Introduction

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The information revolution and the breakneck speed of technological advances over the past quarter century have redefined our world. Instantaneous global communication is available today to any business or person with a laptop and an Internet connection, fueling globalization and worldwide interdependence. International issues such as terrorism, climate change, and the spread of infectious diseases underscore the joint destiny of nations and peoples worldwide. As the gap between advanced, developed countries and poor countries left out of the global economy widens, pressing social problems grow more severe. In our global community, where knowledge and education are the currency that matters most, American higher education has the potential to contribute to the effort to build a better society. The scope of the task is daunting, but the imperative to tackle it cannot be overestimated.

For the past five years, the Forum on the Internet and the University (the Internet Forum) has convened during the annual Aspen Symposium of the Forum for the Future of Higher Education, held each fall at the Aspen Institute. The Forum is a community of academic leaders and scholars from across the country who explore new thinking in higher education, partic-
ularly about issues related to institutional change, strategy, economics, and technology. The Internet Forum’s research culminates at its Aspen symposium, where scholars present their work for discussion and debate. Its goals are to

- create a scholarly platform from which participants can explore how the Internet and related technologies can improve learning, and
- assess the opportunities and risks created by rapid technological change.

At its most recent symposium, the Forum launched a new initiative supported by First Marblehead Corporation: The Forum on Politics, the Economy, and Education is dedicated to exploring the role of higher education in the global political economy—the course of which is deeply influenced by technological change.

Scholarship presented during the 2004 Internet Forum and the Forum on Politics, the Economy, and Education is offered here so as to share more broadly the insights, discussions, and inquiry they sparked.

Technology and Globalization

Globalization was not begun as a matter of public policy. Governments, for example, did not decide to start global sourcing and marketing. Rather, globalization is possible as a result of
new communications technologies and leaps forward in fields such as robotics and biotechnology that are destroying the old industrial-based national economies and replacing them with a new, knowledge-based global economy.

Undoubtedly, technology will continue to advance, and globalization will too. In the global economy, no one is immune from competition. Going forward, the best resource the United States (or any other country) has is education—both in terms of building a highly skilled work force and in cultivating a better understanding of power, cultures, and the realities of our interconnected global society.

Fears of Globalization

Lester Thurow, Lemelson Professor of Management and Economics at MIT and former dean of the Sloan School of Management there, addresses the voices of antiglobalization and the fears driving protesters against it. Ending globalization presumably means imposing government barriers to lower or eliminate trade across national borders and capital flows between countries. Yet that, Thurow says, would lower the average family’s standard of living worldwide—most dramatically in third-world countries.

Thurow notes that, realistically, economic globalization requires a degree of political globalization—yet there is no global government to initiate, lead, or regulate the process. International organizations such as the United Nations, the World Bank, and the World Trade Organization present a partial
answer to the need for global management, but for a number of reasons their authority is restricted. American higher education can contribute to the development of international organizations that can effectively manage globalization and build a prosperous, fair, and inclusive global economy.

**Soft Power and Higher Education**

Joseph Nye, University Distinguished Professor at Harvard University and former dean of the John F. Kennedy School of Government there, explains his notion of *soft power*, which is becoming more important largely as a result of globalization and the communications revolution. Soft power differs from hard military strength and economic power: it rests on the ability to shape what others *want* to do as opposed to using force to *make* them do what you want them to do. Soft power derives largely from a nation’s culture, political values, and foreign policies when others find them attractive.

The United States, Nye says, is greatly influencing the spread of globalization, but has yet to come to grips with what it means to our place in the world order. One of the dark sides of the ease of global communication is that it enables the activities of terrorist groups such as Al Qaeda. Nye suggests that one metric to assess progress in the current struggle against terrorism is whether the number of terrorists being killed with hard power is greater than the number being recruited with soft power. From this point of view, things do not look good.

Nye urges colleges and universities to help raise the level of
discussion and advance American foreign policy by instilling in our students and in the broader public a better appreciation of how the world has changed in important ways over the past 20 to 30 years. He emphasizes the importance of cultural and student exchanges in both creating greater understanding across cultures and enhancing American soft power.

