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Interview

An Interview with Dr. Mark Stoneking

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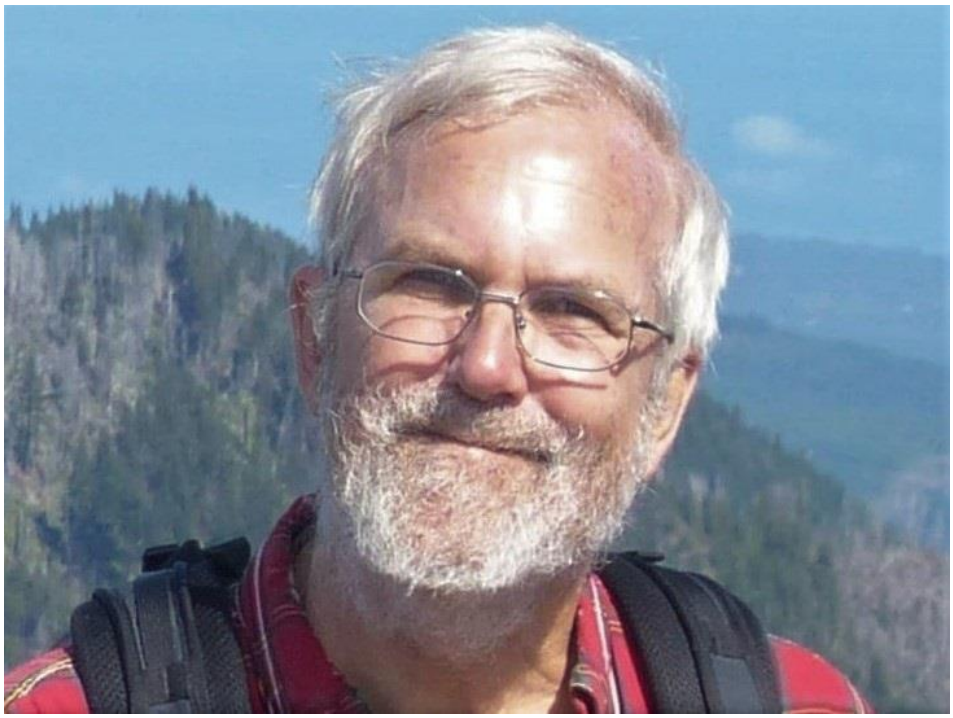

Dr. Mark Stoneking

Dr. Mark Stoneking graduated from the University of Oregon in 1977 with a B.A. (Honors College) degree in anthropology. He then obtained an M.S. degree in genetics from the Pennsylvania State

University in 1979, followed by a Ph.D. in genetics from the University of California, Berkeley in 1986. After postdoctoral work at Berkeley and employment at the Human Genome Center at Lawrence Berkeley Laboratory and the Cetus Corporation in Emeryville, California, in 1990 he joined the faculty of the Anthropology Department at Penn State University. In 1999, he joined the Department of Evolutionary Genetics at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, where he directed the Human Population History Group and was also Honorary Professor of Biological Anthropology at the University of Leipzig.

1. Please Tell Us Your Scientific Background?

I started my undergraduate studies at the University of Oregon as an undeclared major, because I had no idea what I wanted to study. I was therefore able to take courses in a variety of fields, including an introductory course in anthropology, which I took mostly because I didn't know anything about it. I found the study of human past and present variation quite interesting, and ended up majoring in anthropology. Along the way I took some courses in human population biology and human population genetics, which in turn got me interested in genetics. I then went to Penn State to do a master's degree in genetics, and ended up working on the evolutionary genetics of salmonid fish (trout and salmon). Compared to your usual experimental organisms (such as E. coli, Drosophila, etc.), salmonid fish have two major advantages: they are good to eat, and sampling wild populations can be quite a pleasurable activity! This was in the late 1970s and involved studying variation in proteins via gel electrophoresis (isozymes); at the end of my master's work, when I was trying to figure out what to do next, the first studies of mitochondrial DNA (mtDNA) came out. It seemed to me that this would be the next big advance, namely studying variation directly in DNA rather than indirectly via the protein products of genes. There were two labs at the time analyzing mtDNA variation, and I ended up going to Allan Wilson's lab at Berkeley. When I got there I just wanted to learn about mtDNA and didn't particularly care what organism I worked on, but of the various projects Allan had going on, the most interesting to me was that of Becky Cann, who was analyzing human mtDNA variation. And so I started working on human mtDNA variation for my Ph.D., which then re-awakened my interest in anthropology. I came to realize that while humans are terrible as a subject for experimental studies (because of the long generation time, inability to make crosses, etc.), they are ideal as a subject for evolutionary genetic studies, because there is such a rich background of information from other fields such as paleontology, archaeology, linguistics, cultural anthropology, etc. that can be used both as a source of hypotheses about human population history, as well as a sanity check on the inferences we make from genetic data. So it was during my Ph.D. studies that I decided to be a molecular anthropologist, and I haven't looked back since.

