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# HOW TO 'SURVIVE' AFTER GRADUATING IN MATERIALS SCIENCE - I: DEVELOPING A GRADUATE COURSE ON 'SURVIVAL SKILLS FOR SCIENTISTS'

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## ABSTRACT

This article describes the development and content of our graduate course on 'Survival Skills for Scientists' at Institut National de la Recherche Scientifique, Université du Québec. The course was designed to provide graduate students in Materials Science with basic advice on how to plan their careers after graduation (similar advice applies to Physics, Chemistry and Engineering students, and possibly other disciplines as well). The course begins with an analysis of the job market for science and engineering graduates. It then goes on to provide practical skills that go beyond those needed for success in carrying out theoretical work or experiments in the laboratory; these skills include how to plan your career, how to write an article, how to give an oral presentation, how to secure funds for your science, how to write your Curriculum Vitae and in general how to apply for a job, knowledge of the peer review system, the role of scientific meetings and finally the role of Ethics in modern science. We have offered the course in two different formats, described hereafter.

## INTRODUCTION

Most aspiring scientists face a series of frustrations, some minor and some major, usually starting from their training in graduate school – and we are not referring to the disappointment of a failed experiment. For example, some of us are natural speakers, but we were all (quite) nervous when we gave our first presentation; some are excellent writers, and yet we all received major corrections from our supervisors when we drafted our first manuscript for publication. What is worse, most of us from the latest generation had only a very vague idea of what life in the real world (after graduation) would be like. Though (presumably) we all signed up for graduate school because of our passion for science, had we known how competitive the job market would then be, we might have chosen a very different, safer course of studies; or at the least we would have embarked upon it with a better idea of the practical career challenges that lay ahead, and perhaps with a more combative spirit.

All this became apparent when the first two of us (Rosei and Pignolet) joined the faculty of INRS (Institut National de la Recherche Scientifique) in the spring of 2002. While building up our laboratories, we interacted with several students from other groups who were about to graduate. What they all had in common was that they admittedly had little idea about what exactly they wanted to do once they earned their doctorate, and even if they did, how to best do it. The basic conclusion we drew, which was also based on anecdotes gathered from friends and colleagues as well as on knowledge gleaned by attending conferences all over the world, was the following: While modern universities in the developed world (we confess to a nearly complete lack of knowledge of what happens in the developing world) provide excellent material on the scientific and technical "hard" professional techniques and requirements, in general students are left completely on their own to acquire the "soft" professional skills and career development approaches and considerations. This lack of such "survival skills" means that these entrants to the research sciences risk make career-threatening errors in this competition right at the beginning before they can learn its implicit rules.

We therefore set out to develop a graduate course that would aim at filling this educational gap. The 'survival skills' course discusses the practical nuts-and-bolts tactics and the many things which a young scientist ought to know, things which are not, in and of themselves, scientific at all. They are the techniques, tactics and strategies for career planning so as to climb the ladder in the scientific community. To give an example from a completely different field, for a classical musician this would be equivalent to the decisions ranging from whether to become a member of an orchestra or a concert performer or a teacher, to what competitions to enter, to how to evaluate what general style of music to concentrate on etc. but nothing on the actual practicing, playing or interpretation, i.e., nothing on the actual music itself, the realm of musical talent and genius which stems from raw talent and is to be nurtured in other ways.

The 'alpha' version of this course was offered as an informal discussion group with about 15 attendees (graduate students and post-doctoral fellows) meeting for 2 hours once per week during the fall term of 2003. The 'beta' version was subsequently recognized as a credit earning 'special problems' graduate course at INRS, centre Énergie, Matériaux et Télécommunications (INRS-EMT) in the fall of 2005 attended regularly by about 18 students. Most recently, after having given the course several times in the classic lecture format, in May 2008 we experimented with a new set-up. Rather than teach the course throughout a whole four-month session, we concentrated the essence into the form of an intensive workshop over three days. The workshop was attended by about 80 participants from most of the major Universities in the Province of Québec, including Université de Montreal (which hosted it on its premises), Ecole Polytechnique de Montreal, McGill University, Université de Laval, Université de Sherbrooke, Concordia, UQAM and of course INRS.

Broadly speaking, this article (intended as the first in a series in the Journal of Materials Education) is aimed at anyone in the large community of research scientists whose success depends directly on the results that they publish in peer reviewed scientific journals[1]. (In many cases for scientists and engineers working in industry the preferred venue of publication are patents, whose purpose is to protect the intellectual property and competitive advantage of the company, and also internal reports. This will be discussed in greater detail in a subsequent article in this series). Within the peer-reviewed research community we are addressing most directly the young scientists on their way up the ladder. However, we believe that "older" scientists can also gain from this book in the form of helping them to understand the professional preoccupations of their younger colleagues. In particular, we hope that a good proportion of senior scientists will consider participating in such a course as an opportunity to hone their mentoring skills and perhaps develop courses similar to ours. Such courses usually do not require extensive and exhaustive preparation (as the more traditional technical courses often do) and typically lead to interesting and stimulating discussions with the participating students.

