Higher Education in the New Century:
Themes, Challenges, and Options

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Los Angeles, CA
February 6, 2003

It is a real pleasure to return to "the Southland", albeit with a miserable Michigan cold that may erode my voice during these remarks. As you know, I did my graduate work at a small college in the backyard of your President's House in San Marino. In fact, after bringing Michigan to Pasadena five times to play in the Rose Bowl (twice against USC), I began to be introduced as Caltech's ultimate Rose Bowl prank!

After returning to the faculty after serving as dean, provost, and president of the University of Michigan for almost two decades, I have learned that has-been university presidents continue to draw rather diverse and sometimes bizarre assignments:

- A professional chairperson for various groups dealing with subjects ranging from nuclear energy (the Department of Energy) to federal R&D budgets (the National Academy of Sciences) to the impact of IT on the university to interdisciplinary research (NIH).
- But more to the point of today's discussion, I also find myself frequently invited by my colleagues, who are still active in leadership positions, to help them out by serving as a "2x4" in raising controversial issues for their faculties, governing boards, state governments, and other patrons.

It was in much this same spirit that last year Nils Hasselmo invited me to spend an evening with the executive board of presidents of the Association of American Universities to lead them through a discussion of the forces driving change in higher education.

- In part they saw me as an existence proof, since although a bit battered and scared, I had managed to survive two decades of leading change in higher education. They also sought my reassurance that the light at the end of the transformation tunnel was not just a train headed in their direction!
- But they were also worried. They knew that the 1990s had been very, very good to higher education. Private fund-raising rose to an all-time high. Endowments mushroomed in a bull market. The states had money once again. Federal research support was strong (albeit highly skewed toward the life sciences).

And yet, within two years:

The horror of 9-11 had shattered national confidence
A war in the Middle East loomed on the horizon
And the economy proved once again that what goes up must come down.

As you might expect, the early conversation with the AAU presidents began with all of the usual subjects:

money,
students,
technology,
and markets.

But it was soon apparent that there deeper issues that these university leaders really wanted to talk about, issues concerning the powerful forces driving change in our society and our world:

- the globalization of commerce and culture,
- the lifelong educational needs of citizens in a knowledge-driven, global economy,
- the increasing diversity of our population and the growing needs of under-served communities,
- the exponential growth of new knowledge and new disciplines,
- the compressed timescales and nonlinear nature of the transfer of knowledge from campus laboratories into commercial products.
- And the rapid evolution of information and communications technologies which obliterate conventional constraints of space, time, and monopoly and drive rapid, profound, and unpredictable change in our world

They expressed their concerns that the good times of the 1990s led many on their campuses to view the waves of change lapping on the beach as nothing unusual, just the time coming back in once again as it always had. Yet they feared that as universities sunned themselves in the warm sunshine of that peaceful world and a prosperous economy, out over the horizon there could well be a tsunami of economic, social, technological, and market forces, building to heights that could sweep over higher education before we had a chance to respond.

(I might add that after that late night meeting in Chicago, I caught an early morning flight to Washington to testify before the Knight Commission concerning the appalling state of intercollegiate athletics…yet another area of university activity that needs a 2x4, not just to get its attention, but a sledge hammer to beat it back into its cage!)

The Themes of Change in Higher Education

It seemed appropriate to begin this discussion of the challenges and opportunities facing higher education in the new century by reviewing with you several of the issues that were of particular concern to the AAU presidents.

The Changing Nature of the Need for Higher Education

Today, a college degree has become a necessity for most careers, and graduate education desirable for an increasing number.

- A growing population will necessitate some growth in higher education to accommodate the projected increases in the number of traditional college age students, roughly 15% across the U.S. in the next decade, and considerably more in states such as California.
- But even more growth and adaptation will be needed to respond to the educational needs of adults as they seek to adapt to the needs of the high performance workplace.
- Furthermore, such educational needs will be magnified many times on a global scale, posing both a significant opportunity and major responsibility to American higher education.[1]

Both young, digital-media savvy students and adult learners will likely demand

- A major shift in educational methods, away from passive classroom courses packaged into well-defined degree programs, and toward interactive, collaborative learning experiences, provided when and where the student needs the knowledge and skills.
- The increased blurring of the various stages of learning throughout one's lifetime–K-12, undergraduate, graduate, professional, job training, career shifting, lifelong enrichment–will require a far greater coordination and perhaps even a merger of various elements of our national educational infrastructure.
- We are shifting from "just-in-case" education, based on degree-based programs early in one's life, to "just-in-time" education, where knowledge and skills are obtained during a career, to "just-for-you" educational services, customized to the needs of the student.
- The student is evolving into an active learner and eventually a demanding consumer of educational services

Diversity

The increasing diversity of the American work force with respect to race, ethnicity, gender and nationality presents a similar challenge. Women, minorities, and immigrants now account for roughly 85 percent of the growth in the labor force, currently representing 60 percent of all of our nation's workers. The full participation of currently underrepresented minorities and women is crucial to our commitment to equity and social justice, as well as to the future strength and prosperity of America. This is particularly evident in states such as California which no longer have ethnic majority populations.

The growing pluralism of our society is one of our greatest strengths and most serious challenges as a nation. The challenge of increasing diversity is complicated by social and economic factors. Far from evolving toward one America, our society continues to be hindered by the segregation and non-assimilation of minority cultures. Both the courts and legislative bodies are now challenging long-accepted programs such as affirmative action and equal opportunity.