Service-Sector Productivity Growth

Barry Bosworth, senior fellow in the Economic Studies Program at the Brookings Institution, where he also holds the Robert V. Roosa Chair in International Economics, believes that the effect of off-shoring jobs on the rate of job growth in the United States has been trivial. Instead, he explains that a fundamental, underlying change in the U.S. service-producing industries—that is, an acceleration in productivity growth—is responsible for the so-called jobless recovery. Historically, it has been difficult to improve productivity in the services sector; yet the data show that in the past several years, service industries are putting computers and technology to good use. Indeed, they have accelerated service-sector productivity growth.

Bosworth notes that education is the one service industry where productivity appears to be declining, however. He recognizes that measurement of productivity of the education sector is extremely problematic because of the dearth of reliable data and the difficulty of assessing outputs, or quality. He argues for better reporting of data by colleges and universities and exhorts higher education’s leaders to more efficiently and effectively
increase the supply of highly educated citizens. Bosworth maintains that the United States’ best resource is education and points to lagging productivity growth in education as a source of serious concern. To be successful in the global economy, he says, we must find a way to transform a large proportion of the American population into highly skilled workers.

Technology and Scholarship

It has become a cliché to say that education is the last field to take systematic advantage of advances in information technology. While IT certainly has had an impact on education, the dream of transforming teaching and learning and research by taking full advantage of technological advances has not become reality. Yet, remarkable work is being done at colleges and universities across the country to move higher education closer to achieving that vision.

The cutting-edge efforts described here range from the creation of interoperational educational software capable of multiple levels of explanatory power, to a graduate degree program that fuses education and entertainment, to establishing multimedia scholarship as a legitimate form of academic inquiry.

Next-Generation Software

Andries van Dam, vice president for research and Thomas J. Watson, Jr., University Professor of Technology and Education
at Brown University, describes pen-based gestural interfaces for tablet PCs such as MathPad\textsuperscript{2} and ChemPad. These “microworlds,” based on simulation and exploration, foster deeper understanding of difficult topics that otherwise often discourage students from further pursuit.

Van Dam acknowledges that while the microworlds projects developed to date have been useful adjuncts to undergraduate courses, they fall short of the goals of a far more ambitious vision because they are restricted to single concepts with a limited set of parameters. The next generation of educational software van Dam advocates for is based on integrated models that vary in complexity depending upon the learner. This “clip model” architecture is comprised of simulation-based groups of components designed to interoperate and be assembled into systems. Imagine, for example, the power and utility of a set of clip models of the human body that could simulate and explain all its many systems at levels ranging from elementary school to medical school students. Another key advantage of clip models is that they unify otherwise unrelated strands of knowledge and thereby make possible discoveries that lie at the intersection of disciplines.

Entertainment and Education

Don Marinelli, codirector of the Entertainment Technology Center (ETC) and professor of drama and arts management at Carnegie Mellon University (CMU), describes the ETC’s two-year program, which culminates in the master’s of entertain-
ment technology degree, jointly conferred by CMU’s College of Fine Arts and its School of Computer Science. The ETC takes an interdisciplinary approach to fostering in its students an understanding of how to use technology to entertain, inspire, and teach.

The ETC program is based on project work, where students learn by doing and create real things that work. One of the ETC’s earliest projects was to create an interactive dinosaur experience for school-age children in partnership with the Carnegie Museum of Natural History. Other efforts include an interactive 3D graphics software program that specifically targets middle school girls in an effort to provide them with the best possible first exposure to computer programming. The possibilities for blending education and entertainment, Marinelli notes, are bound only by our imaginations.

**Multimedia Scholarship**

Elizabeth Daley, dean of the School of Cinema-Television at the University of Southern California (USC) and executive director of the Annenberg Center for Communication there, and Stephanie Barish, former director of the Institute for Multimedia Literacy at the Annenberg Center at USC and current senior partner of the Creative Media Collaborative, focus on the power of multimedia scholarship to transform, expand, and bridge academic research, pedagogy, and publication.

