SPECIAL ISSUE

Carnegie REPORTER

THE BIG PICTURE

Assessing the Future of Higher Education

Winter 2014 CARNEGIE CORPORATION OF NEW YORK *vol. 7/no. 3*

American Higher Education: An Obligation *to the* Future

by Vartan Gregorian, *President, Carnegie Corporation of New York*

PHOTO BY MICHAEL FALCO

In recent years, there has been a debate raging among policymakers, students, educators, concerned parents, and many others about the purpose of higher education: is it meant to help develop an inquiring mind and a deep appreciation for the value of how knowledge enriches one's lifelong personal and professional achievements or should it be simply focused on gaining the skills to pursue a well-paying career? In other words, we seem to have divided higher education into a black-and-white scenario in which either an individual becomes a sort of pie-in-the-sky dreamer, well-read and able to quote great thinkers but probably starving in a garret while unable to get a decent job, or else he or she graduates from college and immediately plunges into the world of technologically complex, high-stakes, high-financial-reward work and becomes a "great success."

Perhaps the time has come to reconsider that either-or proposition about higher education. The issue is too complex to be addressed in such a simplified manner. For example, as a new study[1] from the Association of American Colleges and Universities (AACU) reports, "Students, parents, and policymakers interested in the 'return on investment' of college education [often assume] that a major in a liberal arts field has a negative effect on employment prospects and earnings potential." But the AACU study makes clear there is compelling evidence that a liberal arts degree continues to be a sound investment, especially in these difficult economic times. The facts show that compared to students who major in professional, preprofessional, or STEM fields, liberal arts majors fare very well in terms of both earnings and long-term career success.

The specifics are indeed eye-opening. They reveal that over the long-term, humanities graduates actually fare better than their peers who are focused on particular professional fields. Upon graduating from college, those who majored in the humanities and social science made, on average, $26,271 in 2010 and 2011, slightly more than those in science and mathematics but less than those in engineering and in professional and pre-professional fields. However, by their peak earning age of 56 to 60, these individuals earned $66,185, putting them about $2,000 ahead of professional and pre-professional majors in the same age bracket.[2] Further, employers *want* to hire men and women who have the ability to think and act based on deep, wide-ranging knowledge. For example, the report finds that 93 percent of employers agree that candidates' demonstrated capacity to think critically, communicate clearly, and solve complex problems is more important than their undergraduate major, and 55 percent said that what they wanted from potential employees was both field-specific knowledge and skills and a broad range of knowledge and skills. Even more evidence of hiring managers' interest in richly educated individuals is the finding that four out of five employers agree that *all* students should acquire broad knowledge in the liberal arts and sciences.[3]

Students do not have to make artificial choices between what they want to know about the world and the skills they need to succeed in it.

All this is heartening news in that it reminds us that the current generation of students—and those who follow after them—do not have to make artificial choices between what they want to know about the world and the skills they need to succeed in it. But there are some who are still not persuaded

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[1] How Liberal Arts and Sciences Majors Fare in Employment: A Report on Earnings and Long-Term Career Paths, *by Debra Humphries and Patrick Kelly, published by the Association of American Colleges and Universities.*
[2] *"Humanities Majors Don't Fare As Badly As Portrayed, New Earnings Report Says,"* HuffPost College, *January 23, 2014.*
[3] *Op. cit.* How Liberal Arts and Sciences Majors Fare in Employment.

Carnegie REPORTER

Note: The online version of this magazine can be found at higheredreporter.carnegie.org/

About This Issue

For the past two years, Carnegie Corporation and *TIME* Magazine have co-hosted a summit on higher education. In the fall of 2013, the focus of the gathering was on the American university as a driver of research and education for the nation, threats to the university's continued excellence, and ideas for innovation and reinvention to meet the challenges and opportunities of the 21st century. Leaders from higher education, state and federal government, philanthropy, and business discussed and debated the future of America's great research universities and related issues affecting higher education. To continue and expand those discussions, the Corporation is presenting this special issue of the *Carnegie Reporter*, which is devoted to articles, speeches and essays by some of America's top educators whose opinions and points of view address aspects of higher education that continue to concern us all.

ELEANOR LERMAN, *Director, Public Affairs and Publications*

by Nicholas Lemann,
Professor of Journalism and Dean Emeritus, Columbia Journalism School

The Soul of the UNIVERSITY

The two most important developments in American higher education in the twentieth century were, arguably, contradictory. First, building on the foundation laid by the Morrill Act of 1862, which gave federal land to states to create colleges that taught "agriculture and the mechanic arts," we created the world's first mass higher education system. When the Carnegie Corporation was founded, fewer than 3 percent of Americans between the ages of 18 and 24 were students in institutions of higher education. About 350,000 young Americans were enrolled in fewer than 1,000 institutions of higher education. A hundred years later, more than 35 percent of 18-to-24-year-olds are enrolled, and about two-thirds of high school graduates immediately go on to get more education. The United States has 20 million students in 4,500 institutions of higher education.

Second, building on the foundation laid by the establishment of Johns Hopkins University in 1876, American higher education has embraced the idea of the research university as its most cherished aspiration. Today there are about 300 American universities that confer doctoral degrees, far more than the original proselytizers for importing the research-university model from Germany to the United States envisioned. And this number understates the importance of the research-university model, because the core of the faculty and senior administration at hundreds more higher education institutions hold doctoral degrees and operate within the academic tenure system that lies at the heart of the way research universities are run.

For many people who have spent their lives working in higher education, mass higher education and research universities make for a perfect fit: together they express both the public service and the intellectual ambitions of educators. And during most of the twentieth century, especially the years between 1950 and 1975, the two big ideas grew and flourished in tandem. But they aren't the same idea. Mass higher education, conceptually, is practical, low-cost, skills-oriented, and mainly concerned with teaching. It caught on because state legislatures and businesses saw it as a means of economic development and a supplier of personnel, and because families saw it as a way of ensuring a place in the middle class for their children. Research universities, on the other hand, grant extraordinary freedom and empowerment to a small, elaborately trained and selected group of people whose mission is to pursue knowledge and understanding without the constraints of immediate practical applicability under which most of the rest of the world has to operate. Some of their work is subsidized directly, by the federal government and by private donors, but they also live under the economic protection that very large and successful institutions can provide to some of their component parts.

I have an immigrant's perspective on higher education, having spent most of my adult life working for news organizations and then, through a series of happy accidents, having become a dean at a major research university in middle age. No matter how much you think you understand how central research is to the university, you can't truly feel its centrality until you have experienced university life from the inside, at a fairly high level. Of the many stakeholder groups in higher education, the most powerful, at least at research universities, is the tenured faculty, and the ticket for admission to that group is first-rate research. Very-high-achieving people who have devoted the main energies of their careers to research, and who use evaluations of research quality to perform ongoing, fairly merciless evaluations of their peers and would-be peers, will naturally see research as the central activity of their institutions. Research is a major income generator for the top universities. Research is central to the immensely appealing conception of the university as an au-

tonomous institution with the freedom to make its own rules.

It's also the case that university leaders, when speaking to the nonuniversity world, rarely present research as the clear central purpose of the university. Tens of millions of Americans have a direct connection to higher education, and probably only a tiny minority of them are even familiar with the term "research university." So universities themselves have contributed to the lack of public understanding of the centrality of research.

At the Higher Education Summit that Carnegie Corporation of New York and *TIME* magazine co-sponsored in September 2013, the disconnect between the views of the research university from inside and outside was vividly on display. A procession of highly distinguished leaders of higher education mainly emphasized the need to protect—in particular, to fund adequately—the university's research mission. A procession of equally distinguished outsiders, including the U.S. secretary of education, mainly emphasized the need to make higher education more cost-effective for its students and their families, which almost inevitably entails twisting the dial away from research and toward the emphasis on skills instruction that characterizes the mass higher education model. *TIME*'s own cover story that followed from the conference hardly mentioned research (it was mainly about how much economically useful material students are learning), even though the research university was explicitly the main focus of the conference. At the conference itself, there was a lot of talk about maintaining American "competitiveness" in the global economy as the main justification for the university's research mission—and the idea of a crisis was pervasive. But how the crisis was defined depended on who was defining it: those who don't work in higher education usually see it as a crisis of high cost and impracticality, and those who do work in higher education usually see it as a crisis of insufficient resources. An unschooled observer who wandered into the conference might leave feeling impressed with many of the specific ideas she heard, but confused about what the overall situation is.

The Ur-text about higher education, at least for educators, is *The Idea of a University*, by John Henry Newman. It is an odd choice: it's a disjointed, incomplete series of lectures from the 1850s, mainly devoted to an issue nobody worries about much any more (the independence of universities from organized religion), and it is explicitly opposed to the research-university ideal, which was beginning to emerge at the time. Newman was making a case, essentially, for Oxford as University in the early nineteenth century: a university for aristocrats and scholars, unscientific, undemocratic, highly personalized, gloriously impractical. And yet such eminent twentieth-century writers on higher education as Alfred North Whitehead, Abraham Flexner, and Clark Kerr all demonstrated in their writings a deep debt to Newman. In 1992 the distinguished historian Jaroslav Pelikan published a book called *The Idea of a University: A Reexamination*, which is a lecture-by-lecture update of Newman.

Why is Newman so enduringly appealing? Part of the reason is that, because universities are so large and do so many different things, very few people have been able succinctly and persuasively to state their central purpose. Part is Newman's wise and elegant writing style. And part is Newman's core idea that the university should be a self-governing institution, set apart and protected from the other main institutions of society that will always try to bend it to their own purposes, devoted to knowledge as an end in itself. "Here are two methods of Education;" he wrote. "The end of the one is to be philosophical, or the other to be mechanical; the one rises toward general ideas, the other is exhausted upon what is particular and external…. Knowledge, in proportion as it tends to be more and more particular, ceases to be Knowledge."

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Abraham Flexner's *Universities: American English German*, published in 1930 in a mood of celebration of the successful importation of the German research university model to the United States over the preceding generation, begins with a tribute to Newman, but dramatically departs from the territory Newman delineated for the university. Flexner's ideal university was deeply engaged with the world, especially through the new social sciences. What

Newman meant when he used the term knowledge was the accumulation, not of information and skill, but of understanding and perspective. Flexner's ideal was the similar-sounding but actually quite different "advancement of knowledge," for which he imagined substantial outside-world applications. That and "solution of problems," he wrote, he considered to be "interchangeable phrases." Universities were uniquely well suited to make the world a better place.

Flexner was aware of the peril that universities might be put at the service of every outside entity and social need.

But Flexner was aware that in proposing that universities have a far more utilitarian mission than the one Newman had in mind, he was entering a realm of potential peril: universities might be turned into entirely practical institutions, put at the immediate service of every outside entity and social need. "A university should not be a weather vane, responsive to every variation of popular whim," he wrote. "Universities must at times give society, not what society wants, but what it needs. Inertia and resistance have their uses, provided they be based on reasonable analysis, on a sense of values, not on mere habit." Flexner was especially skeptical of universities undertaking to teach their students anything practical: "The pursuit of science and scholarship belongs to the university. What else belongs? Assuredly neither secondary, technical, vocational, nor popular education. Of course, these are important; of course, society must create appropriate agencies to deal with them; but they must not be permitted to distract the university." Flexner disapproved, for example, of research universities being home to any form of professional education except in law and medicine, including business schools, journalism schools, schools of education, and denominational divinity schools. That is why, even for him, Newman served as a valuable anchor to windward.

Clark Kerr delivered the Godkin Lectures at Harvard half a century ago, in the spring of 1963, during what looks in retrospect like the historical high-water mark of American optimism. That mood pervades the lectures. Kerr gave the book version of the lectures a title that explicitly echoes, but also rejects, Newman: *The Uses of the University*. (Newman didn't want universities to have uses.) The book has been through a series of new editions over the years, and it still stands as about the best concise, coherent, nonbloviating explanation of what an American university is supposed to be. Kerr shared with Newman a passion for the university as an independent, almost magically self-contained institution, and he shared with Flexner a devotion to the research-university ideal. But he was willing to go much further than Flexner in suggesting that the university could safely take on a wide range of educational and social missions—hence the term he coined for it, the "multiversity." After delineating how conceptually different the mass higher education and research-university ideas were, Kerr confidently asserted that they had "turned out to be more compatible than might at first appear."

Flexner was writing as an intellectual; Newman and Kerr were both writing as intellectuals who were also administrators. In Kerr's case, he was, as president of the University of California, chief administrator of the world's largest higher-education institution, and he was well aware that the compatibility he saw between the two dominant university missions needed, at the very least, some minding. Kerr wrote that there were only 20 true research universities in the United States, and he didn't complain that that was too few. In California, the state colleges were constantly lobbying the state legislature to be upgraded to the alluring status of universities. Kerr's response to this was to persuade the legislature to pass a sweeping master plan for higher education, built around a grand bargain between the two models: on the democratizing side, everyone in California would have the right to a tuition-free higher education, and on the research side, nobody in the vast system except a handful of elite, well-funded universities would be permitted to offer doctoral programs.

Kerr's historic achievement began unraveling almost immediately. In the short run, the Free Speech Movement protests at Berkeley, which came the year after the Godkin Lectures, unpleasantly surprised him. The election of Ronald Reagan as governor of California in 1966, partly because Reagan had tapped into the public's resentment of the student protests, was another surprise. And shortly after taking office, Reagan arranged for Kerr to be fired. In the longer run, both of the key elements of the master plan were abrogated. The California state college system is now the California state university system, and public higher education in California has not been tuition-free for decades. It is still an outstanding system, but not quite so paradisaical or conceptually neat as Kerr believed it could be.

The crisis in higher education, it should be noted, is not like the 2008 financial crisis, or the crisis in the big-city newspaper business that many journalists like to use as a point of comparison when discussing higher education. It is more prospective than actual; colleges and universities aren't going out of business en masse, or even, across the board, significantly curtailing their operations. Because higher education is expected to do so many things—teach everything from prison administration to philosophy, operate winning sports programs, provide in-person management of the transition from adolescence to adulthood, make local economies prosper, be direct providers of medical care, and on and on—it can't possibly do all of them at peak efficiency all the time. The word "crisis," denoting a wide variety of specific problems, has appeared consistently in discussions of higher education, even when, in retrospect, higher education was not in crisis.

What seems to be at the core of today's perception of crisis is cost. Tuition, especially at research universities, has risen more rapidly than inflation for many years. The price of anything is, ultimately, what people are willing to pay for it, and there is a sense among both educators and the public that the wonderfully (from the universities' point of view) inelastic demand of recent decades may have run its course. To say this requires a series of immediate caveats. First, at private colleges and universities the stated tuition is frequently abated by scholarship aid and discounting, and shouldn't be understood as what people actually pay. Second, the scary statistics you see about student debt are usually cherry-picked to produce numbers that overstate the national per-student average. Third, increased costs at public universities are substantially the result of significant cuts in state legislative funding, not of universities gold-plating their operations. Fourth, for each individual American family, obtaining college and university degrees continues to be the one thing most likely to improve its children's economic fortunes. Still the sense that something fundamental may be changing in the economic compact between higher education and the public is palpable.

Why is this? The overall statistical economic case for higher education is at war with a widespread fear that membership in the middle class is getting harder and harder for the rising generation to achieve—especially for those who study the humanities or the nonquantitative social sciences in college. The idea that any family resources devoted to higher education will pay off economically may be going the way of the idea that all single-family homes will rise in value every year. In the nonacademic world, technological advances have made many products and services cheaper. It seems impossible that the same can't be true in higher education—especially with the advent of online courses.

On the other side of the transaction, it is very difficult for institutions of higher education, especially research universities, to reduce their costs. The "cost disease" in talent-based organizations that offer in-person services, which William Baumol identified back in the 1960s, means that universities have to keep paying their professors more without getting productivity increases in return. Competing for faculty members (often in the hope of getting research money as a payoff) is expensive, and so is competing for students by offering them more and more amenities. As nonprofit, large, complex institutions, universities wind up shouldering costly social burdens. Most of them still maintain the kind of benefits for employees (retirement accounts, generous health plans, job security, and so on) that are disappearing in private companies, and much of the substantial recent increase in the number of administrators has to do with some admirable additional missions (community outreach, faculty diversity, environmental stewardship, student counseling) that the university has taken on. The more fortunate universities have substantial endowments, but as nonprofits they aren't supposed to manage themselves such that income far exceeds expense, so they operate on very slim cash margins.

Underlying all of this, though, is the fundamental problem of the country's having adopted two noncongruent ideals of higher education at the same time. With only a few exceptions, like the National Science Foundation, most of the stakeholders that provide resources to universities—including parents, students, alumni donors, legislatures, businesses, and foundations—believe what they are paying for is skills-conferring, teaching-centric institutions. And most of the senior leadership of universities believes that their institutions' core mission is research. Presidents and provosts know that raising the research status of their university is what would make their peers judge them as successful. Faculty members know that the quality of their research is the prime determinant of the course of their careers.

Research is expensive. In the sciences it requires laboratories. In all fields it drives teaching loads down, and therefore payrolls up. The intellectual model it implies pushes the better colleges and universities to operate dozens of academic departments, some of them lightly populated by students. The research university model is designed to make it difficult for schools to react in real time to changes in conditions, in the way that for-profit businesses try to do. If there is an imperative to reduce

costs, research universities are not built to respond to it naturally and swiftly.

One can say, and be partly right, that better communication about research could lessen the cost pressure. Presidents, provosts, and deans, as they incessantly bustle about from event to event, face a constant temptation to deal with each constituency group on the level at which it interacts with the university. Why talk to the athletic boosters about the classics department, or try to sell the business council on tenure, or tell students that it's not really in their interest to have faculty members who do nothing but teach? As no one can fail to have noticed, it is possible on the very rare occasions when the whole university community gathers, like commencement ceremonies, for the senior leadership to power through by delivering a series of inoffensive bromides. This is a temptation to be resisted. The research-university model will be subjected to increasing challenges, and university leaders have a responsibility to talk more openly to the public about the centrality of research to the university mission. Ideally, when they do so, they should not confine their sales pitch only to the most obviously beneficial products of university research—silicon chips and vaccines and so on—but also to the more essential and also more difficult idea of the university as a realm not entirely devoted to what seems at the moment to be most practical.

Having spent the last 10 years as dean of a journalism school, in one of the more skills-oriented domains in higher education, I am familiar with the arguments against keeping the university at a distance from the rest of the world. Why wouldn't you want to make the university resemble the professional workplace as closely as possible? (One of the leading American journalism schools uses the advertising slogan, "Our Classrooms are Newsrooms.") Why would you want to be taught by professors who devote a substantial part of their time to writing projects, instead of working professionals whose only role at the university is to teach? Why shouldn't the curriculum be devoted to imparting the most up-to-the-minute skills, the ones that will have most value in the employment market? Embedded in those questions is a view that a high-quality apprenticeship under an attentive mentor, instead of a university education, would represent no loss, and possibly an improvement.

Universities are just about the only institutions that are set up to transcend the limits of time, location, and immediate circumstance that constrain just about all workplaces. If they take full advantage of that, they can impart to the mind an ability to achieve dispassionate distance, to assess, to contextualize, to connect—as John Henry Newman put it, "a power of judging of passing events, and of all events, and a conscious superiority over them, which before it did not possess." Universities can bring the world from two dimensions into three. I can't resist quoting Newman again, at some length:

> *"That perfection of the Intellect, which is the result of Education, and its* beau ideal*, to be imparted to individuals in their respective measures, is the clear, calm, accurate vision and comprehension of all things, as far as the finite mind can embrace them, each in its place, and with its own characteristics upon it. It is almost prophetic from its knowledge of history; it is almost heart-searching from its knowledge of human nature; it has almost supernatural charity from its freedom from littleness and prejudice; it has almost the repose of faith, because nothing can startle it; it has almost the beauty and harmony of heavenly contemplation, so intimate is it with the eternal order of things and the music of the spheres."*

This may sound luxurious, and it is. It may also sound impractical, but it's not. (What can be impractical is using one's time at a university to acquire skills that may turn out to be valuable only for a short time.) To be able to come closer than most people can to seeing things deeply and as they really are is an enormous advantage in life, including in a career. One can get meaningfully closer to this state by studying literature or theology, if they are taught properly, as well as by studying computer science and economics. Faculty who are deeply engaged in intellectual production will be far better at getting their students there than faculty who see their mission as conferring a set of specific skills or facts. When university leaders, in making the case for the research university, emphasize its practical utility because they believe that will be the only persuasive argument, they are leaving an important part of their mission undone.

If things proceed on the course they seem to be on now and cost really is a big problem, then universities will change—and the universities whose supporters are the most price sensitive are the ones that will change the most. Many of them will change not through any orderly and planned process, but through budget-cutting exercises that financial necessity has imposed on them. And it's obvious what the direction of these changes will be: away from the research-university idea, toward the "mechanic arts." There will be fewer humanities departments, fewer doctoral programs, a smaller proportion of faculty who do research and have tenure, less individual instruction, less campus residency by students, curricula canted toward job skills—in

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by Don M. Randel,
President Emeritus, The Andrew W. Mellon Foundation and the University of Chicago

Paying for Higher Education and RESEARCH

Editor's Note: *This speech was originally delivered at the University of Göttingen on May 16th, 2013.*

It is an honor to speak to you on the occasion of the tenth anniversary of the University of Göttingen's having become a "Foundation under Public Law."[1] It is also, for someone from the United States, a serious responsibility. Our two countries share long and distinguished traditions of higher education and research at a moment in our histories when these traditions are being challenged as never before but at a moment when the vigor of these traditions is more important than ever for the sake not only of our own countries but for the sake of the world. Higher education and research in our two countries have been the underpinnings of freedom and prosperity previously unknown in human history. Freedom and prosperity in the rest of the world depend in considerable degree on the continued freedom and prosperity of ourselves and our closest allies. Hence, we cannot afford to make serious mistakes in our support for higher education and research, and we ought therefore seriously to collaborate and learn from one another in this domain. Unfortunately, what the United States has to contribute to this collaboration and learning is largely a set of negative examples that other nations seem steadily tempted to emulate. I shall try very hard not to sound too much like Cassandra. But in describing for you the situation in the United States, I shall in considerable degree be describing perils to be avoided.

This celebration should, of course, be a happy occasion. And I can assure you that it will be viewed by many in the United States with very considerable envy. I believe that I can confidently assert that the presidents and chancellors of all of the leading public universities in the United States would give a great deal to achieve precisely what you have achieved here. Some have tried and lived to regret it because their states, if not simply hostile to the interests of higher education, have insisted on retaining control while substantially reducing the flow of resources. One of the bravest of these presidents, in a rather public effort, came reasonably close to achieving a greater degree of independence, but political resistance was such that an offer to move to a private institution proved irresistible. Another, engaged in a similar effort, was simply fired. With ten years of successful experience, therefore, you have much to teach us. What we have to teach you, on the other hand, is that one must guard against a certain drift that has become fashionable on both sides

We cannot afford to make mistakes in our support for higher education and research and so ought to collaborate and learn from one another in this domain.

[1] *Note to the reader: Under this arrangement, the university is governed by a foundation that is independent of the State of Lower Saxony, of which the university was previously a public institution. This gives the university administrative independence and the right to acquire property and generate its own resources, though there are some restrictions. Most important, however, is that the State of Lower Saxony continues to provide essentially all of the revenue that it previously provided, which is a very substantial amount and which makes possible negligible fees to students. As in the U.S., much support for research in universities comes from the federal government, and unlike the U.S., much sponsored research is carried on in federally supported independent institutes.*

of the Atlantic and that could have social and economic consequences that we should all regret.

I presume that we can all begin by agreeing that higher education and research are important. But the difficulties begin almost immediately as we attempt to say what we mean by this simple proposition—higher education and research of what kind and for whom and at whose expense? These questions lead quite quickly to very profound questions about the role of the state in society and about social and economic disparities within and across societies. These deeper questions are too easily answered with ideological and political slogans that obscure real-world consequences and hard evidence.

Since what is often described as the U.S. model seems to be attracting more and more attention in Europe and is now advancing steadily in the United Kingdom, let me give a bit of an account of that model as it has actually existed and as we are now increasingly seeing its consequences in the United States. What has made the U.S. model seem so attractive? It has produced some of the world's greatest universities and some of the research that has transformed the economies of the United States and other developed and developing countries. So far so good. But the real attraction of the U.S. model would appear to be the fact that the state—that is, the taxpayer—has in general not paid for it, and is steadily paying for less and less of it.