In developing this course, we had to come to terms with the fact that for the young scientist, (apart from the actual science itself, and apart from reminiscences of successful scientists where some anecdotes may be found) little recorded information is publicly available in terms of practical advice to help make the many choices that fall under the headings of the strategy, tactics and planning considerations which can be applied to a scientific career. We had to make do with the few books [2, 3, 4, 5, 6, 7] that we found on this and related topics (which led two of us to write a new book with the title "*Survival Skills for Scientists*"[8]) and with scattered articles from a variety of journal sources (for a more complete reference list, see the bibliography in Ref. 8).

This article is organized as follows. The first section describes the structure of the course and its components. The subsequent sections briefly relate the various topics we addressed throughout the course. These topics included the need for objective analysis by the students (of themselves, of their capacities and ambitions), of the job market for science graduates ('classical' jobs, trends in the job market, 'alternative' careers (to the 'classical' ones). Skills to acquire included the following: preparing your CV for a job application; preparing for job interviews; scientific communication (oral); scientific communication (written), the use and significance of citation indices and impact factors; understanding of the peer review system; how to make the best use of scientific meetings (conferences, workshops, symposia); how to apply for science funding (fellowships, grants); ethics in science.

## STRUCTURE OF THE COURSE AND LECTURE FORMAT

This course is not meant as a traditional course *ex cathedra*, during which the lecturer enunciates concepts, laws and theories and the students listen and learn more or less passively. Conversely, it is a discussion based course and the students are expected and encouraged to participate actively by sharing their experiences and ideas, suggesting approaches and volunteering for 'special' activities when needed.

The course begins with a discussion of the need for the individual to undertake analyses of their capacities and realistic ambitions and of the strategies they intend to implement to reach their objectives (but without any discussion of the results of these necessarily private self-analyses in the course). A public item of analysis which was in common for all students was a current analysis of the job market for science and engineering graduates. The course then goes on to provide practical skill components that go beyond those needed to successfully carry out theoretical work or experiments in the laboratory. These 'soft skills' include how to write an article, including an understanding of the need and function of the peer review system, how to give an oral presentation, how to secure funds for your science, how to participate in conferences (and which conferences to attend) and how to network there, how to write your Curriculum Vitae for various specific contexts and in general how to apply for a job. The course ends with a discussion of the role of Ethics in modern science and the contexts in which the young researcher needs to be aware of ethical issues which may arrive.

## THE JOB MARKET FOR GRADUATES IN MATERIALS SCIENCE AND ENGINEERING, INCLUDING 'ALTERNATIVE CAREERS'

The first skill component of the course is on the job market and begins with a study of the relevant available literature (Without such an impulsion students usually read only the technically focused literature which directly touches their research). The students are encouraged to study all job-related materials in journals such as the *Materials Research Society Bulletin*, *Materials Today* and *Nano Today* as well as journals from other more general societies that have strong materials components, for example *Chemical and Engineering News*, the *Bulletin of the American Ceramic Society*, *Physics Today and Physics World*, *IEEE-Spectrum and others*. These magazines publish weekly job advertisements and frequently discuss the latest trends in the scientific job market and are therefore very precious resources. Besides these, *Science* and *Nature* also have career sections, which however are usually meant for much broader audiences than just Materials Science and Engineering.

This component was complemented with a full hour of discussion for the academic job market (our own realm of experience) and we also invited external speakers from government laboratories and industry to describe challenges and opportunities related to scientific careers in their sectors. These lectures tend to be extremely inspiring and valuable as they give a direct and honest account of the type of environment that is found outside of academia, with all its advantages, challenges, drawbacks and pitfalls (A note of warning: finding good speakers who are willing to volunteer their time out of their heavy workload is not easy and scheduling is a severe problem; this part of the course requires significant advance planning. This problem is much more severe for the workshop version of the course because one must organize all the talks within three days or so).

## HOW TO WRITE YOUR CURRICULUM VITAE FOR DIFFERENT EMPLOYERS; COVER LETTERS

This lecture aims at providing guidelines on how to approach prospective employers with an appropriately formatted Curriculum Vitae (CV) and cover letter when applying for a job. We emphasize that the format should be changed for different prospective employers, with emphasis on the components of interest to him (For instance, one would provide more details on publications and teaching experience when applying for academic posts and more on project planning, organization and completion, on ability to innovate and adapt as well as anything to do with patents or the like when applying for a job in industry). Some differences on how the CVs are written in different regions of the world are also discussed.