The authors have been working for several years with faculty from a variety of disciplines at USC to integrate multimedia
INTRODUCTION

into standard courses, and share excellent examples of these efforts. One of the key advantages of multimedia scholarship Daley and Barish highlight is the potential for a wide range of sensory experiences that deepens comprehension of the material at hand. A number of faculty have been inspired to develop scholarly, multimedia companions to their traditional books and articles; yet, despite the depth and richness of these materials, traditional publication models pose an enormous barrier to the widespread use of multimedia in scholarship. Daley and Barish describe a refereed journal, *Vectors*, developed by USC’s Institute for Multimedia Literacy, that not only offers a place for electronic publication of multimedia scholarship but also examines the underlying principles that will be most important to such scholarship.

Technology and the Brain

Technological developments, particularly the emergence of functional neuroimaging (fMRI) techniques, have enabled rapid advances in the field of cognitive neuroscience over the past decade or so. The ability to create images of brain activity in healthy people holds tremendous potential for deepening our understanding of the effects of our experiences and our personal traits; indeed, we now have an unprecedented opportunity to discover how the brain learns and remembers. The implications of this new knowledge are vast—and developing quickly.
THE INTERNET AND THE UNIVERSITY

This new understanding about how our brains work also permits informed speculation about human tastes and preferences. The most speculative chapter in this book, about artistic universals, does just that by applying a neuroscientist’s point of view to shed light on just what “art” is.

Educating the Brain

John Gabrieli, former professor of psychology and director of the Gabrieli Cognitive Neuroscience Laboratory at Stanford University and currently Grover Herman Professor of Health Sciences and Technology at MIT, describes research on how our brains record and retrieve memories. It is clear, he says, that the more parts of the brain that are involved in and activated by an experience, the more memory traces are recorded—and thus the more likely it is that one will be able to retrieve that experience and the knowledge gained from it. The value of multimodality training has been demonstrated convincingly in many settings. We know, for example, that rote memorization—just repeating something over and over again—is not an effective way of learning something. Instead, engaging material in meaningful ways has been shown to have significant effects, both psychologically and physically, in the brain.

Gabrieli believes that we are close to uncovering what will arguably be valid alternatives to testing for measuring the efficacy of various teaching methods and learning. And while it is sensible to be cautious as we enter this new realm of possibili-
ties, Gabrieli also advises that we prepare for what the future holds by thoughtfully encouraging and considering research along these lines, as it can potentially make important contributions to the quality of people’s education and lives.

The Artful Brain

V. S. Ramachandran, professor of neurosciences and psychology and director of the Center for Brain and Cognition at the University of California, San Diego, speculates about whether artistic universals exist—that is, are there laws or principles that transcend cultural boundaries and styles? Given that art originates in the brain, Ramachandran believes that neuroscience can help us better understand the basis of art. He proposes a set of 10 artistic universal laws common to all brains and describes how they can be tested by directly studying the brain empirically.

Specifically, Ramachandran believes that the solution to the problem of aesthetics lies in a more thorough understanding of the connections between the brain’s visual centers and its emotional limbic structures. Once we understand those connections, the insights they offer into the human brain will have a profound impact on both the sciences and the humanities. Indeed, Ramachandran’s hope is that these insights will help us bridge the gulf between the two and usher in a new era in which specialization becomes old-fashioned and a twenty-first-century version of the Renaissance person is born.
Conclusion

Technology is a powerful force in creating an interconnected global community. Yet in many ways, the pace of technological advancements has outstripped our ability to manage the changes wrought by it. American colleges and universities can contribute to a better globalization on several levels, including preparing a highly skilled workforce that can compete on a global scale, developing an educated citizenry with a broad understanding of the world in which we live, and, finally, contributing to the building of international institutions and creative solutions to the complex issues we all face together.

We at the Forum hope that the following chapters serve to inspire your vision and imagination as you consider the future of your institution, higher education, and our global society.

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EDITORS’ NOTE

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