The most naïve view of this so-called model seems to be that European and other universities can simply declare themselves to be Harvard, Yale, Princeton, or Stanford and generate private sources for their support rather than continue to rely on support from the state. It is not quite so simple. For a start, the United States has a tradition of private philanthropy that is centuries old and deeply rooted. This cannot be created overnight. But perhaps even more to the point is that Harvard, Yale, Princeton, and Stanford are the only truly wealthy universities in the United States. All of the rest—all of the rest—and even they to some extent, are reliant on student fees as the engine of their economies. This has increasingly become the case as costs have risen and, in the public universities, as the states have steadily reduced their support, especially since the financial crisis that began in 2008 and the effects of which remain very much with us.

In the U.S. almost two-thirds of the 4,500 institutions of higher education are private, and of these just over 40 percent are for-profit. Although the majority of institutions are private, the great majority of students, about 70 percent, are enrolled in public institutions. All of this is in a context in which the federal government (that is, the state with a capital S as opposed to the individual states of the union) has essentially no policy with respect to higher education. The nation's secretary of education has essentially no control over what kind of education is offered and who pays for it. This is all left to the fifty states and to their counties and cities. The secretary of education does preside over a system of financial aid for students who can demonstrate need, but the maximum grant in this scheme does not begin to approach the price to a student of attending even a public four-year institution, much less a private one. Apart from that, the secretary of education has only a few carrots and no sticks.

The public institutions, then, are supported by the fifty states, and historically this has meant charging students relatively low fees and making up the difference with the full cost through taxation. This is essentially the model employed in most developed countries. As the revenue of the states in the United States has dwindled, both because of economic circumstances and because of the growing resistance to taxation, however, fees charged to students have steadily increased. In the leading public universities the fees (excluding the cost of food and housing) may reach $12,000 per annum for students from within the state in question. For students from a different state or from abroad the fees may reach very nearly the equivalent of the fees charged at the leading private institutions, or as much as $35,000 per annum.

At the University of Michigan in the fiscal year 2011, state appropriations accounted for only 6 percent of total revenue. At Berkeley, state appropriations in 2012 accounted for 10.5 percent of total revenue, down over 50 percent since 2003. State appropriations at Berkeley in this period went from being the largest of the four largest sources of funding (along with federal research funding, philanthropy, and tuition) to being the smallest of the four, while tuition in consequence grew to very nearly the equal of the other two. This pressure to increase tuition generally has the anomalous effect of encouraging public institutions to compete for students from states other than their own, which they are allowed to charge much higher fees. A student at the University of Michigan from outside the state of Michigan will be charged very nearly what it costs to go to Harvard, and such students now make up over one-third of the total student population. It is as if the solution to the financing of public higher education is for each state institution to accept only students from other states.

What becomes of poor students in such a scheme? There is not enough dedicated financial aid from either

federal or state sources to satisfy their need for it. Instead they must be in effect subsidized by those students who are able to pay the very highest fees. The result is that instead of letting a system of taxation redistribute income for the purpose of educating students from all economic backgrounds, each institution is left to carry out its own internal redistribution of income from the rich to the poor.

There is a further purely academic effect of the reduction in state support. Once state support reaches as low as 10 percent or lower, one might be tempted to say that further cuts cannot possibly matter very much. The trouble with this view is that there are many different colors of money flowing through large universities, and they are not all fungible. One must first strip away from total revenue the revenues associated with federally funded research, the medical center if any, and all of the revenues, including philanthropy, that are restricted to purposes such as the business school, the law school, the athletics programs, and a good deal else. This makes state support a much larger share of the pie that is available to support the humanities and the arts, for example, which in general have negligible external support. This is especially true if one thinks of the teaching of the humanities and the arts to undergraduates. Tuition, of course, becomes hugely more important in this sector of the pie as a result. Thus, what might seem to be a modest decline in state support in the great scheme of things can compel very serious reductions in support for the humanities and the arts and some of the social sciences and thus have a distorting effect on the academic principles that ought to shape the education that universities exist to provide.

What about private institutions in the U.S.? These receive essentially no direct support for the educational side of the enterprise (as distinct from partial support for certain types of research) from government and are supported overwhelmingly through fees charged to students and through philanthropy. The vast majority of the private institutions are extremely dependent on student fees, with income from current philanthropy and from endowment (that is, philanthropy extending back through the history of the institution) totaling on average 20 percent of annual income. For the great majority the percentage is distinctly smaller. Thus, no one should suppose that in the U.S. model private philanthropy is covering more than a very modest share of the cost of higher education except in a small handful of the wealthiest institutions, and even they rely heavily on student fees.

At the leading private institutions, the total nominal price to the student, including room and board, may exceed $50,000 per annum. In a nation in which median family income is itself around $50,000, most of the nation simply cannot afford to pay this. But very many do not pay it. As with public institutions, this system operates not by redistributing income through taxation at the level of the state so as to make education affordable for the less well-to-do, but instead by charging very high fees to those able to afford them and redistributing that income internally to the extent possible. Virtually every private institution in effect discounts its student fees to some greater or lesser degree. In very many institutions, the income from student fees may be discounted on average by as much as 50 percent. Wealthier students thus subsidize poorer students, and in these institutions, some fraction of the student body is selected based on its ability to pay rather than entirely on academic merit. A system in which each of thousands of institutions with quite different resources of its own is left to engage in such practices on its own is at a minimum incoherent and inefficient. And this system is a principal cause of the complaint about the rising "cost" of higher education, since the public sees the advertised price of education without taking full account of the extent of the discounts that are applied.

Although the majority of U.S. higher education institutions are private, about 70 percent of students are enrolled in public institutions.

There is no time now to take up the question of for-profit higher education. Suffice it to say that in the United States, for-profit higher education depends overwhelmingly on federal financial aid, especially loans, provided to students with need. The amount of aid that these institutions consume is all out of proportion to the number of students that they serve. And many, though not all, engage in outrageous recruiting practices in order to attract students who will bring with them federal grant and loan funds and then leave with a mountain of debt and no degree and no job.

Higher education in the United States, then, is in some ways its own

version of the Wild West. And it should give serious pause to anyone who believes that the markets are the solution to all of society's problems. It is a system in which relentless competition for resources and talent drives up costs rather than the opposite. It produces the anomalous result that some of the very people who would like to solve society's problems through increased market discipline simultaneously wish to increase regulation and introduce price controls in higher education.

Higher education in the U.S. is its own version of the Wild West, which should give pause to those who think markets are the solution to all societal problems.

The simple fact is that the market has made higher education in the United States what it is, complete with features that many wish to complain about, including certain kinds of facilities and staff that contribute to rising costs. This is all reinforced by various rankings of universities, most notably that of *U.S. News & World Report*, which give institutions incentives only to increase costs in the competition for students and faculty. The result is a situation in which institutions must steadily increase competition for students from well-to-do families and attend less and less to students from families that are less well-to-do, to say nothing of poor. Without some sort of leveling mechanism that the market by its very nature will not provide, higher education becomes increasingly the province of the rich and in the process denies a greater and greater part of the income distribution access to the means by which they might improve their lot. Such a system ends by exacerbating income inequality rather than ameliorating it and in the bargain impoverishes the nation's competitiveness as well as its intellectual and cultural life. The market simply makes things better for the people who can pay for them and worse for those who cannot. This might be satisfactory for consumer goods, but it is not satisfactory for education at any level.

The ideological and political arguments that have been advanced in defense of this trend in higher education are that those who benefit from education should be the ones to pay for it, namely, the students, and that the competition of the marketplace will both lower costs and increase quality. There is no hard evidence to support either proposition, and a good deal of hard evidence to the contrary. Absent some form of subsidy, the poor will simply be unable to assemble the resources necessary to pay for the full cost of higher education of any quality, and unless every one of them becomes a hedge-fund manager, they will not earn enough over a lifetime to amortize the required initial debt if it were available. And in higher education, it has already been demonstrated that the marketplace does not reduce costs and that it increases only disparities in quality rather than higher quality across the whole system. Much—though not all—of the for-profit sector of higher education in the U.S. is quite simply scandalous and itself feeds overwhelmingly at the government trough.

I have not yet said anything about research. Let me attempt to remedy that briefly. Unlike most developed countries, including your own, the U.S. has carried out research in its universities rather than in separate state-supported institutions. There is much to be said for this approach. In principle it allows a somewhat greater freedom to the directions that research can take, and it contributes to the formation of a culture within universities that prizes original inquiry and skepticism of received opinion. This benefits everyone, including undergraduates and the citizens that they will become. These benefits are easily eroded, however, and the U.S. model provides a number of cautionary tales.

The temptation is to believe that the research function of the university, rather like its educational function (a distinction that we should resist, however), can be privatized. Here I would insist that the research function must include a very substantial investment in the most basic research. But increasingly there is pressure to invest only in those scientific and technical fields that are imagined to be of near-term value to the economy in general and to the universities themselves in purely financial terms. This often accompanies a naïve belief that the private sector can be counted on to pay for research. The experience of the United States counsels very strongly against such views.

Private sector support for research in U.S. universities has declined steadily over decades and now accounts for only about 3 percent of the cost of that research. And it is increasingly tied to very near-term outcomes. Simultaneously, the corporate sector has largely dismantled its own capacity to conduct basic research. The decline of Bell Labs is only the most prominent and the saddest of such stories. Pharmaceutical companies today are

following in those footsteps. And yet some of the most important scientific discoveries of the modern age—discoveries with enormous economic consequences—were made in the pursuit of science for its own sake. Work at Bell Labs produced the transistor, the laser, and fundamental advances in computer programming. But despite such extraordinary benefits from long-term investments in science, the corporate world has been unable and unwilling to continue them.

Meanwhile, federal government support for research in science is again stagnating in real terms and is not immune from the pressure to produce near-term economic benefits. One result has been an increasing subsidy to federal sponsorship of research from universities themselves, both public and private, for the federal government in no sense pays the full costs of the research that it sponsors. Who then does ultimately pay the difference? Since virtually every university is heavily dependent on the tuition and fees paid by undergraduates, it is perfectly clear that the scientific enterprise is being more or less covertly subsidized by undergraduates. Now, I would absolutely insist that undergraduates benefit enormously from studying in an environment in which scientific research is pursued at the highest level. But it makes no sense to insist that university education costs too much while letting those costs be driven in significant degree by a subsidy to scientific research that is nominally sponsored by the federal government. This is a subject about which university and government officials do not like to speak out loud. On this topic I should say, too, that private philanthropy plays an enormous role especially in contributing to the costs of the physical infrastructure that is necessary for modern research. Very many gleaming new buildings costing hundreds of millions of dollars each bear the name of a generous donor. But rarely do the gifts cover the entire cost. The remainder is most often financed through debt that must be amortized with unrestricted funds, the largest component of which is—you guessed it—undergraduate tuition.

If this talk of the situation of higher education and research in the United States has been rather gloomy in its own terms, I hope that it may serve to cheer you up about the situation that you have created and maintained here at the University of Göttingen. The first and crucial component of it is a continuing partnership between the University and the State of Lower Saxony. The administrative and financial independence that has been achieved for the University can contribute to meaningful efficiency. But no one should suppose, if the experience of the U.S. is any guide, that it can lead to a thorough privatization of all of the University's functions without serious damage to the quality of its academic undertakings and to a withdrawal from a commitment to education as the right of all students of ability without regard to their socioeconomic circumstances. A university as distinguished as the University of Göttingen will enjoy a considerable advantage over many others in attracting private support and students with the ability to pay high fees if it should come to that. It along with a few others might well continue to thrive if the path of the U.S. model were to be followed to a significant degree, just as Harvard, Yale, Princeton, and Stanford have remained and are sure to remain among the world's greatest universities. But what about the rest? As a system for a whole nation that expects to continue to prosper and lead, it is not sustainable in any farsighted way and, I would say, in any just way. Even for a single great university like the University of Göttingen, the transformation from the present system to one that would make it more like Harvard or Yale or Princeton or Stanford would be exceedingly difficult and perhaps not ultimately possible in its economic and political environment.

I congratulate the University of Göttingen and the State of Lower Saxony on the partnership they have created and sustained now for ten years. Long may it thrive. This will require only the continued commitment of both parties and vigilance with respect to pressures for certain kinds of change that elsewhere have proved unfortunate. I dare to hope that some U.S. universities and their states will profit from your example. ■

Federal government support for research in science is again stagnating in real terms and is not immune from the pressure to produce near-term economic benefits. One result has been an increasing subsidy to federal sponsorship of research from universities.

by Robert Birgeneau,
Chancellor Emeritus of the University of California, Berkeley

A New Strategy to Maintain AMERICA'S POSITION *of Global Preeminence*

The nation needs to establish a national challenge grant program for innovation and reframe the role of research universities.

American research and teaching universities have been the envy of the world for six decades. Conservators of human heritage and dynamos of progress, they generate knowledge, educate our youth, foster innovation, seed new businesses, and strengthen our democracy and national security. Our universities account for 55 percent of the research and development that underpins U.S. economic growth.

That is the good news. Unfortunately, the bad news is that this record of excellence and achievement may not continue to hold up—and if it does not, we may find ourselves losing our position as worldwide leaders. The interconnected economies of most nations are fueled by knowledge and innovation, and much of that intellectual energy is born and nourished in our great research universities.

Today, these American institutions are facing unprecedented challenges, in large part because of the 2008 financial meltdown, as well as the ongoing, long-term decline in state support. Policymakers and the public expect our universities to continue to be accessible to all qualified students and at the same time to produce, achieve, and maintain excellence. However, state funding for U.S. universities has plummeted—at the University of California, Berkeley, for example, from which I recently stepped down after nine years as chancellor, funding has dropped from 47 percent of overall budgets in 1991 to 10 percent today.

Many of our sister institutions across the nation have gone from being state-supported to state-assisted to, at best, state-located. As a result of this progressive state disinvestment, public research and teaching universities have seen tuitions increase dramatically, professors furloughed, classes grow steadily larger, and infrastructures de-

Average state funding for public research institutions per full-time enrolled student, 2000–2010

SOURCE: DELTA COST PROJECT

teriorate. If the current trend persists, the result will be extremely damaging to our higher education enterprise, especially the public-university sector.

The United States is the only advanced country in which the federal government does not contribute directly to the financing of the educational operations of its top universities. However, it is clearly in our national interest that public research and teaching universities thrive in every state, that they are fully accessible, and that students graduate with minimal debt.

In previous eras, the United States responded to challenges by expanding higher education and bolstering its capacity to serve the country. In 1862, in the midst of the Civil War, Abraham Lincoln signed the Morrill Act, granting federal land to help states establish public colleges. In 1944, Franklin D. Roosevelt signed the GI Bill and commissioned the eminent scientist Vannevar Bush to craft a comprehensive science policy for the nation. The following year, Bush presented to Harry Truman the seminal report "Science, the Endless Frontier," which argued that the nation's universities were best suited to take the lead in conducting basic research. The policy Bush recommended still guides America's scientific enterprise. In 1946, Truman authorized a commission on higher education that led to the development of community colleges, and in 1965, Lyndon Johnson signed the Higher Education Act to launch the first major student aid program.

Today, our situation calls for a similarly dramatic response that will bring the federal government, states, research institutions, and philanthropic organizations into an unprecedented public-private partnership for innovation.

Under one such program proposed by us at Berkeley:

- Over a 10-year period, 100 of our nation's best public research universities would work with private philanthropies and corporations to raise new permanent endowed capital.
- The federal government would provide $1 billion annually for 10 years in challenge grants to match fully a number of new philanthropic investments in university endowments for research and teaching. This would supplement the government's current funding commitments for university-based research.
- Each state would match the federal contribution over the decade according to a formula to be determined—say, one to one—and as a condition of receiving the federal and philanthropic funds, the state governments would promise, at a minimum, to continue funding their universities at the same level and agree not to substitute federal funding for that currently supplied by the state.

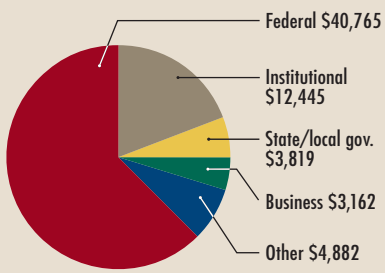
The grants would be available to top research and teaching universities in all states and distributed based on population and competition. Of course, these grants would carry safeguards to ensure both equitable distribution and state fiscal responsibility. For example, the federal government would require that state institutions demonstrate a commitment to college access for a diverse population of students, redouble efforts to keep costs down, preserve a balance between research and teaching, and optimize graduation and retention rates. Moreover, the new endowments would be structured and governed to protect institutional integrity, as well as autonomy and academic freedom.

One proven way to spur this challenge grant initiative would be to establish a high-level national commission to engage the public will and lay out a roadmap for success. Such a commission, much like the work of Vannevar Bush and the Truman Commission after World War II, could examine the place of the research university and consider questions central to the basic research and educational agendas. Preparation for this is already under way through a study sponsored by the American Academy of Arts & Sciences appropriately named "The Lincoln Project."

The commission could address other crucial issues, including: What is the appropriate balance among the research, teaching, and public service missions of universities? How can we help faculty members keep pace with their digitally adept students and use technology to enhance learning? How do we ensure that all segments of our diverse population have equal access to these great institutions? How should universities respond to forces such as commercialization that could threaten academic integrity?

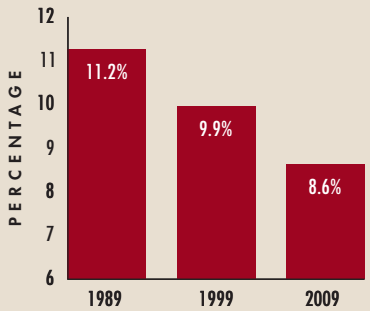
The solutions we seek must be pragmatic yet ambitious. We must look beyond mere sustainability so that our research and teaching universities—and our nation—will thrive for generations. ■

Sources of funds for all research universities, FY 2009



(DOLLARS IN MILLIONS)
SOURCE: NATIONAL SCIENCE FOUNDATION

Percentage of R&D funds for public institutions provided by states



SOURCE: NATIONAL SCIENCE FOUNDATION

by Dr. Clifton R. Wharton, Jr.,
President Emeritus, Michigan State University; Chancellor Emeritus, State University of New York System; Former Chairman and CEO, TIAA-CREF; Former Chairman, Rockefeller Foundation; U.S. Deputy Secretary of State

Never Eat Your SEED CORN

Editor's Note: *This Haskins Award Lecture was original delivered at the Stern School of Business, New York University, on April 24, 2013.*

Charles Waldo Haskins was a preeminent pioneer in the field of accounting. But he was so much more. His credits abound in such areas as: creating the nation's first Certified Public Accounting legislation, establishing the accounting firm of Haskins and Sells, and the founding and deanship of this great university's school of business. These contributions to financial accounting and the Academy are only a few of his multiple noteworthy accomplishments. Thus receiving an award given in his name is an ennobling accolade that I am proudly honored to receive.

I am especially indebted to Dean Peter Henry for this recognition. He is an esteemed academician lauded among his peers and prized by me for his generosity this evening. On this occasion I must congratulate him on his recent book *Turnaround, Third World Lessons for First World Growth*, described as a "riveting tour of postwar world growth, replete with policy successes and devastating mistakes."

Sixty years ago I enrolled as a graduate student in the Department of Economics at the University of Chicago. Among my professors were Nobel prize winners such as Milton Friedman, Gary Becker, and Theodore Schultz, for whom I was research assistant for four years. My doctorate was a symbol of the school's brand of economic and monetary theory, of the then new econometric analysis, and of dedication to empirical research. But I did not become a Friedman "acolyte" promoting the goals and efficiencies of the free market.

Instead, I joined a very small, but distinguished group: The "CBCBCRAEA"—the city born, city bred, city raised, agricultural economics association. Membership is strictly limited to economists who never lived on a farm, never worked on a farm, and never studied agriculture—but we brashly did study and do research on the economics of agriculture.

This story is relevant to the theme of my remarks this evening, drawn from the first lesson I learned as a youthful agricultural economist when studying small farmers in the less developed regions of Latin America and Southeast Asia. Their lives reflected the reality of a legendary Chicago economist Frank H. Knight—whose famous book was *Risk, Uncertainty and Profit*. Subsistence and semi-subsistence farmers lived in a world of high risk and uncertainty. Their long-term survival from year to year depended exclusively upon the food they produced. Facing the risks of crop failures from droughts, monsoons, pests or blights, meant always protecting the seed for the next year's crop—even if it meant going hungry. Their wise rule was: "Never Eat Your Seed Corn."

This principle is the key to a major crisis facing U.S. higher education today. Since public higher education enrolls some 75 percent of all students in the United States, let me begin with that sector.

Since I began working in higher education roughly 50 years ago there have been dramatic changes and declines in the levels and sources of its financial support. For example, when I arrived at Michigan State University, student tuition covered one-third the costs of the university and two-thirds came from state and federal sources. Today, those ratios have exactly reversed. Private universities are not immune due to their dependence upon Federal funds, especially for research. Ten of the 20 largest recipients of Federal grants are private universities.

Why is this happening?

One reason for the crisis is the pub-

lic's growing rejection of the value of education for the improvement of society and the individual. Over time there has been a dramatic shift in society's understanding of the purpose and goals of higher education. Increasingly, higher education's primary goal is seen as preparation for a specific job, not the nurture and growth of a broader human competence. Job outcomes after graduation are becoming the dominant criterion of the value of higher education. This utilitarian trend is having a serious destructive impact upon the "humanizing" areas—the arts, philosophy, theater, music, history, humanities, foreign languages. The "Liberal Arts" may soon be an endangered species.

A second reason has been a growth in our society of anti-science and anti-knowledge views. The "scientific method of inquiry," which for centuries has been the central foundation for the increase in human knowledge, is being steadily eroded. Attacks by burgeoning ideological or religious fundamentalism has led to political pressure upon course content and curriculum choice, even faculty selection. (Dare I mention the continuing fight over teaching evolution and the denial of global warming? Or the recent Congressional legislation to stop funding university political science research?) These views are gradually becoming the basis for justifying inadequate tax support.

A third related negative factor has been a shifting of cost responsibilities, thereby producing ever higher tuition levels for students and their families. The result has been a reduction in educational access for low-income-sector potential students and an increase in the economic burden placed upon middle-income families, not to mention the larger loan debt levels for the graduates themselves. The effects of these negative forces upon educational opportunity in turn impact future human capital growth. Keep in mind recent studies reveal that "A child born into a family in the highest quartile of income (in the U.S.) has a roughly 85 percent chance of earning a college degree. A child born into a family in the lowest quartile of income has a less-than 8 percent chance of earning a degree."[1] This is a huge national loss of future human capital.

These are the major underlying forces producing a steady erosion in the priorities and levels of support for higher education. These same three forces are also being felt by the private colleges and universities, especially through Federal dollars. For example, in 2011 three out of five of the largest recipients of Federal National Institutes of Health grants were private universities. In the top 20 Federal funding of R & D, every public University of Washington is matched by a private Johns Hopkins University.

These destructive trends have spawned disinvestment in the underlying foundation of colleges and universities, public and private. The long-run impact upon the pursuit of excellence and the strengthening of core disciplines is causing a devastating decline in the central institutions for our nation's future growth and development. This path is weakening and destroying the fundamental strength which historically has made higher education so successful in our nation.

Higher education is an investment in human capital—both through the students who are served and the scholars whose research expands the knowledge base of our society. It is the basis for the growth of our national human capital. The public and private institutions of higher education represent our nation's "seed corn" for our future. We eat it at our peril.

There are countless other challenges assailing higher education, such as the escalating expenditures on big time athletics, that are dramatically outpacing those for basic academic functions,[2] or the challenges faced by the explosive new fad of MOOCs (Massive Online Open Courses).[3] Despite all these problems, I am optimistic that my former colleagues—whether trustees, presidents, faculty, alumni, or donors—are fully capable of overcoming these challenges. Best of all, I am certain that their commitment to the academic enterprise and their wisdom will lead to stronger and greater future human capital. As the largest private university in the country

(Continued on page 21)

The "scientific method of inquiry," which for centuries has been the central foundation for the increase in human knowledge, is being steadily eroded.