## JOB INTERVIEWS

During this lecture we conduct mock job interviews asking the students to volunteer as candidates (occasionally we ask one or two to volunteer also for the role of selection committee member).

Although many questions are recurrent even for very different employers, again we emphasize the likely differences in the interview process for a faculty position[9] as opposed to a staff scientist job in an industrial laboratory or a government laboratory.

While these mock interviews tend to be fairly lighthearted and amusing, usually they also serve to demonstrate the complete lack of knowledge of what to expect on the part of the students.

## COMMUNICATING YOUR SCIENCE: GIVING ORAL PRESENTATIONS

Learning to communicate orally (sometimes refereed to as ‘communication skills’, which frequently however has a broader meaning) is very important to become a successful scientist. This type of communication starts informally at the research group level, where students are asked to present their latest work and results to the other members of their group. It continues with the description of presentations at scientific meetings (e.g. conferences) as well as seminars and colloquia in University departments, government laboratories and (more rarely) industrial laboratories and those which are given in connection with a job interviews. Mostly we focus on the structure of an oral presentation as well as a long list of ‘don’ts’.

We also offer a live example of a truly horrible talk and of a well prepared presentation.

## COMMUNICATING YOUR SCIENCE: WRITING ARTICLES

It is somewhat surprising how most students do not fully realize that their best results have essentially no value until they appear in print. Many young scientists get overly excited simply by collecting new information and perhaps interpreting it. While their enthusiasm is to be encouraged, it is also important to make them aware that exciting new knowledge needs to be shared in print with the scientific community. However, one must ultimately steer a middle course between publishing only minimum size snippets to have the maximum number of publications, but none of which will ever be cited as the classic paper on the subject, and the other extreme of one gigantic paper when you are leaving the topic in question, whereby you are liable to be scooped by almost everyone (Perhaps the best is a few well-chosen curtain-raising letters on a new topic and masterful papers aimed at being the best paper for a significant domain; easy to indicate, but hard to achieve).

This lecture thus necessarily deals with the structure of a scientific article; it also distinguishes between different types of articles, including brief ones (Letters, Communications) and longer ones (Full papers) all the way to broader pieces of writing such as Reviews, Feature Articles and even Perspectives. Some students may already have written their first one or two articles. These may react in two ways: (i) they are either bored and feel they have little to learn from this; or (ii) they find it very interesting, wish somebody had explained this to them before they drafted their first manuscript, and are more than willing to share their experience with everybody else. Some practical advice is given on how to deal with referees as well as with their comments (if unfavorable); this aspect is discussed again in the lecture on the peer review system.

## THE PEER REVIEW SYSTEM

This lecture discusses peer review in all its uses, namely publication in international journals, review at conferences, competitive funding and hiring and promotion procedures. After a brief description of how it works, the emphasis is actually on the pitfalls of this system, giving concrete examples of abuse in peer review (often from personal anecdotes, though some are so spectacular that they can be found in the literature) as well as ways to protect yourself[10].

The final take home message of this lecture is that in modern science, *anything that matters is peer reviewed*. This concept cannot be overemphasized since it accompanies scientists throughout their whole careers.

## FUNDING YOUR SCIENCE: FELLOWSHIPS, GRANT PROPOSALS

While many idealists find it distasteful to even discuss the monetary aspect of science, without adequate funding new advances would simply not happen. This includes both funding for yourself (fellowships and the like) and funding for projects in the science you want to do (equipment and materials for experimentalists, supercomputers for theorists, travel support for everybody, etc.). This lecture therefore is important because it gives the students a clear idea of this particular aspect of a scientific career (which probably until now has been completely taken care of by their advisor) and how the funding situation may affect their life and vary between different environments. It is also an opportunity to remind the students of the differences in terms of funding between the three broad job prospects, namely academia (which mostly operates 'bottom-up'), government laboratories and industry (which on the other hand are managed environments and function 'top-down').

## SCIENTIFIC MEETINGS: CONFERENCES, WORKSHOPS, SYMPOSIA

In this lecture we describe the important role of scientific meetings as venues where to present your work, to learn from and to network with your peers. Since these are vital opportunities to advance your career, the choice of meetings you attend should be made strategically and tactically to build your networks, to make contacts and of course disseminate your scientific results and achievements directly. Such meetings are frequently held in popular, famous and/or beautiful locations, which might add interest to it. Hence this lecture can be somewhat lighthearted as it also allows the presentation of one of the fringe benefits of a scientific career, referred to by some as ‘scientific tourism’.

## THE ROLE OF ETHICS IN MODERN SCIENCE

Considering that ethics is the basis for scientific work, it is to a large extent surprising that it is too frequently taken for granted. It is therefore important to include a lecture on this topic (which could actually become a course unto itself).

