

P R E F A C E

The Glion Colloquium has established itself as an influential resource in addressing both the challenges and responsibilities of the world's research universities. Every two years, the Glion Colloquium provides a forum for research university leaders to consider together the role that the world's leading universities should play in addressing the great challenges and opportunities of our times and to explore together how universities, in partnership with governments, industry and society, can contribute both to solutions of global challenges and especially as partners and leaders in change. These activities, consisting of papers prepared by participants prior to three days of intense discussions in Glion-above-Montreux, Switzerland, are captured in subsequent books given wide circulation throughout the world.

Over the past 15 years, over 200 leaders of higher education, business and government agencies have participated in the Glion activities to consider issues such as the challenges of the new millennium, the governance of universities, the increasingly interdisciplinary nature of teaching and research, the globalization of higher education, the relationship between universities and industry, the role of university research in driving innovation and ways to address the challenges of global sustainability. The publications resulting from the Glion activities are now regarded as an important resource for better aligning higher education with the needs of a rapidly changing world.

The topic of the IX Glion Colloquium in June 2013 concerned the ability of the world's research universities to respond to an era of challenge and change. Interestingly enough, this topic arose during discussions at the 2011

Glion Colloquium concerning the role of the world's research universities in addressing the challenges of global sustainability. In the closing session of this earlier conference, the question was raised as to whether the current paradigm of the research university itself was facing serious challenges of sustainability as the world was changing, hence both stimulating and defining the focus of IX Glion.

Today, our world has entered a period of rapid and profound economic, social and political transformation based upon an emerging new system for creating wealth that depends upon the creation and application of new knowledge and hence upon educated people and their ideas. Paradoxically, the accelerating pace of events is driving our societies towards unknown futures in which the role of learning and new knowledge has become ever more important. It has become increasingly apparent that the strength, prosperity and welfare of a nation in a global knowledge economy will demand a highly educated citizenry enabled by development of a strong system of tertiary education. It will also require institutions with the ability to discover new knowledge, develop innovative applications of these discoveries and transfer them into the marketplace through entrepreneurial activities while enabling social organizations, such as governments and corporations, to develop new skills of policy development and decision-making.

Today, the institutions most responsible for advanced education and basic research are the world's research universities. Yet these are being challenged by the powerful forces characterizing the global economy: demographic change, environmental risks, increasing ethnic and cultural diversity, hyper-competitive markets, failing governments and disruptive technologies such as information, biological and nanotechnologies. More specifically, markets characterized by the instantaneous flows of knowledge, capital and work, and unleashed by lowering trade barriers are creating global enterprises based upon business paradigms such as out-sourcing economic activity and off-shoring jobs, a shift from public to private equity investment, and declining identification with or loyalty to national or regional interests.

The populations of most developed nations in North America, Europe and Asia are aging rapidly, while developing nations in Asia, Africa and Latin America are characterized by young and growing populations. Today, we see a serious imbalance between educational need and educational capacity. In a sense, many of our universities are in the wrong place, where populations are aging and perhaps even declining rather than young and growing, driving major population migration and all too frequently the clash of cultures and ethnicity.

New technologies are evolving at an exponential pace, obliterating both historical constraints such as distance and political boundaries, and enabling new paradigms for learning, such as open educational resources, virtual orga-

nizations, social networking and technology-enabled learning systems (e.g., massive open online courses and intelligent tutor automated learning systems) that threaten traditional approaches to learning, innovation and economic growth.

On a broader scale, the education investments demanded by the global knowledge economy are straining the economies of both developed and developing regions. In the developed economies of Europe, America and Asia, the tax revenues that once supported university education for only a small elite are now being stretched thin as they are extended to fund higher education for a significant fraction of the population (i.e., massification) at ever rising levels of quality and standards. Developing nations are overwhelmed by the higher education needs of expanding young populations at a time when even secondary education is only available to a small fraction of their populations.

The changing purpose, role and relationships of research universities became the focus of the opening session of the colloquium. This began with a panel discussion (Duderstadt, Munroe-Blum, Newby) of a recent study by the National Academies of Science, Engineering and Medicine of the United States concerning the future of the American research university. This study, requested by the U.S. Congress, found that, despite the increasing importance of graduate education and research for prosperity and security in a knowledge-driven global economy, the partnership among research universities, government, industry and philanthropic organizations had deteriorated significantly, putting both the quality and capacity of U.S. institutions at considerable risk. While the study recommended several bold actions to address these concerns, the National Academies were concerned that today's weakened economy and political divisiveness in the United States would likely require a decade-long, sustained effort to make progress.