[1] *William E. Kirwan, "The Completion Imperative: Harnessing Change to Meet our Responsibilities," 2013 Atwell Lecture, American Council on Education 95th Annual Meeting, March 3, 2013.*
[2] *Knight Commission on Intercollegiate Athletics, "Restoring the Balance: Dollars, Values, and the Future of College Sports" June 17, 2010.*
[3] *Nick Anderson, "More universities try the MOOC model by moving professors' lectures on line,"* Washington Post, *February 25, 2013.*

by Amy Gutmann,
President, University of Pennsylvania

For WHAT IT'S WORTH

The value of a university education

Editor's Note: *This article derives from an endowed lecture President Gutmann delivered on achieving the aims of higher education at the Spencer Foundation Conference at Northwestern University and subsequently developed further at the De Lange Conference at Rice University. Revised for publication October 21, 2013.*

In 2010, PayPal co-founder and Facebook "angel" investor Peter Thiel announced he would annually award $100,000 each to 20 young people for them to drop out of college and spend two years starting a tech-based business. "You know, we've looked at the math on this, and I estimate that 70 to 80 percent of the colleges in the U.S. are not generating a positive return on investment," Thiel told an interviewer, explaining his view that we are in the midst of a higher education bubble not dissimilar to the housing and dot-com bubbles of previous decades. "Education is a bubble in a classic sense. To call something a bubble, it must be overpriced and there must be an intense belief in it… there's this sort of psycho-social component to people taking on these enormous debts when they go to college simply because that's what everybody's doing."

Since his announcement, more than 60 Thiel Fellows have decamped from university—a significant number of them from Stanford, MIT, and Ivy League schools—to follow their dreams of entrepreneurial glory. Thiel says he hopes his program will prod more people to question if a college education is really worthwhile: "Education may be the only thing people still believe in in the United States. To question education is really dangerous. It is the absolute taboo. It's like telling the world there's no Santa Claus."

Far from being dangerous, the exercise of questioning the value of a college education has never been more important. For many Americans, the grim employment realities since the start of the Great Recession of 2008 have called the value of higher education into question. So we all would do well to ask: Do universities provide private and public benefits commensurate with their private and public costs?

This is a complex, but not impossible, question to answer. The simplest response is to tally the added income benefits a university education accrues to its graduates, subtract its added costs, and determine if in fact benefits exceed costs. Some economists have done this quite well. The overwhelming answer is that a college education has paid off for most graduates to date, has *increased* rather than decreased its wage premium as time has gone on, and can be expected to continue to do so moving forward. If *well-paid* equates to *worthwhile*, then the worth of a college education can be settled by the net wage premium of the average college graduate over the average high school graduate—there would be little more to discuss in the matter.

But it would be a serious mistake to equate the value of a university education to the wage premium earned by its graduates. If higher education is to be understood as something more—something much more—than a trade school in robes, before answering the question of whether a university education is worthwhile, we must first address the more fundamental—and more fundamentally complex—question of mission: *What should universities aim to achieve for individuals and society?*

It is reassuring to those who believe in the worth of a university education—and all the more so in a high-unemployment, low-growth economy—to show that the average person with a college education earns a lot more over her lifetime than the average high school graduate, even after subtracting the cost of college. But even if

we are reassured, we should not allow ourselves to be entirely satisfied with that metric, because economic payback to university graduates is neither the only aim, nor even the primary aim, of a university education. Rather, it is best to consider the value-added proposition of higher education in light of the three fundamental aims of colleges and universities in the 21st century:

- The first aim speaks to who is to receive an education and calls for broader access to higher education based on talent and hard work, rather than family income and inherited wealth: **Opportunity**, for short.
- The second aim speaks to the core intellectual aim of a university education, which calls for advanced learning fostered by a greater integration of knowledge not only within the liberal arts and sciences but also between the liberal arts and professional education: **Creative Understanding**, for short.
- The third aim is an important consequence to the successful integration of knowledge, not only by enabling and encouraging university graduates to meaningfully contribute to society, but also in the creation of new knowledge through research and the application of creative understanding: **Contribution**, for short.

Although the challenges of increasing opportunity, advancing creative understanding, and promoting useful social contribution are not new, they take on a renewed urgency in today's climate. Jobs are scarce. The United States is perceived to be declining in global competitiveness. Gridlock besets our political discourse and increasingly seems to define our national sense of purpose as well. In this environment, it behooves us to remind those who would propose to reform higher education by simply removing some or all of it of the apt observation of the Sage of Baltimore, H.L. Mencken: "There is an easy solution to every human problem—neat, plausible, and wrong."

Many external obstacles to educational and economic opportunity exist in the United States—including poverty, broken families, and cutbacks in public support—which warrant our national attention and, in some instances, urgent action. No one credibly claims that greater access to college education will solve all or even most of these issues. But there is good reason to believe that greater access to high-quality higher education is a vitally important tool in building a more just, prosperous, and successful society. We can, and we *must*, do a better job in meeting the three fundamental goals of opportunity, creative understanding, and contribution to afford the utmost benefits of higher education for both personal and societal progress. Taking to heart the ethical injunction, "physician heal thyself," I focus here on what universities themselves can do to better realize their primary aims.

Starting with the first: What can universities do to help increase educational opportunity? For low- and middle-income students, gainful employment itself is likely to be the most basic economic advantage of a college degree. A recent Brookings Institution study found college is "expensive, but a smart choice," noting that almost 90 percent of young college graduates were employed in 2010, compared with only 64 percent of their peers who did not attend college. Moreover, college graduates are making on average almost double the annual earnings of those with only a high school diploma. And this advantage is likely to stick with them over a lifetime of work. Perhaps most relevant is that even in the depths of the Great Recession, the unemployment rate of college graduates was less than half that of high school graduates, and never exceeded 5.1 percent. Clearly, the more affordable universities make their education to qualified young people from low- and middle-income families, the more we will contribute to both educational and economic opportunity. Other things being equal, universities provide even greater value-added opportunity to low- and middle-income students than to their wealthier peers.

It is especially important to note that opening the door to higher education can have profound effects both on an individual's lifetime earnings and lifelong satisfaction, regardless of whether or not that door is framed by ivy. Less selective two-year, four-year, and community colleges have an especially important role to play here, as selective universities cannot do everything: their focus on cutting-edge study and discovery limits their ability to engage in compensatory education. (The ability to work with a broad range of student readiness is one of the great advantages of community colleges and some less selective institutions, an advantage we risk forfeiting as an ever-higher percentage of the cost of an education is shifted from state and government support to individual responsibility.) Nonetheless, the available data show that selective universities can provide greater access to qualified students from low- and middle-income families than they have in the past.

My concern for increasing access began with a focus on recruiting qualified students from the lowest income groups. Learning more led to the conclusion that increasing access for middle-income students should also be a high priority. At Penn, we began by asking: What proportion of students on a set of selective university campuses (that included Penn) come from the top 20 percent of American families as measured by income? The answer (as of 2003) was 57 percent.

Since all colleges and universities should admit only students who can succeed once admitted, selective colleges and universities also need to ask: What percent of all students who are well-qualified come from the wealthiest 20 percent? Thirty-six percent of all highly qualified seniors (with high grades and combined SATs over 1,200) come from the top 20 percent, while 57 percent of selective university students come from this group. Thus, the wealthiest 20 percent of American families are overrepresented on our campuses by a margin of 21 percent. All of the other income groups are *underrepresented*. Students from the lowest 40 percent of income distribution, whose families earn under about $41,000, are underrepresented by 4.3 percent. The middle 20 percent, who come from families earning $41,000 to $61,000, are underrepresented by 8.4 percent. Students from the second highest income group, whose families earn between $62,000 and $94,000, are also underrepresented by 8.4 percent.

Increasing access to our universities for middle- and low-income students is both an especially worthy, and an increasingly daunting, challenge in the wake of the Great Recession.

Increasing access to our universities for middle- and low-income students is both an especially worthy, and an increasingly daunting, challenge in the wake of the Great Recession. Before the Recession, taking financial aid into account, middle- and low-income families were spending between 25 percent and 55 percent of their annual income to cover the expense of a public four-year college education. That burden has skyrocketed in the past five years, especially for middle-income students who are ineligible for Pell grants and who attend public universities whose public funding (in many cases) has been decimated. This has led to a situation where a student from a typical middle-income family today may pay less to attend Penn than many flagship public universities!

Yet private universities too have experienced a painful financial squeeze. Only by making student aid one of their highest priorities and successfully raising many millions of dollars from generous donors can most private institutions afford to admit students on a need-blind basis and provide financial aid that meets full need. This may be the reason why only about one percent of America's 4,000 colleges and universities are committed to need-blind admissions *and* to meeting the full financial need of their undergraduate students. An even smaller group—just a tiny fraction—of universities are committed not only to meeting the full financial need of all students who are admitted on a need-blind basis, but also to providing financial aid *exclusively on the basis of need*. Those of us in this group thereby maximize the use of scarce aid dollars for students with demonstrated financial need.

At Penn, a focus on need-only aid has enabled us to actually lower our costs to all students from families with demonstrated financial need. Since I became president, we have increased Penn's financial aid budget by more than 125 percent. And the net annual cost to all aided undergraduates is actually ten percent lower today than it was a decade ago when controlled for inflation. Penn also instituted an all-grant/no-loan policy, substituting cash grants for loans for all undergraduates eligible for financial aid. This policy enables middle- and low-income students to graduate debt-free, and opens up a world of career possibilities to graduates who otherwise would feel far greater pressure to pick the highest paying rather than the most satisfying and promising careers.

Although much more work remains, Penn has significantly increased the proportion of first-generation, low- and middle-income, and underrepresented minority students on our campus. In 2013, one out of eight members of Penn's freshman class will be—like I was—the first in their family to graduate from college. The percentage of underrepresented minorities at Penn has increased from 15 percent to 22 percent over the past eight years. All minorities account for almost half of Penn's student body. After they arrive, many campus-wide initiatives enable these students to feel more at home and to succeed. Graduation rates for all groups are above 90 percent.

It is also important to note that the benefit of increasing opportunity extends far beyond the economic advancement of low- and middle-income students who are admitted. Increased socio-economic and racial diversity enriches the educational experience for *everyone* on a campus. By promoting greater understanding of different life experiences and introducing perspectives that differ profoundly from the prevailing attitudes among the most

privileged, a truly diverse educational environment prods all of us to think harder, more deeply, and oftentimes, more daringly.

This observation speaks to the second aim of a university education: *cultivating creative understanding*. Our universities face a daunting challenge: we must immerse students in the unprecedented torrent of new knowledge our contemporary society has unleashed while at the same time somehow providing them with the intellectual tools to make cogent sense of it all. They must be facile with facts and figures, quick in apprehension, and yet slow to jump to easy and ready conclusions. This is the essence of training them to think creatively, as they will be called to do in addressing the most challenging problems facing the world of today and tomorrow. We must optimize their global comprehension, a term used here in the broadest possible sense: global not just as in transnational, but more pointedly as in all-encompassing, as in integrating multiple and oftentimes contradictory perspectives. It will be their global understanding that makes our highly educated students economically competitive, intellectually innovative, and primed for continued lifelong learning.

So what does this need to cultivate global understanding in the 21st century require of our universities? Among other things, I suggest it demands that we foster intensive learning across academic disciplines within the liberal arts and integrate that knowledge with a much stronger understanding of the role and responsibilities of the professions. Whether the issue is health care or human rights, unemployment or immigration, educational attainment or economic inequality, the big questions cannot be comprehended—let alone effectively addressed—by the tools of only one academic discipline, no matter how masterful its methods or powerful its paradigms.

Consider, for example, the issue of climate change in a world that is both more interconnected and more populous than ever before. To be prepared to make a positive difference in this world, students must understand not only the science of sustainable design and development, but also the economic, political, and other issues in play. In this immensely complex challenge, a good foundation in chemical engineering—which is not a traditional liberal arts discipline nor even conventionally considered part of the liberal arts (engineering is typically classified as "professional or pre-professional education")—is just as important as an understanding of economics or political science. The key to solving every complex problem—climate change being one among many—will require connecting knowledge across multiple areas of expertise to both broaden and deepen global comprehension and in so doing unleash truly creative and innovative responses.

A liberal arts education is the broadest kind of undergraduate education the modern world has known, and its breadth is an integral part of its power to foster creative understanding. But it is a mistake to accept the conventional boundaries of a liberal arts education as fixed, rather than as a humanly alterable product of particular historical conditions.

In my own field of political philosophy, for example, a scholarly approach centered on intellectual history ceded significant ground in the 1970s to critical analysis of contemporary public affairs, which was a paradigm common to many earlier generations of political philosophers. Were the liberal arts motivated solely by the pursuit of knowledge for its own sake, and not any concern for worldly relevance, then it would be hard to make sense of such shifts. In the case of this important shift in political philosophy, scholars thought it valuable, in the face of ongoing injustice, to revive a tradition of ethical understanding and criticism of society.

A liberal arts degree is a prerequisite to professional education, and most liberal arts universities and their faculties stand firmly on the proposition that the liberal arts should inform the professions. Why then are liberal arts curricula not replete with courses that teach students to think carefully, critically, and creatively about the roles and responsibilities of professionals and the professions? Perhaps we are assuming that students will make these connections for themselves or that it will suffice if professional schools do so later. Neither of these assumptions can be sustained.

For example, we must not assume that students themselves will translate ethics as typically taught in a philosophy curriculum into the roles and responsibilities of the medical, business, and legal professions. The ethical considerations are too complex and profoundly affected by the institutional roles and responsibilities of professionals. Many lawyers, for example, are part of an adversarial system of justice; many doctors are part of a system where they financially benefit from procedures the costs of which are not paid directly by their patients; and many businesspeople operate in what is commonly called a free market, where external interferences are (rightly or wrongly) presumed, *prima facie*, to be suspect. These and many other contextual considerations profoundly complicate the practical ethics of law, medicine, and business.

My primary point is this: Although the separation of the liberal arts from the subject of professional roles and responsibilities may be taken for granted because it is so conventional, it really

should strike us as strange, on both intellectual and educational grounds, that so few courses in the undergraduate curriculum explicitly relate the liberal arts to professional life. This is a puzzle worthy of both intellectual and practical solution.

This stark separation of the practical and theoretical was neither an inevitable outgrowth of earlier educational efforts, nor has it ever been universally accepted. In fact, it flew in the face of at least one early American effort to integrate the liberal arts and professional education. In his educational blueprint ("Proposals Relating to the Education of Youth in Pensilvania"), which later led to the founding of the University of Pennsylvania, Benjamin Franklin called for students to be taught "every Thing that is useful, and every Thing that is ornamental." Being a principled pragmatist, Franklin immediately addressed an obvious rejoinder, that no educational institution can teach everything. And so he continued: "But Art is long, and their Time is short. It is therefore propos'd that they learn those Things that are likely to be most useful and most ornamental."

I propose that we proudly proclaim a liberal arts education, including its focus on basic research, as broadly pre-professional and optimally instrumental in pursuit of real world goals.

As Franklin's intellectual heirs, we recognize that something educationally significant is lost if students choose their majors for either purely scholastic or purely professional reasons, rather than because they want to be both well-educated *and* well-prepared for a likely future career. The introduction of distribution requirements for all majors is one way of responding to this potential problem. The glory and strength of American liberal arts education is its enabling undergraduates to keep their intellectual sights and their career options open, while cultivating intellectual curiosity and creativity that will enhance any of the career paths they later choose to follow. These are among the most eminently defensible aims of a liberal arts education: to broaden rather than narrow the sights of undergraduates, and to strengthen rather than stifle their creative potential.

I propose that we proudly proclaim a liberal arts education, including its focus on basic research, as broadly pre-professional and optimally instrumental in pursuit of real world goals. At its best, a liberal arts education prepares undergraduates for success in whatever profession they choose to pursue, and it does so by virtue of teaching them to think creatively and critically about themselves, their society (including the roles and responsibilities of the professions in their society), and the world.

So what can we do to bolster this optimal educational system, as envisioned by Franklin? As 21st century colleges and universities, we can build more productive intellectual bridges between liberal arts and professional education. We can show how insights of history, philosophy, literature, politics, economics, sociology, and science enrich understandings of law, business, medicine, nursing, engineering, architecture, and education—and how professional understandings in turn can enrich the insights of liberal arts disciplines. We can demonstrate that understanding the roles and responsibilities of professionals in society is an important part of the higher education of democratic citizens.

This leads to the third aim of a university education: maximizing social contribution. Here in particular is where the university's age-old focus on training scholars and advancing scholarship bumps up against its relatively recent focus (first brought to the fore by German and American research universities of the mid- and late-nineteenth century) on *discovery* and the creation of new knowledge. The sweep of the university's place in society is long, going back more than a thousand years; in that context, the role of the modern research university in America, dating back just to the 1870s, is a comparatively recent innovation. It is nevertheless a development that has had far-reaching and profound consequences in areas ranging from health and medicine to physics and material sciences, the social sciences, and the humanities. Basic research now plays an integral role in our understanding of the liberal arts, and we have come to understand our colleges and universities not just as training grounds for the next generation of fully prepared democratic citizens, but no less as vital economic engines whose discoveries drive future waves of innovation and human progress.

These are discoveries such as those made by Dr. Carl June and his team at

Penn's Abramson Cancer Center, with contributions from colleagues at the Children's Hospital of Philadelphia. Their pioneering research with individualized cancer treatments produced a reengineered T-cell therapy. Just in time, too, for young Emma Whitehead, who was stricken with advanced leukemia when she was just five years old. Under Dr. June's care, Emma, now seven, has beaten her cancer into remission. She's back at school, laughing and learning and playing with her friends. Her miraculous recovery not only means a renewed chance at a long, fulfilling life for her and her parents—it promises renewed hope for so many who are ravaged by cancer.

In university classrooms and laboratories across the country, the brightest minds are leveraging research and discovery to contribute to the social good. Most of these stories are not as dramatic as Emma's, but each in its own way has changed and will continue to change how we live and work and understand our world. The full tale of the benefits that universities bring extends far beyond technological and medical advances. We help governments build good public policy based on robust empirical data, garnered from university research. We build better international cooperation through the study of languages and cultures, economic markets, and political relations. We strengthen economies by fostering scores of newly discovered products, markets, and industries. We safeguard our collective health and well-being with insight into global phenomena and systems such as climate change, shifting sea levels, and food supply and agricultural production. All the vital basic and applied research being conducted by universities cannot be accounted for in any one list—the sum is too vast. What I can sum up here is this: If we do not do this research, no one will.

Colleges and universities also contribute to society at the local level by modeling ethical responsibility and social service in their institutional practices and initiatives. Their capital investments in educational facilities contribute to the economic progress of their local communities. Colleges and universities at every level can be institutional models of environmental sustainability in the way they build and maintain their campuses.

While the core social contribution of universities lies in both increasing opportunity for students and cultivating their creative understanding, the analogous core social contributions of universities in the realms of faculty research and clinical service are similarly crucial. And both are only strengthened by better integrating insights across the liberal arts and the professions. An education that cultivates creative understanding enables diverse, talented, hardworking graduates to pursue productive careers, to enjoy the pleasures of lifelong learning, and to reap the satisfactions of creatively contributing to society. The corresponding institutional mission of colleges and universities at all levels is to increase opportunity, to cultivate creative understanding, and—by these and other important means such as innovative research and clinical service—to contribute to society.

At their best, universities recruit hardworking, talented, and diverse student bodies and help them develop the understandings—including the roles and responsibilities of the professions in society—that are needed to address complex social challenges in the 21st century. To the extent that universities do this and do it well, we can confidently say to our students and our society that a university education is a wise investment indeed. ■

SEED CORN

Continued from page 15

with its outstanding record of success, I am confident that NYU will make a major contribution.

Let me close by reflecting a moment on the competition between universities over which one is best. The problem is very acute if the alumnus has graduated from several universities—in my case three. I have learned that one way to dampen the conflict is with exaggerated humor. My favorite story is the following:

Three economics professors were in an airplane that fatally crashed. They arrived in Heaven to face God sitting on *her* great white throne.

God addresses the first professor. "What do you believe in?"

The first professor replies, "I studied and taught at Harvard. I believe in giving power to the people. I think that government is the best mechanism to help people make their dreams come true for a better life."

God thinks for a second and she says, "OK, I approve of that. Come and sit at my left."

God then addresses the second professor. "What do you believe in?

The second professor replies, "I studied and taught at Yale. I believe that the combustion engine is evil and that we must save the world from global warming to protect the whole earth from extinction."

God thinks for a second, and she says, "OK, that sounds good. Come and sit on my right."

God then addresses the third professor. "What do you believe in?"

The third professor replies, "I studied and taught at New York University…and I believe you are sitting on my throne!" ■

by L. Rafael Reif,
President of the Massachusetts Institute of Technology

Better, More AFFORDABLE COLLEGES *Start Online*

How digital learning can become a part of every campus.

Everyone would like a solution to the problem of rising college costs. While students worry that they cannot afford a college education, U.S. colleges and universities know they cannot really afford to educate them either. At a technology-intensive research university like the Massachusetts Institute of Technology, it now costs three times as much to educate an undergraduate as we receive in net tuition—that is, the tuition MIT receives after providing for financial aid. To push the research frontier and educate innovators in science and engineering demands costly instrumentation and unique facilities. Even for institutions with substantial endowments, subsidizing a deficit driven by these and other costs is, in the long run, unsustainable.

Some wonder whether today's online technologies—specifically, massive open online courses, or MOOCs, which can reach many thousands of students at a comparatively low cost—could be an answer. I am convinced that digital learning is the most important innovation in education since the printing press. Yet if we want to know whether these technologies will make a college degree less expensive, we may be asking the wrong question. I believe they will; we are assessing this possibility at MIT even now. But first we should use these tools to make higher education better—in fact, to reinvent it. When the class of 2025 arrives on campuses, these technologies will have reshaped the entire concept of college in ways we cannot yet predict. Those transformations may change the whole equation, from access to effectiveness to cost.

To understand the potential, it's important to focus on what digital learning is good for. At least at the moment, it is surely not very good at replacing a close personal connection with an inspiring teacher and mentor. However, it is incomparably good at opening possibilities for billions of human beings who have little or no other access to higher learning. The global appetite for advanced learning is enormous: MIT OpenCourseWare—the initiative we started in 2002 to post virtually all our course materials for free online—has attracted 150 million learners worldwide. Today learners from every state in America and every nation on earth are actually taking MIT online classes; the edX platform we launched with Harvard 17 months ago has enrolled 1.25 million unique learners—10 times the number of living MIT graduates. With our edX partner institutions, we see an immense opportunity to help people transform their lives.

Yet digital learning also offers surprising advantages even for students with access to the best educational resources. First, digital technologies are remarkably good at teaching content: the basic concepts of circuits and electronics, the principles of chemistry, the evolution of architectural styles. At an online-learning summit at MIT, one eminent professor of physics from a peer university explained that although he loves lecturing and receives top ratings in student reviews, he recently came to rethink his entire approach. Why? Because testing indicated that many students did not come away from his lectures ready to apply the concepts he aimed to teach. By contrast, comparable students taught through online exercises—including immediate practice, feedback, and reinforcement—retained the concepts better and were better prepared to put them into practice. With so much introductory material moving online, instructors can take time that was previously reserved for lectures and

use it to exploit the power of innovative teaching techniques. A 2011 study co-authored by physics Nobel laureate Carl Wieman at the University of British Columbia showed the benefits: when tested on identical material, students taught through a highly interactive "flipped classroom" approach did nearly twice as well as peers taught via traditional lectures.

Digital learning technologies offer a second advantage, which is harder to quantify but is deeply appealing to both students and faculty: flexibility. Just as college traditionally requires four years at the same academic address, traditional courses require large groups of students to regularly gather at the same time and place. By making it possible to break the course content into dozens of small conceptual modules of instruction and testing, digital learning allows students to engage the material anytime, any day, as often as they need to, anywhere in the world. A student can now spend a year immersed in remote field research on an important problem while staying in sync with the courses in her major. A team of students working on a project can now reach for a new concept just at the moment they need it to solve a problem—the most powerful learning incentive of all.

And we are only beginning to benefit from a third advantage of digital learning: the ability to analyze and gain information from the vast data we are generating about how people actually learn best. By providing, on a huge scale, a systematic, data-driven way to learn about learning, online technologies will provide testable conclusions that could improve teaching methods and strategies for both online and in-person instruction.

