CHAPTER 6

The Changing Nature of Research and the Future of the University

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INTRODUCTION

The contemporary research university reaches into every aspect of modern society. It educates the graduates that sustain commerce, government, and professional practice; it performs the research and scholarship so essential to a knowledge-driven global economy; and it applies this knowledge to meet a diverse array of social needs including health care, economic development, and national security. Although the changing needs and nature of society were important factors in shaping the evolution of the university over the centuries, so too has been the changing nature of research and scholarship. Intellectual transformations ranging from scholasticism to the scientific revolution have played a major role in defining the nature of the university in the past and are continuing to do so today. This paper attempts to identify some of the changes occurring today in scholarship and research, and speculates about the impact on the future form of the research university.

First, however, it seems appropriate to establish a benchmark by summarizing how changes in the nature of research over the past 50 years have been important determinants in shaping the contemporary research university. Although much of this discussion will be focused on the American experience, many of these factors have influenced the evolution of research universities in other nations and are even more likely to do so in the decades ahead as the nature of learning, research and scholarship becomes increasingly international.

THE AMERICAN RESEARCH UNIVERSITY, CIRCA 2000

The character of today's American research university was shaped some 50 years ago by the seminal report, *Science, the Endless Frontier* produced by a World War II study group chaired by Vannevar Bush (Bush, 1945). The central theme of the document was that the nation's health, economy and military security required continual deployment of new scientific knowledge; hence the federal government was obligated in the national interest to ensure basic scientific progress and the production of trained personnel. It stressed a corollary principle: that the government had to preserve freedom of inquiry, to recognize that scientific progress results from the "free play of free intellects, working on subjects of their own choice, in the manner dictated by their curiosity for explanation of the unknown". Rather than attempting to build separate research institutes or academies, the federal government decided instead to rely on a partnership with the leading American universities by supporting research on the campuses through a system of competitive, peer-reviewed grants and a framework for contractual relationships between universities and government sponsors. Faculty investigators were encouraged to work on research of their own choosing, with the anticipation that eventually this unconstrained research would lead to significant social benefits.

The resulting partnership between the federal government and the nation's universities has had an extraordinary impact. Federally supported academic research programmes on the campuses have greatly strengthened the scientific prestige and quality of American research universities, many of which now rank among the world's best. The academic research enterprise has not only provided leadership in the pursuit of knowledge in the fundamental academic disciplines, but through the conduct of more applied-mission-focused research, it has addressed national priorities such as health care, environmental sustainability, economic competitiveness, and national defence. It has laid the technological foundations for entirely new industries such as microelectronics, biotechnology, and information technology. Furthermore, by combining research with advanced training, it has produced the well-trained scientists, engineers, and other professionals capable of applying this new knowledge.

Yet it is also clear that while the research university model evolving during the latter half of the 20th century has been remarkably successful, many of its most distinguishing characteristics have been mixed blessings. The single-investigator model of sponsored research, in which individual faculty members are expected to secure whatever resources are necessary for research and graduate training in their narrow area of scholarship, has driven the dominance of disciplinary specialization and reductionism. Faculty have learned that the best way to attract funding in a competitive, peer-reviewed research culture is to become as specialized as possible, since this narrows the group of those likely to review their proposals (perhaps even to their colleagues), thereby driving even more the disciplinary fragmentation of the academy. As a result, academic disciplines dominate the modern research university, developing curriculum, marshalling resources, administering programmes, and doling out rewards.

Since competition for grants and contracts play such an important role in supporting research and graduate education, it is not surprising that research universities tend to set their sails to track the ever-shifting winds of federal research priorities. For example, as the space race of the 1960s was succeeded by the social programmes of Lyndon Johnson's Great Society and concern about the environment of the 1970s, research universities throttled back academic programmes in the physical sciences and engineering in favour of the applied social and health sciences (e.g. education, social work, medicine, dentistry and public health). Today the health concerns of an ageing baby-boom population have stimulated a doubling of the budget of the National Institutes of Health, triggering a massive shift from the physical and social sciences into the life sciences on many campuses, as universities have sensed the shift of federal priorities from "guns to pills". More specifically, during the past decade the budget of the National Institutes of Health increased by more than 150 %, to $27 billion for FY2003, while the research budgets of those agencies such as the Department of Energy, Department of Defense, and the National Aeronautics and Space Administration remained relatively stagnant or declined. Even the National Science Foundation experienced only modest growth, to roughly $5 billion in FY2003. Today, roughly 62 % of every federal research dollar flowing to the campuses is in biomedical research (Committee on Science, Engineering and Public Policy, 2003).

