

Brave New Worlds

Graduate Education
for the 21ST Century



Canadian Association for Graduate Studies

The aims of the Canadian Association for Graduate Studies are:

to promote excellence in graduate education, and to foster research, scholarship and creative activity among those involved in graduate studies

to serve as a catalyst for the development and exchange of information about graduate matters among universities, the granting councils, graduate student organizations and other interested or related organizations or entities

to encourage the fair and equitable treatment of all graduate students in all member institutions

to hold meetings and conferences, including an annual conference, at which time the annual general meeting of the association will be held, and to publish, from time to time, via the print and/or electronic media, materials which will advance graduate education

to disseminate to the public, the media and to federal and provincial governments, information about the purpose and needs of graduate education

to share and promote policies, practices and procedures with respect to all matters pertaining to graduate education

to provide advice to granting councils and other agencies about their postgraduate scholarship programs and other programs affecting student funding

to co-operate and liaise with related regional, provincial, national and international associations, as appropriate

to promote the maintenance of national standards for graduate degree programs, and to support the regular external evaluation of graduate programs

The members of CAGS are Canadian universities with graduate programs, graduate student associations, research funding agencies and relevant foreign organizations.

It holds an annual conference. It publishes yearly a statistical report on graduate studies in Canada. With the collaboration of the University Microfilms International, it offers each year the two CAGS-UMI Distinguished Dissertation Awards to recognize students who have written doctoral dissertations that make unusually significant and original contributions to the natural sciences and the humanities.

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Brave New Worlds

GRADUATE EDUCATION FOR THE 21ST CENTURY



**A Report on the International Conference
held in Montreal, October 24th to 27th, 2001**

*Prepared by Patricia Demers and Rashmi Desai
Ottawa, April 2002*



CANADIAN ASSOCIATION FOR GRADUATE STUDIES

Conference Schedule

KEYNOTE LECTURE

The Changing Landscape
Graduate Education – Elite Higher Education in Mass Systems, or Lifelong Learning for All?
 Peter Scott, Vice-Chancellor, Kingston University

CHANGING TRENDS

Papers
Knowledge in a Knowledge Society: Six Transitions
 Karin Knorr-Cetina, Professor of Sociology, Universität Konstanz (Germany)

How Universities Can Meet the Challenges of the 21st Century
 Bruce Alberts, President, National Academy of Sciences (U.S.A.)

CHANGING SKILL SETS IN GRADUATE EDUCATION

Presentation
 Edmée Métivier, Senior Vice-president, Business Development Bank of Canada

GRADUATE EDUCATION IN INTERDISCIPLINARY AND COLLABORATIVE RESEARCH ENVIRONMENTS

Presentation
 Bruce Alberts, President, National Academy of Sciences, (U.S.A.)

EMERGENCE OF A “NEW UNIVERSITY PROFESSOR” AND IMPACT ON GRADUATE STUDIES

Presentation
 Jules LaPidus, President Emeritus, The Council of Graduate Schools (U.S.A.)

GRADUATE STUDIES AND OUTREACH TO COMMUNITIES

Presentation
 Gérard Bouchard, Professeur, Université du Québec à Chicoutimi, Director, Interuniversity Institute on the Study of Populations

INNOVATION, COMMERCIALIZATION AND DISINTERESTED INQUIRY

Presentation
 Suzanne Fortier, Vice-principal Academic, Queen's University, and Vice-president, Natural Sciences and Engineering Research Council of Canada

RECONFIGURING GRADUATE STUDIES

Papers
Rethinking the Doctorate in the 21st Century
 George Walker, Vice-president for Research and Dean of the Graduate School, Indiana University and Senior Scholar, The Carnegie Foundation for the Advancement of Teaching (U.S.A.)

The Master's Degree
 Jennifer Haworth, Associate Professor of Education, Loyola University of Chicago (U.S.A.)