For all the strengths of today's digital technologies, however, we know that some things—perhaps the most important elements of a true education—are transmitted most effectively face-to-face: the judgment, confidence, humility, and skill in negotiation that come from hands-on problem solving and teamwork; the perseverance, analytical skill, and initiative that grow from conducting frontline lab research; the skill in writing and public speaking that comes from exploring ideas with mentors and peers; the ethics and values that emerge through being apprenticed to a master in your field and living as a member of a campus community.

Online learning may not help students arrive at such lessons directly—but it may serve to clear the way. At MIT, faculty members experimenting with online tools to convey content in their courses are finding that it allows them more time to focus on education: detailed discussions, personal mentorship, project-based learning. They are developing a blended model that uses online tools strategically—and they are making education more engaging and more effective for more students than it has ever been before.

Digital learning technologies present us with a tremendous opportunity to examine what college is good for, to imagine what colleges might look like in the future, and to strive for ways to raise quality and lower costs. To teach what is best learned in person, do we need four years on campus, or could other models be even more effective? Could the first year of course work be conducted online as a standard for admission? Or could online tools allow juniors to spend a year working in the field? Then there's the question of our physical campuses. MIT has about 200 lecture halls. How many will we need in 20 years—and what different learning spaces should campuses include instead? Should we develop a new kind of blended education that combines the best of online and in-person learning? Would this lead to a new, more customized and valuable model of residential education—and what changes should we make to maximize that value?

Once we answer these questions, the college experience could look quite different in 10 or 20 years. I expect a range of options, from online credentialing in many technical fields all the way to blended online and residential experiences that could be more stimulating and transformative than any college program in existence now. Higher education will have the tools to engage lifelong learners anywhere, overturning traditional ideas of campus and student body. I believe these experimental years will produce many possibilities, so that future learners will be able to choose what is best for them. If you're wondering how much these options will cost, a better question might be, How much will these options be worth? I strongly believe that by capitalizing on the strengths of online learning, we will make education more accessible, more effective, and more affordable for more human beings than ever before. ■

At MIT, faculty members experimenting with online tools to convey content in their courses are finding that it allows them more time to focus on education: detailed discussions, personal mentorship, project-based learning.

Recognizing the Real and the Potential:

FIELDS MEDAL *for Mathematical Efforts*

Fields Medal recipients since inception

Year	Winners
1936	Lars Valerian Ahlfors (Harvard University) (April 18, 1907 – October 11, 1996)
	Jesse Douglas (Massachusetts Institute of Technology) (July 3, 1897 – September 7, 1965)
1950	Atle Selberg (Institute for Advanced Study, Princeton) (June 14, 1917 – August 6, 2007)
1954	Kunihiko Kodaira (Princeton University) (March 16, 1915 – July 26, 1997)
1962	John Willard Milnor (Princeton University) (born February 20, 1931)
1966	Paul Joseph Cohen (Stanford University) (April 2, 1934 – March 23, 2007)
	Stephen Smale (University of California, Berkeley) (born July 15, 1930)
1970	Heisuke Hironaka (Harvard University) (born April 9, 1931)
1974	David Bryant Mumford (Harvard University) (born June 11, 1937)
1978	Charles Louis Fefferman (Princeton University) (born April 18, 1949)
	Daniel G. Quillen (Massachusetts Institute of Technology) (June 22, 1940 – April 30, 2011)
1982	William P. Thurston (Princeton University) (October 30, 1946 – August 21, 2012)
	Shing-Tung Yau (Institute for Advanced Study, Princeton) (born April 4, 1949)
1986	Gerd Faltings (Princeton University) (born July 28, 1954)
	Michael Freedman (University of California, San Diego) (born April 21, 1951)
1990	Vaughan Jones (University of California, Berkeley) (born December 31, 1952)
	Edward Witten (Institute for Advanced Study, Princeton) (born August 26, 1951)
1994	Jean Bourgain (Institute for Advanced Study, Princeton) (born February 28, 1954)
	Efim Zelmanov (University of Wisconsin) (born September 7, 1955)
1998	Curtis T. McMullen (Harvard University) (born May 21, 1958)
2002	Vladimir Voevodsky (Institute for Advanced Study, Princeton) (born June 4, 1966)
2006	Andrei Okounkov (Princeton University) (born June 26, 1969)
	Terence Tao (University of California, Los Angeles) (born July 17, 1975)
2010	Ngô Bao Châu (Institute for Advanced Study, Princeton) (born June 28, 1972)

The Fields Medal is awarded every four years on the occasion of the International Congress of Mathematicians to recognize outstanding mathematical achievement for existing work and for the promise of future achievement.

PHOTO OF THE FIELDS MEDAL BY STEFAN ZACHOW.

American Academia's
NOBEL HISTORY

Nobel Prize winners from American universities and other academic institutions.

Year	Category	Name	Achievement	Academic affiliation
1907				
	Physics	Michelson, A.A.	Spectroscopic and metrological investigations	University of Chicago
1914				
	Chemistry	Richards, Theodore William	Accurate determination of the atomic weights of numerous elements	Harvard University
1923				
	Physics	Millikan, Robert Andrews	Work on elementary electric charge and the photoelectric effect	California Institute of Technology
1927				
	Physics	Compton, Arthur Holly	Discovery of wavelength change in diffused X-rays	University of Chicago
1930				
	Physiology/medicine	Landsteiner, Karl	Grouping of human blood types	Rockefeller Institute for Medical Research
1933				
	Physiology/medicine	Morgan, Thomas Hunt	Heredity transmission functions of chromosomes	California Institute of Technology
1934				
	Chemistry	Urey, Harold C.	Discovery of heavy hydrogen	University of California at Berkeley
	Physiology/medicine	Minot, George Richards	Discoveries concerning liver treatment for anemia	Harvard Medical School
	Physiology/medicine	Murphy, William P.	Discoveries concerning liver treatment for anemia	Harvard Medical School
	Physiology/medicine	Whipple, George H.	Discoveries concerning liver treatment for anemia	School of Medicine and Dentistry at the University of Rochester
1936				
	Physics	Anderson, Carl David	Discovery of the positron	California Institute of Technology
1937				
	Physics	Davisson, Clinton Joseph	Experimental demonstration of the interference phenomenon in crystals irradiated by electrons	Carnegie Institute of Technology
1939				
	Physics	Lawrence, Ernest Orlando	Invention of the cyclotron	University of California at Berkeley
1943				
	Physics	Stern, Otto	Discovery of the magnetic moment of the proton	Carnegie Institute of Technology
	Physiology/medicine	Doisy, Edward Adelbert	Discovery of chemical nature of vitamin K	St. Louis University
1944				
	Physics	Rabi, Isidor Isaac	Resonance method for registration of various properties of atomic nuclei	Columbia University
	Physiology/medicine	Erlanger, Joseph	Researches on differentiated functions of nerve fibers	Washington University in St. Louis
	Physiology/medicine	Gasser, Herbert Spencer	Researches on differentiated functions of nerve fibers	Washington University in St. Louis
1946				
	Chemistry	Northrop, John Howard	Preparation of enzymes and virus proteins in pure form	Rockefeller University
	Chemistry	Stanley, Wendell Meredith	Preparation of enzymes and virus proteins in pure form	Rockefeller University
	Chemistry	Sumner, James Batcheller	Discovery of enzyme crystallization	Cornell University
	Physics	Bridgman, Percy Williams	Discoveries in the domain of high-pressure physics	Harvard University
	Physiology/medicine	Muller, Hermann Joseph	Production of mutations by X-ray irradiation	Indiana University

Nobel Prize winners from American universities and other academic institutions *(continued)*

Year	Category	Name	Achievement	Academic affiliation
1949				
	Chemistry	Giauque, William Francis	Behavior of substances at extremely low temperatures	University of California at Berkeley
1950				
	Physiology/medicine	Kendall, Edward Calvin	Research on adrenal cortex hormones, their structure and biological effects	Princeton University
1951				
	Chemistry	McMillan, Edwin Mattison	Discovery of and research on transuranium elements	University of California at Berkeley
	Chemistry	Seaborg, Glenn T.	Discovery of and research on transuranium elements	University of California at Berkeley
1952				
	Physics	Bloch, Felix	Discovery of nuclear magnetic resonance in solids	Stanford University
	Physics	Purcell, E.M.	Discovery of nuclear magnetic resonance in solids	Harvard University
	Physiology/medicine	Waksman, Selman Abraham	Discovery of streptomycin	Rutgers University
1953				
	Physiology/medicine	Lipmann, Fritz Albert	Discovery of coenzyme A–citric acid cycle in metabolism of carbohydrates	Harvard Medical School
1954				
	Chemistry	Pauling, Linus	Study of the nature of the chemical bond	California Institute of Technology
	Physiology/medicine	Enders, John Franklin	Cultivation of the poliomyelitis virus in tissue cultures	Boston Children's Hospital, affiliated with Harvard Medical School
	Physiology/medicine	Robbins, Frederick Chapman	Cultivation of the poliomyelitis virus in tissue cultures	Case Western Reserve University
	Physiology/medicine	Weller, Thomas H.	Cultivation of the poliomyelitis virus in tissue cultures	Harvard School of Public Health
1955				
	Chemistry	du Vigneaud, Vincent	First synthesis of a polypeptide hormone	Cornell Medical College
	Physics	Kusch, Polykarp	Measurement of the magnetic moment of the electron	Columbia University
	Physics	Lamb, Willis Eugene, Jr.	Discoveries in the hydrogen spectrum	University of Arizona
1956				
	Physics	Bardeen, John	Investigations on semiconductors and invention of the transistor	University of Illinois at Urbana-Champaign
	Physiology/medicine	Cournand, André F.	Discoveries concerning heart catheterization and circulatory changes	Columbia University College of Physicians and Surgeons
	Physiology/medicine	Richards, Dickinson Woodruff	Discoveries concerning heart catheterization and circulatory changes	Columbia University College of Physicians and Surgeons
1958				
	Physiology/medicine	Beadle, George Wells	Genetic regulation of chemical processes	California Institute of Technology
	Physiology/medicine	Lederberg, Joshua	Genetic recombination	Stanford University
	Physiology/medicine	Tatum, Edward L.	Genetic regulation of chemical processes	Rockefeller Institute
1959				
	Physics	Chamberlain, Owen	Confirmation of the existence of the antiproton	University of California, Berkeley
	Physics	Segrè, Emilio	Confirmation of the existence of the antiproton	University of California, Berkeley
	Physiology/medicine	Kornberg, Arthur	Work on producing nucleic acids artificially	Washington University in St. Louis
	Physiology/medicine	Ochoa, Severo	Work on producing nucleic acids artificially	New York University School of Medicine
1960				
	Chemistry	Libby, Willard Frank	Development of radiocarbon dating	University of California, Los Angeles (UCLA)
	Physics	Glaser, Donald A.	Development of the bubble chamber	University of Michigan
1961				
	Chemistry	Calvin, Melvin	Study of chemical steps that take place during photosynthesis	University of California, Berkeley
	Physics	Hofstadter, Robert	Determination of shape and size of atomic nucleons	Stanford University
	Physiology/medicine	Békésy, Georg von	Functions of the inner ear	Harvard University
1962				
	Physiology/medicine	Watson, James Dewey	Discoveries concerning the molecular structure of DNA	Harvard University
1963				
	Physics	Mayer, Maria Goeppert	Development of shell model theory of the structure of the atomic nuclei	University of California at San Diego
	Physics	Wigner, Eugene Paul	Principles governing interaction of protons and neutrons in the nucleus	Princeton University
1964				
	Physics	Townes, Charles Hard	Work in quantum electronics leading to construction of instruments based on maser-laser principles	Massachusetts Institute of Technology
	Physiology/medicine	Bloch, Konrad	Discoveries concerning cholesterol and fatty-acid metabolism	Harvard University

Nobel Prize winners from American universities and other academic institutions *(continued)*

Year	Category	Name	Achievement	Academic affiliation
1965				
	Physics	Feynman, Richard P.	Basic principles of quantum electrodynamics	California Institute of Technology
	Physics	Schwinger, Julian Seymour	Basic principles of quantum electrodynamics	Harvard University
1966				
	Chemistry	Mulliken, Robert Sanderson	Work concerning chemical bonds and the electronic structure of molecules	University of Chicago
	Physiology/medicine	Huggins, Charles B.	Research on causes and treatment of cancer	University of Chicago
	Physiology/medicine	Rous, Peyton	Research on causes and treatment of cancer	Rockefeller Institute
1967				
	Physics	Bethe, Hans Albrecht	Discoveries concerning the energy production of stars	Cornell University
	Physiology/medicine	Hartline, Haldan Keffer	Discoveries about chemical and physiological visual processes in the eye	Rockefeller University
	Physiology/medicine	Wald, George	Discoveries about chemical and physiological visual processes in the eye	Harvard University
1968				
	Chemistry	Onsager, Lars	Work on theory of thermodynamics of irreversible processes	Yale University
	Physics	Alvarez, Luis W.	Work with elementary particles, discovery of resonance states	University of California, Berkeley
	Physiology/medicine	Holley, Robert William	Deciphering of the genetic code	Cornell University
	Physiology/medicine	Khorana, Har Gobind	Deciphering of the genetic code	University of Wisconsin–Madison
1969				
	Physics	Gell-Mann, Murray	Classification of elementary particles and their interactions	California Institute of Technology
	Physiology/medicine	Delbrück, Max	Research and discoveries concerning viruses and viral diseases	California Institute of Technology
	Physiology/medicine	Hershey, A.D.	Research and discoveries concerning viruses and viral diseases	Carnegie Institution
	Physiology/medicine	Luria, Salvador	Research and discoveries concerning viruses and viral diseases	Massachusetts Institute of Technology
1970				
	Economics	Samuelson, Paul	Work in scientific analysis of economic theory	Massachusetts Institute of Technology
1971				
	Economics	Kuznets, Simon	Extensive research on the economic growth of nations	Harvard University
	Physiology/medicine	Sutherland, Earl W., Jr.	Action of hormones	Vanderbilt University School of Medicine
1972				
	Chemistry	Anfinsen, Christian B.	Fundamental contributions to enzyme chemistry	Harvard Medical School
	Chemistry	Moore, Stanford	Fundamental contributions to enzyme chemistry	Rockefeller University
	Chemistry	Stein, William H.	Fundamental contributions to enzyme chemistry	Rockefeller University
	Economics	Arrow, Kenneth J.	Contributions to general economic equilibrium theory and welfare theory	Stanford University
	Physics	Bardeen, John	Development of the theory of superconductivity	University of Illinois at Urbana-Champaign
	Physics	Cooper, Leon N.	Development of the theory of superconductivity	Brown University
	Physics	Schrieffer, John Robert	Development of the theory of superconductivity	University of California at Santa Barbara
	Physiology/medicine	Edelman, Gerald Maurice	Research on the chemical structure of antibodies	Rockefeller Institute for Medical Research
1973				
	Economics	Leontief, Wassily	Input-output analysis	Harvard University
1974				
	Chemistry	Flory, Paul J.	Studies of long-chain molecules	Stanford University
	Physiology/medicine	Claude, Albert	Research on structural and functional organization of cells	Rockefeller University
	Physiology/medicine	Palade, George E.	Research on structural and functional organization of cells	Yale University Medical School
1975				
	Economics	Koopmans, Tjalling C.	Contributions to the theory of optimum allocation of resources	Yale University
	Physics	Rainwater, James	Work on the atomic nucleus that paved the way for nuclear fusion	Columbia University
	Physiology/medicine	Baltimore, David	Interaction between tumor viruses and the genetic material of the cell	Massachusetts Institute of Technology
	Physiology/medicine	Dulbecco, Renato	Interaction between tumor viruses and the genetic material of the cell	Salk Institute for Biological Studies
	Physiology/medicine	Temin, Howard Martin	Interaction between tumor viruses and the genetic material of the cell	University of Wisconsin–Madison
1976				
	Chemistry	Lipscomb, William Nunn, Jr.	Structure of boranes	Harvard University
	Economics	Friedman, Milton	Consumption analysis, monetary theory, and economic stabilization	University of Chicago
	Literature	Bellow, Saul	Novelist	University of Chicago
	Physics	Richter, Burton	Discovery of new class of elementary particles (psi, or J)	Stanford University
	Physics	Ting, Samuel C.C.	Discovery of new class of elementary particles (psi, or J)	Massachusetts Institute of Technology
	Physiology/medicine	Blumberg, Baruch S.	Studies of origin and spread of infectious diseases	University of Pennsylvania

Nobel Prize winners from American universities and other academic institutions *(continued)*

Year	Category	Name	Achievement	Academic affiliation
1977				
	Physics	Anderson, Philip W.	Contributions to understanding the behavior of electrons in magnetic, noncrystalline solids	Princeton University
	Physics	Van Vleck, John H.	Contributions to understanding the behavior of electrons in magnetic, noncrystalline solids	Harvard University
	Physiology/medicine	Guillemin, Roger Charles Louis	Research on pituitary hormones	Salk Institute for Biological Studies
	Physiology/medicine	Schally, Andrew Victor	Research on pituitary hormones	Tulane University
	Physiology/medicine	Yalow, Rosalyn S.	Development of radioimmunoassay	Medicine at Mount Sinai Hospital
1978				
	Economics	Simon, Herbert Alexander	Decision-making processes in economic organizations	Carnegie Mellon University
	Physiology/medicine	Nathans, Daniel	Discovery and application of enzymes that fragment DNA	Johns Hopkins University
	Physiology/medicine	Smith, Hamilton Othanel	Discovery and application of enzymes that fragment DNA	Johns Hopkins University
1979				
	Chemistry	Brown, Herbert Charles	Introduction of compounds of boron and phosphorus in the synthesis of organic substances	Purdue University
	Economics	Schultz, Theodore William	Analyses of economic processes in developing nations	University of Chicago
	Physics	Glashow, Sheldon Lee	Unification of electromagnetism and the weak interactions of subatomic particles	Harvard University
	Physics	Weinberg, Steven	Unification of electromagnetism and the weak interactions of subatomic particles	Harvard University
	Physiology/medicine	Cormack, Allan MacLeod	Development of the CAT scan	Tufts University
1980				
	Chemistry	Berg, Paul	First preparation of a hybrid DNA	Stanford University
	Chemistry	Gilbert, Walter	Development of chemical and biological analyses of DNA structure	Harvard University
	Economics	Klein, Lawrence Robert	Development and analysis of empirical models of business fluctuations	University of Pennsylvania
	Literature	Milosz, Czeslaw	Poet	University of California, Berkeley
	Physics	Cronin, James Watson	Demonstration of simultaneous violation of both charge-conjugation and parity-inversion symmetries	Princeton University
	Physics	Fitch, Val Logsdon	Demonstration of simultaneous violation of both charge-conjugation and parity-inversion symmetries	Princeton University
	Physiology/medicine	Benacerraf, Baruj	Investigations of genetic control of the response of the immune system to foreign substances	Harvard Medical School
	Physiology/medicine	Snell, George Davis	Investigations of genetic control of the response of the immune system to foreign substances	Jackson Laboratory, an independent, nonprofit biomedical research institution
1981				
	Chemistry	Hoffmann, Roald	Orbital symmetry interpretation of chemical reactions	Cornell University
	Economics	Tobin, James	Portfolio selection theory of investment	Yale University
	Physics	Bloembergen, Nicolaas	Applications of lasers in spectroscopy	Harvard University
	Physics	Schawlow, Arthur Leonard	Applications of lasers in spectroscopy	Stanford University
	Physiology/medicine	Hubel, David Hunter	Processing of visual information by the brain	Harvard Medical School
	Physiology/medicine	Sperry, Roger Wolcott	Functions of the cerebral hemispheres	California Institute of Technology
1982				
	Economics	Stigler, George J.	Economic effects of governmental regulation	University of Chicago
	Physics	Wilson, Kenneth Geddes	Analysis of continuous phase transitions	Cornell University
1983				
	Chemistry	Taube, Henry	Study of electron transfer reactions	Stanford University
	Economics	Debreu, Gerard	Mathematical proof of supply and demand theory	University of California, Berkeley
	Physics	Chandrasekhar, Subrahmanyan	Contributions to understanding the evolution and devolution of stars	University of Chicago
	Physics	Fowler, William A.	Contributions to understanding the evolution and devolution of stars	California Institute of Technology
	Physiology/medicine	McClintock, Barbara	Discovery of mobile plant genes that affect heredity	Cold Spring Harbor Laboratory
1984				
	Chemistry	Merrifield, Bruce	Development of a method of polypeptide synthesis	Rockefeller Institute for Medical Research

Nobel Prize winners from American universities and other academic institutions *(continued)*

Year	Category	Name	Achievement	Academic affiliation
1985				
	Chemistry	Hauptman, Herbert A.	Development of a way to map the chemical structures of small molecules	Hauptman-Woodward Medical Research Institute
	Chemistry	Karle, Jerome	Development of a way to map the chemical structures of small molecules	Naval Research Laboratory
	Economics	Modigliani, Franco	Analyses of household savings and financial markets	Massachusetts Institute of Technology
	Physiology/medicine	Brown, Michael S.	Discovery of cell receptors relating to cholesterol metabolism	University of Texas Southwestern Medical Center
	Physiology/medicine	Goldstein, Joseph L.	Discovery of cell receptors relating to cholesterol metabolism	University of Texas Southwestern Medical Center
1986				
	Chemistry	Herschbach, Dudley R.	Development of methods for analyzing basic chemical reactions	Harvard University
	Chemistry	Lee, Yuan T.	Development of methods for analyzing basic chemical reactions	University of California, Berkeley
	Economics	Buchanan, James M.	Public-choice theory bridging economics and political science	George Mason University
	Physiology/medicine	Cohen, Stanley	Discovery of chemical agents that help regulate the growth of cells	Washington University in St. Louis
1987				
	Chemistry	Cram, Donald J.	Development of molecules that can link with other molecules	University of California, Los Angeles
	Economics	Solow, Robert Merton	Contributions to the theory of economic growth	Massachusetts Institute of Technology
	Literature	Brodsky, Joseph	Poet, essayist	Mount Holyoke College
1988				
	Physics	Lederman, Leon Max	Research in subatomic particles	Columbia University
	Physics	Schwartz, Melvin	Research in subatomic particles	Columbia University
	Physics	Steinberger, Jack	Research in subatomic particles	Columbia University
1989				
	Chemistry	Altman, Sidney	Discovery of certain basic properties of RNA	Yale University
	Chemistry	Cech, Thomas Robert	Discovery of certain basic properties of RNA	University of Colorado
	Physics	Dehmelt, Hans Georg	Development of methods to isolate atoms and subatomic particles for study	University of Washington, Seattle
	Physics	Ramsey, Norman Foster	Development of the atomic clock	Harvard University
	Physiology/medicine	Bishop, J. Michael	Study of cancer-causing genes called oncogenes	University of California School of Medicine, San Francisco
	Physiology/medicine	Varmus, Harold	Study of cancer-causing genes called oncogenes	University of California School of Medicine, San Francisco
1990				
	Chemistry	Corey, Elias James	Development of retrosynthetic analysis for synthesis of complex molecules	Harvard University
	Economics	Markowitz, Harry M.	Study of financial markets and investment decision making	City University of New York
	Economics	Miller, Merton H.	Study of financial markets and investment decision making	University of Chicago
	Economics	Sharpe, William F.	Study of financial markets and investment decision making	Stanford University
	Physics	Friedman, Jerome Isaac	Discovery of atomic quarks	Massachusetts Institute of Technology
	Physics	Kendall, Henry Way	Discovery of atomic quarks	Massachusetts Institute of Technology
	Physiology/medicine	Murray, Joseph E.	Development of kidney and bone-marrow transplants	Brigham and Women's Hospital [Harvard Medical School]
	Physiology/medicine	Thomas, E. Donnall	Development of kidney and bone-marrow transplants	University of Washington, Fred Hutchinson Cancer Research Center
1991				
	Economics	Coase, Ronald	Application of economic principles to the study of law	University of Chicago
1992				
	Chemistry	Marcus, Rudolph A.	Explanation of how electrons transfer between molecules	California Institute of Technology
	Economics	Becker, Gary S.	Application of economic theory to social sciences	University of Chicago
	Physiology/medicine	Fischer, Edmond H.	Discovery of class of enzymes called protein kinases	University of Washington, Seattle
	Physiology/medicine	Krebs, Edwin Gerhard	Discovery of class of enzymes called protein kinases	University of Washington, Seattle
1993				
	Economics	Fogel, Robert William	Contributions to economic history	University of Chicago
	Economics	North, Douglass C.	Contributions to economic history	Washington University, St. Louis
	Literature	Morrison, Toni	Novelist	Princeton University
	Physics	Hulse, Russell Alan	Identifying binary pulsars	Princeton University
	Physics	Taylor, Joseph H., Jr.	Identifying binary pulsars	Princeton University
	Physiology/medicine	Sharp, Phillip A.	Discovery of "split," or interrupted, genetic structure	Massachusetts Institute of Technology

