Interview with Dr. Luis Delaye

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ABSTRACT

Dr. Luis Delaye works at the Research and Advanced Studies Centre of the National Polytechnic Institute of Mexico (CINVESTAV). His work takes place in the Evolutionary Genomics laboratory within the department of Genetic Engineering, and his area of research is the origin and evolution of new genes, the evolution of reduced genomes, and horizontal gene transfer. In his early years, his interests were focused on the origin of organisms, and as a result, he has been devoted to the subject of evolution since his undergraduate studies in Biology at the National Autonomous University of Mexico (UNAM). In 2009, Dr. Delaye completed his postdoctoral studies in Valencia, Spain.

Liliana Corona (LC): Hello, today we are with Dr. Luis Delaye,and we would like to know a bit more about his work as a researcher of evolution at CINVESTAV.

Dr. Luis Delaye (LD): Hello, thank you very much, it is a great pleasure to be here.

LC: Let's start with the essential, how would you define 'evolution'?
LD: Well, evolution is a fascinating process and in my opinion it could be defined on three levels corresponding to the way in which we study it:

The first is microevolution, which refers to the change of allele frequencies in populations, where mutations play a fundamental role in the change between generations.

The intermediate level, where we study the speciation process, is the part that connects macroevolution with microevolution, and involves the mechanisms,by which new species arise, the role of natural selection and endosymbiosis.

The third is macroevolution, by which large groups of living things arise, such as molluscs, plants, eukaryotes, and etc. It is also responsible for order within the 'evolutionary tree' structure. This level requires large-scale study.

LC: Why is it important to study evolution?
LD: Well, it has a fundamental importance – first of all because nothing in biology makes sense or is logical without the light of evolutionary theory – evolution provides coherence, and most importantly, allows us to attempt to understand what the origin of life was.

Secondly, evolutionary theory is useful for practical applications. It was Pasteur who said: "There are no such things as applied sciences, only applications of science".The scientific study of living beings allows us to learn how microorganisms adopt new mechanisms, for example resistance to antibiotics, which is particularly relevant when it comes to fighting viruses, where it is necessary to investigate their mechanisms of defense. Artificial selection is also important in the improvement of agricultural produce.

LC: Why did you decide to work in this area? What was your motivation?
LD: Since I first began studying, the most important question I had was how life originated. This led me to venture into the laboratory of Dr. Antonio Lazcano at UNAM, which was devoted to the study of the origin of life. In that lab, they studied a number of evolutionary processes that explain the characteristics of microorganisms and that was fantastic.

LC: What have been your favourite research projects in your career so far?
LD: Well, one of them was my thesis for my degree, since to explain the main subject it relied on two theories – Horowitz's theory and the Patchwork theory – and I found all this material fascinating. I have also worked on a project on the evolution of polymerases, and although it was not published, I enjoyed it all the same. When I worked on the reconstruction of SOPE genome, a really interesting apparent product of endosymbiosis, I was fascinated because I really enjoyed discovering the origin of new genes.

LC: What has been the most interesting result from your research?
LD: It was when I worked with the issue of the origin of new genes, because when I made my hypothesis for the project, my prediction was correct. I had originally developed a theory; but a few years ago,it was tested experimentally in the U.S. and the result was as I had predicted. This was very exciting for me. Also during my PhD, I worked on a project about endosymbiosis in which I began to study genomes, and it was quite challenging for me to assemble something so complex (which, by the way, is still incomplete). I was fascinated by collecting new and interesting data about a biological system.

LC: What projects are you currently working on?
LD: I am studying a series of overlapping genes that have demonstrated their existence experimentally, and by estimating rates of evolution, I am trying to infer whether there is a related feature, and also evidence of natural selection in viral proteins. As well as this, I am creating a project with the aim of constructing a database in order to study the comparative biology of reduced genomes.

LC: What obstacles do you face? What is the biggest challenge in the study of evolution?
LD: Well, in my case, it has been the mathematics. It was difficult for me because during my undergraduate studies, I did not see much Math, and when I began looking at the theory of evolution, there was a lot of Math involved.

It gets even more complicated with mathematical modeling of things such as the inference of past processes, which allows you to connect events and find out how they happened. Math is also vital in order to make correct predictions.

LC: What tool do you use to study evolution?
LD: Well, it depends which area you study – there are all sorts of areas that you could focus on in evolution, from archaeology to ecology, but in my case, I use computers. They are a basic tool, but they are essential for the creation of databases.

LC: And speaking of computers, what is the role of bioinformatics in the study of evolution?
LD: Critical, because it provides the means to answer the questions we have, for example BLAST is a program that helps us to find homologous genes for evolutionary analysis. We also have tools that allow us to do phylogenetic analysis to study protein structures or gene databases. There are also programming languages like Python, which are built to carry out programs that simulate the evolutionary processes that we are interested in.

LC: What message would you give to young people who want to work in this area?
LD: To trust their intuition and skills; evolution is the most fascinating branch of biology, and there is now almost no field of biological research that doesn't

Dr. Luis Delaye Photo courtesy of Liliana Corona Martínez

require a tool or knowledge provided by evolutionary biology.

LC: Finally, do you have any advice for readers?
LD: I can recommend reading some authors, such as Darwin of course, but also Lynn Margulis, Stephen Jay Gould, Richard Dawkins, Ernst Mayr to start with. Also, if you want to work in bioinformatics, I would advise studying biology first and then studying computer science afterwards.

LC: Dr. Delaye thank you very much for this valuable information about your training and work as a researcher in the very interesting topic that is evolution.

About the Author

Liliana Corona Martínez is currently studying at the University of Queretaro in Mexico.

Information for Teachers

1. Have you seen examples of STEM work in schools which deserves to be published?
2. Are there projects or coursework out there which will otherwise lie forgotten on a shelf or USB memory stick?
3. Would you like to encourage a student (or group) to consider publishing it in a science journal for others to read and for posterity? (…being a published author looks great on their CV!)

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