Here, as you may know, I speak with some personal involvement since I am a named defendant in two cases involving the University of Michigan's admissions policies that will be heard by the Supreme Court later this spring (I'm the "et. al."). We don't have the time this morning to get into the intricate details of these cases (although essentially every news source in the nation has already taken a stance on one side or the other). Suffice it to say that the decisions on these cases may well define the methods we will be able to use to achieve diversity in the years ahead--for BOTH public and private higher education.

Yet, regardless of the outcome of the Michigan cases, we must continue to recognize that as both a leader of society at large and a reflection of that society, the university has a unique responsibility to develop effective models of multicultural, pluralistic communities for our nation. We must strive to achieve new levels of understanding, tolerance, and mutual fulfillment for peoples of diverse racial and cultural backgrounds both on our campuses and beyond. We need to shift our attention from simply access to educational opportunity to success in achieving educational objectives. But it has also become increasingly clear that we must do so within a new political context that will require new policies and practices.

Technology

Two years ago the presidents of our National Academies launched a project to understand better the implications of information technology for the future of the research university, which I was asked to chair.[2]

Our steering group has met on numerous occasions to consider these issues, including site visits to major technology laboratories such as Bell Labs and IBM Research Labs and drawing upon the expertise of the National Academy complex and last year we pulled together over 100 leaders from higher education, the IT industry, and the federal government, and several private foundations for a two-day workshop at the National Academy of Sciences to focus our discussion.

Let me mention three key conclusions from first phase of this study:

Point 1: The extraordinary evolutionary pace of information technology will not only continue for the foreseeable future, but it could well accelerate on a superexponential slope.

Digital technology is characterized by an exponential pace of evolution in which characteristics such computing speed, memory, and network transmission speeds for a given price increase by a factor of 100 to 1000 every decade. Over the next decade, we will evolve from “giga” technology (in terms of computer operations per second, storage, or data transmission rates) to “tera” and then to “peta” technology (one million-billion or 10^{15}). To illustrate with an extreme example, if information technology continues to evolve at its present rate, by the year 2020, the thousand-dollar notebook computer will have a data processing speed and memory capacity roughly comparable to the human brain.[3] Except it will be so tiny as to be almost invisible, and it will communicate with billions of other computers through wireless technology.

For planning purposes, we can assume that by the end of the decade we will have available infinite bandwidth and infinite processing power (at least compared to current capabilities). We will denominate the number of computer servers in the billions, digital sensors in the tens of billions, and software agents in the trillions. The number of people linked together by digital technology will grow from millions to billions. We will evolve from “e-commerce” and “e-government” and “e-learning” to “e-everything”, since

digital devices will increasingly become our primary interfaces not only with our environment but with other people, groups, and social institutions.

Point 2: The impact of information technology on the university will likely be *profound, rapid, and discontinuous*–just as it has been and will continue to be for the economy, our society, and our social institutions (e.g., corporations, governments, and learning institutions).

Information and communications technology will affect the activities of the university (teaching, research, outreach), its organization (academic structure, faculty culture, financing and management), and the broader higher education enterprise. However, at least for the near term, meaning a decade or less, we believe the research university will continue to exist in much its present form, although meeting the challenge of emerging competitors in the marketplace will demand significant changes in how we teach, how we conduct scholarship, and how our institutions are financed.

Universities must anticipate these forces, develop appropriate strategies, and make adequate investments if they are to prosper during this period. Procrastination and inaction are the most dangerous courses for universities during a time of rapid technological change.

Point 3: It is our belief that universities should begin the development of their strategies for technology-driven change with a firm understanding of those key values, missions, and roles that should be protected and preserved during a time of transformation.

Markets

The growing and changing nature of higher education needs will trigger strong economic forces. Already, traditional sources of public support for higher education such as state appropriations or federal support for student financial aid have simply not kept pace with the growing demand. This imbalance between demand and available resources is aggravated by the increasing costs of higher education, driven as they are by the knowledge- and people-intensive nature of the enterprise as well as by the

difficulty educational institutions have in containing costs and increasing productivity. It also stimulated the entry of new for-profit competitors into the education marketplace.

The weakening influence of traditional regulations and the emergence of new competitive forces, driven by changing societal needs, economic realities, and technology, are likely to drive a massive restructuring of the higher education enterprise. From our experience with other restructured sectors of the economy such as health care, transportation, communications, and energy, we could expect to see a significant reorganization of higher education, complete with the mergers, acquisitions, new competitors, and new products and services that have characterized other economic transformations. More generally, we may well be seeing the early stages of the appearance of a global knowledge and learning industry, in which the activities of traditional academic institutions converge with other knowledge-intensive organizations such as telecommunications, entertainment, and information service companies.[4]

The Skills Race

Ask any governor about state priorities these days and you are likely to hear concerns expressed about education and workforce training. The National Governors Association notes that "The driving force behind the 21st Century economy is knowledge, and developing human capital is the best way to ensure prosperity."

The signs of the knowledge economy are numerous. The pay gap between high school and college graduates continues to widen, doubling from a 50% premium in 1980 to 111% today. Not so well know is an even larger earnings gap between baccalaureate degree holders and those with graduate degrees. In the knowledge economy, the key asset driving corporate value is no longer physical capital or unskilled labor. Instead it is intellectual and human capital.