Nobel Prize winners from American universities and other academic institutions *(continued)*

Year	Category	Name	Achievement	Academic affiliation
1994				
	Chemistry	Olah, George A.	Development of techniques to study hydrocarbon molecules	University of Southern California
	Economics	Harsanyi, John C.	Development of game theory	University of California, Berkeley
	Economics	Nash, John F.	Development of game theory	Princeton University
	Physics	Shull, Clifford G.	Development of neutron-scattering techniques	Massachusetts Institute of Technology
	Physiology/medicine	Gilman, Alfred G.	Discovery of cell signalers called G-proteins	University of Texas Southwestern Medical Center at Dallas
1995				
	Chemistry	Molina, Mario	Explanation of processes that deplete Earth's ozone layer	Massachusetts Institute of Technology
	Chemistry	Rowland, F. Sherwood	Explanation of processes that deplete Earth's ozone layer	University of California, Irvine
	Economics	Lucas, Robert E., Jr.	Incorporation of rational expectations in macroeconomic theory	University of Chicago
	Physics	Perl, Martin Lewis	Discovery of tau subatomic particle	Stanford University
	Physics	Reines, Frederick	Discovery of neutrino subatomic particle	University of California, Irvine
	Physiology/medicine	Lewis, Edward B.	Identification of genes that control the body's early structural development	California Institute of Technology
	Physiology/medicine	Wieschaus, Eric F.	Identification of genes that control the body's early structural development	Princeton University
1996				
	Chemistry	Curl, Robert F., Jr.	Discovery of new carbon compounds called fullerenes	Rice University
	Chemistry	Smalley, Richard E.	Discovery of new carbon compounds called fullerenes	Rice University
	Economics	Vickrey, William	Contributions to theory of incentives under conditions of asymmetric information	Columbia University
	Physics	Lee, David M.	Discovery of superfluidity in isotope helium-3	Cornell University
	Physics	Osheroff, Douglas D.	Discovery of superfluidity in isotope helium-3	Stanford University
	Physics	Richardson, Robert C.	Discovery of superfluidity in isotope helium-3	Cornell University
1997				
	Chemistry	Boyer, Paul D.	Explanation of the enzymatic conversion of adenosine triphosphate	University of California, Los Angeles
	Economics	Merton, Robert C.	Methods for determining the value of stock options and other derivatives	Harvard University
	Economics	Scholes, Myron S.	Methods for determining the value of stock options and other derivatives	Stanford University
	Physics	Chu, Steven	Process of trapping atoms with laser cooling	Stanford University
	Physiology/medicine	Prusiner, Stanley B.	Discovery of the prion, a type of disease-causing protein	University of California School of Medicine, San Francisco
1998				
	Chemistry	Kohn, Walter	Development of the density-functional theory	University of California, Santa Barbara
	Physics	Laughlin, Robert B.	Discovery of the fractional quantum Hall effect	Stanford University
	Physics	Störmer, Horst L.	Discovery of the fractional quantum Hall effect	Columbia University
	Physics	Tsui, Daniel C.	Discovery of the fractional quantum Hall effect	Princeton University
	Physiology/medicine	Furchgott, Robert F.	Discovery that nitric oxide (NO) acts as a signaling molecule in the cardiovascular system	SUNY Health Science Center, Brooklyn
	Physiology/medicine	Ignarro, Louis J.	Discovery that nitric oxide (NO) acts as a signaling molecule in the cardiovascular system	University of California School of Medicine, Los Angeles
	Physiology/medicine	Murad, Ferid	Discovery that nitric oxide (NO) acts as a signaling molecule in the cardiovascular system	University of Texas Medical School at Houston
1999				
	Chemistry	Zewail, Ahmed H.	Study of the transition states of chemical reactions using femtosecond spectroscopy	California Institute of Technology
	Physiology/medicine	Blobel, Günter	Discovery that proteins have signals governing cellular organization	Rockefeller University
2000				
	Chemistry	Heeger, Alan J.	Discovery of plastics that conduct electricity	University of California, Santa Barbara
	Chemistry	MacDiarmid, Alan G.	Discovery of plastics that conduct electricity	University of Pennsylvania
	Economics	Heckman, James J.	Development of methods of statistical analysis of individual and household behavior	University of Chicago
	Economics	McFadden, Daniel L.	Development of methods of statistical analysis of individual and household behavior	University of California, Berkeley
	Physics	Kilby, Jack S.	Development of the integrated circuit (microchip)	Texas A&M University
	Physiology/medicine	Greengard, Paul	Discovery of how signals are transmitted between nerve cells in the brain	Rockefeller University
	Physiology/medicine	Kandel, Eric R.	Discovery of how signals are transmitted between nerve cells in the brain	Columbia University

Nobel Prize winners from American universities and other academic institutions *(continued)*

Year	Category	Name	Achievement	Academic affiliation
2001				
	Chemistry	Sharpless, K. Barry	Work on chirally catalyzed oxidation reactions	The Scripps Research Institute
	Economics	Akerlof, George A.	Analysis of markets with asymmetric information	University of California, Berkeley
	Economics	Spence, A. Michael	Analysis of markets with asymmetric information	Stanford University
	Economics	Stiglitz, Joseph E.	Analysis of markets with asymmetric information	Columbia University
	Physics	Cornell, Eric A.	Achievement of Bose-Einstein condensation in dilute gases of alkali atoms; early fundamental studies of the properties of the condensates	University of Colorado
	Physics	Wieman, Carl E.	Achievement of Bose-Einstein condensation in dilute gases of alkali atoms; early fundamental studies of the properties of the condensates	University of Colorado
	Physiology/medicine	Hartwell, Leland H.	Discovery of key regulators of the cell cycle	University of Washington, Fred Hutchinson Cancer Research Center
2002				
	Chemistry	Fenn, John B.	Development of techniques to identify and analyze proteins and other large molecules	Virginia Commonwealth University
	Economics	Kahneman, Daniel	Integration of psychological research into economic science, especially concerning human judgment and decision making under uncertainty	Princeton University
	Economics	Smith, Vernon L.	Establishment of laboratory experiments as a tool in empirical economic analysis	George Mason University
	Physics	Davis, Raymond, Jr.	Detection of neutrinos	University of Pennsylvania
	Physics	Giacconi, Riccardo	Seminal discoveries of cosmic sources of X-rays	Johns Hopkins University
	Physiology/medicine	Horvitz, H. Robert	Discoveries concerning genetic regulation of organ development and programmed cell death (apoptosis)	Massachusetts Institute of Technology
2003				
	Chemistry	Agre, Peter	Discoveries regarding water channels and ion channels in cells	Johns Hopkins University School of Medicine
	Chemistry	MacKinnon, Roderick	Discoveries regarding water channels and ion channels in cells	Rockefeller University
	Economics	Engle, Robert F.	Development of techniques for the analysis of time series data	New York University
	Physics	Leggett, Anthony J.	Discoveries regarding superconductivity and superfluidity at very low temperatures	University of Illinois, Urbana
	Physiology/medicine	Lauterbur, Paul	Development of magnetic resonance imaging (MRI)	University of Illinois, Urbana
2004				
	Chemistry	Rose, Irwin	Discovery of ubiquitin-mediated protein degradation	University of California, Irvine
	Economics	Prescott, Edward C.	Contributions to dynamic macroeconomics	Arizona State University
	Physiology/medicine	Axel, Richard	Discovery of odorant receptors and the organization of the olfactory system	Columbia University
	Physiology/medicine	Buck, Linda B.	Discovery of odorant receptors and the organization of the olfactory system	University of Washington, Fred Hutchinson Cancer Research Center
	Physics	Gross, David J.	Discovery of asymptotic freedom in the theory of the strong interaction	University of California, Santa Barbara
	Physics	Politzer, H. David	Discovery of asymptotic freedom in the theory of the strong interaction	California Institute of Technology
	Physics	Wilczek, Frank	Discovery of asymptotic freedom in the theory of the strong interaction	Massachusetts Institute of Technology
2005				
	Chemistry	Grubbs, Robert H.	Development of the metathesis method in organic synthesis	California Institute of Technology
	Chemistry	Schrock, Richard R.	Development of the metathesis method in organic synthesis	Massachusetts Institute of Technology
	Economics	Schelling, Thomas C.	Contributions to game-theory analysis	University of Maryland, College Park
	Physics	Glauber, Roy J.	Contributions to the field of optics	Harvard University
	Physics	Hall, John L.	Contributions to the development of laser spectroscopy	University of Colorado
2006				
	Chemistry	Kornberg, Roger D.	Work on the molecular basis of eukaryotic transcription	Stanford University
	Economics	Phelps, Edmund S.	Analysis of intertemporal trade-offs in macroeconomic policy	Columbia University
	Physics	Mather, John C.	Discovery of the blackbody form and anisotropy of the cosmic microwave background radiation	University of Maryland, College Park
	Physics	Smoot, George F.	Discovery of the blackbody form and anisotropy of the cosmic microwave background radiation	University of California, Berkeley
	Physiology/medicine	Fire, Andrew Z.	Discovery of RNA interference—gene silencing by double-stranded RNA	Stanford University School of Medicine
	Physiology/medicine	Mello, Craig C.	Discovery of RNA interference—gene silencing by double-stranded RNA	University of Massachusetts Medical School

Nobel Prize winners from American universities and other academic institutions *(continued)*

Year	Category	Name	Achievement	Academic affiliation
2007				
	Economics	Hurwicz, Leonid	Work that laid the foundations of mechanism design theory	University of Minnesota
	Economics	Maskin, Eric S.	Work that laid the foundations of mechanism design theory	Institute for Advanced Study
	Economics	Myerson, Roger B.	Work that laid the foundations of mechanism design theory	University of Chicago
	Physiology/medicine	Capecchi, Mario R.	Discovery of principles for introducing specific gene modifications in mice by the use of embryonic stem cells	University of Utah, Salt Lake City
	Physiology/medicine	Smithies, Oliver	Discovery of principles for introducing specific gene modifications in mice by the use of embryonic stem cells	University of North Carolina at Chapel Hill
2008				
	Chemistry	Chalfie, Martin	Discovery and development of the green fluorescent protein, GFP	Columbia University
	Chemistry	Shimomura, Osamu	Discovery and development of the green fluorescent protein, GFP	Marine Biological Laboratory (MBL), Woods Hole, MA; Boston University Medical School
	Chemistry	Tsien, Roger Y.	Discovery and development of the green fluorescent protein, GFP	University of California, San Diego
	Economics	Krugman, Paul	Analysis of trade patterns and location of economic activity	Princeton University
	Physics	Nambu, Yoichiro	Discovery of the mechanism of spontaneous broken symmetry in subatomic physics	Enrico Fermi Institute, University of Chicago
2009				
	Chemistry	Steitz, Thomas	Studies of the structure and function of the ribosome	Yale University
	Economics	Ostrom, Elinor	Analysis of economic governance, especially the commons	Indiana University; Arizona State University
	Economics	Williamson, Oliver E.	Analysis of economic governance, especially the boundaries of the firm	University of California, Berkeley
	Physiology/medicine	Blackburn, Elizabeth H.	Discovery of how chromosomes are protected by telomeres and the enzyme telomerase	University of California, San Francisco
	Physiology/medicine	Greider, Carol W.	Discovery of how chromosomes are protected by telomeres and the enzyme telomerase	Johns Hopkins University School of Medicine
	Physiology/medicine	Szostak, Jack W.	Discovery of how chromosomes are protected by telomeres and the enzyme telomerase	Harvard Medical School
2010				
	Chemistry	Heck, Richard F.	Development of techniques to synthesize complex carbon molecules	University of Delaware
	Economics	Diamond, Peter A.	Analysis of markets with search frictions	Massachusetts Institute of Technology
	Economics	Mortensen, Dale T.	Analysis of markets with search frictions	Northwestern University
2011				
	Economics	Sargent, Thomas J.	Empirical research on cause and effect in the macroeconomy	New York University
	Economics	Sims, Christopher A.	Empirical research on cause and effect in the macroeconomy	Princeton University
	Physics	Perlmutter, Saul	Discovery of the accelerating expansion of the universe through observations of distant supernovae	University of California, Berkeley
	Physics	Riess, Adam G.	Discovery of the accelerating expansion of the universe through observations of distant supernovae	Johns Hopkins University
	Physiology/medicine	Beutler, Bruce A.	Discoveries concerning the activation of innate immunity	University of Texas Southwestern Medical Center
2012				
	Chemistry	Kobilka, Brian K.	Studies of G-protein-coupled receptors	Stanford University School of Medicine
	Chemistry	Lefkowitz, Robert J.	Studies of G-protein-coupled receptors	Duke University Medical Center
	Economics	Roth, Alvin E.	Work on market design and matching theory	Harvard University
	Economics	Shapley, Lloyd S.	Work on market design and matching theory	University of California, Los Angeles
	Physics	Wineland, David J.	Development of methods that enable measuring and manipulation of individual quantum systems	University of Colorado, Boulder

by John L. Hennessy,
President, Stanford University

The Real Crisis in HIGHER EDUCATION

Much has been written about the rising costs of higher education and increasing student debt levels, and there is no doubt that both issues are serious concerns. But hidden amid the conversation about cost and debt is another crisis with even more profound implications—the completion rate for today's college students.

To many, the problem may not be apparent. Roughly eight in 10 traditional college students—who attend a public or private nonprofit four-year university, on an exclusively full-time basis—graduate within six years, according to the National Student Clearinghouse Research Center.

But look closer, and there's real trouble. The data show that minority students, students who attend part-time (even for a short time), and students at for-profit colleges have much lower completion rates for four-year degrees.

Leaving school before achieving a four-year degree seriously affects an individual's economic prospects. It exacerbates the student debt challenge, as students accumulate debt but fail to achieve the college degree so crucial to repaying it. It also has major implications for our nation's competitiveness.

The relationship of college completion to personal economic security is well documented but worth highlighting. The Bureau of Labor Statistics reports that the January 2013 unemployment rate for individuals with a bachelor's degree was 3.7 percent, compared to 8.1 percent for those with only a high school diploma and 7 percent for those with some college but no bachelor's degree.

Recent data from Georgetown University's Center for Education and the Workforce show that median lifetime earnings for bachelor's degree holders are $964,000 higher than for high school–only graduates, and more than $500,000 higher than those with a two-year degree or some college but no degree.

But the National Student Clearinghouse study shows that important groups of students are struggling to get to a degree.

Part-time students are one such group. Among students who start at a four-year public university, for instance, 79 percent of those studying full time graduate within six years. But the figure is 17 percent for those who attend part time and 42 percent for those who attend some full time and some part time. (The numbers are a bit higher, but similar, for students attending four-year private nonprofit universities.)

Completion rates also vary significantly by type of institution. Considering all attendees (part-time, full-time, and those who do both over time), students who start and finish in the same public university graduate at a 57 percent rate; for those at a private nonprofit, the rate is 69 percent. Alarmingly, only 41 percent of entering students at four-year, for-profit institutions complete their degrees within six years—and the full-time average net tuition at a for-profit school is about three times that of public universities.

Graduation rates for minority students are significantly lower than for the overall population.

Graduation rates for minority students also are significantly lower than for the overall population. Federal data show six-year graduation rates at four-year universities 8 percentage points lower for Latinos than the overall average, and 18 percentage points lower for African-Americans.

The data are less complete when it comes to the reasons behind lack of completion. But three main factors are clearly important.

First, lack of adequate high school preparation and ability to do college work is a critical factor. Second, many students feel they must work extensive hours to afford to attend college, as reported in the recent National Survey of Student Engagement. Third, both lack of academic engagement and slow progress hurt graduation: Students who feel less engaged are more likely to drop out, and lack of classes and changes in major both extend time to degree.

These issues need to be elevated, so that nationally we begin talking about college completion in the same way we talk about college costs. It's time for a serious, national action plan to help more students graduate.

■ We need a true national commitment to better preparing students for college work, reducing the need for remedial coursework. The many challenges facing the K-12 system are complex and more appropriately detailed elsewhere, but better preparing students in high school must be integral to any effort to improve college completion.

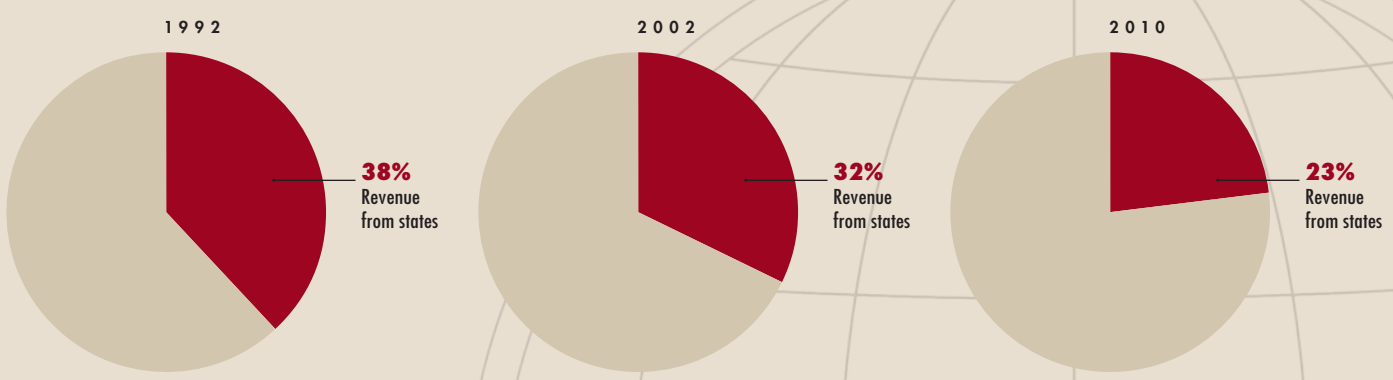
■ We need a collaborative approach to ensuring that a typical family's college expenses after financial aid grow at a rate no faster than inflation. This is a shared responsibility, with colleges needing to control cost growth and enhance scholarships; the federal government strengthening its financial aid programs; states restoring funding for their public institutions; and families beginning to save early for college.

■ Recent advances with online learning offer opportunities for enhancing completion, although not a simple panacea. In addition to using technology to improve efficiency and effectiveness in college, the use of online instruction in high schools, during summer periods, and in developing lower-cost remediation seems promising.

■ Finally, colleges must focus on improving completion. Making the completion rate a primary focus of accreditation review seems an obvious step. Likewise, institutional eligibility for federal and state financial aid should be contingent on graduation rates, adjusted for risk in the student population. We know that students who are more deeply engaged—through such strategies as smaller, interactive classes, better and more personal advising, close work with faculty in independent study, and service learning opportunities—attain higher graduation rates.

Increasing the graduation rate at our nation's colleges and universities is a critical issue and a shared responsibility. It deserves a higher place in our national dialogue. ■

PUBLIC RESEARCH UNIVERSITIES' REVENUE FROM STATES



SOURCE: NATIONAL SCIENCE FOUNDATION

by Nannerl O. Keohane,
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The Liberal Arts and Presidential LEADERSHIP

Editor's Note: *This is the text of a speech given to the Council of Independent Colleges Presidential Institute on January 4, 2012.*

I'm indeed honored to address this gathering of leaders of colleges historically committed to a strong liberal arts education, and glad that my husband Robert Keohane, who is chairing the presidential search committee of his alma mater, Shimer College, is also attending the conference. All of us are here in part to celebrate the impressive record of our campuses and reaffirm our commitment for the future. But there are also challenges that we need to face together. We should pool our ideas and energies, and think strategically about how we can most effectively champion liberal arts education today and in the future. My task is to set the stage for these discussions.

Here's how I will proceed: first, I'll say a few words about the liberal arts as a historic phenomenon with much resonance in our world today. Then I'll present four arguments that may be useful to you as you confront the skeptics. Finally, I'll talk briefly about leadership and how *you* can make a difference.

The liberal arts through history

Any one of you here today could give a persuasive definition of the liberal arts, and doubtless have done so many times. I am especially fond of Thomas Cronin's definition of the liberal arts as "the liberating arts—freeing us from prejudice, dogmatism, and parochialism, from complacency, sentimentality, and hypocrisy, from sloppy reasoning and careless writing." A liberal arts education doesn't always accomplish all those things, but it surely gives us a good beginning. Cronin has presided over two liberal arts colleges, and his definition appears in a recent book entitled *Leadership and the Liberal Arts*, edited by J. Thomas Wren. Here's another pungent definition of a liberal education by Louis Menand, in *The Marketplace of Ideas*, as "a background mentality, a way of thinking, a kind of intellectual DNA that informs work in every specialized area of inquiry."

Ironically, of course, this very broad, capacious form of education we call the liberal arts is rooted in a specific curriculum in classical and medieval times, including rhetoric, arithmetic, geometry, the *trivium*, and the *quadrivium*. But it would be wrong to assume that because it has such ancient roots, this kind of education is outdated, stale, fusty, or irrelevant. The liberal arts lend themselves particularly well to contemporary high-tech methods of imparting knowledge.

We all wrestle with the challenges of educating students who are used to multitasking, doing their homework while listening to music on their I-phones, and texting on their I-pods. For such students, the web-based facilities of exciting liberal arts courses are particularly salient. What would Aristotle or Erasmus or Robert Maynard Hutchins not have given for a technique that allows one to tour the world's greatest museums, looking closely at the details of countless masterpieces, explore the ruins of ancient castles and pyramids and forums, join archeological digs at your desk, turning objects around to see all sides of them, visualize problems in geometry or astronomy or mathematics in several dimensions and work out their solutions.

An excellent example of the power of multimedia coupled with the liberal arts is a general education course sometimes taught at Harvard University by Stephen Greenblatt as English 126, "Imaginary Journeys." The course is described as being "about global mobility, encounter, and exchange at the time that Harvard College was founded in 1636. Using the interactive resources

of computer technology, we follow imaginary voyages of three ships that leave England in 1633. [Each student is assigned to one of the ships, which are separated by a storm and therefore visit different destinations and experience different fates.] Sites include London's Globe Theatre, Benin, Barbados, Brazil, Mexico." The course was inspired by Yo Yo Ma's Silk Road project, and the website provides an incredible wealth of material from many different sources—music, art, literature, architecture, history, geography. With this kind of course in mind, it seems that the liberal arts could almost have been designed for sophisticated online learning, so far from being stale or fusty are these ways of knowing.

As a liberal arts education becomes more appealing to leaders and families in Asia and elsewhere in the world, it is losing ground in the U.S.

And this kind of education is more and more appealing to students and teachers at universities around the world. Donald Markwell, the warden of Rhodes House, recently gave a series of lectures in Canada, entitled "The Need for Breadth." He referred to a "surge of interest" in liberal education in "many other countries." He mentions new programs at the Universities of Melbourne and Western Australia, the Universities of Manchester and Warwick in the UK. He cites a major address in London by Yale's Richard Levin in which Levin noted that "Asian leaders are increasingly attracted to the American model of undergraduate curriculum," specifically because of the two years of breadth and depth in different disciplines provided before a student chooses an area of concentration or embarks on professional training. Levin described liberal arts honors programs at Peking University, Yonsei University in South Korea, and the National University of Singapore; he also referred to liberal arts curricula at Fudan University, Nanjin University, and the University of Hong Kong. In her recent book entitled *Not for Profit: Why Democracy Needs the Humanities*, Martha Nussbaum notes that she has been recently involved in discussions about creating a liberal arts curriculum in the Netherlands, Sweden, India, Germany, Italy, and Bangladesh.