The faculty members of research universities are well aware that their careers – their compensation, promotion, and tenure – are determined more by their research productivity, as measured by publications, grantsmanship and peer respect, than by other university activities such as undergraduate teaching and public service. This reward climate helps to tip the scales away from teaching and public service, especially when quantitative measures of research productivity or grantsmanship replace more balanced judgements of the quality of research and professional work. So too, the fragmentation of disciplines driven in part by increasing specialization of scholarship has undermined the coherence of the undergraduate curriculum. There appears to be a growing gap between what faculty members like to teach and what undergraduate students need to learn (Shapiro, 1991).

Just as the research interests of the faculty drove the fragmentation of undergraduate education, so too, graduate education has been reshaped largely to benefit faculty research. In a sense this was natural since Ph.D. programmes have traditionally seen their role as training the next generation of academicians, that is, self-replication. All too often, however, the current research-driven paradigm tends to view graduate education as either a by-product activity, driven by the level of research funding, or as a source of cheap labour for research projects. Such exploitation of students for the benefit of faculty research extends to the postdoctoral level as well. Postdoctoral students have the sophistication to be highly productive research assistants. They are highly motivated and work extremely hard. And they are cheap. Hence, it is not surprising that in many fields the postdoctoral student has become the backbone of the research enterprise. In fact, one might even cynically regard postdocs as the migrant workers of the research industry, since they are sometimes forced to shift from project to project, postdoc to postdoc appointment, even institution to institution, before they find a permanent position.

The growing pressures on faculty, not only to achieve excellence in teaching and research, but also to generate the resources necessary to support their activities, are immense (Clark, 1998). At a university like Michigan, with roughly 2,700 faculty members generating over $700 million of research funding per year, this can amount to an expectation that each faculty member will generate hundreds of thousands of research dollars per year, a heavy burden for those who also carry significant instructional, administrative, and service responsibilities. Pressures on individual faculty for success and recognition have led to major changes in the culture and governance of universities. The peer-reviewed grant system has fostered fierce competitiveness, imposed intractable work schedules, and contributed to a loss of collegiality and community. It has shifted faculty loyalties from the campus to their disciplinary communities. Faculty careers have become nomadic, driven by the marketplace, hopping from institution to institution in search of higher salaries, more generous research support and better colleagues.

As one junior faculty member exclaimed in a burst of frustration: "The contemporary university has become only a holding company for research entrepreneurs!"

THE CHANGING NATURE OF RESEARCH AND SCHOLARSHIP

What changes in the nature of research and scholarship might we identify as significant factors in determining the nature of the university in the century ahead?

Disciplines or Dinosaurs

It is important to acknowledge the dynamic nature of the disciplinary character of scholarship. What we regard as entrenched disciplines today have changed considerably in the past and continue to do so. New ideas and concepts continue to explode forth at ever-increasing pace. We have ceased to accept that there is any coherent or unique form of wisdom that serves as the basis for new knowledge. We have simply seen too many instances in which a new concept has blown apart our traditional views of the field. Just as, a century ago, Einstein's theory of relativity and the introduction of quantum mechanics totally revolutionized the way that we thought of the physical world, today's speculation about dark matter and quantum entanglement suggest that yet another revolution may be under way. The molecular foundations of life have done the same to the biomedical sciences.

In part the knowledge explosion is driven by the increasingly sophisticated nature of the experimental apparatus used to gather data and the digital technology used to store, curate and communicate knowledge. But it is also due simply to the fact that an ever-increasing population ever more dependent upon knowledge for economic prosperity has driven a major expansion in the numbers of scientists, engineers, and other scholars. There are also qualitative changes in the nature of research itself. Twenty-first-century science is marked by increasing complexity that frequently overwhelms the reductionist approach of the disciplines.

Basic vs. Applied Research

There is a definite hierarchy of academic prestige – or, perhaps better stated, an intellectual pecking order – within the university. In a sense, the more abstract and detached a discipline is from "the real world", the higher its prestige. In this ranking, perhaps mathematics or philosophy would be at the pinnacle, with the natural sciences and humanities next, followed by the social sciences and the arts. The professional schools fall much lower down the hierarchy, with law, medicine, and engineering followed by the health professions, social work, and education at the bottom. Clearly, within this culture of academic snobbery, the distinction of basic ("curiosity-driven" or Baconian) versus applied ("mission-oriented" or Newtonian) research becomes significant, perhaps tracing back to the Humboldtian ideal of pure *Wissenschaft*.