While data-faking, cutting corners in reporting and (more rarely) plagiarism are the items that make up much of the public discussion of ethics in science, the young researcher needs to be aware of the way in which ethical issues can surface more frequently in everyday science. These include ethical sharing of the credit for publications, including authorship and author order in publications, giving credit for assistance which falls short of credit as co-author, what to do with “anomalous” results, and to what extend they may – and more often may not - ‘borrow’ already well written phrasing (cut-and-paste) from the published literature for their own use, are some of the ethical issues which may arise even where financially sensitive issues such as intellectual property is not involved. When intellectual property is involved, with all the associated legal complications, the researcher must be very aware of what might arise before rather than after the fact.

## CONCLUSIONS

Ultimately the aim of a ‘Survival skills’ course is to help young scientists to help themselves to make their way in science, leaving the purely creative and ‘scientific’ part up to them. In other words, it is a ‘soft skills’ / career development course. Without this knowledge and its application, we are convinced that the progress of young researchers in the world of science will be left far more to chance than it should be (In fact, far more advice can be found on such common activities such as buying a car or a house or starting a business!).

In essence, the ‘survival skills’ course is intended as a guide on how to manage your career in science. Any would-be entertainer or author normally acquires the services of an agent or a manager to help in managing to help planning career moves and in selling the output. Although some might be lucky enough to have supervisors or mentors that would guide and help them to tackle real life issues and acquire the needed soft skills to swiftly advance their career, some are not, and this article, the first in a series, is aimed at making you into your own agent.

Most scientists (and nearly all those beginning in science) attend to matters mentioned above only when faced with a deadline of some sort. This means that only a minimum of planning can be done at the last minute[11]. It is possible to do much better by taking the trouble to tend to one’s career at least on a weekly basis.

Based on our experience so far, this course yields the best dynamics and is best offered with a student group of 10 to 20, and two instructors. We have found that in smaller groups it is difficult to get the students to participate enough, whereas the risk with larger groups is that the discussion may go off on tangents too often, not to mention the risk for some to 'highjack' the course and for others to fail participating actively. Also, if only one instructor is present the students tend to be too shy and less willing to participate in the discussion, effectively rendering it a monologue. With two professors, each can play devil's advocate or gadfly for the other when appropriate.

We found the course to be very enjoyable and effective in both traditional and workshop formats. The extended length of a full-semester course means that it is relatively easy to modify and improve during the course. On the other hand, the workshop format has the advantage of reaching out to a critical mass of participants that can greatly exceed the 10-20 mentioned above; however, it does require more resources, in particular some funds to reimburse the cost of guest lecturers and also enough volunteer instructors to break out into groups of 15-20 participants for theme discussions, all to be focused in a relatively short time.

We have not yet decided on the format we will use for the next edition of the course. However, given the great success of the workshop, we are likely to repeat it in this format since it reaches a much larger audience.

## ACKNOWLEDGEMENTS

F.R. is grateful to the Canada Research Chairs program for partial salary support.

## REFERENCES AND NOTES

1. For those who are not yet familiar with the term 'peer reviewed literature', this means literature for which publication is obtained only through the filter of judgement by their peers in research science. This is usually carried out anonymously.
2. P.J. Feibelman, *A Ph.D. Is Not Enough: A Guide to Survival in Scienc*e, Perseus Publishing, 1993.
3. C.J. Sindermann, *Winning the games scientists play*, Perseus Publishing, 2001.
4. G. Schatz, *Jeff's View on science and scientists*, Elsevier, 2006.
5. J.T. Yang, *An Outline of Scientific Writing,* World Scientific, 1995.
6. B.H. Thyer, *Successful Publishing in Scholarly Journals*, Sage Publications Inc., 1994.
7. A.J. Friedland, C.L. Folt, Writing Successful Science Proposals, Yale University Press, New Haven, 2000.
8. F. Rosei, T.W. Johnston, *Survival Skills for Scientists,* Imperial College Press, July 2006.
9. M. Anderson, 'So You Want to Be a Professor!', *Physics Today,* April, 2001.
10. D. Grimm, "Peer review: Suggesting or Excluding reviewers can help get your paper published", *Science* **309**, 1974 (2005).
11. P. Smaglik, "Thinking ahead", *Nature* **423**, 565 (2003).

## APPENDIX I

**Course Syllabus: *"Survival Skills for Scientists"***

*[See following pages]*

## APPENDIX II

**Workshop Program: *"Survival Skills for Scientists"***

*[See following pages]*

# APPENDIX I : COURSE SYLLABUS

## *"SCIENTIFIC SURVIVAL SKILLS"*

- 1 credit course. Each lecture would last approx. 1 - 1.5 hours.

- No final exam. Students are evaluated through classroom participation and homework assignments.