A New Challenge for Universities: the Emergence of Educational Companies
 Paul Bélanger, Director, Interdisciplinary Centre for Research and Development in Continuing Education, UQAM

KILLAM LECTURE

Higher Education and the Higher Educational Economy
 Dr. John Evans, Vice-Chair, NPS/Allelix Bio-pharmaceuticals Inc.
 Place: Montreal Neurological Institute

HOW CAN DOCTORAL EDUCATION BE ENHANCED TO IMPROVE OUTCOMES? ARE THERE NEW PATTERNS OF DOCTORAL EDUCATION EMERGING?

Presentation
 Maresi Nerad, Director, Institute for the Advancement of Graduate Education and Research Associate Professor University of Washington (U.S.A.)

IS THERE A NEED TO REDEFINE THE MASTER'S DEGREE? HOW?

Presentation
 Jennifer Haworth, Associate Professor of Education, Loyola University of Chicago (U.S.A.)

HOW CAN NEW TECHNOLOGIES TAKE GRADUATE STUDIES BEYOND DISCIPLINARY AND INSTITUTIONAL BOUNDARIES?

Presentation
 Mark Bullen, Acting Director, Distance Education & Technology Continuing Studies, University of British Columbia

MENTORING

Presentation
 Chris Golde, Scientist, Wisconsin Center for Education Research and Senior Scholar, The Carnegie Foundation for the Advancement of Teaching (U.S.A.)

THE POSTDOCTORAL PERIOD

Presentation
 Enriqueta Bond, President, The Burroughs Wellcome Fund (U.S.A.)

UNIVERSITIES AND CHANGE

Papers
What needs changing: the methods, the programs or the outcomes of education?
 Alain Touraine, Research Professor, Centre d'analyse et d'intervention sociologiques (CADIS), (France)

The changing university: metamorphosis or coevolution?
 Sylvie Dillard, Président-director general, Fonds québécois sur la nature et les technologies

Impact of Government Research Policies on University Research and Graduate Education
 A Conversation Among: David Cliche, ministre de la Recherche de la Science et de la Technologie (Québec); Edward Goldenberg, Senior Policy Advisor, Prime Minister's Office; Kevin Keough, Chief Scientist, Health Canada; Robert Lacroix, Recteur, Université de Montréal; Lorna Marsden, President, York University

CHANGING TRENDS IN GRADUATE EDUCATION IN OTHER COUNTRIES

Presentations
 Howard Green, Chair, U.K. Council for Graduate Education and Dean of the Graduate School, Staffordshire University (U.K.)
 Binglin Gu, Vice-president, Association of Chinese Graduate Schools and Dean of the Graduate School, Tsinghua (China)
 Federico Graef, Director de Fortalecimiento del Posgrado, Consejo Nacional de Ciencias y Tecnologías (Mexico)
 Debra Stewart, President, Council of Graduate Schools (U.S.A.)



Preface

Alan C. Weedon, President, Canadian Association for Graduate Studies

In this report, we share with you the proceedings of our most recent conference, Brave New Worlds: Graduate Education for the 21st Century, at which we examined the current status of graduate studies in Canada and beyond, explored the avenues for change and suggested ways to improve graduate education. We were bold in our attempt to make this international gathering a milestone for graduate studies. We can now confidently conclude that our efforts were successful. The meeting gave rise to highly stimulating discussions at theoretical and practical levels. We are convinced this will bolster the cause we hold so dearly, educational excellence at the graduate level. Now it is your turn to assess the results as you read this report.

We wish to express our profound gratitude to all who attended this international conference and ensured its success through the quality of their contributions. We would also like to extend sincere thanks to our sponsors for providing

us with generous grants to make possible a meeting of this magnitude. We especially want to highlight the contributions of Nicole Bégin-Heick of Nicole Bégin-Heick & Associates Inc. and Dean Louis Maheu of Université de Montréal to the organization of the conference. Its success reflects their vision and hard work, for which we are very grateful. Finally, professors Patricia Demers of the University of Alberta and Rashmi Desai of the University of Toronto deserve our praise and gratitude for drafting this impressive report.