Yet, as we know, the trends in the U.S. are in the opposite direction. And this is not just a recent problem. Louis Menand cites evidence that in the U.S., "the proportion of undergraduate degrees awarded annually in the liberal arts and sciences has been declining for **a hundred years**, apart from a brief rise between 1955 and 1970, which was a period of rapidly increasing enrollments and national economic growth." Thus, paradoxically, as a liberal arts education becomes more appealing to leaders and families in Asia and elsewhere in the world, it is losing ground in our own country.

At least three factors are at work in this decline: a) the creation of increasingly specialized disciplines, and the rewards for faculty members of advancing knowledge in those areas; b) the economic premium that is thought to reside in a highly technical form of preparation for careers; and c) a growing focus on graduate education from the early 20th century to the present day. These developments have clearly not been beneficial for American undergraduate education.

"Liberal education in crisis" is a tiresomely familiar theme, and countless commissions, reports, and study groups have attempted to address it. I am under no illusions that I have the magic key to resolve a problem that has stumped so many brilliant educators. But these questions are not just theoretical quandaries for you. They are the issues you confront almost every day: how do we defend liberal education against the skeptics—parents, potential students, the media, the marketplace, even some trustees and students?

Arguments for the liberal arts today

I will offer four arguments designed to defend the liberal arts (as distinct from vocational or narrowly pre-professional training) as the best education for undergraduates. I'll discuss these arguments in order from the narrowest to the most capacious, so you can take your pick depending on your audience or your personal preference.

The first, most practical defense: I would argue that the liberal arts (and sciences) are **the best possible preparation for success in the learned professions—**law, medicine, teaching—as well as in the less traditionally learned but increasingly arcane professions of business, finance, and high-tech innovation.

There are many ways to study any discipline; the subjects that make up the liberal arts curriculum are not themselves inherently liberal. As our colleague President Lynn Pasquarella of Mt. Holyoke has recently reminded us, one can study the humanities in a technical rather than a liberal fashion—narrow, esoteric, with no attempt to

broaden or challenge the mind to consider critically what one has learned. And one can also study biology or physics, political science or anthropology, even economics, in a more or less liberal fashion. So my first claim is that a liberal arts education, including a liberally oriented study of the natural and social sciences, *presents material in a context that will be much more useful to budding lawyers or physicians or venture capitalists* than a narrowly construed preparation in their "own field."

For example, if you study neuroscience with a sense of awe about the complexities of the human brain, and some attention to questions about what it means to be human, not just a technical focus on the darting neurons, or study biology with an awareness of the bewildering diversity and richness of our natural world rather than attending only to the way the molecules fit together, you will have a better background as a physician when you go to med school, or a scientist when you get your PhD Surely your bedside manner or your classroom techniques will also be much improved! And if you study some history and philosophy, you will be much better prepared as a lawyer or financier than if you study only law, or a narrowly construed pre-business program. Our eldest granddaughter Charlotte (a very happy although slightly chilly first-year student at Bowdoin College this year, and a prospective MD) is going to major in neuroscience, which is taught at Bowdoin in a way that surely engages critical thinking and liberal learning.

So my first defense of liberal learning is **what you are taught and the way you learn it: the materials a doctor or financial analyst or physicist or humanist needs to know, but taught in a liberally construed fashion,** so that you look at the subject from many different dimensions and incorporate the material into your own thinking in ways that will be much more likely to stay with you, and help you later on. There are several distinct advantages of this way of learning: it's *insurance against obsolescence*; in any rapidly changing field (and every field is changing rapidly these days), if you only focus on learning specific materials that are pertinent in 2012, rather than learning about them in a broader context, you will soon find that you have no use for these bits of knowledge and your training will have become valueless. Most important, with a liberal education you will have *learned how to learn*, so that you will be able to do research to answer questions in your field that will come up years from now, questions that nobody could even have envisioned in 2012, much less taught you how to answer. That's all part of the first defense!

The second, slightly less utilitarian defense of a liberal arts education is that it **hones the mind, teaching focus, critical thinking, and the ability to express oneself clearly both in writing and speaking**—skills which are of great value no matter what profession you may choose. It's not just that you are taught specific materials in a liberally designed context, but more generally, the way your mind is shaped, the habits of thought that you develop.

When I discussed this talk with Nancy Malkiel, a Smith graduate who was dean of the college at Princeton for 24 years, she told me a story that makes this point exactly. As dean, Nancy worked hard to create appealing incentives for students to major in some of the less frequented fields, to take the pressure off econ or poli sci. At Princeton's commencement last year, the mother of a student Nancy had advised, who had chosen quite happily to major in religion, accosted her and said: "Dean Malkiel, you told my daughter to major in religion and she still doesn't have a job!" Nancy gently pointed out that the young woman had graduated only a few minutes earlier and assured the mother that things would almost certainly work out. And sure enough, a few weeks ago the mother was riding a bike across the Princeton campus and stopped to say hello to Nancy, and said: "Guess what? My daughter did get a job! She was volunteering at a non-profit global organization and they were really impressed that she could write so clearly and elegantly, do research on any topic she was assigned to cover, assemble the evidence to make persuasive arguments, and analyze complex problems, so they offered her a job."

These are the skills a liberal arts education instills in us. They were well described by no less an authority than a former dean of Harvard Law School, Erwin Griswold, cited in a recent speech by Dean Martha Minow. Griswold was discussing an ideal vision of the Law School, but his arguments fit a liberal education wherever it is provided: "You go to a great School not so much for knowledge as for arts or habits; for the art of expression, for the art of entering quickly into another person's thoughts, for the art of assuming at a moment's notice a new intellectual position, for the habit of submitting to censure and refutation, for the art of indicating assent or dissent in graduated terms, for the habit of regarding minute points of accuracy, for the art of working out what is possible in a given time; for taste, for discrimination, for mental courage, and mental soberness." That's the second argument.

My third argument for a liberal arts education is that **a liberal arts education is the best education for citizenship in a democracy like our own.** In the book I cited earlier, *Not for Profit*, Martha Nussbaum points out that from

the early years of our republic, educators and leaders have "connected the liberal arts to the preparation of informed, independent, and sympathetic…citizens." Nussbaum argues that democracies need "complete citizens who can think for themselves, criticize tradition, and understand the significance of another person's sufferings and achievements." She lists the skills democratic citizens need: to "think well about political issues affecting the nation; to recognize fellow citizens as people with equal rights; to have concern for the lives of others; to grasp what policies of many types mean for the opportunities and experiences of one's fellow citizens; to imagine well a variety of complex issues affecting the story of a human life; to judge political leaders critically, but with an informed and realistic sense of the possibilities available to them; to think about the good of the nation as a whole, not just that of one's local group," and "to see one's own nation, in turn, as part of a complicated world order." These are the kinds of skills a liberal arts education fosters.

At a time when democracy is struggling to be born in countries around the world, and countries that have long enjoyed democracy are struggling to sustain it against pressures of multiple varieties, this may be the best of all the arguments for a liberal arts education. We need citizens who can think for themselves, who can assess arguments made by people who have a stake in a particular outcome, attend to nuances in difficult policy situations, and respect the interests and the dignity of others who are not like them.

The fourth argument for a liberal education, in addition to the way materials are presented, the habits of mind that are instilled, and the preparation for democratic citizenship, is even broader; it is in many ways my favorite of the four.

When I was at Wellesley and Duke, I occasionally used a memorable image at convocation as the new academic year began. With due credit, I borrowed it from Michel de Montaigne's 16th-century essay, "Of Solitude." Montaigne lived an active life in many ways, with family, friends, political positions, much travel; but he was exceptionally well aware of the importance of occasional solitude. Montaigne's favorite place for writing and reflection was the tower library on his estate in Southwestern France, to which he climbed by a series of narrow staircases reaching to the very top of his domain, with a view of the vineyards and grainfields, a ceiling carved with some of his favorite quotations, and lines of books and manuscripts around the shelves. If you visit his estate, you can still see that library and understand directly what his life was like.

Inspired by that beloved space, Montaigne used the arresting image of the "back room of the mind." He thought of his own mind as a kind of tower library to which he could retreat even when he was far from home, filled with quotations from wise people and experimental thoughts and jokes and anecdotes, where he could keep company with himself. He suggested that we all have such back rooms in our minds, and that the most valuable and attractive people we know are those who have rich and fascinating intellectual furniture in those spaces rather than a void between their ears. When I used this image I would counsel students to think of their college education as above all a way of furnishing the "back rooms of their minds." In this way, they would be much better conversationalists, so that their company would be sought out by others, rather than being regarded as a simpleton or a bore, and they would also be better prepared to relish solitude, whether they chose it or it was imposed on them.

Countless students and their parents have told me that they recalled that image of the "back room of the mind" many years afterwards and had found it helpful through many periods in their lives. Virginia Woolf used a different spatial image to make a similar point in her book *Three Guineas*, when she talked about the importance of cultivating taste and the knowledge of the arts and literature and music. She argues that people who are so caught up in their professions or business that they never have time to listen to music or look at pictures lose the sense of sight, the sense of sound, the sense of proportion. And she concludes: "What then remains of a human being who has lost sight, sound and a sense of proportion? Only a cripple in a cave."

One more spatial image in support of this fourth argument, from a recent speech by my successor as president of Duke University, Richard Brodhead. Dick Brodhead is an eminent scholar of American literature and strong proponent of the liberal arts. He spoke of the human capacity to "make things that outlive their makers," and he asserted that as we make or enjoy such things, "we go out in spirit toward the works of others." Humans have the distinctive ability, he continued, "to exit the confines of our own experience and take up mental residence in spaces created by others." And when we do so "with sufficient intensity of feeling, we in turn have a chance to be changed. This is the way we annex understandings that have been struggled toward by others that we would never have reached on our own. This is how we get to see the world differently from the way our own minds or culture habitually present it."

One example here: in addition to neuroscience, my Bowdoin granddaughter Charlotte is also planning to

concentrate in art history, a passion that she never knew she had until she got to Bowdoin and discovered the excellent museum, fine arts department, and engaging colleagues. Although there are good art works in her home, no one in her family is an artist, so this is not something she cared much about as she was growing up; instead, it's a newly discovered personal dimension that will enrich her life immeasurably going forward. And that's my fourth argument for a liberal arts education: furnishing the back room of your mind, preparing yourself for both society and solitude.

My final argument for the liberal arts will resonate with many of you in this gathering, although it is unlikely to convince the skeptics. This is the argument that **a liberal arts education admits you to a community of scholars, both professional and amateur, spanning the ages.** Here I would quote one of my predecessors as president of Wellesley, Alice Freeman (later Alice Freeman Palmer). When she presided over Wellesley in the last part of the 19th century, it was quite unusual for girls to go to college (as indeed it still is today in some parts of the world). She gave a well-known speech to answer the repeated question she got from girls and their families, "Why Go to College?" Alice Freeman said: "We go to college to know, assured that knowledge is sweet and powerful, that a good education emancipates the mind and makes us citizens of the world." The sweet and powerful knowledge imparted by a liberal arts education is specifically designed to fulfill this promise, as no other kind of education can be: it emancipates the mind, and makes us citizens of the world.

Alice Freeman Palmer's phrase "citizen of the world" has impeccable liberal arts credentials. It was first coined by Plutarch to describe Socrates. Martha Nussbaum published a book with that title in 1997. And it nicely loops back to my third and fourth arguments: liberal knowledge, sweet and powerful, broadens our perspective beyond the narrow confines of our own experience, and makes us good citizens not just of our countries, but of the whole world. As the time-honored phrase used by the presidents of several colleges and universities in conferring the baccalaureate degree would have it, "I welcome you to the company of educated men and women."

So, five nested arguments for the liberal arts: a) providing the "deep background" materials people need for their professions and business occupations, in a long-term, capacious fashion rather than a narrowly technical immediacy that will quickly become obsolete; b) honing the mind with skills that are useful in any profession, and any life; c) preparing us well for citizenship in a democracy; d) furnishing the back room of the mind; and admitting us to a community of learned and curious men and women, making us better citizens not only for our communities and our country, but the world.

Presidential leadership

Armed with these arguments and others you will devise or read about, how do you, as a college president, go about making the case for the liberal arts? What tactics should you use? Here's an especially delicious quote from President Emeritus of Whitman College Tom Cronin, who notes that "effective leadership remains in many ways the most baffling of the performing arts. Intuition, flare, risk-taking, and sometimes even theatrical ability come into play." This point really resonates for me, as I'm sure it does for some of you as well. Leadership is itself an art, and to make the case for the liberal arts you should be quite ready to use your personal flare, intuition, theatrical ability, and even take some risks. Don't feel you have to confine your arguments to sober and conventional arenas. However, you also have to be savvy and cagey, or your theatricality can backfire; as Cronin says, this is a particularly baffling kind of art.

In my book *Thinking about Leadership*, I define a leader as follows: "Leaders determine or clarify goals for a group of individuals and bring together the energies of members of that group to accomplish those goals." Leaders do this in all kinds of groups, from the most informal committee to the largest nation state. The responsibilities of the president of a college or university are among the weightiest of the forms of leadership. If you take my definition as one guide to action, you can think of your role as a presidential leader in this way: you are clarifying what a liberal arts education means for your college (and the world), and galvanizing the energies of the faculty and trustees and student leaders to pursue that goal. In fact, one of the primary responsibilities for you as president of a liberal arts college is to support the liberal arts, which are basic to the historic mission and

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by Mary Sue Coleman,
President of the University of Michigan

Can We MEET *the* CHALLENGE?

Research universities must become more agile, collaborative, global in focus, and open to risk.

Editor's Note: *A version of this article originally appeared in* TIME*, October 7, 2013.*

How will it feel to become a second-class nation? Inferior in technological innovation, second class in artistic creativity, a follower rather than a leader? This is possible—not certain—but a very real danger if the United States continues on its present course.

The United States can claim 35 of the world's top 50 research universities, but we face intense competition from other nations that see the economic advantage of strong research universities.

The U.S. share of global research spending declined from 39 percent in 1999 to 34 percent in 2010 and is expected to keep falling, according to a 2012 report from the National Academy of Sciences. While the growth in U.S. spending on R&D is increasing by 3.2 percent per year, China is escalating its investment at six times that rate (20 percent), and other nations are expanding advanced education on a scale mirroring that of the United States in the last century.

Moreover, we now see a reverse of the "brain drain" that brought so much talent to our shores. Four in 10 students pursuing science and engineering doctorates at U.S. universities are from other countries. Many of them who once would have chosen to live in America now plan on returning home because they see a bright future for their scientific work there, and U.S. immigration standards impose barriers to retaining this trained talent.

This might not be so worrisome if U.S. undergraduate enrollment in math and science fields could meet our long-term need for research scientists. We know it cannot. Only a small fraction of our undergraduates study the natural sciences or engineering compared with near majorities in Singapore, China, and France.

While in earlier times, our country rallied around science, education, and advanced learning, today these are not national priorities. We confuse the prevalence of modern technology with national strength in science. But the core of technology, as well as other advances, is science. Nations on the rise see support of research universities as an investment in the future; unfortunately, many Americans speak of it only as a cost.

Vigorous concerted action to support basic research is paramount in contemporary America. Putting a man on the moon was extraordinary but relatively simple compared with tackling global climate change, for example. Recognizing the complexity of the problems we face augurs the capacity to solve them—as a nation and as global citizens.

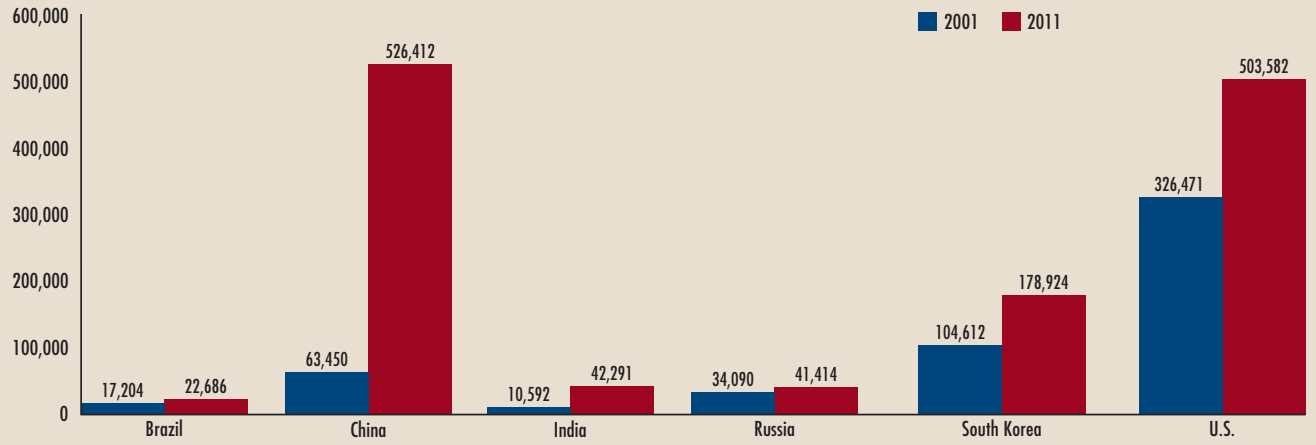
No other American institution rivals higher education's commitment to discovering and sharing knowledge at its most basic level. At the research university I lead, we have developed powerful partnerships regionally and internationally to benefit our state and the larger world.

The University of Michigan, Michigan State University, and Wayne State University, all public universities, began collaborating in 2006 by forming the University Research Corridor (URC) to leverage the tremendous strengths of our scientists. Today the URC ranks among the country's top university research regions.

The University of Michigan is also working with Qatar University to conduct social science research in Gulf states; with the University of Ghana to train OB/GYNs to be experts in family planning; and with the University of São Paulo to better understand adrenal cancer's prevalence in Brazil.

For U.S. universities to maximize

Number of patent applications from leading countries in 2001 and 2011



SOURCE: THOMSON REUTERS DERWENT WORLD PATENTS INDEX, APPEARING IN THE CHRONICLE OF HIGHER EDUCATION ALMANAC, 2013-14

their strengths, we must be decisive, creative, agile, and inclusive. That means:

■ **Supporting a culture of risk-taking.** Faculty seeking grant funding often must demonstrate how a project might be directly applicable to a practical advance. But the most creative and novel studies—the ones that often do lead to breakthroughs—can sometimes be stymied. We must ensure that our best minds have the support to follow innovation wherever it leads. At Michigan, for example, we're committing $100 million for medical researchers to conduct novel science in a "fast forward" manner.

■ **Intensifying interdisciplinary research.** Advances in medicine, for instance, will depend on combinations of biology, nanotechnology, information sciences, and engineering. When Michigan pledged $30 million to hire 100 junior faculty members—during the depths of the recession—the qualification was that scholars work in teams, across boundaries, to tackle society's thorniest problems. Emerging combinations will yield unimaginable discoveries that will improve lives.

■ **Expanding our reach by offering a high-quality, affordable education,** not only for low-income students but also for students from middle-class families who face hardship owing to the recent recession. Widening our doors develops the talents of all of our citizens, including bringing more exceptional students into STEM fields.

■ **Spending public money efficiently,** encouraging greater philanthropic support, and ensuring that students complete degrees in a timely manner can motivate taxpayers, corporations, foundations, and state and federal governments to strengthen their support for our endeavors.

■ **Ensuring that strong undergraduate teaching is part of the larger research continuum.** At Michigan, we emphasize that research and teaching are not antithetical; we are proud of the fact that we are one of the great universities of the country, distinguished in both teaching and research, and that we help create the next generation of leaders, scientists, and an educated citizenry.

Now more than ever, the research university must provide a thriving culture for entrepreneurs and risk takers whose discoveries will help us meet today's challenges and position ourselves to meet tomorrow's. ■

Number of foreign-born students enrolled in graduate science and engineering programs in the U.S. (based on country of residence) in 2009

1.	India	61,420
2.	China	42,440
3.	South Korea	10,120
4.	Taiwan	6,530
5.	Turkey	3,480
6.	Canada	3,120
7.	Other countries	45,160
	Total	**172,270**

SOURCE: NATIONAL SCIENCE FOUNDATION

Top 10 U.S. doctoral institutions with most foreign students, as of 2012

1.	University of Southern California	9,269
2.	University of Illinois at Urbana-Champaign	8,997
3.	New York University	8,660
4.	Purdue University	8,563
5.	Columbia University	8,024
6.	UCLA	6,703
7.	Northeastern University	6,486
8.	University of Michigan at Ann Arbor	6,382
9.	Michigan State University	6,209
10.	Ohio State University	6,142

SOURCE: INSTITUTE OF INTERNATIONAL EDUCATION

by John Etchemendy,
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Are Our Colleges and Universities FAILING US?

Few days pass by without an article appearing in a major newspaper or magazine highlighting a failure of one sort or another on the part of American colleges and universities. Many focus on very real financial concerns surrounding the rising cost of higher education in the U.S. Average tuition costs have gone up faster than the rate of inflation since the early 1980s, and this creates legitimate concern about the continued affordability of a college education for today's young people. The cost of college today is, in inflation-adjusted terms, roughly double what it was in 1980.

Few of these articles take a deep or serious look at the reasons for this increase. Many reporters (and their editors) seem satisfied with superficial explanations that point to a lavish new dorm at one college or a new recreation center (with obligatory climbing wall) at another.[1] They don't stop to think how rare and recent these collegiate Taj Mahals really are, or what a tiny fraction of a university's budget—which is dominated by salaries, not debt payments on a new rec center—they represent. Though they may make for an attention-grabbing story, they can hardly explain a 30-year trend that has affected costs at even the most pedestrian of college campuses.

In fact, the rate of increase in the cost of higher education for the past 30 years has exactly matched the rate of increase in the cost of dental services, legal services, and, for most of those years, physician services.[2] What dentists, lawyers, and physicians have in common is that they are highly educated service providers whose industries have not yet been transformed by efficiency gains brought about by new technology. It still takes one dentist about 20 minutes to fill one tooth, and although the filling is probably far better than it was 30 years ago, the dentist still needs to be paid for that 20 minutes. Just so, it still takes one professor an hour to teach a one-hour class to 40 students. Sure, classes could all be doubled or tripled in size to achieve greater efficiency, but colleges, students, and parents all recognize that this entails a sacrifice in quality. Ironically, the most commonly cited measure of educational *quality*, student-faculty ratio, can also be viewed as a measure of *inefficiency*.

Every service industry that has not benefited from sweeping efficiency increases and that relies on highly educated service providers is subject to the same economic forces.[3] And the result has been a similar, long-term cost profile in each of these industries. Fancy dorms and climbing walls are not the cause of the problem. Would that they were, since that would make the solution easy. As it is, finding a more efficient way to deliver a truly high-quality college education is extremely difficult, but is the only way to solve the cost crisis in higher education. Many promising experiments are now going on, including so-called "MOOCs," massive open online courses, but it remains to be seen whether these or related technologies will yield high-

[1] *See, for example, "U.S. Colleges Get Swanky: Golf Courses, Climbing Walls, Saunas,"* Bloomberg News*, June 24, 2005; "Resort Living Comes to Campus,"* The Wall Street Journal*, December 6, 2012; "Oh, So That's Why College Is So Expensive,"* Forbes*, Aug. 28, 2012; "Climbing costs strain colleges, families: Schools add amenities, expand to compete for students,"* Baltimore Sun*, May 12, 2009. For an excellent discussion of how little these amenities have actually contributed to college costs, see* Climbing Walls and Climbing Tuitions*, Rita Kirshstein and James Kadamus, The Delta Cost Project, American Institutes of Research, 2012.*

[2] *For an excellent and careful analysis of the rising college costs, see* Why Does College Cost So Much? *by Robert Archibald and David Feldman, Oxford University Press, 2011.*

[3] *See Archibald and Feldman (2011) for a discussion of these forces. They argue that there are two main reasons costs for these services increase faster than the consumer price index (CPI). First, industries that show significant efficiency gains (such as manufacturing) tend to pull down CPI, and so those that do not show comparable gains (in this case, service industries) become more expensive* relative to CPI*. Second, as wages for highly educated workers increase relative to less educated workers (largely due to increases in technology), the cost of services requiring highly educated providers further outpaces overall inflation. These two factors explain a large part of the increase in college costs, though there are clearly other factors at work as well, including significant increases in instructional and support services provided on most campuses today.*

quality substitutes for significant parts of the undergraduate curriculum.