**1. Introduction.**

- Description of the course and course philosophy.

- The (perceived) need for a course on professional development.

- Outline of the course and topics.

- Suggestions (from the students) for other issues to be discussed.

- By its very nature, this course is interactive: students are expected to participate actively in the discussion.

- Presentation of existing literature on professional development.

- The basic message is: plan ahead.

**2. The scientific job market.**

- What are the “classical” jobs for a science graduate?
  (i) academia
  (ii) government laboratories
  (iii) industrial laboratories

- What are the differences between these types of jobs?

- Where can you find information, i.e. job ads?

- What are the trends in the job market?

- Alternative jobs:
  - start–up company
  - engineer, technical staff
  - consultant
  - patent attorney
  - patent officer (e.g. European Patent Office).
  - Scientific journalist

**Homework:** Write or answer an ad for a scientific position

**3. How to prepare your Curriculum Vitae (CV).**

- Different CVs for academia and for industry.

- Different CVs for Europe and for North America (possibly for other countries, e.g. Japan)

- In your CV, you should be exhaustive in describing yourself and your achievements, but you should be synthetic at the same time. Optimize your signal to noise ratio.

**Homework:** Prepare your CV and defend it

**4. How to prepare for a job interview.**

- Interview for a faculty position.

- Interview for a job in industry (more ‘business’ like). The concept of business plan.

- Mock job interview

**Homework:** Defend your CV (will be criticized and noted as well as the mock job interview)

**5. Scientific communication I**

- How to prepare an Oral presentation.

- Do’s and don’ts of an Oral presentation.

- Timing: do not exceed your allotted time.

- Fifteen ways to get your audience to leave you.

- Guidelines on how to give a truly terrible talk.

- Structure of a scientific presentation:
  - Introduction
  - Results
  - Conclusions and perspectives

- Difference between a contributed talk, an invited talk and a plenary talk.
- Departmental seminars and colloquia.
- Speaking in Public.
- A good scientist must be a good communicator. The best results are useless if they are not communicated effectively.

**Homework**: Write a criticism of one of the (intentionally bad!) presentations given as examples.

**6. Scientific Communication II.**

- The structure of a scientific article.
  - title
  - author list
  - abstract
  - introduction
  - experimental (methods)
  - results
  - discussion
  - conclusions
  - acknowledgements
  - references
- Different types of articles: letters/communications, long articles, review articles, feature articles, perspective articles.
- Use outlines to structure your discourse.
- Prepare your figures first, then write your story around the figures.
- Less is more: be synthetic.
- Graduate work: MSc and PhD theses.
- Vulgarization, popular science

**Homework:** Rewrite an abstract; Alternatively: Choose between a critical comment or a perspective of a given article

**7a. The peer review system.**

- Editors, referees.
- Bad referees vs. good referees.
- Write your papers for an audience.
- Think ahead about comments and reactions from referees.
- Conflicts of interest / famous examples (YBCO from P. Chu).

**7b Citation Indices, Impact Factor.**

- What is the impact factor (I.F.) of a journal? Why is it perceived to be important?
- High profile journals and editorial ‘power’. Journal proliferation (literature/information proliferation ).
- Choice of journals where to publish.
- Conference proceedings.

**Homework:** Write a referee report for a given paper

**8. Scientific ethics.**

- Perception of honest vs. dishonest behavior / Discussion with the students
- Examples of scientific fraud.
- Science is self–correcting.

**Homework:** Essay on why science cannot survive without ethics; Alternative: Propose an alternative to the peer review system

**9a. Scientific meetings, conferences, workshops, symposia**

- What are the three important reasons to attend a conference?
- Conference proliferation.
- Costs associated to conference participation.
- Student awards and prizes, student grants
- Oral presentations vs. Poster presentations.
- Small meetings vs. large meetings.
- Networking and job ads at meetings.
- Examples of large meetings (APS, ACS, AVS, IEEE, MRS, ECOSS, EPS, E-MRS etc.)

**Homework**: Find a conference in your field and write a proposal to your advisor (including a budget) to convince him to finance your participation at the meeting
Alternatively, write an abstract for that conference.

**9b. Cultural differences**

- Working in North America, Europe, Asia.
- Hierarchy in Europe vs. independence in North America.
- Job security in Europe vs. North America.

**Homework**: none

**10. Science and Money.**

- How to fund your research.
- Fellowships, scholarships, and where to gather information.
- Grant proposals.
- Industrial contracts.
- Establishing a track record.

**Homework:** Write a one page application for a fellowship emphasizing the originality of your project

**11. Presentation by a scientist from industry (**should include a job description, and expectations**)**

**Homework:** Based on the presentation summarize in your opinion what are the essential differences between industrial and academic scientist.