From the outset, we nurtured the hope that the conference sessions would lead to tangible actions and the enhancement of graduate studies. As this report reveals, we identified several avenues that we now need to pursue. The Canadian Association for Graduate Studies (CAGS) therefore has formed working groups to develop the major themes identified at this event. These working groups will draft specific recommendations for faculties of graduate studies, research councils and governments.



Brave New Worlds Graduate Education for the 21st Century

Graduate education, research and the growth of a knowledge society exist in a mutually dependent continuum. Intricate connections link these elements. It is more critical than ever for Canadian graduate schools to be alert to the varied and changing needs of master's and PhD students and postdoctoral fellows, and to ensure their programs reflect the modes and capitalize on the opportunities of our increasingly global environment. Funding issues, times to completion and professionalization underscore the important link between graduate education and the national economy. It is also essential to position Canadian initiatives and trends in graduate education within the context of international association and collaboration. These were the principles guiding the international conference on graduate education for the 21st century, *Brave New Worlds*.

In October 2001, 198 participants – graduate students, faculty and administrators from Canadian universities, corporate and government representatives, and 27 foreign delegates – gathered in Montreal to share ideas and strategies for the changing landscape of graduate education. *Brave New Worlds* deliberately blended excitement and critique: high spirits about potentially transformative experiments and pointed comments about shortcomings. Like the Renaissance and modernist texts from which the title derives, the program combined praise – as expressed by Miranda for the shipwrecked survivors whom she calls “beauteous” people, an exclamation immediately ironized in Shakespeare’s *The Tempest* – and criticism, as conveyed in the futurist undertakings of Huxley’s dystopia. The pluralized title invited diverse feedback.

Designed to explore and map the reconfigured terrain of graduate education, the conference was a major initiative of the Canadian Association for Graduate Studies. The twofold aim of CAGS is to establish and promote standards of excellence in Canadian graduate programs and to spread the word about the benefits of these programs to Canadian society. Thus, the international scope of the conference was necessary and timely. While the Association of Universities and Colleges of Canada (AUCC) estimates universities will need to hire approximately 3,000 new faculty per year until 2006, with 30,000 new faculty hired by 2010, what is emerging from *Brave New Worlds* is of vital national importance. Moreover, there is an increased demand for graduates of master's and doctoral programs, not only by academia, but also by industry and government.

This report concentrates on identifying issues, explaining proposals for change and sketching action plans for CAGS, for Canadian graduate faculties, and for the federal and provincial granting councils and the governments to which they report. The central, interrelated topics for Canadian graduate education are:

- the reformation of the PhD
- appropriate financial support for students
- a made-in-Canada review of the multi-purpose master's degree
- an examination of the postdoctoral experience
- a way to safeguard intellectual property

These challenges, and ways to meet them, are not discrete and independent. As the issues interconnect, so will the solutions require joint, collaborative action. Nothing less than the future of Canadian research and, consequently, Canadian productivity and innovation is at stake.



Canada's Goal: Develop the most skilled and talented labour force in the world.

Achieving Excellence: Investing in People, Knowledge and Opportunity, Canada's Innovation Strategy,

(Government of Canada, February 2002)



For the research university and the research community, the future appears increasingly positive.... Canada is on the verge of having all

the critical elements of a new policy framework in place that will

J. Robert S. Prichard, President Emeritus, University of Toronto

support and reward excellence and allow our leading research

Federal Support for Higher Education and Research in Canada: The New Paradigm (Killam Annual Lecture, 2000)

universities to aspire to full membership in the ranks of the leading

public research universities of the world.

A Moment of Unique Opportunities and Challenges

The university participates in a radically altered world, where boundaries - disciplinary and national - are increasingly porous and contested, and concepts of core and periphery are often reversed or revised. Within this interconnected and inconstant reality, the adaptable and creative mind reaps the reward. A renewed commitment calls for an examination of the pressing social, citizenship and ethical issues.

