. This was utterly astonishing to me. I started in the Baltimore lab the year David won the Nobel prize — a very exciting time and place to be. As I was finishing my thesis, a new faculty member, Bob Horvitz arrived to spread the gospel of the worm in the US. He gave a lecture to the students about worm mutants with abnormal cell lineage patterns, which seemed like a fantastic opportunity to find out about genes controlling cell fate and cell division. I was instantly attracted to the worm as a system for studying development. Luckily, Bob had an empty lab to fill and accepted me as his first postdoc.

Do you have a favourite paper? When I teach, I enjoy demonstrating the power of genetics by examining certain elegant papers. One of these is the 1983 paper from Iva Greenwald, Paul Sternberg and Bob Horvitz on *lin-12*, which encodes the nematode Notch homolog (Cell *34*, 435–444). That paper is a fantastic example of how deep insight into molecular mechanism can be derived from the application of astute experimental design, simple genetic manipulations and clarity of analysis.

What is your favourite conference? There is a meeting that I find delightful, although it is not really a scientific conference in the usual sense. For the past three years I have had the opportunity to serve as a judge at the national finals of the Siemens Westinghouse Competition in Science, Technology and Mathematics. This has become the highlight of my professional year. The talent and enthusiasm of these high school kids is just so invigorating. I get a huge kick from meeting these extraordinary young people, and seeing the obvious joy that they get from doing science. It is also

fascinating to learn more about other scientific disciplines from the non-biologist judges.

Speaking of high school students and young scientists; what are your views of the state of science education in the US? My experience with the Siemens Westinghouse competition has taught me that there is an enormous pool of scientific talent among our young people. Unfortunately, what is largely missing is opportunity; very few students have access to truly stimulating, hands-on experience in scientific inquiry. I believe that science is one of the most basic of human instincts — like hunting and gathering. So, instinctually all very young kids are talented scientists, but most lose interest as they get older. In the US, our university-level science education is good, but the secondary grades are turning kids off. This estrangement of young students from science results not just in lost personal opportunities, but also contributes to a general disrespect for science in our culture today. We need to somehow recapture the excitement of the Apollo era!

Do you have a scientific hero? I love scientists, so I have lots of scientific heroes, including the usual individuals of exceptional talent and impact, such as Galileo, Einstein, Edison, Crick, Feynman. But I am attracted to the notion that almost anyone can do science, given a reasonable measure of normal ability, inclination and opportunity. So some of my heroes are less famous, such as

Ole Roemer, the 17th century Dutch astronomer who made the first reasonably accurate measurement of the speed of light by timing the eclipses of Jupiter's moons, using simple telescopes and clocks. As a kid, I was inspired by the story of Clyde Tombaugh, the farm boy (like me) who got a job at Lowell Observatory and went on to discover Pluto.

You were involved in the discovery of small RNA regulation in the worm: are you surprised by the recent explosion in research on miRNAs? I think I will always be astonished by microRNAs. When we found the *lin-4* small RNA, I thought it was fascinating, but I can't honestly say that I was sure it would turn out to be of broad significance. The *lin-4* gene functions in a genetic pathway controlling developmental timing that did not seem to be conserved outside nematodes. We tried for years to clone *lin-4* from other nematode species without success. But when the Ruvkun lab found that *let-7*, another small RNA in the same pathway, is phylogenetically conserved, we began in earnest our search for other similar small RNAs. Enthusiasm for miRNAs has also been stimulated enormously from the simultaneous interest in small interfering (si)RNAs and RNA interference in general.

What is your greatest research ambition? I hope to keep doing it as long as I can — as long as I feel that I am still learning and progressing as a scientist, and making some sort of contribution. I love to do experiments with my own hands, so I imagine myself ending up in some special home for aged scientists, with wheelchair accessible lab benches, and large-print computer screens, and so forth.

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Walking the walk

Walking upright on two legs is a trait unique to humans amongst our ape cousins. There has been much controversy and uncertainty about when human ancestors evolved an upright gait, but a new study suggests that *Australopithecus afarensis*, 3.2 million years ago, already walked this way.

The team, led by William Sellers at Loughborough University with colleagues at the University of Dundee and the University of Liverpool, reporting in the Royal Society's Interface journal (published online), have used an 'evolutionary robotics' model to study the famous fossil footprints discovered 25 years ago at Laetoli in Tanzania dated at 3.5 million years, alongside analysis of 'Lucy' — a fossil of *A. afarensis,* a species thought to possibly have left the footprints in the volcanic mud.

The model, tested on modern humans, suggests that these hominids walked at speeds greater than those of modern quadruped apes and that they adopted a bipedal gait. Our two-legged manner may therefore be well embedded in history.

Stepping out: A new study suggests early hominids may have adopted upright walking as long as 3.2 million years ago. (Photo: EMPICS.)