**12. Presentation by a scientist from a government laboratory (**should include a job description, and expectations)

**Homework:** Based on the presentation summarize in your opinion what are the essential differences between science at a governmental and an academic lab.

**Conclusions.**

Assessment of the course (material provided, teaching art, teachers); Suggestions for improvements and other issues to be discussed.

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## APPENDIX II. WORKSHOP PROGRAM

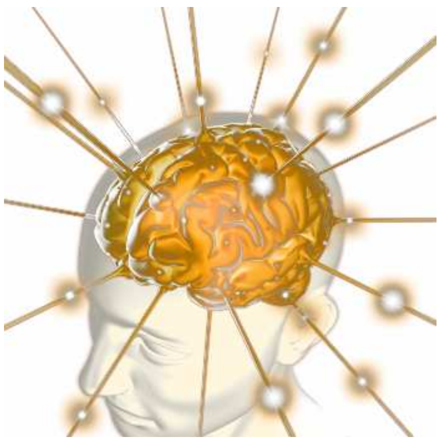
*[See following page.]*

## APPENDIX II: WORKSHOP PROGRAM

**Techniques de Survie Scientifique - Survival Skills for Scientists**

**May 12–14 2008**

**Université de Montréal**
***Pavillon André-Aisenstadt***



Co-Chairs:

Prof. Alain Pignolet
&
Prof. Federico Rosei

*(INRS-EMT / Univ. du Québec)*
*Sponsored by Plasma Quebec*

*Great thanks to CSACS for student support*

***Compétences indispensables à la réussite d'une carrière en Science et Génie:***
***CE QUI NE VOUS A PAS ÉTÉ ENSEIGNÉ À L'UNIVERSITÉ***

***Essential Skills for a successful career in Science and Engineering:***
***WHAT THEY DO NOT TEACH YOU IN UNIVERSITY***

## Workshop Program

### *Monday May 12 2008*

| | |
|---|---|
| 09:30 - 10:30 | Enregistrement + Rafraîchissements / Registration + Refreshments |
| 10:30 – 11:00 | Message de Bienvenue / Welcome address |
| 11:00 - 12:00 | ***Marc Garneau:*** "Le scientifique accompli" / "The complete Scientist" |
| 12:00 - 12:30 | Questions et discussion avec l'orateur / Questions and discussion with the speaker |
| 12:30 - 13:30 | Pause Dîner / Lunch Break |
| 13:30 - 15:00 | Cours – Discussion "Le marché de l'emploi / Job Market, CVs, Entretiens d'embauche / Interviews"<br>• Le marché de l'emploi pour des diplômés en Sciences et Génie; Choix de carrières / The job market for graduates in Science and Engineering; Career Choices |
| 14:15 | Pause / Break<br>• Comment écrire son Curriculum Vitae; exemples pour un poste académique, industriels ou dans un laboratoire gouvernemental / How to write your Curriculum Vitae; examples for Academia, industry, government laboratories; job interviews |
| 15:00 - 16:00 | ***Robert Brouillette:*** "Tout ce qu'un Chercheur doit savoir sur la Propriété Intellectuelle" |
| 16:00 - 16:30 | Questions et discussion avec l'orateur / Questions and discussion with the speaker |
| 16:30 - 17:00 | Pause Café / Coffee Break |
| 17:00 - 18:30 | Cours – Discussion "Ethics in Science"<br>• ABC de l'éthique en Science: l'intégrité scientifique; le plagiat / Ethics in Science 101: scientific integrity. Plagiarism. |
| 17:45 | Pause / Break<br>• ABC de l'éthique en Science: La fraude Scientifique; la falsification des résultats. Exemples récents / Ethics in Science 101: scientific fraud; falsification of data. Recent examples. |

### *Tuesday May 13 2008*

| | |
|---|---|
| 09:00 - 10:30 | Cours – Discussion "La communication scientifique" / "Scientific communication"<br>• Comment écrire une bonne communication scientifique. Différents types de communications écrites: Lettre, article, article de revue, chapitre de livre, livres / How to write a scientific communication. Different types of communications: Letters, Full Papers, Reviews, Book Chapters, Books. |
| 09:45 | Pause / Break<br>• L'impact de votre recherche scientifique (publiée). Citations, measures des citations, facteurs d'impact / The 'scientific impact' of your (published) work. Citations, citation indices and the 'impact factor'. |
| 10:30 - 11:00 | Pause Café / Coffee Break |
| 11:00 - 12:30 | Cours – Discussion "évaluation par les pairs" / "Peer Review"<br>• L'évaluation par les pairs. Fonctionnements, avantages et inconvénients / The 'Peer review system'. How it works and its pitfalls. |
| 11:45 | Pause / Break<br>• Discussion critique du système d'évaluation par les pairs. Existe-t-il de meilleurs systèmes? / Critical discussion of peer review. Are there alternative methods? Examples of 'bad' reviewers. |
| 12:30 - 13:30 | Pause Dîner / Lunch Break |
| 13:30 - 14:30 | ***Joëlle Margot:*** "Comment on devient physicienne, professeure et comment le rester? " / "How to become physicist, professor and how to stay there?" |
| 14:30 - 15:00 | Questions et discussion avec l'orateur / Questions and discussion with the speaker |
| 15:00 - 16:30 | Cours – Discussion "Dissémination, Conférences, Réseautage" / "Dissemination, Conferences, Networking" |