In reality, however, the progression of basic knowledge from the library or the laboratory to societal application is far from linear, and the distinction between basic and applied research is largely in the eye of the beholder (Sonnert & Holton, 2002). Furthermore, there is yet another mode of research that represents a conscious combination of basic and applied research:

so-called Jeffersonian science (using as an analogy the Lewis and Clark expedition, which was justified to Congress as discovering paths to further westward expansion, and portrayed to the Spanish as a purely scientific expedition, sampling unknown fauna and flora). Such research aims at providing the fundamental knowledge essential to address a key social priority (also known as Pasteur's quadrant [Stokes, 1997], referring to Pasteur's discovery of micro-organisms when trying to find a better way to brew beer) is not only important in its own right, but it creates the opportunity to make public support of all types of research more palatable to policy makers and taxpayers. Contemporary examples would include the neuroscience and cognitive science necessary to create better schools, the atomic and quantum physics necessary for nanotechnology, and, of course, the molecular biology necessary for progress in health care (providing an excellent case study through the growth in the NIH budget of the effectiveness of Jeffersonian research in building the case for strong public support).

The Conduct of Research

The process of creating new knowledge is evolving rapidly away from the solitary scholar to teams of scholars, often spread over a number of disciplines. This is driven by many factors. The enormous expense of major experimental facilities such as high-energy physics accelerators, astronomical observatories, and biochemical laboratories compel scientists to work in teams consisting not only of primary investigators but specialists such as systems engineers and software developers that may number in the hundreds. Similarly the complexity of contemporary research topics such as protein function or global change span many disciplines that require multidisciplinary teams.

While this may be a marked departure from the Humboldtian notion of the isolated scholars attempting to attain objective truth, it is actually more consistent with the nature of human social interactions. In the past, these scholarly communities generally occurred within disciplines, at the department level within universities, or scholarly communities scattered across the globe in highly specialized areas. Today these communities are increasingly multidisciplinary teams aimed at the investigation of complex research topics.

The International Nature of Scholarship

Any discussion about the future of the research university must account for the impact of the pervasively international character of research. To be sure, international cooperation in research is demanded by large and expensive facilities such as high-energy accelerators or astronomical observatories; for projects requiring coordinated research programmes such as global climate change; and for cross-national comparisons of health, education and economic development. However international cooperation is much more than joint financial support of major facilities with other nations. Scholarship is a global enterprise in which nations must participate both for their own benefit and that of the world.

Information and communications technologies have provided a powerful new tool to facilitate and extend international scholarship. By forging new national and international alliances and by carefully exploiting the new communications technologies on the horizon – putting the entire world in nearly instantaneous low-cost contact through the Internet (and its successors) – we can link to our scientific and scholarly colleagues throughout the world. Driven by information technology, the network has become more than a web which links together learning resources. It has become the architecture of advanced learning organizations (Dolence & Norris, 1995). Information, knowledge, and learning opportunities are now distributed across robust computer networks to hundreds of millions of people around the globe. The knowledge, the learning, the cultural resources that used to be the prerogative of a privileged few are rapidly becoming available anyplace, anytime, to anyone.

The Tools of Research

The tools of research continue to evolve, increasing dramatically in power, scope and, of course, cost. Research university leaders and funding agencies have long pointed to the staggering size and cost of the experimental facilities characterizing the physical sciences, e.g. the high-energy physics accelerators such as the Large Hadron Collider or astronomical observatories such as the Keck telescopes or the Hubble Space Telescope. But today many research universities are making even larger investments in the biomedical sciences, building new "life sciences institutes" to achieve the critical mass of facilities and scientists to tap the massive funding flowing into molecular genetics, proteomics, and biotechnology. Over the longer term, one might well question whether these research facilities will soon follow the path of high-energy physics and astronomy, becoming too large and expensive for single institutions – and perhaps even nations – and instead requiring international consortia of institutions, sponsors, and scientists.

