

## **CSC2006 Halifax, Nova Scotia**

### **Career Panel Discussion: Pursuing an Academic Career in Chemistry**

#### **Doing “good” science**

Science involves a lot of hard work. Perseverance is required.

You will fail more times than you will succeed.

People will more likely knock down your “great” ideas or worse steal them from you.

Traits for success: stamina, command of the literature, and intelligence in that order.

You need to learn to identify good questions to pursue and to filter out what is important from what is not.

To fully know a subject or an idea you need to know how it is connected to its nearest neighbour ideas and to other apparently disconnected ideas. The leaps forward happen when you connect an idea from one discipline with another from a different discipline. This means you need to know the historical development of ideas in your field of interest: who did what, when, and how?

Problem solving is a key critical skill. Most interesting problems are at the boundaries of traditional disciplines. Therefore interdisciplinary research is key.

The fastest and most effective way to connect ideas in science is through the language of mathematics.

#### **Choosing a university for undergraduate and graduate school**

Match your field of interest with the reputation of the school and the particular department. This completes the mantra: do what you love.

Check out the quality and quantity of its library holdings: this is the university’s umbilical cord to the outside world. Look for classic references, books, databases, and journal subscriptions.

Look at the frequency of talks given by its faculty members to its own department.

Look at the colloquium series: who comes to visit the department to give talks?

Look at the number and variety of named lectureships.

Pay attention to the people who introduce speakers to find out the connections between themselves and the speakers.

Examine the breadth and depth of course offerings in your area. Do they match current research trends? Is the undergraduate curriculum in phase with how research is done today? Are courses mentioned in the course calendar offered every year?

Find out what scholarships, fellowships, and bursaries are available that you can ballot for.

What are the requirements for the PhD degree? Are they rigorous enough? What is the reputation of such a degree from a particular institution?

What is the university's examination schedule like? Are their weekend exams? Do you have a study week to prepare for the finals?

### **Key strategies successful undergraduate and graduate students follow during the course of their studies**

- They develop a good memory. They focus more on concepts and broader underlying ideas than rote memorization of disconnected facts.
  - Take good lecture notes. They summarize each lecture using flowcharts that show each topic and the connecting ideas between them. This optimizes their study time since it is possible to identify areas that they are already proficient in and those that require more attention.
  - They master the literature in their subject areas and know what are the “bibles” in their field; they know where to look for what information; they take regular time out to read the current literature.
  - They learn to become independent and to be self-learners.
  - Establish personal and professional connections with peers and people in other fields as early as possible.
  - Make connections with people who are better than themselves, but beware of arrogance.
  - Have close friends in each of the four main areas of science: mathematics, physics, chemistry, and biology. They will need them for dealing with future science problems and for employment purposes.
  - Keep their eyes and ears open to other people's ideas.
  - Establish a trustworthy circle of professionals around them to buffer themselves against the coming adversities.
  - This is what makes successful people successful and what keeps them moving forward and happy in what they are doing in science.
  - The most prized trait that professors look for in students is the ability to work independently with little supervision. This means that you must have command of the literature so that your advisor can build their trust in you as you produce novel and unexpected research results during the course of your studies.
- Students that hold scholarships and fellowships are better able to finance their education and be less of an overhead burden on their advisor's grants.

### **Selecting potential research advisors for post-graduate study**

Do thorough literature background checks on their publication track record: area of science, frequency of publication, journals that they publish in, number of co-authors and collaborators. Read trade and society magazines to learn of their awards and research recognition.

Ask about the career fates of his/her students. This will give you a window to your fate if you were to join their research group.

How do they **manage** their research group? Talk with their students and post-docs to get the straight goods. How do they conduct group meetings? How often? Are they structured?

Will your advisor let you pursue your own ideas right through to publishing your work on your own as the author of correspondence?

Do they incorporate research ideas in their teaching?

Do they practice and value research and teaching equally or do they divorce them? Are they up-to-date with the literature in their field?

Remember this motto: *research is the grindstone on which research skills are sharpened.*

### **Key behavioural patterns of successful academics**

- Have an imagination.
- Were inspired at a young age about science.
- Learned by apprenticeship from past “good” advisors.
- Sought people of influence who promoted their scientific efforts and ideas.
- Sought people who steered them in the path of other “good” connections.
- Sought professional allies from within and outside their area of science as early as possible.
- Sought mentors who made no distinction between excellence in research and teaching.
- Are always aware of connections between ideas in their field.
- Are proficient in using the scientific literature to keep up to date, to clarify their ideas, and get ideas for future work.
- Maintain dogged focus on their ideas.
- Actively participate in the whole research/teaching enterprise.
- Willingly open themselves up to criticism from others and show resilience, stamina, and belief in their academic goals.
- Are keenly aware that they are only as good as their students and research fellows under their direction.
- Actively advertise their work and give recognition to the achievements of their students at conferences and meetings.

## Description of the triangulation principle in connecting with people

People move in their career path more often by being repelled rather than by being attracted to particular people or subjects.

People listen to people they know and trust, particularly if they “grew up” together.

People take seriously the opinions and ideas of those they know and trust.

Academics listen and take seriously the opinions and ideas of those they know and trust that are of the same rank.

When approaching someone new with your “great” idea make sure that you are first introduced to them by someone who knows and trusts you and your target, and has the same rank as your target. This will ensure that your idea will be taken seriously and will be acted upon swiftly. This strategy is the basis of meaningful recommendations and recommendation letter writing on your behalf.

Remember this motto: *you're a good scientist only when someone else says you're a good scientist (and that someone else IS a prominent scientist of reputation).*

### Caveats

Students' biases and prejudices mirror those of their academic advisors.

Professors do not have professional certification to teach.

Research, teaching, and administrative activities are not equally respected.

Doctoral programs do not prepare you for the true job of a professor: managing a research group, advertising research work, obtaining funding for research work, preparing coherent lectures for undergraduate students, and reviewing papers and grant proposals . These skills are obtained by emulating the very few “good” professors you will encounter in your academic careers and by deliberately asking to do these tasks during your graduate and post-doctoral education.

Be aware of the advantages and disadvantages of joining research groups headed by young, mid-career, and senior faculty members.

Don't expect your professor to look out for you in your career development. Be aware of predators who bank on student naiveté.

Don't ever accept to do collaborative work with an industrial partner without first obtaining a clear written agreement on the objectives and plans for the project between yourself, your academic advisor, and the industrial partner. Don't expect that your professor has your best interests in mind. Beware of laissez-faire, “play-it-by-ear” agreements. You as a student or post-doc will lose every time when something goes wrong and no traceable agreement exists.

Make sure that when you take up your post-doctoral appointment you use this time to showcase your research prowess. You must come up with your own project that you negotiate with your chosen advisor; this means all the logistics of carrying out the research and how the findings are to be made known to the world.

For more information please visit CareerChem on how you can be a successful student and future academic. There will be a detailed workshop following this panel discussion on strategies for obtaining academic positions in chemistry.

John Andraos

May 30, 2006