Our graduate programs must reflect this new world as we nurture the researchers, innovators and creators of tomorrow. According to Bruce Alberts, president of the National Academy of Sciences in the United States, corporations have had to become "nimble and adaptable," while universities on the whole remain "hierarchical and stodgy," reluctant to become "mixing bowls encouraging the collision of ideas." The principle - and the benefit - involved in this shift is combinatorial: 100 units of knowledge can be

combined in 1000 times more ways than can 10 units. The 2001 Killam lecturer, John Evans, president emeritus of the University of Toronto and vice-chair of NPS/Allelix Pharmaceuticals, observed the perspective of "sovereign silos" is giving way to "borderless domains." We need carrots to reward those who take risks and to inspire new configurations, and we need sticks to goad inertia and self-satisfaction. Suzanne Fortier, vice-principal academic at Queen's University, reminds us that, in the shift from comfort to risk, university research spans the gamut from discovery to marketing as it strives to balance academic integrity and curiosity. Knowledge production today, says Peter Scott, vice-chancellor of Kingston University in the United Kingdom, is generated in the "agora," a place populated by activist groups and the entire body of citizens/consumers. It embraces "socially robust knowledge," responsive to politics and the market square, and it reaches out in anticipation of further associations.

The disciplinary societies, funding agencies, graduate students and, very importantly, respected faculty in the disciplines, feel the time is ripe for initiatives at the individual university and department or program level to look carefully at the PhD experience.

George Walker, Vice-President Research and Graduate Dean, Indiana University and Senior Scholar, The Carnegie Foundation for the Advancement of Teaching *Rethinking the Doctorate in the Twenty-First Century* (Brave New Worlds, 2001)

Reforming the PhD

Doctoral studies lead to an important and revealing credential. Yet the programs themselves are often slow to adapt and reform in light of newly hybridized disciplines. Such doctoral student surveys as *At Cross Purposes* (Pew Charitable Trusts, 2001) indicate students' overwhelming recommendation of an interdisciplinary focus and breadth. Moreover, retrospective reviews of the preparation, quality and outcomes of doctoral education, which could provide a systematic mechanism for assessing the appropriateness of graduate education, are in short supply. Maresi Nerad, director of the Institute for the Advancement of Graduate Education and Research at the University of Washington, notes, "Graduate schools do not

know how long it takes their students to find professional employment. They do not have information on employment patterns by field, by type of program, gender, ethnicity, first generation college-goers, or multi-year fellowship recipients." One significant difference between Canada and the United States is the lack of infrastructural assets in Canada and the absence of joint initiatives involving the granting councils and charitable foundations.

With the support of graduate deans and the endorsement of the granting councils and CAGS, graduate teaching faculty must assess the structure and process of their graduate programs, along with forms of career preparation. Where necessary, they should consider, implement, institutionalize and disseminate changes.

Key factors in this self-assessment should be

- the diversity of the student population
- graduation and attrition rates
- times-to-degree
- the number of programs
- the fullness and accuracy of the information package sent to prospective students
- the availability of multiple mentors
- the careful scrutiny of graduate supervisors
- the submission of annual progress reviews from the student and supervisor
- the opportunities for interdisciplinary and multi-disciplinary work and collaboration
- the availability of team-based projects
- the availability of professionalization and pedagogy seminars
- the availability of workshops devoted to project management and research leadership training skills
- the introduction of new skills
- the types of bridges built with other faculties, and with communities outside the university
- the encouragement of mobility between practical experience and academia
- the exposure to non-academic career options
- the tracking of graduates' careers and use of alumni surveys

Instructive Models and Initiatives

The Carnegie Initiative on the Doctorate
www.carnegiefoundation.org/CID

This multi-year research program aimed at enriching and invigorating the education of doctoral students is based on the belief that the PhD should create stewards of the discipline. Stewardship involves the generation, conservation and transformation of knowledge.

At Cross Purposes: What the Experiences of Today's Doctoral Students Reveal about Doctoral Education. A Survey Initiated by the Pew Charitable Trusts 2001
www.phd-survey.org

This survey looks at doctoral education through the eyes of students. It finds that the training doctoral students receive is not what they want, nor does it prepare them for their jobs.