The rapid evolution of digital technology also poses both new opportunities and challenges. A new age has dawned in S & E research, pushed by continuing progress in computing, information and communication technology, and pulled by the expanding complexity, scope and scale of today's challenges. The capacity of this technology has crossed thresholds that now make possible a comprehensive cyber-infrastructure on which to build new types of knowledge environments and organizations and to pursue research in new ways and with increased efficiency. The emerging vision is to use cyberinfrastructure (Atkins, 2003) to build more ubiquitous, comprehensive digital environments that become interactive and functionally complete for research communities in terms of people, data, information, tools and instruments and that operate at unprecedented levels of computational, storage and data-transfer capacity.

The Relationship Among Research, Education, and Learning

For decades, the conventional wisdom in the United States has been that research and teaching were mutually reinforcing and should be conducted together, at the same institutions by the same people (Pelikan, 1992). Higher education has long attempted to weave together research and education, particularly in making the case for public support of the research mission of the university. Yet the relationship of research to teaching quality is far from obvious. For example, in most research universities there is an ever-widening gap between the research activities of the faculty and the undergraduate curriculum.

There is a certain irony here. The research university provides one of the most remarkable learning environments in our society – an extraordinary array of diverse people with diverse ideas supported by an exceptionally rich array of intellectual and cultural resources. Yet we tend to focus our educational efforts on traditional academic programmes, on the classroom and the curriculum. In the process, we may have overlooked the most important learning experiences in the university.

Increasingly, we realize that learning occurs not simply through study and contemplation, but through the active discovery and application of knowledge. From John Dewey to Jean Piaget to Seymour Papert, we have ample evidence that most students learn best through inquiry-based of "constructionist" learning. As the ancient Chinese proverb suggests "I hear and I forget; I see and I remember; I do and I understand."

Perhaps it is time to integrate the educational mission of the university with the research and service activities of the faculty by ripping instruction out of the classroom – or at least the lecture hall – and placing it instead in the discovery environment of the laboratory or studio or the experiential environment of professional practice.

From Partnership to Procurement

We noted earlier the profound shift in federal research priorities that has occurred over the past several decades, shifting from the support of the physical sciences and engineering (e.g. in areas such as microelectronics and aerospace engineering) to support the Cold War and the space race, to the biomedical sciences, reflecting the demands for better health care from an ageing population. There is growing recognition that our nation needs to address possible imbalances among the fields of science and engineering – at a time when many fields are increasingly interdependent for achieving optimal results in the productivity of the economy and the pursuit of knowledge.

Perhaps even more disturbing are signs suggesting that the basic principles of the extraordinarily productive research partnership that has existed for the past half-century between the federal government and the research university have begun to unravel. The government is increasingly shifting from being a partner with the university – a patron of basic research – to becoming a procurer of research, just as it procures other goods and services. This view has unleashed on the research university an army of government staff, accountants, and lawyers all claiming to want to make certain that the university meets every detail of its agreements with the government. This situation is compounded by an array of new legislation and policies seeking both to demand and measure the performance associated with programmes supported by federal tax dollars such as the Government Performance Results Act (GPRA) of 1992 and the more recent Performance Assessment Rating Tool imposed by the current administration.

The Commercialization of the Academy

The efforts of universities and faculty members to capture and exploit the soaring commercial value of the intellectual property created by research and instructional activities create many opportunities and challenges for higher education. To be sure, universities recognize and exploit the increasing commercial value of the intellectual property developed on the campuses as an important part of their mission. But there are also substantial financial benefits to those institutions and faculty members who strike it rich with tech transfer. This has infected the research university with the profit objectives of a business, as both institutions and individual faculty members attempt to profit from the commercial value of the products of their research and instructional activities. Universities have adopted aggressive commercialization policies and invested heavily in technology transfer offices to encourage the development and ownership of intellectual property rather than its traditional open sharing with the broader scholarly community. They have hired teams of lawyers to defend their ownership of the intellectual property derived from their research and instruction. On occasions some institutions and faculty members have set aside the most fundamental values of the university, such as openness, academic freedom, and a willingness to challenge the status quo, in order to accommodate this growing commercial role of the research university (Press & Washburn, 2000).

