Profile of Dr. Georg Hausner

Dr. Georg Hausner, Associate Professor (Microbiology)

1. When did you start to have an interest in Microbiology, or Science in general?

In High school I always I had a love for English, Chemistry and Biology. Once I came to the realization that my actual poetry writing skills were to say "rather limited" I pursued Chemistry and to a larger extend Biology at University. In my second year I had a 'great' prof that turned me on to the world of fungi and I never looked back. I was fortunate that I was able to take a wide variety of courses during my undergraduate years, such as courses dealing with Plants, Fungi, Algae, Genetics, Plant and Animal physiology, Chordates, Parasitology etc. Ultimately I found that molecular biology, genetics and evolution unifies all living organisms on this planet.

2. Tell us about the path you took to get to where you are.

My path was a "see where it takes me approach" i.e. I had no clue(s)! After graduating I spent the summer working on the family farm but eventually I decided that I should do something. So I showed up at the office of Dr. James Reid (formerly of the Department of Botany at the University of Manitoba) in 1985 to see if he had a position for a student. My Master's project dealt with aspects of fungal physiology and my PhD dealt with fungal taxonomy/systematics and fungal evolution using molecular markers and phylogenetics. My postdoctoral work (Michigan State University) dealt with fungal genetics. I worked as a research associate/research scientist in Agriculture Canada research stations in Morden (MB) and Lethbridge (AB) working on developing molecular markers that might provide disease resistance against fungal diseases in flax and potato. Although I enjoyed working on these projects I found the environment restrictive with regards to pursuing my own interests so I accepted a term position with the University of Calgary and eventually (2000) a tenure track position at the University of Manitoba. So depending on your goals, careers in science can be a long term investment.

3. Briefly tell us about your research? What role(s) do undergraduate students play in it?

I primarily work on species of *Ophiostoma*, *Grosmannia* and *Ceratocystis*; these are fungal genera that include many forest pathogens and so-called blue-stain fungi. As pathogens some of these species can have significant impact as they will stunt, or in many instances kill trees. This obviously has an even more dramatic impact, for example: (1) on the environment (trees do represent a sink for CO_2 and on many other forms of life that depend on trees as a habitat); (2) on industry [forestry such as pulp & paper or lumber/construction; or the potential use of trees as a source for cellulose that can be converted into biofuels by microorganisms]; (3) on Urban forests (Dutch Elm Disease – caused by members of the *O. ulmi* species complex); (4) on bioremediation efforts where trees are used to stabilize eroded areas or trees are used to sequester potential soil pollutants. Maintaining healthy forests is vital to our environment and economy, thus understanding the biology and biodiversity of the pathogens that can damage this valuable resource is extremely important. These fungi are also becoming increasingly more problematic due to the arrival of new bark-beetle species that vector these fungi; in the case of the Mountain Pine Beetle the blue-stain fungi actually make it possible for the beetle to successfully overcome the trees resistance mechanisms. This beetle (with "help" of some *Grosmannia* and *Ophiostoma* sp.) is

currently devastating forests in British Columbia.

So my research efforts can be summarized as follows:

1. Developing rapid molecular tools (sequencing the rDNA ITS region) and data bases that allow for rapid identification of forest pests (species of Ophiostomatales).

2. Characterizing mitochondrial genomes of blue-stain fungi to understand the persistence of genetic elements (such as plasmids, mobile elements) that may have implications in genetic diseases and thus allow for the identifying of naturally occurring hypovirulents (can infect trees but do not cause symptoms of the disease) strains that could be used in biocontrol strategies. Recently my work on Chestnut Blight (caused by *Cryphonectria parasitica*) in collaboration with Bertrand and Fulbright (Michigan State University) showed that mtDNA plasmids and a "defective" group II intron can be implicated in manifesting hypovirulence in *C. parasitica*.

3. Characterizing group I and group II introns plus bioprospecting for novel DNA cutting enzymes (so called homing endonucleases) among the fungi. Potential homing endonuclease genes are over expressed in *E. coli* in order to confirm DNA cleavage activity and determine the target and cleavage sequences. Recently we uncovered several twintrons, elements composed of mobile introns inserting within other mobile introns, and we are now interested on how these twintrons evolved and how they splice and move.

Over the years all aspects of my research program has involved undergraduate students either as "Summer students" or as "Project students". The key is to expose students to variety of techniques and topics and find out their potential and their strengths. Ultimately science is a discipline that requires creativity and self-motivation.

4. What does it take to be a successful scientist?

Hard work, persistence and not being afraid of failure are the prerequisite for being a scientist. Ultimately you have to be your own harshest critic and always be your own "devils" advocate to challenge yourself. You also have to be successful in communicating your findings both verbally and in writing. Publish or perish is certainly applicable to science.

5. Describe your overall lifestyle (work-life balance, family time, leisure time? etc).

Maintaining a funded research program, publishing papers, training research personal (undergraduate and graduate students), teaching and service to the University and Scientific community can be a 24/7 undertaking. There is no easy way to balance all aspects of life except to realize that one cannot get everything done and that one needs "down" time. I do enjoy gardening (indoors and outside), cooking, and I enjoy listening to music (from classical to heavy metal).

6. What advice would you give to undergraduate students currently working in research?

Do you have passion for research? Do you look forward to getting up in the morning to get to the laboratory? Does failure raise your level of curiosity and make you work harder? My advice if you said yes to the previous questions – research will ultimately reward you. We all have strength and weaknesses – recognized the latter and built on the first. Never be afraid to challenge yourself; science is extremely competitive so you have to thrive to be the best in what you do. Be careful with regards to "overspecialization" – you might be the "best" in the field but the only job out there is taken and that person will not retire for the next 20 years. Make sure you have training in core skills that can be applied to other areas.

7. What advice would you give to undergraduate students that are looking for a research job?

Get as much experience as possible by getting summer positions in research laboratories and yes grades count as you need to know the background of the area you wish to work in and to be competitive for summer jobs. Read as much as you can on the science topics that interests you. Ultimately be willing to relocate and to continuously learn new ideas and techniques. Science is rapidly changing so it is easy to be left behind.

8. What kind of jobs can undergraduate students, who have research experience in your field, have upon graduation?

Research experience gained in my research group includes basic molecular biology skills, genetics, plus some applied bioinformatics, and mycology. These are core skills that can be applied to many other research areas. Former students from my program currently work in agricultural, medical, and mycological research environments (Industry, Government and University). Some have moved on to enter Medical Schools.

9. How do you foresee the future of Microbiology or life science?

There will always be a need for scientists and with microbes being of concern to human health, relevant to bioremediations, biotechnology, biofuels, food industry, and agriculture (forestry etc.) there should be many opportunities. I am still optimistic that there is a bright future for the life sciences – but one has to keep an almost global view to pursue opportunities. As stated above be flexible in changing locations and areas of research, expect to continuously upgrade yourself by learning new techniques and by staying current on various scientific topic.