# Networking and Other Challenges of doing a PhD in European Foulbrood

I have now been working on my PhD, studying the epidemiology of the serious brood disease European Foulbrood (EFB), for three years, so readers who have been following my progress will know this is the third article to catalogue research progress.

Much of my activity over the past months has involved processing samples supplied by the National Bee Unit's Bee Inspectors. These were either infected adult and larval honey bees, or extracted DNA prepared at Fera taken from a larger project across England and Wales. The aim was to try and uncover epidemiological links between outbreaks of EFB; that is to say, to gain understanding about and explain relationships between geographically disparate outbreaks of EFB. While fundamental to the aims of my project, this is similar to work I have presented in previous articles for *BBKA News* and in the current piece I would like to describe some of my more diverse experiences.

At the end of March and beginning of April this year I attended a Programming for Evolutionary Biology course, at the University of Leipzig in Germany. A highlight of my PhD, this was very different from anything I had experienced before, involving lectures and practical classes from world renowned experts in the use of computer programming to help understand biological problems. The main thrust of the course was the use of various computer languages to perform statistical analyses of data, and to interpret results of 'Next-generation Sequencing.' This type of DNA sequencing is becoming widely used in biological research and allows orders of magnitude more data to be generated about an organism's genetic makeup compared with traditional sequencing technologies. I already have generated some of this data from my study organism, *Melissococcus plutonius* (the causative organism of EFB), and I plan to analyse this with my own computer scripts. However, just as important as the actual course content was the opportunity to talk with professors and students from all over the world about our research, as well as spending three weeks in the beautiful city of Leipzig.

Meeting other academics and forging links for further work has been something of a theme of this year. In March I attended the COLOSS workshop on EFB at Fera. The meeting gathered together researchers working on EFB in Europe, and participants from Norway, the Netherlands, Switzerland and the UK. It was illuminating to talk about different approaches to EFB control across the continent and to make important contacts. As a direct result of this meeting I am to be the fortunate recipient of a number of samples of *M. plutonius* from the Netherlands, giving me the excellent opportunity to investigate their epidemiological relationships, both within the Netherlands, and possibly in a larger European context. As well as these 'one-off' meetings, we have also had the tremendous luck to have a visiting academic stay with us at the National Bee Unit. Professor Keith Delaplane, of the University of Georgia, USA, is an expert in beekeeping and entomological science. I was present at an enthralling talk he gave to this year's NDB (National Diploma of Beekeeping) class about the potential benefits of polyandry, the mating of a honey bee queen with multiple drones, and viewing honey bees as a superorganism. This means considering the honey bee colony, rather than the individual bee, to be the subject of evolution and this can be extended to think of the colony possessing different, 'organs,' such as the brood comb being used to share chemical and other messages. On a more a day-to-day basis we have had many stimulating discussions about beekeeping, academia and the right way to do science.

As already touched upon, building links is invaluable in studying a globally distributed disease like EFB. I, my colleagues and supervisors at Fera, have managed to assemble a range of samples of *M. plutonius* from Scotland, the Republic of Ireland, the Netherlands, France, Denmark, the USA and Thailand, and I hope to get access to a few more over the coming months. I will be using these to try and gain an understanding of global EFB spread. As a consequence of this I have gone back to the library to see how *Apis melifera*, the Western honey bee, has been dispersed around the globe and how that can help us interpret the concomitant spread of EFB. This sort of historical research was not something I anticipated doing at the start of my project, but I have found it fascinating, and a genuine pleasure. Of particular interest has been the case of the honey bee in America, where the story starts with its first confirmed introduction from England to the New World in Bermuda, in 1617. The beginnings of honey bee spread through continental North America were in Virginia in the early 1620s (again transported from England). After several more introductions from the Old World, some successful others less so, bees began to make their own way through the woods of the South and Midwest. These bees thrived in their new environment, such that bee trees became a relatively common (and pleasurable) find for pioneers in the nascent USA. These stories are not just of historical interest; I hope to be able to use this sort of information to explain the type of data I might generate from my own international samples.

*The University of York University Challenge Team, 2012, just prior to our victorious first round match. Photo with permission of ITV Studios Limited.*

I am now entering my final year, and will have to submit my thesis in September 2013. While this is a somewhat daunting prospect, I have thoroughly enjoyed my time in York and at Fera, and hope that my last few months of laboratory work will make some really novel insights into EFB spread and *M. plutonius* biology.

## Acknowledgements

My work is supervised by Dr Thorunn Helgason and Professor J Peter W Young at the University of York, Dr Giles Budge and Dr Richard Thwaites at Fera (the Food and Environment Research Agency), and by Bernard Diaper, at BDI (Bee Disease Insurance). The project is funded by a BBSRC CASE studentship in partnership with BDI. My attendance at the Programming for Evolutionary Biology course was generously aided by a grant from the Society for General Microbiology.

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