But here we face a major challenge, since it is increasingly clear that we are simply not providing our citizens with the learning opportunities needed for a 21st Century knowledge economy. Recent TIMMS[5] scores suggest that despite school reform efforts of the past two decades, the United States continues to lag other nations in the mathematics and science skills of our students. Despite the growing correlation between the level of one's education and earning capacity, only 21% of those in our population over the age of 25 have graduated from college. Furthermore, enrollments in graduate

programs have held constant or declined (particularly in technical fields such as engineering and computer science) over the past two decades.[6]

The space race galvanized public concern and concentrated national attention on educating "the best and brightest," the elite of our society. The skills race of the 21st Century will value instead the skills and knowledge of our entire workforce as a key to economic prosperity, national security, and social well-being.

Education is becoming a powerful political force. Just as the space race of the 1960s stimulated major investments in research and education, there are early signs that the skills race of the 21st Century may soon be recognized as the dominant domestic policy issue facing our nation.

A New Social Contract

Even more fundamentally, as we enter the new millennium, there is an increasing sense that the social contract between the university and American society may need to be reconsidered and perhaps even renegotiated once again.[7]

Today we have entered an era in which educated people and the knowledge they produce and use have become the keys to the economic prosperity and social well-being. Moreover, education, knowledge, and skills have become primary determinants of one's personal standard of living. One might well argue that it has become the responsibility of democratic societies to provide their citizens with the education and training they need, throughout their lives, whenever, wherever, and however they desire it, at high quality and at an affordable cost.

Of course, this has been one of the great themes of higher education in America. Each evolutionary wave of higher education has aimed at educating a broader segment of society, at creating new educational forms to that—the public universities, the land-grant universities, the normal and technical colleges, the community colleges, and today's emerging generation of cyberspace universities.

But we now will need new types of colleges and universities with new characteristics:

1. Just as with other social institutions, our universities must become more focused on those we serve. We must transform ourselves from faculty-centered to learner-

centered institutions, becoming more responsive to what our students need to learn rather than simply what our faculties wish to teach.

2. Society will also demand that we become far more affordable, providing educational opportunities within the resources of all citizens. Whether this occurs through greater public subsidy or dramatic restructuring of the costs of higher education, it seems increasingly clear that our society—not to mention the world—will no longer tolerate the high-cost, low-productivity paradigm that characterizes much of higher education in America today.

3. In an age of knowledge, the need for advanced education and skills will require both a personal willingness to continue to learn throughout life and a commitment on the part of our institutions to provide opportunities for lifelong learning. The concept of student and alumnus will merge.

4. Our highly partitioned system of education will blend increasingly into a seamless web, in which primary and secondary education; undergraduate, graduate, and professional education; on-the-job training and continuing education; and lifelong enrichment become a continuum.

5. Already we see new forms of pedagogy: asynchronous (anytime, anyplace) learning that utilizes emerging information technology to break the constraints of time and space, making learning opportunities more compatible with lifestyles and career needs; and interactive and collaborative learning appropriate for the digital age, the plug-and-play generation. In a society of learning, people would be continually surrounded by, immersed in, and absorbed in learning experiences, i.e. ubiquitous learning, everywhere, every time, for everyone.

6. The great diversity characterizing higher education in America will continue, as it must to serve an increasingly diverse population with diverse needs and goals. But it has also become increasingly clear that we must strive to achieve diversity within a new political context that will require new policies and practices.

It is clear that the access to advanced learning opportunities is not only becoming a more pervasive need, but it could well become a defining domestic policy issue for a knowledge-driven society. Higher education must define its relationship with these emerging possibilities in order to create a compelling vision for its future as it enters the new millennium

Challenges Particular to the Research University

Clearly as the primary source of basic research and the next generation of scholars and knowledge professionals, the research university will remain an asset of great value.

But it is important to realize that the rest of the postsecondary education enterprise is changing rapidly.

Concern: If the research university becomes too moored to the status quo, it may become less and less relevant to the rest of the enterprise.

Let me turn now to several topics of particular concern to institutions such as USC and Michigan:

Federal Research Policy

In 1995, the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council issued a report entitled, *Allocating Federal Funds for Science and Technology*,[8] aimed at making the research funding process more coherent, systematic, and comprehensive; ensuring that funds were allocated to the best people and the best projects; ensuring that sound scientific and technical advice guided the allocation process; and improving the federal management of R&D activities.

The NAS report also recommended an interesting principle for allocating federal research funding:

- The United States should be among the leaders in all major fields of science and technology.
- The United States should be the absolute leader in key science and technology

areas of major strategic importance.

For example, it is clear that the nation should be the absolute leader in areas of strategic importance such as biotechnology, nanotechnology, and information technology. However it need only be among the leaders in an area like high energy physics (implying, of course, that the United States should be prepared to build expensive accelerators through international alliances rather than alone as in the ill-fated Superconducting Supercollider).

- The FS&T budget dropped significantly in early 1990s and has only recovered in past two years.

- During the 1990s, the big winner in federal research appropriations has been the National Institutes of Health (the biomedical sciences); NSF has held its own with modest gains; most mission agencies have lost ground.
  More specifically, during the past eight years, the R&D increases experienced by the federal agencies amount to +111% for NIH, +68% for NSF, + 21% for NASA, + 11% for DOD, and –1% for DOE. As a result, today almost 60 cents of every federal research dollar spent on university campuses is for biomedical research.