German Research Council Graduiertenkollegs
 Since 1989, these interdisciplinary theme-oriented research and doctoral programs have involved a limited, competitively selected team of faculty, PhD students and postdoctoral students (8-15 faculty, 15-25 students, 1-2 postdoctoral fellows). They provide early visibility in the national and international scientific community for their graduates. There are also opportunities for international exchanges between Canadian and German institutions.

IGERT: NSF-Funded Integrative Graduate Education and Research Training Program
 This interdisciplinary team approach trains future professionals, scientists and academicians by exposing them to real world issues and teaching problem-framing skills.

Re-envisioning the PhD - Ten Years Later
www.depts.washington.edu/envision
 This survey offers sobering statistics about the marginally better job satisfaction for PhD graduates who opt for careers in the private, government and non-profit sectors, in contrast to those who pursue academic careers.

Preparing Future Faculty Program
 Gaff, Jerry G, Anne S. Pruitt-Logan, Richard A. Weibl.

Building the Faculty We Need: Colleges and Universities Working Together (Association of American Colleges and Universities and the Council of Graduate Schools, 2000)
www.preparing-faculty.org
 Professionalization seminars - either at the front or back end of graduate programs or throughout - should be mandatory. Teaching apprenticeship programs and teaching mentors are valuable investments, especially as many institutions require a teaching portfolio for tenure.





Relative to 30 years ago, doctoral students are poorly paid, and many accumulate considerable debt.

Chris Golde, Overview of Doctoral Education Studies and Reports 1990-Present

(Brave New Worlds, 2001)

It is terribly shortsighted not to offer our graduate students competitive levels of support at the moment they are making potentially permanent decisions about whether or not to pursue their research careers in Canada.

J. Robert S. Prichard, President Emeritus, University of Toronto

Federal Support for Higher Education and Research in Canada: The New Paradigm (Killam Annual Lecture, 2000)

Funding Graduate Students

Educating the Best Minds for the Knowledge Economy, a CAGS position paper on student financial support (www.cags.ca), argues compellingly for increased support of graduate students. Such a priority is fundamental to meet faculty, industry and government hiring needs and the prime minister's objective of moving to fifth from 15th place by 2010 in research and development rankings of the Organization for Economic Co-operation and Development (OECD) (throne speech, thirty-seventh Parliament, Jan. 30, 2001).

To the federal and provincial governments, CAGS recommends that support to graduate students be improved by:

- increasing the awards budgets of the research granting councils
- increasing the number and value of research grants through which research assistant positions are paid
- providing greater tax relief on scholarships, research assistant positions and other means of research student support
- improving student loan programs

To provide the necessary environment for graduate studies, CAGS works in partnership with the AUCC, the Canadian Association of University Teachers (CAUT) and the associations of graduate students to:

- build a solid, comparative database on graduate student funding

- lobby for adequate and continued funding for indirect research costs
- lobby for funding for the maintenance of crumbling campus infrastructure

CAGS applauds the federal government's endowment of \$125 million to the Pierre Elliott Trudeau Foundation to support 100 doctoral and postdoctoral scholarships (25 annually for four years) in the humanities and human sciences. CAGS is also pleased to note that the federal government intends to implement most of the measures identified in our position paper as part of its Innovation Strategy, announced in February 2002.

Accordingly, the government will:

- increase by five per cent per year until 2010 the number of graduate students admitted to our universities
- provide financial incentives to graduate students
- double the number of fellowships and scholarships awarded by the federal granting councils
- increase support to the federal granting councils to enable them to award more research grants at higher funding levels
- support the indirect costs of university research

Along with sister organizations, CAGS will monitor this strategy and prompt the federal government to maintain this course.

The master's degree signals cognitive shifts - from undergraduate

Conference delegate,

lecture formats and reliance on textbooks to teamwork and applied

Session on Redefining the Master's Degree (Brave New Worlds, 2001)

investigation. There are huge differences in pedagogy, interaction

and program culture.