This discussion was broadened (Munroe-Blum) using the experience of Canadian universities as they attempted to address global challenges and expand international research programs in the face of instabilities in government funding and eroding public trust and confidence. As costs have risen and priorities for tax revenues have shifted to other public policy goals, governments have asked more and more stridently, what are universities for? The imperatives of a knowledge-driven global economy have provided a highly utilitarian answer: to provide the educated workforce and innovation necessary for economic competitiveness (Rawlings), despite the importance of their more fundamental primary responsibilities of education, scholarship and the conservation and promotion of cultural heritage. The session concluded with discussion of the remarkable contrasts provided by higher education in Asian nations such as Singapore (Tan), characterized both by strong government commitments of funding and a willingness to explore exciting new paradigms

for the research universities involving innovative international partnerships, uses of technology and novel efforts to better integrate the fundamental missions of teaching and research.

The second session concerned the changing nature of discovery, learning and innovation, driven by the changing needs of society, government policy and technology. The discussions began with the changing nature of research sponsorship in the United Kingdom, as government funding transitioned from the support of research grants to individual investigators to grand challenges requiring the creation of multidisciplinary theme centres in universities (Borysiewicz). Campus research activities have been further influenced by the impact of the European Research Area, stressing key themes, large-scale research facilities and innovation and technology transfer that challenge the highly disciplinary structure of universities and faculty training. The discussion then shifted to the third mission of universities as they moved beyond their classical roles of teaching and research to actively engage with the socio-economic and political environment (Van Zyl). The discussion revealed sharp contrasts between such engagement in developed economies, where efforts were heavily focused on the technology transfer to industry, and developing economies in regions such as Africa, where both poverty and resource limitations required quite different roles for universities. The last two presentations (Duderstadt and Aebischer) addressed the impact of rapidly evolving technologies on teaching and research with the emergence of new paradigms such as MOOCs (massively open online courses) and learning analytics for the universities' educational mission, with clouds, big data and disciplinary convergence driving a shift in research paradigms from hypothesis-driven to data-correlation-driven discovery. While the powerful impact of technology-driven activities such as MOOCs to efficiently access gigantic student markets opens up enormous opportunities for both access and quality, there is still very limited evidence on the effectiveness of these approaches.

The third session focused on the complex issues of the cost, price and value of higher education, or more specifically, who benefits and who pays for research universities. The presentations began with a very thorough analysis (Weber) of these issues from the perspectives of both economic and social policy, including the sharp differences in the approaches taken by Europe and North America, where the current model for financing higher education in nations heavily dependent upon public tax support is simply incapable of sustaining massification while achieving world-class quality, and Asia where rapidly developing economies have given high priority to higher education. It was noted (Newby) that even as governments in Europe and America are providing our universities with less resources, they are attempting to exert greater influence through increasing regulation and a more forensic focus on impact and value for money, imposing more accountability for both the educational

and research activities of universities. The extreme example of this has been the devastating cuts in state appropriations (over 60%) experienced by the University of California (Katehi), perhaps the most prominent research university system in the world. While there was considerable discussion of the many factors driving these challenges, there was also an effort to develop an agenda involving both universities and governments to address them (Daniels) that would encompass issues such as the growing inequality in access to higher education.

The fourth session concerned the particular nature of the changing nature of research universities in developed countries, such as the emergence of research universities in France (Beretz), where world-class quality has become a major priority for the universities (in addition to the traditional “grandes écoles” system). Similarly, Swiss universities are evolving (Loprieno), under some pressure from the Bologna process, to embrace the Bildung/Ausbildung paradigm of broader education at the college level and focused disciplinary training in graduate schools, essentially transitioning from “universitas” to “university”. While both funding and quality are still strong in Swedish universities, the high tuition and visa requirements recently placed upon international students could cripple their ability to sustain globally competitive and relevant research programs (Akesson). The final discussion focused on the challenges of providing a smooth transition in university faculties from one generation to the next, both addressing the attractiveness of the academic profession for junior faculty and the appropriate role and mobility of senior faculty (Noorda).

The fifth session shifted to a discussion of the experiences of building world-class research universities in developing economies. China’s achievement in building sufficient university capacity to increase participation of 18- to 22-year-olds from 1% in 1982, to 26% today with a goal of 40% in 2020 was particularly impressive (Zhang), as was the commitment to attract faculty of international quality. There was also discussion of India’s experience (Shevgaonkar) in providing the capacity to serve a very large student population, while achieving world-class quality through both creative use of online learning and focusing research support on elite institutions such as the IIT and IIM systems. Of particular interest was the recent effort in Korea to elevate the Korean Advanced Institute of Science and Technology to MIT quality through a combination of investment, discipline and cultural changes (Suh). The discussion was broadened to examine the experience of the other “Asian tigers” (Singapore, Hong Kong, Taiwan) in building world-class research universities (Niland).

The final session consisted of a broad discussion of both the format and funding of the Glion Colloquium. There was a strong sense of the great value of attracting a truly global representation of university leadership with a flex-

ible agenda that provided considerable opportunity for open discussions informed by short papers prepared in advance by each participant. Following the IX Glion Colloquium, these papers have been refined by the authors and are included as chapters in this book, although with a summary chapter containing several of the key points made in the discussions in each session.

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