- Since scientific disciplines are supported by different federal agencies, a serious imbalance has developed in federal funding among the physical sciences, engineering, social sciences, and life sciences.
  For example, DOD supports 60% of computer science, 69% of electrical and mechanical engineering, 27% of mathematics, and 38% of materials research, so when DOD R&D budgets are cut, these disciplines suffer.

- The federal government's share of R&D has fallen far below that of industry, dropping from 65% in 1970 to 26% in 1999.[9]

There is a wide consensus that U.S. scientific preeminence and economic growth depend on maintaining the share of GDP devoted to R&D, with a target goal of 3%. And, indeed, total R&D spending has been increasing over the past decade, rising to 2.8% in 2000. Yet since 1987, industry R&D has increased by 196% while the federal

share of total R&D has dropped from 46% to 27%. In part this remarkable growth in private sector R&D has been stimulated by the importance of applied research and development in a technology-driven economy. But it also depends on the flow of basic research findings and the associated training of scientists and engineers, principally the concern of the federal government. Hence the growth of industry spending on R&D should not lull observers into thinking that the federal FS&T budget can be reduced. In fact, one might well question whether the current federal investment is adequate to sustain the necessary private sector investment in these activities, so critical to our economic prosperity. Furthermore, a continuing need exists 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 and addressing the urgent needs of homeland security.

These statistics raise the obvious question: How are federal research priorities really determined? One might attribute the pronounced shift in federal science policy from the support of the physical science and engineering to the support of the biomedical sciences as a reflection of changing national priorities over the past 50 years, as the urgency of military security declined with the end of the Cold War, and the concerns about health care grew with the aging of the baby boomer generation. More cynically, one might also consider this shift due in part to the sausage-making process used to construct the federal budget, a process that relies on a Congressional committee structure strongly favoring biomedical research and particularly susceptible to lobbying influence, while penalizing many other science and engineering disciplines by embedding their support in mission agencies subject to appropriations cuts (e.g., DOD and DOE).

Whatever the reason, it is clear that the past 50 years of federal science policy can be captured with the simple phrase: *From guns to pills*…with the pronounced shift in federal priorities for research funding from the support of the physical sciences and engineering to the support of the biomedical sciences.

So much for the past. What might we expect for the next several decades? This brings me naturally to my next topic.

The Federal Role in Meeting the Nation's Need for Intellectual Capital, the Skills Race

As the United States enters a new century, we face social and economic challenges triggered by globalization, technological change, and demographic change that have established the development of our nation's human and intellectual capital as our highest domestic priority. At similar critical periods in our nation's history, the federal government took strong action to address our citizens' needs for education

The Northwest Ordinances

The Land-Grant Acts

The GI Bill

The Truman Commission

The Government-University Research Partnership

The National Defense Education Act

Today our society is undergoing a profound transition, this time from an industrial to a knowledge-based society. Hence it may be time for a new social contract aimed at providing the knowledge and the educated citizens necessary for prosperity, security, and social well-being in this new age. Perhaps it is time for a new federal act, similar to the land grant acts of the nineteenth century, that will help the higher education enterprise address the needs of the 21st Century.

At the dawn of the age of knowledge, one could well make the argument that education itself will replace natural resources or national defense as the priority for the twenty-first century. We might even conjecture that a social contract based on developing and maintaining the abilities and talents of our people to their fullest extent could well transform our schools, colleges, and universities into new forms that would rival the research university in importance.

If the past 50 years of science policy can be characterized as a transition in national priorities "from guns to pills," let me suggest that the next 50 years will see the transition "from pills to brains". It is time that we realized that our nation's intellectual capital, the education of our people, the support of their ideas, their creativity, and their innovation, will become the dominant priority of a knowledge-driven nation.

But perhaps there is another issue, even more compelling, that will driven national priorities for the 21st Century:

Global Sustainability

It could well be that coming to grips with the impact of our species on our planet, learning to live in a sustainable fashion on Spaceship Earth, will become the greatest challenge of all to our generation. We must find new ways to provide for a human society that presently has outstripped the limits of global sustainability.This will be particularly difficult for the United States, a nation that has difficulty in looking more than a generation ahead, encumbered by a political process that generally functions on an election-by-election basis, as the current debate over global change makes all too apparent. With just 4.5% of the world's people, we control 25% of its wealth and produce 25% to 30% of its pollution. It is remarkable that the richest nation on earth is the lowest per capita donor of international development assistance of any industrialized country.

Ironically, the tragic events of September 11, 2001 might be viewed as a wake-up call, if we view these terrorist attacks not simply as a brief and brutal criminal attack but rather the consequence of more fundamental causes. As the noted biologist Peter Raven put it in a recent address (Raven, 2002, p. 954-958):

> "The United States is a small part of a very large, poor, and rapidly changing world, and we, along with everyone else, must do a better job. Sustainability science has a good deal to say about how we can logically approach the challenges that await us, but the social dimensions of our relationships are also of fundamental importance. Globalization appears to have become an irresistible force, but we must make it participatory and humane to alleviate the suffering of the world's poorest people and the effective disenfranchisement of many of its nations. As many have stated in the context of the current world situation, the best defense against terrorism is an educated people. Education, which promises to each individual the opportunity to express their individual talents fully, is fundamental to building a peaceful world."