Promoting the Multi-Purpose Master's

The master's is not a failed doctorate or merely a terminal degree. Offering differentiated levels of training, the master's is especially adaptive to new and hybridized fields. In fact, in the United States, it has become prominent as a professionally relevant learning experience, challenging students to work, as Jennifer Haworth and her co-authors argue in *A Silent Success: Master's Education in the US* (1993), "the interface between academe and the workplace." Burton R. Clark, in his book, *Places of Inquiry: Research and Advanced Education in Modern Universities* (1993), points to the renewed curriculum of master's education as the training ground for research-sensitive practitioners since "the genie of inquiry is everywhere out of the bottle." Such emerging fields as bioinformatics and humanities computing, and such interdisciplinary fields as ecocriticism and environmental risk management, look to the master's to provide a professional platform.

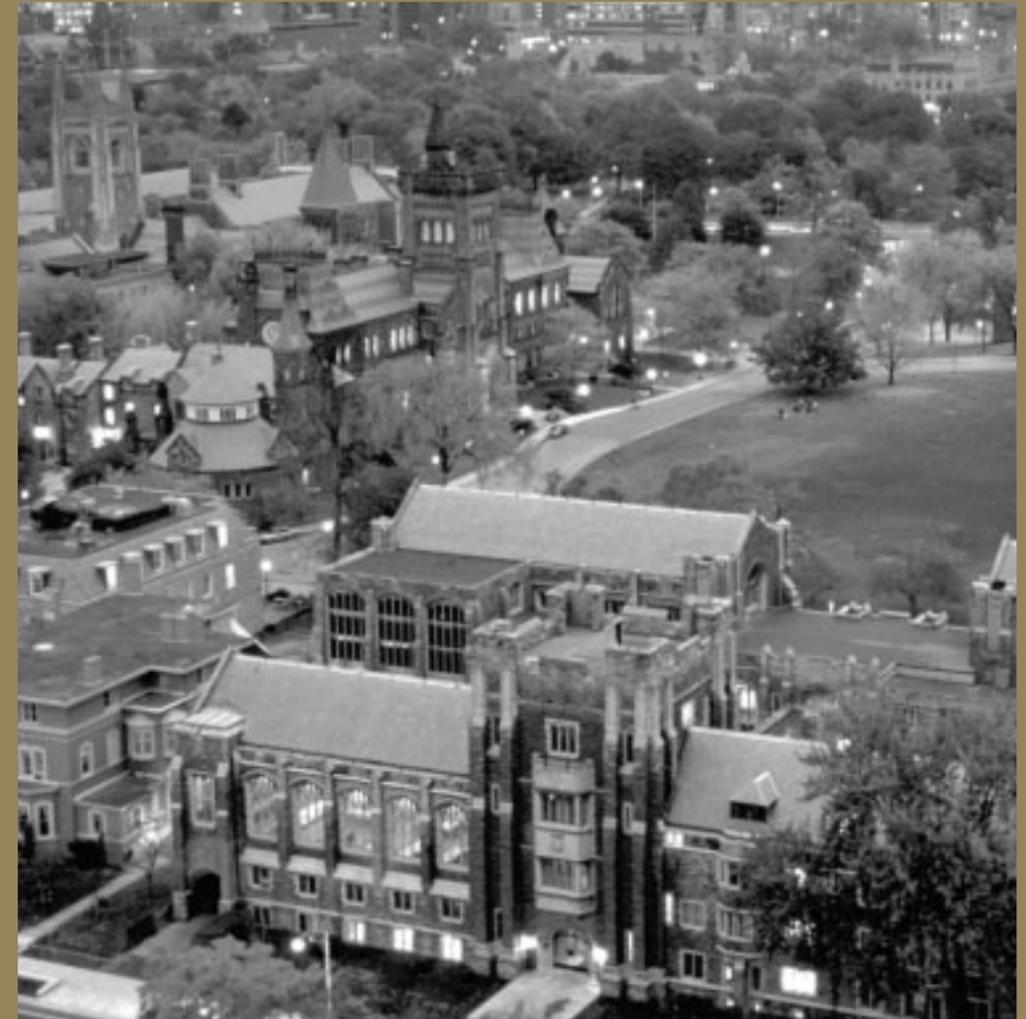
While this "connected" degree, usually related to practical problems and circumstances, is the topic of continuing investigation in the United States, where professional fields of study dominate at the master's level, the perception and practices of master's programs in Canada are essentially different. The thesis master's is still a strong component of Canadian graduate programs. The Canadian master's requires a tailor-made study to inform a broader public about its contributions to the economy, to professions and to well-being. Distinctively Canadian and often regionally specific trends, along with the full range of program types (thesis,