SOME IMPLICATIONS FOR THE 21ST CENTURY RESEARCH UNIVERSITY

Intellectual Architecture

The changes in the nature of scholarship, from disciplinary to multi/inter-trans/cross-disciplinary, from specialization and reductionism to complexity and consilience, from Baconian or Newtonian to Jeffersonian, from analysis to creativity, will likely reshape the intellectual architecture of the university, as well as its organizational structure. Clearly top-down organizations, imposed by administrators with little experience or understanding of life in the intellectual trenches, will fail to tap the energy and creativity of faculty and students. Managing intellectual change in the university is not about putting centralized command-and-control systems in place. On the other hand, leaving the future of the university to faculty entrenched in traditional disciplines would similarly doom it to ossification. The organization of the university will become increasingly driven by innovative scholarship, teaching, and learning at the grassroots level. To preserve vitality will require flexible, decentralized structures, competing with one another for survival.

The increasingly rapid and non-linear nature of the transfer of knowledge from the library and laboratory into practical application suggests that more basic research activities may shift from the academic disciplines into professional schools. For example, the clinical applications (and revenue) associated with molecular genetics and proteomics have already drawn much of the most exciting basic research in the life sciences into clinical departments such as immunology and internal medicine. So too, engineering is becoming increasingly dependent upon and involved in basic research topics such as quantum computing and nanoscience. Some of the most exciting basic work in the social sciences is now found in professional schools such as business, public policy and law.

The development of information and communications technologies, the increased mobility of people and the migration of populations driven by economic, social and political factors will provoke even greater cultural contact and the internationalization of public life, education and scholarship, and academic institutions. If universities are to be able to capitalize on discoveries made elsewhere and facilities located elsewhere, they must have world-class researchers who maintain constant communication and work frequently in collaboration with the best scholars throughout the world. International science and technology cooperation is also necessary in order to make progress on many common problems that require a global perspective, i.e. stopping new infectious diseases, understanding volcanic hazards, cataloguing biological diversity and reversing soil degradation.

NEW PARADIGMS FOR THE RESEARCH UNIVERSITY

So what might we anticipate as possible future forms of the university? The monastic character of the ivory tower is certainly lost forever. Although there are many important features of the campus environment that suggest that the most universities will continue to exist as a place, at least for the near term, as digital technology makes it increasingly possible to emulate human interaction in all the senses with arbitrarily high fidelity, perhaps we should not bind teaching and scholarship too tightly to buildings and grounds. Certainly, both learning and scholarship will continue to depend heavily upon the existence of communities since they are, after all, highly social enterprises. Yet as these communities are increasingly global in extent, detached from the constraints of space and time, we should not assume that the scholarly communities of our times, constrained to a physical campus, would necessarily dictate the future of our universities.

As illustrations, let me suggest several possible visions of the future, that progress ever more toward an unpredictable and unknowable future (and, as some might contend, toward the lunatic fringe...)

The Core-in-Cloud University

Many research universities are already evolving into so-called "core-in-cloud" organizations (Gibbons, 1994) in which academic departments or schools conducting elite education and basic research, are surrounded by a constellation of quasi-university organizations – research institutes, think tanks, corporate R & D centres – that draw intellectual strength from the core university and provide important financial, human, and physical resources in return. Such a structure reflects the blurring of basic and applied research, education and training, the university and broader society.

More specifically, while the academic units at the core retain the traditional university culture of faculty appointments (e.g. tenure) and intellectual traditions (e.g. disciplinary focus), those quasi-academic organizations evolving in the cloud can be far more flexible and adaptive. They can be multidisciplinary and project-focused. They can be driven by entrepreneurial cultures and values. Unlike academic programmes, they can come and go as the need and opportunity arise. And, although it is common to think of the cloud being situated quite close to the university core, in today's world of emerging electronic and virtual communities, there is no reason why the cloud might not be widely distributed, involving organizations located far from the campus. In fact, as virtual universities become more common, there is no reason that the core itself has to have a geographical focus.

To some degree, the core-in-cloud model could revitalize core academic programmes by stimulating new ideas and interactions. It could provide a bridge that allows the university to better serve society without compromising its core academic values. But, like the entrepreneurial university, the cloud could also become a fog, scattering and diffusing the activities of the university and creating a shopping mall character with little coherence.