There are 30 million people in the world today who are fully qualified to enter a university but for whom no university place is available. Within a decade there will be 100 million university-ready people. Yet, as Sir John Daniels, former head of the British Open University notes, in most of the world, higher education is mired in a crisis of access, cost, and flexibility (Daniel, 1996). Unless we can address and solve this crisis,

billions of people in coming generations will be denied the education so necessary to compete in, and survive in, an age of knowledge.

We must realize that the wealthy nations of the world have a particularly important role to play to assist developing nations in building the educational systems to meet their exploding needs

Commercialization

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. Clearly there are substantial financial benefits to those institutions and faculty members who strike it rich with tech transfer.

But there are also many signs that the commercialization of intellectual property has its downside as well. Today scientists sign agreements requiring them to keep both the methods and the results of their work secret for a certain period of time. More than a quarter of US geneticists say they can't replicate published findings because other investigators will not give them relevant data or materials. There is growing evidence suggesting that industrial sponsorship actually influences the outcome of scientific work.[10] Universities are encountering an increasing number of conflict of interest cases, stimulated by the exploding commercial value of intellectual property and threatening not only institutional integrity but even human life in conflicted clinical trials.

In recent years many universities seem to have adopted the attitude that "What is good for General Motors—or rather, consistent with the Bayh-Dole Act–is good for the country." They recognize and exploit the increasing commercial value of the intellectual property developed on the campuses as an important part of their mission (and part of their reward as well, I might add.) 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.[11]

But what is the public interest here? It is certainly the case that many in both government and the business world have increasingly seen universities not merely as centers of learning and basic research but as sources of commercially valuable knowledge. But is this also in the public interest of a society that has created, supported, and depended upon the university as a place of learning, education, and unfettered scholarship? Is there a conflict between the commercial demands of the marketplace and the broader roles of the university of our society?

Transferring university-developed knowledge to the private sector fulfills a goal of federally funded research by bringing the fruits of research to the benefit of society. With this important technology transfer comes increasingly close relationships between industry and universities. While this provides benefits to society, it also increases the risk of academic research being compromised by constraining open publication of research methods and results while diverting faculty from more fundamental research topics not so directly linked to commercial outcomes. Ironically, it has been the freedom of universities from market constraints that is precisely what allowed them in the past to nurture the kind of open-ended basic research that led to some of the most important (and least expected) discoveries in history.

There is a deeper issue here. The American university has been seen as an important social institution, created by, supported by, and accountable to society at large. The key social principle sustaining the university has been the perception of education as a *public good*--that is, the university was established to benefit all of society. Like other institutions such as parks and police, it was felt that individual choice alone would not sustain an institution serving the broad range of society's education needs. Hence public policy dictated that the university merited broad support by all of society, rather than just by the individuals benefiting from its particular educational programs.

Yet, today, even as the needs of our society for postsecondary education intensifies, we also find an erosion in the perception of education as a public good deserving of strong societal support.[12] State and federal programs have shifted from investment in the higher education enterprise (appropriations to institutions or students)

to investment in the marketplace for higher education services (tax benefits to students and parents). Whether a deliberate or involuntary response to the tightening constraints and changing priorities for public funds, the new message is that education has become a private good that should be paid for by the individuals who benefit most directly, the students. Government policies that not only enable but intensify the capacity of universities to capture and market the commercial value of the intellectual products of research and instruction represent additional steps down this slippery slope.

Education and scholarship are the primary functions of a university, its primary contributions to society, and the most significant roles of the faculty. When universities become overly distracted by other activities, they not only compromise these core missions but they also erode their priorities within our society. The shifting perspective of higher education from that of a social institution, shaped by the values and priorities of broader society, to, in effect, an industry, increasingly responsive to the marketplace only intensifies this concern. While it is important that the university accept its responsibility to transfer the knowledge produced on its campus to serve society, it should do so in such a way as to preserve its core missions, characteristics, and values.

Competition

As the competition among colleges and universities for students, faculty, resources, and reputations intensifies, there are growing concerns that the escalating “arms race” among colleges and university could create disruptive tensions among the higher education enterprise. This is aggravated by vast wealth accumulated by several of the elite private universities that allows them to buy “the best and brightest” students through generous financial aid programs (including merit-based programs) and raid outstanding faculty from less well-endowed institutions. Particularly troublesome are those elite research universities that tend to build their senior faculty by raiding established scholars from other institutions that have invested heavily in their development from the junior ranks. The growing gap between faculty salaries characterizing private and public research universities have created a Darwinian ecosystem in which wealthy elite universities have become predators feeding on the faculties of their less well-endowed prey, causing immense damage to the quality of the latter’s programs by luring away their top faculty with offers they are unable to match.