project, applied and fast-track), delivery modes and funding patterns, necessitate a study based in Canada.

Among this proposed national study's topics would be:

- the proportion (changing or consistent) of applied, thesis, project and fast-track master's programs
- the nature of theses or of a research component in a master's program
- a survey of employer perceptions of the master's
- a survey of graduate satisfaction with the degree
- the views of faculty and administrators at master's only and at medical-doctoral universities
- the effects on enrolments, times-to-degree and career decisions of different provincial funding programs, and of the discrepancy between available funding by National Sciences and Engineering Research Council of Canada (NSERC) and Canadian Institutes of Health Research (CIHR) and non-existent but anticipated funding by Social Sciences and Humanities Research Council of Canada (SSHRC)
- the transformations (positive and negative) effected by distance education and Web-based e-learning programs
- international comparisons, including trends in master's education in the United Kingdom (Council for Graduate Education), Mexico (Consejo Nacional de Ciencias y Tecnologías) and China (Association of Chinese Graduate Schools)

The NSERC Task Force Report on Virtual Universities and E-Learning should be a valuable resource.



We don't assess the outcomes of the master's.

Conference delegate, Session on Redefining the Master's Degree

We don't know the impact this degree has.

(Brave New Worlds, 2001)



No detailed information currently exists on post-doctoral appointments and their role in continued training and career outcomes.

Maresi Nerad, *Enhancing Doctoral Education to Improve Outcomes*

(Brave New Worlds, 2001)

There is very little information about people serving as postdocs,

Chris Golde

many of whom lack any formal institutional status or mentorship.

Overview of Doctoral Education Studies and Reports: 1990-Present (Brave New Worlds, 2001)

Postdocs need independence and status within, and to be better integrated into the university structure.

Understanding the Postdoc Experience

In many institutions, the experience of the post-doctoral fellow (PDF), who has few disciplinary contacts and minimal career guidance, is comparable to falling into an oubliette. In light of predicted hiring patterns, this situation is inefficient and impractical. We need local and national data on the number, location, institutional expectations and career patterns of PDFs. CAGS proposes establishing a working group to support recommendations designed to provide one-stop shopping for PDFs and an enabling fellowship period.

CAGS recommends that the association itself develop guidelines to:

- define the academic aims of the PDF
- promote the PDF position inside and outside the university
- collaborate with graduate deans and vice-presidents of research to create one-stop shopping points for PDFs within institutions, to ensure the institution has mechanisms to identify PDFs and to investigate the tax implications of the PDF as an employee.

CAGS recommends that federal and provincial research granting agencies, together with institutions:

- explore development paths to allow PDFs to establish research and teaching careers (as with a modification of the NSERC University Faculty Award to fit this new reality)

- require PDF registration for direct awards, as well as those funded through grants
- implement global payments to facilitate the institution's identification of PDFs
- consider the CIHR model of identifying PDFs through a decentralized training strategy

CAGS also recommends that universities and research institutions:

- specify the conditions and expectations of the fellowship in writing
- provide the necessary materials, tools or texts for the PDF's research
- offer professional development workshops
- consider following the successful practice of the University of Montreal of issuing a certificate on the positive recommendation of the department at the end of the fellowship

A useful model is the National Academy of Science's major study, *Enhancing the Postdoctoral Experience for Scientists and Engineers: A Guide for Postdoctoral Scholars, Advisers, Institutions, Funding Organizations and Disciplinary Societies*. (www.nap.edu/catalog/9831.html)

In addition, the Statement of Principles developed by SSHRC, NSERC and CIHR should be consulted.