| | |
|---|---|
| | • Comment donner une bonne présentation orale. Présentations aux conférences: séminaires et colloques`. / How to give a scientific oral presentation. Presentation at conferences; seminars and colloquia. |
| 15:45 | Pause / Break |
| | • Participation aux congrès scientifiques; Ateliers symposiums, conférences. Réseautage professionnel / Participation in scientific meetings; workshops, symposia, conferences. Networking with peers. |
| 16:30 - 17:00 | Pause Café / Coffee Break |
| 17:00 - 18:00 | ***Bertrand Bolduc:*** "Démarrer une entreprise technologique: À quoi s'attendre" |
| 18:00 - 18:30 | Questions et discussion avec l'orateur / Questions and discussion with the speaker |

## *Wednesday May 14 2008*

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| 09:00 - 10:00 | ***Brian Grenon:*** "Survival in the Multi-Faceted World of Science" |
| 10:00 - 10:30 | Questions et discussion avec l'orateur / Questions and discussion with the speaker |
| 10:30 - 11:00 | Pause Café / Coffee Break |
| 11:00 - 12:30 | Cours – Discussion "Le Financement de la Science " / "Science Funding" |
| | • Comment financer vos idées de recherche Scientifique? Environnements de recherche 'top down' et 'bottom up' / How to fund your scientific ideas? Difference between 'top down' and 'bottom up' environments. |
| 11:45 | Pause / Break |
| | • Comment écrire un projet gagnant. Écrire une demande de bourse, une demande de financement. En quoi cela diffère-t-il d'écrire un article? / How to write a winning proposal. Fellowship applications vs. Grant applications. Grant applications vs. writing articles. |
| 12:30 - 13:30 | Pause Dîner / Lunch Break |
| 13:30 - 14:30 | ***Teodor Veres:*** "Il y a une vie après la thèse: Exemple d'un parcours professionnel & recherche dans un laboratoire gouvernemental |
| 14:30 - 15:00 | Questions et discussion avec l'orateur / Questions and discussion with the speaker |
| 15:00 - 16:00 | Discussion: Carrières pour diplômés en sciences et génie, Carrières alternatives / Careers for scientists, Alternative careers |
| 16:00 - 16:30 | Wrap-Up & End |

## Speakers' biographies


***Marc Garneau***

Dr. Marc Garneau is the first Canadian in Space and the former President of the Canadian Space Agency (Nov. 2001 – Nov. 2005). He graduated with a degree in engineering physics at the Royal Military College of Canada at Saint-Jean-sur-Richelieu, Quebec, in 1970 and a doctorate from Imperial College, London in 1973.

Marc Garneau was a Combat Systems Engineer, then instructor in naval weapon systems at the Canadian Forces Fleet School in Halifax. Promoted to Commander in 1982 while Staff at the Royal Military College, he was transferred to Ottawa in 1983 and became design authority for naval communications and electronic warfare equipment and systems.

He was selected as a Canadian astronaut in December 1983. He was seconded to the Canadian Astronaut Program from the Department of National Defense in February 1984 to begin astronaut training. He became the first Canadian astronaut to fly in space as a Payload Specialist on October 1984 on board of Challenger,

Shuttle Mission 41-G. He was named Deputy Director of the Canadian Astronaut Program in 1989, providing technical and program support in the preparation of experiments to fly during future Canadian missions. Dr. Garneau completed a one-year training and evaluation program the Johnson Space Center to be qualified for flight assignment as a Mission Specialist. He initially worked on technical issues for the Astronaut Office Robotics Integration Team and subsequently served as Capsule Communicator (CAPCOM) in Mission Control during Shuttle flights. A veteran of three space flights (STS-41G in 1984, STS-77 in 1996 and STS-97 in 2000), Marc Garneau has logged over 677 hours in space.
In February 2001, he was appointed Executive Vice President, Canadian Space Agency. He was subsequently appointed President of the Canadian Space Agency (CSA). He was president of the CSA from November 22, 2001 to November 28 2005.