But, as in all ecosystems, evolutionary adaptation does occur. The vast wealth of predatory private universities depends on public largesse through very generous tax policies that benefit both charitable giving and endowment investments. As the faculty raiding practices of these predatory institutions become more aggressive and intrusive, the large public universities may eventually be forced to unleash their most powerful defensive weapon: political clout. After all, influential as the elite private universities may be, they are no match for the political influence of state universities, able to build and coordinate considerable political pressure in every state and within Congress. One can imagine a situation in which the pain from irresponsible faculty raids by wealthy private universities becomes so intense that the public universities are compelled to unleash the "T" word, taxes, and question the wisdom of current tax policies that sustain such vast wealth and irresponsible behavior at public expense–both taxpayers and public institutions. Needless to say, this would be the equivalent of nuclear warfare and could damage very deeply both private and public institutions. But it could happen if higher education is unable to de-escalate or at least constrain the arms race for top students and faculty.

The Imperatives of Change

A rapidly evolving world has demanded profound and permanent change in most, if not all, social institutions. Certainly most of our colleges and universities are attempting to respond to the challenges and opportunities presented by a changing world. They are evolving to serve a new age. But most are evolving within the traditional paradigms, according to the time-honored processes of considered reflection and consensus that have long characterized the academy.

While most colleges and universities have grappled with change at the pragmatic level, few have contemplated the more fundamental transformations in mission and character that may be required by our changing world.

Furthermore change in the university is rarely driven from within. After all, one of the missions of the university is to preserve time-honored values and traditions. So too, tenured faculty appointments tend to protect the status quo, and the process of shared governance provides the faculty with a mechanism to block change. Most campus administrators tend to be cautious, rarely rocking the boat in the stormy seas driven by

politics either on campus or beyond. Governing boards are all too frequently distracted from strategic issues in favor of personal interests or political agendas.

Earlier examples of change in American higher education, such as the evolution of the land-grant university, the growth of higher education following World War II, and the evolution of the research university, all represented reactions to major forces and policies at the national level. The examples of major institutional transformation driven by internal strategic decisions and plans from within are relatively rare. Change is a particular challenge to the public university, surrounded as it is by powerful political forces and public pressures that tend to be conservative and reactionary.

The glacial pace of university decision making and academic change simply may not be sufficiently responsive to allow the university to control its own destiny. There is a risk that the tidal wave of societal forces could sweep over the academy, both transforming higher education in unforeseen and unacceptable ways while creating new institutional forms to challenge both our experience and our concept of the university.

Some Lessons Learned

During the 1980s and 1990s the University of Michigan attempted just such a major strategic transformation.

Typically discussions of change in higher education begin with bread-and-butter issues such as:

1. Financing public higher education.
2. Managing (or governing) colleges and universities.
3. Developing strategies and tactics.

But from my own experience, let me suggest a somewhat different set of issues:

Values

It is important to always begin with the basics, to launch a careful reconsideration of the key roles and values that should be protected and preserved during a period of transformation. For example, how would an institution prioritize among roles such as

educating the young (e.g., undergraduate education), preserving and transmitting our culture (e.g., libraries, visual and performing arts), basic research and scholarship, and serving as a responsible critic of society? Similarly, what are the most important values to protect? Clearly academic freedom, an openness to new ideas, a commitment to rigorous study, and an aspiration to the achievement of excellence would be on the list for most institutions. But what about values and practices such as shared governance and tenure? Should these be preserved? At what expense?

A Commitment to Excellence, but in an Increasingly Diverse Way

Of course, we all aspire to excellence, but just how do we set our goals? Frank Rhodes refers past several decades as the "Harvardization" of American higher education, in which the elite research universities became the gold standard, the model that other types of institutions, whether they be large public universities, private liberal arts colleges, or even regional and community colleges, attempted to emulate. But in the years ahead, Rhodes believes that we will see the de-Harvardization of higher education, as people begin to realize that an elite paradigm which simply focuses more and more resources on fewer and fewer does not serve the needs of American society.

Rather the premium will be on the development of unique missions for each of our institutions, missions that reflect not only their tradition and their unique roles in serving society, but as well their core competency. As industry has learned, in an increasingly competitive global marketplace, you have to focus on what you can do best, where you are truly world-class, and outsource other products and services.

This will require not only that each of our colleges and universities develop a unique vision, but beyond that, that they be prepared to focus resources to achieve it. They must be prepared to shift resources when necessary, possibly reducing or even eliminating some programs and activities in order to improve or initiate others. In such decisions, it must keep in mind the important criteria of quality, centrality, and cost-effectiveness.

Engaging the Stakeholders

Next, as a social institution, the university should endeavor to listen carefully to society, learning about and understanding its varied and ever-changing needs,

expectations, and perceptions of higher education. Not that responding to all of these would be desirable or even appropriate for the university. But it is important to focus more attention on those whom we were created to serve.

Subsidiarity and Autonomy

Yet another lesson that we have learned is the principle of subsidiarity, that all decisions should be made at the lowest possible level. That is, whether we consider higher education from the state level, as a system, as individual universities, or as academic departments, one should strive to decentralize both authority and responsibility to the lowest possible level, to those closest to the action. Of course, this is not a message that I need to tell USC, since we actually learned the archaic form of decentralized budgeting known as "responsibility center management" from your former VP-Finance.

Alliances

Colleges and universities should place far greater emphasis on building alliances with other institutions that will allow them to focus on core competencies while relying on alliances to address the broader and diverse needs of society. For example, flagship research universities in some states will be under great pressure to expand enrollments to address the expanding populations of college age students, possibly at the expense of their research and service missions. It might be far more constructive for these institutions to form close alliances with regional universities and community colleges to meet these growing demands for educational opportunity. Another example would be alliances between research universities and liberal arts colleges that take mutual advantage of the learning-intensive environment of the latter and the vast intellectual resources of the former.