After my Ph.D. I stayed on in Allan's lab in Berkeley for a postdoc for two years, as there was an interesting new technique called the polymerase chain reaction (PCR) which had been developed at the Cetus Corporation, where a former student of Allan was vice president, so we heard about this method early on. PCR revolutionized molecular anthropology (as it did many other fields), so it was an easy decision to stay in Berkeley. After that I had brief positions as a research scientist with the Human Genome Center at Lawrence Berkeley Laboratory (where I mostly learned how not to do science) and with Henry Ehrlich at Cetus (who was a great mentor), where I got involved with forensic applications of mtDNA analysis. In 1990 I landed a tenure-track position with the anthropology department at Penn State, which was a great place for me as not only was the

department, under the guidance of Ken Weiss, extremely supportive, but Penn State was developing a very strong presence in molecular evolutionary genetics. I benefitted greatly from interactions with people such as Masatoshi Nei, Andy Clark, Tom Whittam, Linda Maxon, Blair Hedges, Ross Hardison, etc. With the aid of some very talented students and postdocs I was able to establish a successful research program in human population history, and also carried out research and casework on forensic applications of mtDNA analysis – through the latter we had the opportunity to work on the identification of the remains of the outlaw Jesse James, and to show that Anna Anderson – despite widespread belief - was not Anastasia Romanov.

In 1996-97 I spent a sabbatical year in Svante Pääbo's group at the University of Munich. Svante had been a postdoc in Allan Wilson's lab during the latter part of my Ph.D. studies, and we had kept in touch and gotten together at a few meetings since then; I greatly enjoyed my interactions with Svante and he was quite enthusiastic about my coming to Munich. It was during my time in Munich that the Max Planck Society proposed a new institute in Evolutionary Anthropology, to be located in Leipzig in the former East Germany, and started recruiting Svante to be a director. Svante in turn asked me if I would be interested in joining his department as a group leader, and it was not a hard decision: unlike the U.S., where I was spending increasing amounts of time and mental energy trying to come up with the funding to do the research I wanted to do, the Max Planck provides very generous, guaranteed funding, eliminating the need to apply for grants. Moreover, I was very attracted to the idea of being able to continue to collaborate with Svante, and to the advantages of living in Europe that I saw for my family. And so while I was not looking to leave Penn State, we packed up and moved to Leipzig at the end of 1998.

This turned out to be the best decision I could have ever made. Being able to spend my time thinking about the science I wanted to do, rather than how to pay for the science I wanted to do, was extremely liberating. We could plan long-term projects without worrying about grants ending, or if something new and interesting came up, we could start to work immediately rather than thinking that this would be cool to do, now we just have to write a grant and maybe in a year or so we'll actually have some money to do it. A particularly important aspect of our work that this enabled was fieldwork to collect samples for human population history studies. In order to avoid competition with the large consortium projects such as 1000 Genomes, we focused our efforts on little-studied areas of the world that were often rather difficult to access. Occasionally – not often enough – I was able to participate in such expeditions, and I treasure my fieldwork experiences in such places as Zambia, Namibia, the Philippines, Indonesia, and the Solomon Islands – seeing how people live in such areas, listening to their stories and talking with them about their lives and history, returning to the communities to inform them of our results, brings a whole new dimension to the work. Even more important for our research was that we could fund students and colleagues from institutions in the areas we wanted to study to carry out sample collections and then have them come to the lab with the samples to do the genetic analyses. These were truly "win-win" situations, in that we gained access to valuable samples that would otherwise remain inaccessible, while the students and colleagues gained valuable knowledge and expertise that they brought back to their home institutions. And another result of such cooperations that I treasure is the network of friendships that I have built up around the world.

2. What Is Your Main Research Area? How Did You First Become Interested in It? Is There a Particular Case Which Has Influenced You the Most?

I'm a molecular anthropologist, which means that in my research I use molecular genetic methods to address questions of anthropological interest about human origins, population structure, history, and migrations. I'm also interested in the impact of natural selection on human populations, and the influence of human cultural practices on our genetic variation. I've detailed above how I became interested in this field; it certainly didn't hurt that during my Ph.D. I was fortunate enough to work with Becky Cann and Allan Wilson on the first detailed study of human mtDNA variation, which was published in *Nature* in 1987 and strongly suggested a recent African origin for human mtDNA. This study – the so-called "mtDNA Eve" hypothesis - attracted an enormous amount of interest (and controversy). And I thereby came to realize that it is nice to have lots of people interested in what you do – in some ways the work I participated in as a master's student on the evolutionary genetics of salmonid fish was even more interesting, but there are a lot fewer people interested in fish than there are interested in humans.