Efficiency gains result from price competition, and U.S. colleges and universities, while highly competitive, have traditionally competed on the basis of quality, not price. This leads to fierce competition for high-quality faculty and creates pressure to *decrease* rather than increase the student-faculty ratio. It also leads to expansions of non-instructional staff to provide new and improved services to both students and faculty, and has pushed some campuses to upgrade their dorms and recreation centers—in a few cases, to extremes. But the key cause of the cost crisis is the basic economic fact described above. Unless we find a way to deliver a college education in a substantially more efficient fashion, its growth in cost will continue to outpace inflation.

There has also been a great deal of focus on the related issue of growing student debt. There is no question this is an increasing problem. But again, few articles have given it the careful treatment it deserves, opting instead to highlight stories of students borrowing over a hundred thousand dollars to finance their bachelor's degree. But these examples are extremely rare. Indeed in 2007-08, the median debt nationwide of graduating seniors at non-profit colleges and universities was roughly $10,000 and 36 percent graduated with no debt at all. Thanks to financial aid, at Stanford, as at many of the "most expensive" universities in the country, the *median* debt of graduating seniors is zero (three-quarters graduate with no debt at all) and the *average* indebtedness of a graduating senior is less than $5,000.

The story is more sobering at for-profit colleges, where less than 10 percent of students have no debt when they graduate and 60 percent have debt of more than $30,000.[4] Since these institutions disproportionately serve lower-income students, these levels of debt can leave their students in severe financial straits. Still, for-profit colleges educate a relatively small segment of the overall student population, though the segment is rapidly growing.

Many people were shocked when total student debt exceeded the nation's cumulative credit card debt. This certainly deserves a story, but also warrants some thoughtful analysis. For example, not a single commentator has pointed out that this increase coincides with nationwide changes in consumer spending habits. College has long been an expense that families spread over many years. At one time, it was common to build college savings accounts in anticipation of eventual tuition bills. Now, college savings have become less common, only to be replaced by additional college debt.[5] These are simply alternative strategies for spreading tuition costs over multiple years. And, like it or not, the substitution of debt for savings has become the preferred method for making most major purchases, whether of a refrigerator or a college education. Layaway plans and college savings accounts have given way to credit cards and college loans.

Most economists agree that, other things equal, a higher savings rate is healthier than increasing consumer debt. But setting that aside, how concerned should we be that educational debt now exceeds credit card debt? As consumer choices go, I could imagine much worse decisions than spending more on college education than on current consumption. At least college is an investment in the future.

None of this is to say that the cost of college and the magnitude of college debt are not real concerns. They are, and they pose a serious threat to the accessibility of college for an increasingly large portion of our populace. But no progress will be made on either issue without understanding what is really going on. As in medicine, treatments based on faulty diagnoses are often far worse than no treatment at all.

The value of a college education

The most deeply troubling charge leveled at U.S. colleges and universities concerns the value of the education they provide their students. It has long been assumed that a college education yields significant benefits both for the individual who receives the education and for the nation as a whole. It has become a platitude that a college degree is needed to successfully compete for a job in the so-called "knowledge economy," and that *national* competitiveness increasingly depends on the proportion of our population who receive post-secondary educations.

But even this has been challenged in recent years. Some of the challenges are as superficial as articles attributing the college cost crisis to lavish dorms. For example, investor Peter Thiel generated great fanfare by launching a scholarship program that pays high school graduates *not* to go to college, but to launch businesses instead. This is based on his hunch that a college education does not improve one's entrepreneurial skills, and so for these students would be a waste of time.

Thiel's hunch ignores a great deal of evidence to the contrary. Indeed, even commonly cited entrepreneurs who launched successful companies

[4] *National Postsecondary Student Aid Study (NPSAS), 2007-2008, cumulative borrowing by sector, http://nces.ed.gov/surveys/npsas/xls/B9_CumDebtLumpSectorBA08-09.xls.*

[5] *According to a recent Moody's investor report, in just the last three years, the proportion of families with any college savings dropped from 60 percent to 50 percent, and those who saved set aside an average of only $11,781, down from $21,615 three years ago. (Moody's Investor Service, March 12, 2013.)*

before completing college often developed the core ideas, found their partners, and did initial development work while still in college. The fact that the diploma itself was not a key to their success hardly detracts from the benefits, educational and otherwise, that they derived from their college experience. And of course, the reality is that the vast majority of young people would be ill advised to gamble their future on a high-risk entrepreneurial venture, just like most would be ill advised to bet on becoming a movie star.

Of far more concern are reports from employers that college students are graduating without the skills needed to succeed in the workplace. Now, a college education is not job training, at least in the narrow sense, and was never intended to be. But it most certainly should equip students with general knowledge, skills, and habits of mind that provide the foundation for productive employment. If colleges are failing at this basic task, then students and parents are right to ask whether they get their money's worth from high tuition, and taxpayers are right to question whether the government should continue subsidizing student loans.

Of course, complaining about perceived or imagined failings of the younger generation is nothing new, so isolated reports from employers are hardly evidence that the college degree stands for less now than it did twenty, thirty, or fifty years ago. There have always been plenty of students who made it through college without much growth in practical skills to show for it. This prompted Henry Ford, as far back as 1934, to comment, "A man's college and university degrees mean nothing to me until I see what he is able to do with them." Ford was a great supporter of education, but as his remark shows, he did not view the degree as an iron-clad guarantee of anything.

Still, while anecdotal reports may not be good evidence, it is extremely important to ask whether American colleges and universities are producing graduates with the kinds of skills needed in the modern workplace. This is why few books about higher education have received as much attention, either in the popular press or among policymakers, as *Academically Adrift: Limited Learning on College Campuses*, by Richard Arum and Josipa Roksa.

In this book, Arum and Roksa present the results of an extensive study of students at a large and representative sample of U.S. colleges and universities. Based on these results, they argue that a large proportion of students at today's colleges and universities show little or no improvement on the key reasoning and communication skills expected of a college graduate and demanded in today's employment marketplace. They conclude that all too many students, as well as the colleges they attend, are "academically adrift."

The picture Arum and Roksa paint is a sobering one:

> *An astounding proportion of students are progressing through higher education today without measurable gains in general skills as assessed by the [Collegiate Learning Assessment test]. While they may be acquiring subject-specific knowledge or greater self-awareness on their journeys through college, many students are not improving their skills in critical thinking, complex reasoning, and writing.*[6]

The Collegiate Learning Assessment test, or "CLA" as it is widely known, is a standardized test designed to measure general competencies in critical thinking, analytical reasoning, problem solving, and writing. These general skills are widely considered by both employers and educators to be among the most important workplace skills, and enhancing them is universally recognized as one of the primary goals of a college education. The most widely cited conclusion drawn by Arum and Roksa from their data is that 45 percent of the undergraduates studied showed no measurable gains in these crucial skills.

This would be a devastating indictment of the higher education system in the U.S.—if it were correct. It turns out, though, that the evidence presented by Arum and Roksa falls far short of justifying the sweeping claims made in their book, as I will eventually explain. But before looking at the details of the study, it is important to pause and review some powerful, general reasons to approach their conclusion with a healthy degree of skepticism. Chief among those reasons are certain basic economic facts that are well known but rarely appreciated for what they show. The first of these is the wide and growing discrepancy between the earnings of college graduates and the earnings of those who do not go to college.

The college premium

We all know that, on average, college graduates earn more than those who do not go to college. Indeed, according to a recent study by Daron Acemoglu and David Autor, the *college premium*—the difference between the earnings of the average college graduate and the average high school (only) graduate—stands at record levels. They

[6] Academically Adrift: Limited Learning on College Campuses*, Richard Arum and Josipa Roksa, Chicago (2011), p. 36.*

calculate that the "earnings of the average college graduate in 2008 exceeded those of the average high school graduate by 97 percent."[7] In other words, college graduates on average earn nearly twice as much as those who do not go to college. There is little question that this is the largest college premium in history, and certainly the widest gap since comparative wage data became available in the early 20th century.

Other authors, using very different methodologies, come to similar conclusions. For example, while the figure cited above averages the earnings of all college graduates, including those with advanced degrees, Carnevale, Rose, and Cheah estimate that the projected median lifetime earnings of those with a baccalaureate degree alone are 74 percent higher than the earnings of those with just a high school degree.[8]

Perhaps more interesting, these authors find a college premium in almost every line of work, even those that do not require a college degree. For example, food service managers and retail salespersons—occupations open even to those with no high school diploma—benefit from a college education: in these professions, workers with a bachelor's degree earn between 50 and 65 percent more than those with only a high school diploma. Other professions show more modest benefits from the college degree, such as stock clerks, waiters, and security guards. In these professions, the college premium ranges from 18 percent (stock clerks) to 45 percent (security guards). Rare is the occupation that exhibits no college premium at all: mail carriers, carpenters, and truck drivers are among the few lines of work where a college education does not, on average, increase an individual's earnings.

In another study, Zaback, Carlson, and Crellin arrive at similar figures for the overall college premium, but also look at the premium for different college majors and in different states of the union.[9] They find that the magnitude of the premium varies by major (a science and engineering major earns a 95 percent premium, while an arts and humanities major earns 55 percent), and by state (ranging from a 40 percent premium in South Dakota to 88 percent in California). But there is no combination of major and state that does not see a wage premium for a baccalaureate degree.[10]

If it is true that almost half of today's students show "no measurable gains in general skills" as they proceed through college, then how can we account for the large and growing discrepancy between the incomes of those with and without a college degree? Why are employers paying so much more for employees who have graduated from college, even in lines of work where the degree is not a requirement for entry and even for majors that provide no directly relevant job training?

Of course, raw economic data do not prove causality, only correlation. But assuming we can rule out some kind of mass delusion on the part of the employers of America, there seem to be only two possibilities: The first is that employers are rewarding something *other than* skills that are gained or improved during college, perhaps general intelligence, persistence, or some other characteristic not substantially affected by the college experience. The only alternative is that employers pay the substantial wage premium at least in part for traits and skills that are acquired or honed during college.

Is college a passive filter?

Let's consider the first possibility. Some people have claimed that the main benefit of a college degree is that it signals a set of abilities and traits that graduates *bring* to college, not characteristics they acquire while they are there. On this hypothesis, colleges play a primarily *sorting* or *filtering* role, and employers simply rely on this filter when they seek highly skilled workers. Employers are paying a premium not for how the college experience has molded or transformed prospective employees, but rather, so to speak, for the raw material, the preexisting traits that led to their original admission and eventual completion of the college degree.

It is important to ask whether American colleges and universities are producing graduates with the kind of skills needed in the modern workplace.

This hypothesis does not stand up to scrutiny, for a number of reasons. Consider first the signal sent by college admission. College admission, at least

[7] *"Skills, Tasks and Technologies: Implications for Employment and Earnings," Daron Acemoglu and David Autor,* NBER Working Paper No. 16082 *(2010), p. 7.*
[8] The College Payoff: Education, Occupations, Lifetime Earnings*, Anthony P. Carnevale, Stephen J. Rose, and Ban Cheah, Georgetown University Center on Education and the Workforce (2011), p. 4.*
[9] The Economic Benefit of Postsecondary Degrees: A State and National Level Analysis*, Katie Zaback, Andy Carlson, and Matt Crellin, State Higher Education Officers Association (2012).*
[10] *Among standard baccalaureate majors, the lowest premium is 27 percent for social and behavioral science majors in New Hampshire and South Dakota.*

to highly selective institutions, no doubt signals something about the individual admitted. Admission to a selective college is, after all, a filter. But employers could easily replicate this kind of filter themselves, by requiring that applicants supply the same material required by college admission offices—SAT scores, high school records, and so forth. For that matter, they could employ former college admission officers to assist in their hiring. Alternatively, they could begin recruiting freshmen who have already been admitted to a selective college, rather than waiting until they finish their degree. This is basically what professional sports leagues do, hiring players as soon as league rules allow.

If the degree were simply a signal of traits students bring to college, not a mark of what they get while there, then at [highly selective] colleges, we should see employers recruiting students as soon as they are admitted.

The example of professional sports leagues is instructive. This is a case where employers are indeed primarily interested in traits the student athlete brings to college, rather than skills they acquire during their college experience. To be sure, college athletes further develop their athletic skills while playing at the college level. But for the most part, professional coaches are just as equipped as college coaches to give young athletes the necessary training and experience in their sport. The college degree itself, and the *academic* accomplishments it signifies, are irrelevant to their hiring decisions.

And what is the consequence of this situation? Put simply, the frequency of college degrees among professional athletes is *directly proportional* to the restrictiveness of the league rules governing rookie hiring. Major League Baseball has the least restrictive rules, allowing recruitment directly out of high school. As a result, a total of 39 MLB players who played in a major league game last year—roughly 4 percent—had college degrees.[11] The National Basketball Association is slightly more restrictive; its "one and done" rule allows recruitment after a single year of college play. Roughly 20 percent of NBA players have college degrees. The National Football League has the most restrictive rules, and also the highest proportion of college graduates among its players. Approximately half of NFL players have completed a baccalaureate degree.[12]

Although there is no source of data to prove or disprove this, it is probably the case that among professional athletes, the college premium is actually *negative*: those with a college degree very likely have lower salaries on average than those without. This would be a predictable result of the fact that the most prized and talented athletes are recruited out of college long before they have a chance to finish their degrees. Less talented athletes, those not lured by early, highly lucrative recruitment offers, have more time to complete their degrees.

If employers were primarily using college as a signal of general intelligence, plus perhaps the ambition to apply and get into a selective college, then we would expect to see much more hiring behavior like professional sports leagues. But such early recruitment is virtually unheard of in any other profession.

It is also important to recognize that the prior discussion assumes that college admission is selective. But in fact, most college students do not attend schools whose admission is highly selective, and the college premium that needs to be explained is not limited to alumni of those institutions. It measures the *average* wage benefit across graduates of *all* colleges and universities. So the hypothesis that employers are using college *admission* as a filter is doubly flawed: it does not stand up to scrutiny for selective colleges, and even if it did, most college admission is not highly selective.

Of course, it might be that the signal employers are looking for is not *admission* to college but the fact that the individual persisted in pursuing a four-year degree. This is another way in which college acts as a filter: graduates were not only admitted, they also stuck with the college project for four long years. This requires a certain level of ability, commitment, and motivation that would certainly interest most employers.

Now we should be careful to remember the hypothesis we are considering. Obviously, a bachelor's degree *does* signal, among other things, the ambition and persistence required to finish the degree. There is no debate about

[11] *"College Grads in Baseball a Rare Breed," Jon Paul Morosi,* Fox Sports*, May 18, 2012, http://msn.foxsports.com/mlb/story/curtis-granderson-college-grads-in-baseball-a-rare-breed-051712.*

[12] *"N.B.A. Players Make Their Way Back to College," Jonathan Abrams,* The New York Times*, October 5, 2009, http://www.nytimes.com/2009/10/06/sports/basketball/06nba.html.*

that. The question is whether employers pay a premium *only* for a graduate's preexisting character traits, and not for skills and traits that are developed and improved due to the college experience. In other words, is college more like the TV show *Survivor*, with the college degree awarded to those who are motivated and talented enough to complete a sequence of otherwise pointless tasks?

Again, both salary data and employer behavior suggest otherwise. For example, if the college premium were primarily rewarding character traits like diligence and tenacity, traits that may well be indicated by a college degree, then we would expect individuals who enter college but *fail* to complete a degree to suffer a penalty compared to those who complete high school but choose to enter the employment market immediately. After all, the former individuals have proven that they *did not* have the required diligence and tenacity to complete the college project on which they embarked. But in fact the data point in the opposite direction. Individuals who begin college but fail to complete any degree still enjoy a 20 percent wage premium *above* high school graduates who go directly into the work force. This is exactly what we would expect if the premium actually rewards skills improved during college, not the persistence required to finish a degree.[13]

Moreover, there are many other ways to demonstrate persistence and diligence. The most simple and obvious is to hold down a job for several years. Indeed, holding down a job is a significantly *better* signal of the ability to hold down a job in the future than having gotten through college. Other things equal, the more similar the evidence, the better the predictive power.

To the extent that a baccalaureate degree is simply a mark of diligence and persistence, we would expect employers to reward equally their more experienced employees. And yet the average high school graduate with five or even ten years of employment experience still does not earn close to what the average college graduate earns, even with little or no experience. This is hardly surprising. After all, an excellent high school record plus four years of diligent work experience does not qualify you for the kinds of jobs and pay levels open to those with a similar high school record plus a college degree. Yet that is exactly what we would expect if the pure "sorting and filtering" model were accurate.

Consider one final piece of evidence. A number of colleges and universities, particularly the most selective, have graduation rates well above 90 percent. Students admitted to these colleges not only have outstanding high school records, they are also virtually guaranteed to graduate. If the college degree were simply a signal of abilities and traits students bring to college, not a mark of what they get while there, then at least at *these* colleges, we should see employers recruiting students as soon as they are admitted. They have already demonstrated the intelligence and ambition required for admission to the most selective schools, and their eventual graduation is almost a sure bet. Why wait four years to hire them, when they could be spending those years productively employed? And yet, once again, outside of professional sports, no employers choose to do this.

The economic data

Clearly, there is strong evidence against the hypothesis that college serves merely as a filter, that employers are interested primarily in the raw material, not how that material has been molded or transformed by the college experience. It would be extremely hard to explain employer behavior if they are not rewarding traits and skills that students obtain or improve during their time at college. Given that fact, what are we to make of the economic data surrounding the college premium?

As any economist will tell you, the college premium is a measure of the value employers place on the skill (and consequent *productivity*) differential between college graduates and those with lower levels of education. Thus the college premium can be affected by a number of different factors. Traditional economic theory focuses on the relative supply of and demand for the skills represented by a college degree. For example, it is well understood that the relative demand for highly skilled labor increases as technology transforms the workplace. Technology tends to decrease the need for large numbers of unskilled laborers, but also requires more highly skilled workers to implement, operate, and maintain. Recent history has seen a large increase in technological innovation, and this in turn has increased the relative demand for skilled over unskilled workers.

The other side of the economic story is the relative supply of the skills in question: are there enough educated workers in the workforce to meet the demand, or too few or too many? In the U.S., the supply of college graduates has continually increased since the 1950s, though the *rate* of increase has not been constant. The increase was quite rapid during the late '60s through the '70s, but slowed down during the '80s and

[13] *Carnavale, et al., p. 3. Note that these are all, by definition, individuals who are in occupations that do not require a college degree. These occupations tend to be lower paying and also have smaller college premiums. For example, security guards with a baccalaureate degree earn about 45 percent more than those with only a high school degree, while those with some college but no degree earn about 20 percent more than those with only a high school degree. This explains why the premium for some college but no degree is only slightly more than a quarter of the premium for a baccalaureate degree.*

’90s. And as it turns out, the college premium actually *decreased* from 1970 to 1980, no doubt because the rapidly growing supply of college graduates outpaced any increase in demand. Since 1980, however, the college premium has steadily grown, thanks to a combination of increasing wages of college graduates and decreasing wages of those with only high school degrees.[14] From 1980 to the present, the college premium in the U.S. has almost doubled.

There is another factor, besides the aggregate supply and demand for skilled labor, that can affect the college premium. Remember that the college premium measures the relative wages of college and high school graduates. But of course, employer demand is for *workforce skills*, not *diplomas*. As we said earlier, the premium is a measure of the value employers place on the *differential skills* of these two groups of workers. But that differential could change. For example, suppose there came a point where there were *no* differences in the skills of a college graduate and a high school graduate. Very quickly, the *college* premium would trend toward zero. There would still be differential demand for workers with different skill levels, but if the college degree no longer indicated a higher level of skills, employers would not be willing to pay a premium for those who hold the degree.

This introduces a layer of complexity, but an extremely important one, to the college premium. After all, the relative skills of high school and college graduates—and hence the underlying value to employers—could change if there were significant changes in the educational effectiveness of either high schools or colleges. For example, if the average skills of students graduating from high school dropped while those of college graduates remained roughly the same, then we would expect the *relative* value of college graduates to increase, even though their *absolute* skill level remained the same. On the other hand, if the skills of college graduates dropped while those of high school graduates remained the same, we would see the college premium decline. The gap in skills is what matters, and if this grows or shrinks, so too will the college premium.

The central question raised by Arum and Roksa in *Academically Adrift* is whether U.S. colleges have in recent years become less effective in imparting important workplace skills to their graduates. To put this important question another way, has the skill differential between high school graduates (the “raw material” entering college) and college graduates (the output) decreased?

At first glance, it is hard to square such a decrease with the economic data, with the continued growth in the U.S. of the college premium. Other things equal, a decrease in the skill differential should result in a *shrinking* of the premium, not continued growth. But of course, other things are not equal: changes in either the supply of college graduates or the demand for their skills might disguise changes in the skill differential represented by a college degree.

Now as we mentioned earlier, the relative supply of college graduates in the U.S. has continually increased during the postwar period, including in recent decades. Other things equal, this would also lead to a decrease in the college premium, and so would accentuate, not counteract, a decline in the college skill differential. So the only potentially confounding factor is *changing demand* for skilled labor. In particular, if demand for skilled workers has increased enough, then desperate employers might pay more for college graduates even if there are more of them available and the incremental skills they each bring to the workplace have gone down.

This seems fairly unlikely, but is hard to rule out entirely without a direct gauge of changing U.S. demand for skilled labor, one that is independent of the college premium itself. But no such measure is available. We can, however, learn something by looking at international data. Since the workplace technology driving today’s demand for skilled workers is cheap and widely available in the developed world, it is reasonable to assume that there is approximate parity in the demand for a skilled workforce in other highly developed economies. So it is instructive to look at the college premiums paid in other developed countries.

Unfortunately, systems of secondary (high school) and tertiary (college) education vary a great deal in different developed countries. In some countries, such as the United Kingdom, secondary education goes further while the first college degree is more specialized than in the U.S. In other words, much of what is covered in the first year or so of college in the U.S. is already covered in secondary schools in the U.K. Conversely, college education in the U.K. roughly matches the last two or three years of a U.S. college degree. The overall target is approximately the same, but the secondary/tertiary division of labor is somewhat different.

Because of these differences, there are fewer confounding variables if we look at the premium paid for college graduates compared to *unskilled* or *minimally skilled* workers, that is, individuals who did not complete their secondary (high school) education. It seems reasonable to assume that the skill levels of workers who have

[14] *See Acemoglu and Autor (2010), Figures 1-4.*

not completed high school, at least in economically developed countries, are fairly similar. Accordingly, let's compare the labor cost of a college graduate to the labor cost of an unskilled or minimally skilled worker in the 34 countries that make up the Organization for Economic Cooperation and Development (OECD).[15] The labor cost is the annual cost to the employer of hiring such a worker, including wages, benefits, and other mandatory costs. It is the best measure of what employers are willing to pay for different levels of skill.

The ratio of the average labor costs across all 34 countries is 1.8. In other words, on average employers are willing to pay 1.8 times as much for a college graduate as they are for an unskilled worker. In the U.S., unskilled workers cost employers an average of $35,700, very close to the overall OECD average of $37,900. But a college graduate costs an employer $92,900, 2.6 times the cost of an unskilled worker. There are only four OECD countries whose cost ratios equal or exceed 2.6: the Czech Republic (2.9), Hungary (2.9), Poland (2.8), and Slovenia (2.6). In each of these countries the relative *supply* of college graduates is among the lowest in the OECD, which accounts for their high ratios. By contrast, in countries where the supply of college graduates is similar to the U.S., the labor cost ratio is substantially lower than ours.[16]

If you graph the labor cost ratios of all the OECD countries against the percentage of college (tertiary) graduates, the resulting graph shows the economically predicted decrease in the cost ratio as the supply of graduates increases, with one notable exception: the United States is a clear outlier, with a substantially higher college premium than would be expected given its plentiful supply of graduates.[17]

This anomaly prompts the following observation by the OECD authors:

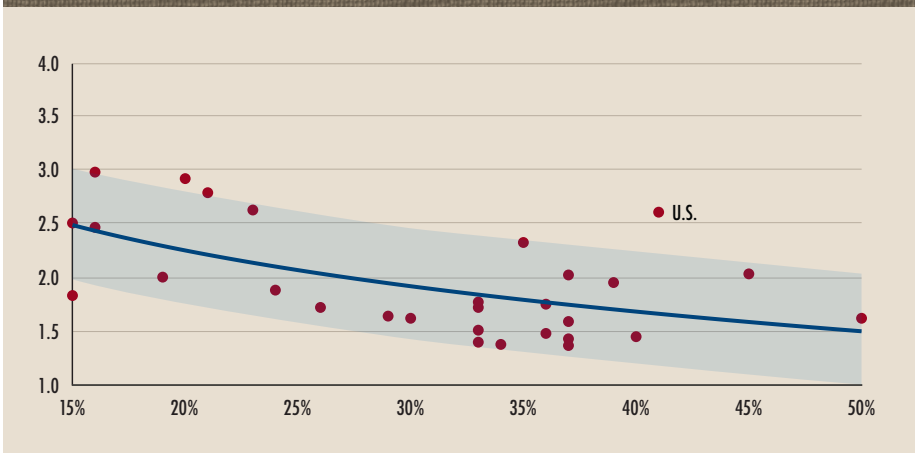
> *The labour costs for tertiary graduates in the United States are more than 2.5 times those for individuals without an upper secondary education, even though educational attainment levels are high (40%). This is likely a reflection that demand still outstrips even a relatively large supply of tertiary graduates, or that productivity differentials between these two educational categories [in the U.S.] are particularly large.*[18]

Since there is no apparent reason the demand for workplace skills in the U.S. should differ strikingly from all other OECD countries, this would suggest that the skill (and consequent productivity) differential is actually *larger* in the U.S. than in other countries.