Here alliances should be considered not only among institutions of higher education (e.g., partnering research universities with liberal arts colleges and community colleges) but also between higher education and the private sector (e.g., information technology and entertainment companies). Differentiation among institutions should be encouraged, while relying upon market forces rather than regulations to discourage duplication.

Experimentation

We must recognize the profound nature of the rapidly changing world faced by higher education. Many of the forces driving change are disruptive in nation, leading to quite unpredictable futures. Planning in the face of such uncertainty requires a more experimental approach to university transformation.

A personal example is useful here. During the 1990s we led an effort at the University of Michigan to transform the institution, to re-invent it so that it better served a rapidly changing world. We created a campus culture in which both excellence and innovation were our highest priorities. We restructured our finances so that Michigan became, in effect, a privately supported public university. We dramatically increased the diversity of our campus community. We launched major efforts to build a modern environment for teaching and research using the powerful tools of information technology.

Yet with each transformation step we took, with every project we launched, with each objective we achieved, we became increasingly uneasy. The forces driving change in our society and its institution were far stronger and more profound that we had first thought. Change was occurring far more rapidly that we had anticipated. The future was becoming less certain as the range of possibilities expanded to include more radical options. We came to the conclusion that in a world of such rapid and profound change, as we faced a future of such uncertainty, the most realistic near-term approach was to explore possible futures of the university through experimentation and discovery. That is, rather than continue to contemplate possibilities for the future through abstract study and debate, it seemed a more productive course to build several prototypes of future learning institutions as working experiments. In this way we could actively explore possible paths to the future. For example,

- We explored the possible future of becoming a privately supported but publicly committed university by completely restructuring our financing, raising over $1.4 billion in a major campaign, increasing tuition levels, dramatically increasing sponsored research support to #1 in the nation, and increasing our endowment ten-fold. Ironically, the more state support declined as a component of our revenue base (dropping to less than 10% by the late 1990s), the higher our Wall

Street credit rating, finally achieving the highest AAA rating (the first for a public university).

- Through a major strategic effort known as the Michigan Mandate, we altered very significantly the racial diversity of our students and faculty, doubling the population of underrepresented minority students and faculty over a decade, thereby providing a laboratory for exploring the themes of the "diverse university."

- We established campuses in Europe, Asia, and Latin America, linking them with robust information technology, to understand better the implications of becoming a "world university."

- We played leadership roles first in the building and management of the Internet and now Internet2 to explore the "cyberspace university" theme.

But, of course, not all of our experiments were successful. Some crashed in flames, in some cases spectacularly:

- We tried to spin off our academic health center, merging it with another large hospital system in Michigan to form an independent health care system. But our regents resisted this strongly, concerned that we would be giving away a valuable asset (even though we would have netted well over $1 billion in the transaction and avoided the $100 million annual operating losses we are now facing as managed care sweeps across Michigan.

- Although we were successful eventually in getting a Supreme Court ruling that provided relief from intrusive nature of the state's sunshine laws, we ran into a brick wall attempting to restructure how our governing board was selected and operated. (It remains one of the very few in the nation entirely determined by public election and partisan politics.)

- And we attempted to confront our own version of Tyrannosaurus Rex by challenging our Department of Athletics to better align their athletic activities with academic priorities, e.g. recruiting real students, reshaping competitive

> schedules, throttling back commercialism…and even appointing a real educator, a former dean, as athletic director. Yet today we are posed to spend $20 million on skyboxes for Michigan Stadium after expanding stadium capacity three years ago to over 110,000.

Nevertheless, in most of these cases, at least we learned something (if only our own ineffectiveness in dealing with cosmic forces such as college sports). More specifically, all of these efforts were driven by the grass-roots interests, abilities, and enthusiasm of faculty and students. While such an exploratory approach was disconcerting to some and frustrating to others, fortunately there were many on our campus and beyond who viewed this phase as an exciting adventure. And all of these initiatives were important in understanding better the possible futures facing our university. All have had influence on the evolution of our university.

Our approach as leaders of the institution was to encourage strongly a "let every flower bloom" philosophy, to respond to faculty and student proposals with "Wow! That sounds great! Let's see if we can work together to make it happen! And don't worry about the risk. If you don't fail from time to time, it is because you aren't aiming high enough!" We tried to ban the word "NO" from our administrators.

Turning Threats into Opportunities

It is important for university leaders to approach issues and decisions concerning transformation not as threats but rather as opportunities. True, the status quo is no longer an option. However, once we accept that change is inevitable, we can use it as a strategic opportunity to control our destiny, while preserving the most important of our values and our traditions.

Creative, visionary leaders can tap the energy created by threats such as the emerging for-profit marketplace and technology to engage their campuses and to lead their institutions in new directions that will reinforce and enhance their most important roles and values.

Concluding Remarks

We have entered a period of significant change in higher education as our universities attempt to respond to the challenges, opportunities, and responsibilities before them.[13]

The past decade has been such a time of significant change in higher education, as our institutions have attempted to adapt to the changing nature of resources and respond to public concerns. Undergraduate education has been significantly improved. Costs have been cut and administrations streamlined. Our campuses are far more diverse today with respect to race and gender. Our researchers are focusing their attention on key national priorities.