In its best form, academic participation in drug-related science

Steven Lewis et al.,

both spurs innovation and, through the disinterest and skepticism

Dancing with the Porcupine: Rules for Governing the University-Industry Relationship, CAUT Bulletin (October, 2001)

that are hallmarks of the academic mission, provides a check on the

premature enthusiasms of industry.

Safeguarding Intellectual Property

In the information age, sometimes referred to as the second incunabulum, the technological reality of the screen generally replaces the printed codex. Electronic communication presents opportunities as well as cautions for graduate education. Online learning allows flexibility. It can foster inter-institutional, international and intercultural collaborations. And it can promote wider adoption of electronic theses. But it also requires standards to ensure quality, academic rigour and ownership of broadly disseminated intellectual property.

In the parallel developments of the commercialization of research, similar safeguards to protect the graduate student's research as an individual intellectual property must be put in place. The university's primary mission is the creation and dissemination of knowledge. However, research now spans the full spectrum from discovery to marketing. This broadened scope has generated intense debate about innovation and commercialization, about the role of government and the private sector in post-secondary education and research, and about the dangers for academic freedom and integrity.

Modern universities need to cultivate a fine balance between the ivory tower and the marketplace. Creative tensions between these two elements can generate discoveries and advance the frontiers of knowledge in fundamental and applied sciences. Universities can create a successful environment by putting in place policies that address ethical conduct in research and safeguard intellectual property, and by assessing risk in the new paradigm. Such policies should be consistent with the principles of freedom to publish and academic freedom. Faculty, students and postdoctoral associates should learn, through appropriate workshops, the best practices to be consistent with these policies.

CAGS should create a template of essential elements for these policies and a manual of best practices. An example is the booklet, *On Being a Scientist: Responsible Conduct in Research* (Washington, D.C., National Academy Press, 1995). The essential criteria for CAGS on the issue of intellectual property are the quality of graduate education and the standards of excellence in graduate programs.



We don't train integrators, and we

Plenary Session on Impact of Government Research Policies on University Research and Graduate Education

need them desperately.

(Brave New Worlds, 2001)



We can now confidently conclude that

Alan C. Weedon, President, Canadian Association for Graduate Studies

our efforts were a success.

(Brave New Worlds, 2001)

CAGS concludes that the output of master's and doctoral students

Nicole Bégin-Heick,

must double to meet the anticipated demand, and that more student

Educating the Best Minds for the Knowledge Economy: Setting the Stage for Success (CAGS, 2001)

financial support is needed to enable larger numbers of students to

access graduate education.

Plans for Action

As a result of the interest and ideas generated at *Brave New Worlds*, CAGS will:

- invite reports on PhD assessments and reforms in selected graduate faculties, and updates from senior scholars, with the Carnegie Initiative on Rethinking the Doctorate, which will be presented at the 2002 and 2003 annual CAGS meetings (www.cags.ca)
- continue reporting on times-to-completion at both master's and PhD levels, since they relate directly to the quality of the graduate education experience
- disseminate responses to the CAGS position paper on student financial support, collect and analyze comparative data to promote changes in funding and oversee any changes to student financing
- present progress reports on the proposed Canadian study of the master's degree
- prepare and distribute guidelines for PDFs and report on the CAGS working group on PDFs
- create a template of essential elements for intellectual property policies and a manual of best practices
- respond to invitations to collaborate with the UK Council for Graduate Education, the Mexican Consejo Nacional de Ciencias y Tecnologías and the Chinese Association of Graduate Schools
- lay the groundwork for the next international conference on graduate education in 2004

Acknowledgments

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