3. Which Topics are Included? In Your Opinion, What Challenges and Developments Can We Expect to See in among These Topics?

My research spans several different aspects of using molecular genetic method to address questions concerning the origins and relationships of various human populations, as well as the impact of natural selection and cultural practices on human genetic variation. For this work, over the years we have either gone into the field to obtain samples (typically, cheek cells or saliva, which are sampled non-invasively) or arranged collaborations with foreign researchers who either have or are willing to go into the field to obtain samples of interest for us. And a major new development is the growing realization that we need to do more to engage both the communities who provide samples, and our foreign collaborators, in the studies we do. To be sure, we have always provided opportunities for foreign collaborators to come to the institute to learn and participate in the laboratory and analytical procedures, so they can bring this knowledge back to their home institution, and I am proud of the fact that I have mentored several foreign students who have earned Ph.D. degrees with me, based on samples that they have obtained. Moreover, we take seriously the responsibility to return the results of our research to the participating communities – for example, in 2015 I spent 6 weeks driving a Land Rover over rather sketchy roads in Botswana and Namibia, and we delivered oral and written reports to over 40 communities. But there is more that can be done – and needs to be done – by researchers such as myself, who rely on the good graces of people in foreign lands to be able to carry out our work.

4. Considering the Progress in Your Research Area, Could You Please Share Us Some Hot Topics or Cutting-edge Technologies in Your Research Field?

There are several areas where advances in technology are having a tremendous impact on molecular anthropology. Advances in genomics and next-generation sequencing are making it easier and less expensive than ever to obtain high quality genome-wide data. In particular, new developments in ancient DNA research have greatly expanded the scope of such studies (including, for example, the retrieval of DNA from cave sediments), which in turn have had a major impact on

our understanding of past human migrations and population history. Along with the technological advances in obtaining genomic data from modern and ancient populations, there have been crucial developments on the bioinformatics and population genetics side – especially in model-based approaches to understanding demographic history - which enable more and more insights from the data at hand. Finally, a very new and exciting development is the application of methods from functional genomics to understanding the genetic changes that characterize modern humans – i.e., how did humans become human?

5. As an Experienced Researcher in This Field, What Do You Consider to Be Key Aspects of Research That Apply to the Practice?

Molecular anthropology requires (at least) three rather different skill sets: the ability to interact with individuals and communities of very diverse backgrounds and interests in order to carry out the field-based research to obtain samples for genetic analyses; conducting the laboratory analyses to generate the data; and carrying out the computational analyses of the data. Lately, the first and third aspects (fieldwork – and the attendant ethical and moral obligations and considerations, mentioned briefly above - and computational analyses) are receiving the most attention, while laboratory analyses are increasingly relegated to specialized facilities. Which is a pity, I think, as students who only carry out computational analyses of data generated by others (which is increasingly the case) may not be aware of particular biases in the data that can arise as a consequence of the laboratory work (e.g., ascertainment biases arising due to the choice of SNPs that are genotyped, or regions of the genome that are sequenced).

6. Do You also Offer Training and/or Further Education in Your Area?

Now that I am retired I no longer take on students or postdocs, but I still teach a course in molecular anthropology when asked to, and give lectures for colleagues in courses they offer.

7. Let Us Know How You Balance Your Job with Privacy? What are Your Secrets of Success for This?

One of the benefits of moving from the U.S. to Europe was to gain an appreciation for a healthy work-life balance. In the U.S., it was a source of pride among my colleagues to work insane hours and never take a vacation; in Europe, people take vacations very seriously and think (rightfully so, in my opinion) that there is something wrong with you if you don't take a regular break from work. It is admittedly difficult – there is always another paper to read, or manuscript to work on, or analysis to do – but I've learned to take time out to enjoy other aspects of life, without worrying about the impact on my scientific productivity.

8. What Are Your Future Plans?

I've recently retired from the Max Planck Institute and moved to Lyon, France, where my wife (and frequent collaborator) is a linguist with a CNRS lab. After nearly 10 years that we've been going back and forth between Leipzig and Lyon, it is a very nice change to both be in the same place! I've also arranged an affiliation with a CNRS lab in evolutionary biology in Lyon, and I have a few projects still ongoing in Leipzig, so while I won't have my own lab any more, I'll still be able to do some science. And otherwise I plan to learn French and enjoy the very nice wine, food, and ambience of Lyon!