Yet, these changes in the university, while important, have been largely reactive rather than strategic. For the most part, our institutions still have not grappled with the extraordinary implications of an age of knowledge, a society of learning that will likely be our future.

From this perspective, it is important to understand that the most critical challenge facing most institutions will be to develop the capacity for change. As we noted earlier, universities must seek to remove the constraints that prevent them from responding to the needs of a rapidly changing society. They should strive to challenge, excite, and embolden all members of their academic communities to embark on what should be a great adventure for higher education. Only a concerted effort to understand the important traditions of the past, the challenges of the present, and the possibilities for the future can enable institutions to thrive during a time of such change.

Clearly higher education will flourish in the decades ahead. In a knowledge-intensive society, the need for advanced education will become ever more pressing, both for individuals and society more broadly. Yet it is also likely that the university as we know it today—rather, the current constellation of diverse institutions comprising the higher education enterprise—will change in profound ways to serve a changing world. The real question is not whether higher education will be transformed, but rather how . . . and by whom. If the university is capable of transforming itself to respond to the needs of a society of learning, then what is currently perceived as the challenge of change may, in fact, become the opportunity for a renaissance, an age of enlightenment, in higher education in the years ahead.

For a thousand years the university has benefited our civilization as a learning community where both the young and the experienced could acquire not only knowledge and skills, but the values and discipline of the educated mind. It has defended and propagated our cultural and intellectual heritage, while challenging our norms and beliefs. It has produced the leaders of our governments, commerce, and professions. It has both created and applied new knowledge to serve our society. And it has done so while preserving those values and principles so essential to academic learning: the freedom of inquiry, an openness to new ideas, a commitment to rigorous study, and a love of learning.[14]

There seems little doubt that these roles will continue to be needed by our civilization. There is little doubt as well that the university, in some form, will be needed to provide them. The university of the twenty-first century may be as different from today's institutions as the research university is from the colonial college. But its form and its continued evolution will be a consequence of transformations necessary to provide its ancient values and contributions to a changing world.

Several years ago, during a meeting with my executive officers following my announcement of my decision to step down as president and return to the faculty, one of my vice-presidents slipped me a piece of paper with the well-known quote of Machiavelli:

> "There is no more delicate matter to take in hand, nor more dangerous to conduct, nor more doubtful of success, than to step up as a leader in the introduction of change. For he who innovates will have for his enemies all those who are well off under the existing order of things, and only lukewarm support in those who might be better off under the new."

After almost a decade of attempting to lead a transformational change process at the University of Michigan, I could only respond with an emphatic "AMEN!" The resistance can be intense, and the political backlash threatening.

To be sure, it is sometimes difficult to act for the future when the demands of the present can be so powerful and the traditions of the past so difficult to change.

Yet, perhaps this is the greatest challenge for our institutions, and the most important role of our leadership, in the years ahead as we attempt to build universities for the 21st Century.

[1] John S. Daniel, Mega-Universities and Knowledge Media (Kogan Page, London, 1996)

[2] The co-principal investigators of the National Academies project are William A. Wulf, President of the National Academy of Engineering and Professor of Computer Science at the University of Virginia and James J. Duderstadt, Professor of Science and Engineering at the University of Michigan.

[3] Ray Kurzweil, *The Age of Spiritual Machines: When Computers Exceed Human Intelligence* (New York: Viking, 1999).

[4] Marvin W. Peterson and David D. Dill, "Understanding the Competitive Environment of the Postsecondary Knowledge Industry", in Planning and Management for a Changing Environment, edited by Marvin W. Peterson, David D. Dill, and Lisa A. Mets (San Francisco: Jossey-Bass Publishers, 1997) pp. 3-29.

[5] *The Third International Mathematics and Science Study-Repeat*, National Science Foundation and Department of Education, 2001.

[6] Douglas S. Massey, "Higher Education and Social Mobility in the United States 1940-1998 (Association of American Universities, Washington, 2000)

[7] Vernon Ehlers, "Unlocking Our Future: Toward a New National Science Policy," a report to Congress by the House Committee on Science (September 24, 1998).

[8] *Allocating Federal Funds for Science and Technology,* Committee on Criteria for Federal Support of Research and Development, (National Academy Press, Washington, 1995).

[9] Federal R&D as a percentage of total R&D in the US reached a high point in 1964 at 66.8 percent, equaled 46.4% in 1987, and in 1999 was 26.7 percent. See NSF, *National Patterns of Research and Development Resources 1999 Data Update* (NSF 00-306).

[10] "Data Hording Blocks Progress in Genetics", *Science,* Vol 295, January 25, 2002, p. 599.

[11] Eyal Press and Jennifer Washburn, "The Kept University", *The Atlantic Monthly*, March, 2000, pp. 39-54.

[12] Robert Zemsky, "Rumbling," *Policy Perspectives*, Pew Higher Education Roundtable, sponsored by the Pew Charitable Trusts (Philadelphia: Institute for Research on Higher Education, April 1997).

[13] "The Glion Declaration: The University at the Millennium," *The Presidency*, Washington, D.C.: American Council on Education, Fall 1998): 27-31.

[14] Werner Z. Hirsch and Luc E. Weber, "The Glion Declaration: The University at the Millennium", *The Presidency*, Fall, 1998 (American Council on Education, Washington) p. 27