***Robert Brouillette***

Robert Brouillette is attorney, civil engineer, patent agent and trademark agent. He studied engineering at the University of Sherbrooke and law at Laval University. He joined the *Ordre des ingenieurs du Québec* in 1972 and passed the Quebec Bar exam in 1977. He became trademark agent in 1978, and patent agent in 1980.
He started his professional career with Ogilvy Renault in 1977. In 1992 he founded *Brouillette Charpentier Fortin* (now BCF). He recently founded *Brouilllette and Associates*, an office of attorneys, patent and trademark agents that caters to entrepreneurs and innovators. He is recognized by 'The Best Lawyers in Canada' as leading expert in information technology law and by 'Lexpert' as a specialist in intellectual property law. He is also a 'Certified Licensing Professional' (CLP).
He is a member of the Board of Directors of *Simstmart Technologies Inc*., *Groupe iWeb Inc.*, *Investissements Mondias Inc*., *Leddartech Inc.* and other high technology companies. He also acted as a business angel investor in a number of start-up companies.


***Joëlle Margot***

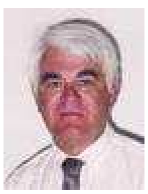
Joëlle Margot received her education in Plasma Physics at Université d'Orsay (France). She was first involved in the development and modeling of plasmas produced by proton beams and then in 1981 she joined the National Research Council of Canada (NRC) where she worked on the physics of auroral plasmas. She joined the plasma physics group of the Université de Montréal in 1985 to undertake activities in the domain of plasmas sustained by electromagnetic surface waves. One of the most important field to which she has contributed is the development and characterization of high-density plasmas generated by surface waves. At the beginning of the 90s she started to investigate high-density plasmas for applications in etching of thin films and she was the first to establish a research program in this field in Canada. Since 2005, she has been the scientific director of Plasma-Québec, a Québec funded strategic network that get together the researchers involved in plasma science and applications.

***Bertrand Bolduc:***

Mr. Bolduc is a licensed pharmacist (U. of Montreal – 1990) and holds a MBA from HEC Montreal (2000). He is recognized by his peers as one of Quebec's biopharmaceutical leaders. He was awarded numerous prizes and has more than 15 years of experience in the biopharmaceutical industry. Mr. Bolduc has worked at '*Servier*', '*Biovail*', '*Axcan*', '*Procrea*' and '*TGN Biotech*'. He has launched two new drugs on the Canadian market and made several business and product acquisitions. He also participated or led financing deals, both private and public for total proceeds of C $ 90 M. In September 2003, Mr. Bolduc was appointed President & CEO of '*Mistral Pharma Inc.*', a specialty pharmaceutical company which is listed on the TSX-Venture under the MIP symbol. M. Bolduc is a director of '*Prevtec MICROBIA Inc.*', '*Opsens Inc.'* (TSX-V: OPS) and '*MotionSphere Capital*'.

In 2006, he became the chairman of '*Galenova Inc.*', a distributor of pharmaceutical products, and co-owner of '*Gentes & Bolduc Pharmacists*', the leading compounding pharmacy in Quebec. Mr. Bolduc lectures at the M.Sc. in drug development program offered by the Faculty of Pharmacy at University of Montreal.

A former President of the Pharmaceutical Marketing Club of Quebec, Mr. Bolduc was also the President of *BioQuebec* from 2001 to 2003. He was re-elected in 2004 and 2005. With close to 250 member companies, *BioQuebec* is the voice of the bio-industry in Quebec. In 2007, Mr. Bolduc cofounded '*Pharm-AGRIA*', the non-traditional pharmacist association of Quebec.



***Brian Grenon***

Brian Grenon received his degrees in Organic Chemistry from the University of Vermont. Following his degree work he was employed at the National Institutes of Health in Bethesda, Maryland where he worked in the area of atherosclerosis research and cell biology. His primary focus was cell chemistry and electron microscopy.

In 1978 he joined IBM in the area of photomask technology and e-beam lithography. For 19 years he was responsible for photomask technology development for the corporation.

In 1997 he started Grenon Consulting, Inc., an independent semiconductor consulting company.

He has published several hundred technical papers and holds patents in the area of photomask technology. He is the current President of the Photomask Working group of SPIE.

His career has seen assignments in academia, government laboratories, industry and private practice.

***Teodor Veres***

Teodor Veres received his M.Sc. degree in Physics in 1986 from Babes-Bolyai University, in Romania. He pursued his graduate studies at University of Montreal, where he obtained a Ph.D. in 1999 for his work on spin-dependent electronic transport and giant magnetoresistance in magnetic nanostructures.

Since 2000 he is Research Officer and Group Leader at the National Research Council's Industrial Materials Institute (NRC-IMI) in Boucherville. At NRC-IMI he oversees the activities in alternative micro/nanofabrication for sensing and medical diagnostic applications, as well as the synthesis and characterization of functional nanostructures for biomedical applications.

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