New Civic Life Forms

Today, as knowledge becomes an ever more significant factor in determining both personal and societal wellbeing, and as rapidly emerging information technology provides the capacity to build new types of communities, we might well see the appearance of new social structures (Benton Foundation, 1996). A century ago, stimulated by the philanthropy of Andrew Carnegie, the public library became the focal point for community learning. Today, however, technology allows us to link together public and private resources such as schools, libraries, museums, hospitals, parks, media and cultural resources. Further, communities can easily be linked with the knowledge resources of the world through the Internet. Perhaps a new "civic life form" will evolve to provide community education and knowledge networks that are open and available to all. These might evolve from existing institutions such as libraries or schools or universities. They might be a physically located hub or virtual in character. However, they also might appear as entirely new constructs, quite different than anything we have experienced to date. Perhaps it is time to consider a blank-sheet approach to learning, by setting aside existing educational systems, policies and practices, and instead first focusing on what knowledge, skills and abilities a person will need to lead a productive and satisfying life in the century ahead. Then, by considering the diversity of ways in which people learn, and the rich array of knowledge resources emerging in our society, one could design a new ecology of learning for the 21st Century.

The University à la Neuromancer (Gibson, 1984)

Ray Kurzweil's *The Age of Spiritual Machines* provides a provocative vision of possible futures for our society by projecting Moore's Law – the exponential evolution of digital technology – over the next several decades. He suggests that over the next decade intelligent courseware will emerge as a common means of learning, with schools and colleges relying increasingly on software approaches, leaving human teachers to attend primarily to issues of motivation, psychological wellbeing, and socialization (Kurzweil, 1999).

More specifically, Kurzweil speculates that by the end of this decade, although schools are still not on the cutting edge, the profound importance of the computer as a knowledge tool will be widely recognized. Many children will learn to read on their own using their personal computers before entering grade school. Within two decades, most learning will be accomplished using intelligent software-based simulated teachers. To the extent that human teachers do teaching, the human teachers are often not in the local vicinity of the student and will be viewed more as mentors and counsellors than as sources of learning and knowledge.

Within three decades (2030), Kurzweil suggests that human learning will be primarily accomplished using virtual teachers and enhanced by the widely available neural implants that improve memory and perception (although not yet able to download knowledge directly thereby bypassing formal education entirely). Although enhanced through virtual experiences, intelligent interactive instruction and neural implants, learning still requires time-consuming human experience and study. This activity comprises the primary focus of the human species, and education becomes the largest profession as human and non-human intelligences are primarily focused on the creation of knowledge in its myriad forms. Finally, a century hence, Kurweil speculates that learning will no longer be the struggle it once was. Rather the struggle will be discovering new knowledge to learn.

While many would argue (indeed, many have argued) with Kurzweil's view of the future, it does illustrate just how profoundly different the future may be both for our society and our universities.

CONCLUDING REMARKS

As one of civilization's most enduring institutions, the university has been extraordinary in its capacity to change and adapt to serve a changing society. Far from being immutable, the university has changed considerably over time and continues to do so today. The remarkable diversity of institutions of higher education, ranging from small liberal arts colleges to gigantic university systems, from storefront proprietary colleges to global "cyberspace" universities, demonstrates the evolution of the species.

Today we have entered yet another period of rapid change, as an array of powerful economic, social and technological forces are transforming social institutions such as the university. This impending revolution in the structure and function of higher education stems from the worldwide shift to a knowledge-based society. Educated people and the knowledge they produce will increasingly become the source of wealth for nations. The knowledge produced on our campuses is expanding exponentially with no slowing in sight.

As we look to the profound changes ahead of us, as we explore possible visions for the future, it is important to keep in mind that throughout their history, universities have evolved as integral parts of their societies to meet the challenges of their surrounding environments. This disposition to change is a basic characteristic and strength of university life, the result of our constant generation of new knowledge through scholarship that, in turn, changes the education we provide and influences the societies that surround us. In a very real sense, the university is both driving and being driven by technological, social and economic forces at work throughout the world.

This propensity of universities to change is nicely balanced by vital continuities, especially those arising from our fundamental scholarly commitments and values and from our roots in democratic societies. While the emphasis, structure, or organization of university activity may change over time to respond to new challenges, it is these scholarly principles, values, and traditions that animate the academic enterprise and give it continuity and meaning. An integral part of the life of the university has always been to evaluate the world around us in order to adjust our teaching, research and service missions to serve the changing needs of our constituents while preserving basic values and commitments. We must always bear in mind those deeper purposes of the university that remain unchanged and undiminished in importance. Our institutions must remain places of learning where human potential is transformed and shaped, the wisdom of our culture is passed from one generation to the next, and the new knowledge that creates our future is produced.

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