It is very hard to square these data with Arum and Roksa's conclusion that colleges in the U.S. are failing to impart important workplace skills to their graduates. Of course, these authors focus on more recent graduates, while the economic data we've examined so far deal with broad averages in the overall workforce. Would we see a difference if we narrowed our view to recent graduates?

The answer is *no*. If we look at the labor cost ratios among 25 to 34 year olds, the pattern remains roughly the same. In the U.S., the cost ratio between 25 to 34 year old college graduates and 25 to 34 year old unskilled

Labor Cost Ratios vs. Tertiary Graduates: 25-64 year olds



[15] *The data in the following discussion are drawn from* Education at a Glance*, 2011, OECD, Tables A10.1, A1.3a, and A10.2. For the purpose of this discussion, "college graduate" includes all graduates of tertiary education programs, including those we would call technical colleges, and "unskilled worker" includes anyone who has not completed their country's counterpart of our 12-year high school education. In some countries, they may have completed vocational training programs, and so be somewhat more skilled than their U.S. counterparts. The OECD countries are: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, (South) Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.*

[16] *These countries and their labor cost ratios are: Israel (2.0), South Korea (2.0), United Kingdom (2.0), Australia (1.6), Canada (1.6), New Zealand (1.5), Finland (1.4) and Norway (1.4).*

[17] *See* Education at a Glance*, 2011, Chart A10.3, which graphs data for 45-54 year-old workers. I have graphed the data for all workers from 25-64 years old, which is more inclusive and demonstrates the same point. If we graph the labor cost ratio of college graduates to high school graduates, rather than unskilled workers, the outcome is similar, although the ratios are obviously smaller. Here, the labor cost ratio in the U.S. is 1.7. The closest country with similar college attainment levels is Israel, at 1.6, and most fall well below 1.5.*

[18] Education at a Glance*, 2011, p. 179, emphasis added.*

workers is 2.3, while the OECD average is 1.5. Only two other OECD countries have ratios in this age cohort that are comparable to the U.S.: Hungary (2.5) and Luxembourg (2.3). Again, Hungary's high ratio is influenced by a low percentage of 25 to 34 year old college graduates, but Luxembourg's educational attainment rates are similar to ours. Thus among this cohort of workers, Luxembourg and the United States are the two standouts among OECD countries. There is no evidence here that the skill differential among recent graduates of American colleges and universities has declined in the least.

It turns out that for each additional year of college, the per capita GDP of a region increases a remarkable 17.4 percent.

Comparative data on the wage premium strongly suggest that college graduates in the U.S. are *more* productive relative to unskilled or minimally skilled workers than college graduates in other developed countries. Furthermore, the data suggest that this holds as much for recent graduates as for those who graduated years ago. This is consistent with two widely held views: first, that the U.S. system of primary education does not compare well with primary education in many other countries, and second, that U.S. higher education remains the best in the world.

Education and regional prosperity

So far, we've considered the economic effect of a college degree on the individual receiving the degree. But equally relevant is the effect of a college-educated workforce on a community or region's economic productivity. A recent study by the Milken Institute tracked changes in educational attainment levels and economic output for 261 U.S. metropolitan areas for the years 1990, 2000, and 2010.[19] Not surprisingly, they found that increases in a region's average level of education are strongly correlated with the area's gross domestic product per capita and real wages per worker. Specifically, adding one year to the average education level of the workers in a region is associated with a 10.5 percent increase in per capita GDP and an 8.4 percent increase in average wages.[20]

This is an impressive correlation, but the Milken authors found that the effect is even more striking when the added education is at the college level. In particular, they looked at the impact of an additional year of schooling among workers who already had at least a high school diploma. In other words, what happens if the average education of high school graduates in a region increases from, say, 13.5 years (one and a half years of college) to 14.5 years (two and a half years of college)?

It turns out that for each additional year of college, the per capita GDP of a region increases a remarkable 17.4 percent. Similarly, the average worker's wages in the region are boosted 17.8 percent. By contrast, "an additional year of education for workers with just nine or 10 years of schooling has little effect on real GDP per capita or real wages per worker."[21]

The Milken study found large variations in how much the per capita GDP of metropolitan areas in the U.S. changed from 1990 to 2010. And while they identify several factors that contribute to the variation, such as changes in the mix of industries in a region, they conclude that over 70 percent of the variation is explained by the change in education level of the region's workforce.[22] Increasing the level of schooling, particularly at the college level, was by far the dominant driver of a region's productivity gains.

The focus of the Milken study on regional productivity gains sheds important light on the effectiveness of U.S. colleges and universities. While one might conceivably imagine that the salary premium for a baccalaureate degree is the result of something other than differential skills acquired in college—say, the network of influential contacts a graduate obtains—it is hard to see how anything other than differential skills could yield the kind of productivity gains analyzed by the Milken authors. If colleges are not increasing the workplace skills, that is, *productivity*, of the individuals they educate, then how can educating more members of a region's workforce increase the productivity of the region? The productivity must come from a more productive workforce.

[19] A Matter of Degrees: The Effect of Educational Attainment on Regional Economic Prosperity, *Ross C. DeVol, I-Ling Shen, Armen Bedroussian, and Nan Zhang, Milken Institute (2013).*

[20] *The regional returns estimated by the Milken study are consistent with other recent studies. For example, Turner, et al., study the economic return to U.S. states as the average education level in the state increases. They estimate that "the return to a year of schooling for the average individual in a state ranges from 11% to 15%." See "Education and Income in the States of the United States: 1840-2000," Chad Turner, Robert Tamura, Sean Mulholland and Scott Baier,* Journal of Economic Growth *(2007).*

[21] A Matter of Degrees, *p. 10.*

[22] A Matter of Degrees, *p. 9.*

The Milken study shows that there is a real economic benefit to college education, not just a personal benefit to the individual receiving the degree. It also shows that American employers are acting quite rationally when they pay a premium for college-educated employees, since it allows them to capture the very real productivity gains that result from additional education. In a sense, it completes the picture whose contours were suggested by the wage data previously reviewed. College education produces a more productive worker, and that is why employers pay more for college graduates.

Arum and Roksa's argument

All of the economic data point to the same conclusion: American colleges and universities are equipping their graduates—and equipping them remarkably well—with skills that enhance their productivity in the workplace. This is the backdrop against which we should assess the central argument of *Academically Adrift*. All too many readers, in both the popular media and academic circles, have uncritically accepted Arum and Roksa's conclusions without the slightest hesitation. Like the verdict that college costs are driven by lavish dorms, the story seems almost too congenial to criticize.

Let's look more carefully at Arum and Roksa's methodology to see if we can understand how their conclusion can run so counter to the brute economic evidence. Arum and Roksa base their argument on results obtained by administering a standardized test, the Collegiate Learning Assessment (CLA), to a large population of students. The test was administered twice, once during the first semester of their freshman year, and then again during the last semester of their sophomore year. The population was drawn from a wide variety of colleges and universities, and by most measures closely resembles the overall student population of the U.S. Since the study follows the same set of students through the first three semesters of their college experience, it seems reasonable to assume that the difference in individual scores measures the impact of the intervening semesters on the students' performance on this test.

The CLA is a standardized test intended to measure general skills in critical thinking, analytical reasoning, problem solving, and writing. It does not assess more specific subject-matter knowledge or other abilities that students may learn in their courses. Nonetheless, these general skills are widely considered among the most important workplace skills, and enhancing them is universally recognized as one of the primary goals of a college education. The CLA is a "constructed response" test, relying on essay-style responses rather than predetermined, multiple-choice answers. The test is scored by human graders applying rubrics designed to ensure consistency in scoring.

Given the economic evidence running counter to Arum and Roksa's conclusion, there are two questions—or really, clusters of questions—that we need to consider. First, we need to ask what exactly the CLA measures. Arum and Roksa assume that it measures the key general skills most highly valued in today's workplace. But this assumption might be mistaken for two sorts of reasons, which we will discuss in a moment. Second, we need to examine Arum and Roksa's interpretation of their data, to see if the conclusions they draw from it are actually supported by the evidence. What does their data actually show, and is the situation as bleak as they make it out to be?

What does the CLA measure?

It is clear that the CLA measures *something*, if only the ability to perform well on this and similar types of tests. But does it measure the crucial skills and characteristics actually required in the workplace? This may not be the case for two reasons. First, the CLA may be an accurate measure of general reasoning, analytical, and communication skills, but the workplace may put a higher value on the specialized knowledge and skills that the CLA does not even attempt to measure—say, quantitative skills or subject specific knowledge. This could certainly explain the divergence between Arum and Roksa's observations and the high value U.S. employers place on a college education. But if U.S. colleges are successfully producing graduates with the skills most highly valued by employers, even if not those measured by the CLA, it is hard to view Arum and Roksa's results as indicating a serious problem. They are simply measuring the wrong thing.

No doubt specialized skills explain some of the disconnect between Arum and Roksa's results and the economic data. Highly specialized knowledge that can only or most easily be obtained in college certainly accounts for some fraction of the college premium. But this cannot be the whole story, or even the dominant factor. For one thing, the specialized knowledge and skills that lead to the most highly paid professions require graduate or professional degrees, and the premium for a baccalaureate degree alone is already 74 percent. There are a small number of undergraduate majors that provide professional or quasi-professional training, but the college premium is by no means limited to these majors. Indeed, specialized skills cannot begin to explain the striking breadth of the college premium, the fact that it shows up

to a greater or lesser extent in virtually every line of work, and regardless of the student's major. This breadth must be due to more general skills and characteristics that are broadly acquired by college graduates.

The second possibility is that the CLA is *aimed* at the right general skills, but it may be a poor measure of those skills, at least as they manifest themselves in the workplace. It is easy to see how this might be the case. The CLA is a timed, standardized test, administered in an artificial setting quite unlike that encountered in an actual workplace. It would not be surprising if the outcomes from this test do not correlate well with an individual's ability to analyze problems in the workplace, find optimal solutions, and successfully communicate or carry out those solutions. After all, the two tasks—standardized test taking and the average workplace challenge—could hardly be more dissimilar. They are performed on very different timescales (one or two hours versus days or weeks); they involve different levels of motivation (a test whose results have no personal consequences compared to the highly salient consequences of salary and career advancement); and they permit entirely different strategies (such as seeking advice from others, trial and error, and other approaches precluded to the test taker). Even the communication skills measured by the CLA—basically the ability to write a formal memo—are of uncertain relevance to a workplace dominated by email and oral communication.

It would be a mistake to underestimate the importance of these differences. Take, for example, motivation. A recent study by researchers from the Educational Testing Service, one of the largest providers of standardized tests, showed that differences in motivation have a huge impact on students' test scores.[23] Using a test designed to measure college-level reasoning, quantitative, and communication skills, they found that motivated students, particularly those who stand to *personally* benefit from their own high performance, significantly outperformed students in a control group who were not similarly motivated. The researchers found that the effect on performance was as large as .68 standard deviations at one institution, the equivalent of a 25-percentile performance difference for the average student, and averaged .41 SD at the three institutions studied.[24] By comparison, the average difference seen by Arum and Roksa between freshman and sophomore scores on the CLA was .18 SD, the equivalent of a 7-percentile difference.

The test used by the ETS researchers contained both a constructed response (essay) section and multiple-choice sections. Interestingly, they found that the impact of low motivation was significantly larger on the essay section of their test—the part most similar to the CLA—than on the multiple-choice sections. This stands to reason since, as they note, "it takes more effort and motivation for students to construct an essay than to select from provided choices."[25]

Clearly, given the magnitude of this effect, even a slight change in motivation felt by students taking the CLA as freshmen and then again as sophomores could easily swamp any actual change in their underlying skills. And it is easy to see why student motivation might decline between the freshman and sophomore administrations of the test, and rather hard to imagine how it might increase. As anyone familiar with college students can attest, freshmen tend to arrive on campus with high enthusiasm, anxious to perform well, and slightly intimidated by authority. By the end of sophomore year, these characteristics lessen as students become more focused on their own studies and extracurricular pursuits, and generally less pliant. The ETS authors conclude that "differential motivation between freshmen and sophomores, in addition to the low motivation in general, was likely the key factor responsible for the limited learning reported in the Arum and Roksa study."

Whether or not this is the complete explanation, there is an important lesson to be learned from this study. Arum and Roksa's application of the CLA, as with most uses of testing for program rather than individual assessment, is an example of *low-stakes testing*, that is, testing whose results make little or no material difference to the test takers themselves. Low-stakes testing is extremely vulnerable to the vagaries of student motivation. Unless measures are taken to ensure that the test takers are actually motivated to perform to the best of their abilities, the results are of questionable value.

The fundamental lesson might be put this way: low-stakes testing is not even an accurate measure of the individual's capacity to perform well *on that very test*. We began this discussion by saying that the CLA measures, at the very least, the ability to perform well on tests of this sort, but in fact even that may be an unwarranted assumption.

Note that this problem is independent of the question of whether the test, even when taken by perfectly motivated subjects in ideal circumstances, accurately measures the real-world skills that we are interested in and that

[23] *"Measuring Learning Outcomes in Higher Education: Motivation Matters," Ou Lydia Liu, Brent Bridgeman, and Rachel M. Adler,* Educational Researcher *(2012).*
[24] *Liu, Bridgeman, and Adler, p. 356.*
[25] *Liu, Bridgeman, and Adler, p. 360.*

we actually teach. We have already described several reasons the CLA may do a poor job of measuring analytical and problem-solving skills as they manifest themselves in the actual workplace. But there are others. For example, there are many general traits and habits of mind that are resistant to accurate measurement by standardized test, and yet are highly relevant to workplace problem solving. Creativity, judgment, and the ability to work with others are obvious examples.

The more we appreciate the sheer complexity of skills, character traits, and habits of mind that affect an individual's performance in the workplace, the more skeptical we should be that a standardized test can be devised that accurately measures that ability. And this is why a quality undergraduate education provides a wide range of subjects, taught in classes employing a diverse mix of instructional formats and assessment methods, along with ample opportunities for experiential learning and other co-curricular activities. *It is no accident that the complexity of the workplace is reflected in the complexity of the college experience.*

It takes an extreme leap of faith to think that a test like the CLA can accurately measure the general skills demanded in today's workplace, or even a significant subset of those skills. Of course, the best measure of whether college graduates in the U.S. are acquiring the skills needed in the workplace is, and will always be, their *actual performance* in the workplace. And the best indicator of that remains the differential value employers place on college graduates over high school graduates, as reflected in the college premium.

If the CLA provided an important, independent measure of workplace skills, we would expect to find a significant wage differential between those who perform highly on the test and those who do not, once they enter the workforce. Unfortunately, there is not a lot of data on this key question, though there is some. Arum and Roksa performed a follow-up survey of the college graduates from their Academically Adrift study.[26] Among other things, they found that those who had, as seniors, performed in the bottom quintile on the CLA were three times more likely to be unemployed than those from the top quintile (9.6 percent vs. 3.1 percent). But among those who were employed full time, they did not find the expected wage differential. The average salary of the top quintile ($35,097) was barely higher than the average salary of the bottom quintile ($35,000), and the average salary of the middle three quintiles ($34,741) was actually below that of the bottom group.

Since the follow-up survey was conducted just two years after most of the students graduated, it is possible that a wage differential will emerge as they proceed through their careers. But as it stands, this new data should give us pause. Arum and Roksa claim that U.S. colleges and universities are not equipping their graduates with the skills required in the modern workplace. But they base their argument on tenuous data from a test whose scores, according to their own follow-up survey, do not seem to predict earnings in the marketplace. Against the backdrop of overwhelming economic evidence to the contrary, it is hard to give this argument a great deal of credence.

What do the data really show?

There are many reasons to question whether the CLA is a good measure of the general skills expected of a college graduate. Still, the CLA has many supporters who consider it a state-of-the-art test of an extremely important set of reasoning and communication skills. As a logic professor who has taught these skills for over thirty years, I certainly concur about their importance, even though they may represent only a narrow sliver of the skills and characteristics that contribute to success in the workplace.

It takes an extreme leap of faith to think that a test like the CLA can accurately measure the general skills demanded in today's workplace.

It is essential to acknowledge two things, however. First, the CLA is by no means an accurate measure of even these limited skills. The dramatic effect of motivation on student performance alone shows that the results are anything but unerring. Second, it is abundantly clear that no standardized test can capture the full panoply of important characteristics that college aims to impart or improve. It is naïve to think that such a narrow and constrained measurement technique can adequately gauge the range of knowledge, skills, talents, dispositions, character traits, and habits of mind that contribute to workplace performance and that the college experience, at its best, molds and transforms.

Nonetheless, we can acknowledge both of these points but still wonder

[26] Documenting Uncertain Times: Postgraduate Transitions of the *Academically Adrift* Cohort, *Richard Arum, Esther Cho, Jeannie Kim, and Josipa Roksa, New York: Social Science Research Council (2012).*

whether there are important lessons to be learned from Arum and Roksa's data. Does it give us reason for concern about how well students are learning the specific skills the CLA targets? I think the answer, even to this more limited question, is *no*.

The first thing to realize is that the most widely reported claim made by Arum and Roksa—that 45 percent of the students made "no measurable gains in general skills"—involves a common statistical fallacy. Alexander Astin first pointed this out in an article in *The Chronicle of Higher Education*.[27] Let me describe the problem in non-technical terms. Suppose we are interested in determining whether an individual student's reasoning skills have improved between the two sittings of the CLA exam. We know that CLA scores in themselves are an imprecise measure of the underlying skills because of unavoidable sources of measurement error, such as the student's mental or physical state on the day of the exam, imprecision in scoring the test, and so forth. So how do we know when a change in CLA score indicates a real change in ability?

If it is important to avoid wrongly declaring improvement when none has actually occurred—what is known as a *false positive* or Type I error—we need to require that the student's later score exceed the earlier score by some margin of error. Using a larger margin of error gives us more confidence that the change in score is not simply a fluke but indicates a genuine improvement in skill. But the larger the margin of error we choose, the more *false negatives* or Type II errors we will incur, that is, students whose skills have actually improved even though their scores did not meet our more stringent requirement. That is the unavoidable tradeoff: aiming for fewer false positives inevitably produces more false negatives.

So where does the widely quoted 45 percent figure come from? Arum and Roksa have settled on a particular margin of error for measuring improvement (corresponding to a "95 percent confidence level"), and found that 55 percent of the students tested demonstrate improved levels of skill. That is, each of these student's test scores increased more than the chosen margin of error, giving us confidence that the change in score was not caused by measurement error, but was instead due to a genuine improvement in skill.

But what can we say about the other 45 percent? Can we say with equal confidence that their skills *did not* improve between the two sittings? Absolutely not. In fact, the very technique that gives us confidence of improvement on the part of the 55 percent also ensures that the 45 percent *includes more false negatives*, students whose skills actually improved but who were excluded by our more stringent requirement. All we can say about these students is that their scores, for whatever reason, did not increase beyond the chosen margin of error. This might be due to no improvement in the skills in question, but might also be due to any number of measurement errors—for example, scoring imprecision or, to echo our previous discussion, decreased motivation on the part of the student.

What do Arum and Roksa have to say about the possibility of false negatives, students whose skills improved though their scores fell short? Here is their casual dismissal of the problem:

> *A test such as the CLA…may face challenges of reliability, raising the possibility that some of the students showing no gains [in score] may actually be learning. However, questions of reliability are likely to pertain to the other half of the distribution as well, meaning that some of the students reporting gains may not actually be learning much.*[28]

The problem with this response is that it reveals a fundamental confusion. They are in effect saying: sure, there may be false negatives, but it is just as likely that there are false positives. But that's simply wrong: the whole point of requiring a *margin of error* is to diminish the chance of false positives, though in doing so we necessarily incur *more false negatives*. The two sides do not somehow balance out. Thinking that they do is a blatant fallacy.

In fact, Arum and Roksa's nonchalant dismissal of this concern would actually have been more appropriate if they had not employed *any* margin of error, but had simply assumed improved skills for all those whose raw score increased between the two sittings. Of course, the percent whose skills they reported as "improved" would then have been significantly higher than 55 percent, and the percent that did not "improve" would be correspondingly lower. Since Arum and Roksa do not provide their raw data, we do not know precisely how much the numbers would change.

In any event, the sensational and oft-repeated claim that 45 percent of the students in the study showed no learning gains is simply a mistake.

So looking at Arum and Roksa's results, what can we legitimately say about the student learning? There are three significant facts to keep in mind. First, it is important to remember that the two administrations of the test were separated by only three semesters of college, about a year and a half. Anyone who has taught either writing or critical thinking realizes that these are skills

[27] *"In 'Academically Adrift,' Data Don't Back Up Sweeping Claim," Alexander W. Astin,* The Chronicle of Higher Education*, February 14, 2011.*
[28] *Arum and Roksa (2011), p. 219.*

that are slowly improved through practice and repetition, not ones that are acquired easily or quickly. Second, we should bear in mind that Arum and Roksa's data come from a low-stakes test setting and so are subject to large motivational effects. Given predictable declines in motivation between the two administrations of the test, the study is, as the ETS authors say, "likely an underestimation of students' true college learning."[29] The motivational effects inherent in the study design already predispose the results toward *false negatives* (students whose improvement is masked by decreased motivation) and away from *false positives* (students whose test performance improved in spite of no change in underlying skill). Finally, the fact that we additionally require a statistical margin of error before declaring improvement biases the results even further away from false positives, while incurring the unavoidable risk of yet more false negatives.

Given these facts, what should our prior expectations be about the study's results? Speaking for myself, I would not have been surprised if the study failed to detect any learning improvement between the two administrations of the test. The fact that 55 percent of the students involved in the study nonetheless showed improvement beyond the chosen margin of error is actually remarkable. Far from being an indictment of our students and our colleges, it is a surprising and encouraging result.

The same can be said for the change in average score. Arum and Roksa report that the average score on the exam improved by "only" .18 standard deviations. They go on to explain:

> *This translates into a seven percentile point gain, meaning that an average-scoring student in the fall of 2005 would score seven percentile points higher in the spring of 2007. Stated differently, freshmen who enter higher education at the 50th percentile would reach a level equivalent to the 57th percentile of an incoming freshman class by the end of their sophomore year.*[30]

Arum and Roksa present this as a negative result. This is a rather puzzling reaction. Indeed, in another context, we could imagine the paragraph above appearing in an advertisement promoting an SAT test prep service. When we add to that the fact that the study design likely underestimates the students' learning, it is hard to read into this data a legitimate cause for concern.

Once we strip away Arum and Roksa's rhetoric of crisis and look at the actual data they present, it takes on an entirely different cast. Using a methodology that is biased toward understating student progress, they nonetheless see evidence of a reassuring degree of learning across a very broad base of students attending a wide variety of colleges and universities. They see this progress using a test that targets a set of abstract reasoning and communication skills widely known to be among the most difficult to teach, and they see the improvement after only three semesters of the students' college experience.

This is not evidence of a system that is academically adrift, but evidence entirely consistent with what the economic data tell us: graduates produced by American colleges and universities display a significant skill differential that employers reward with the most substantial wage premium offered in the economically developed world.

Conclusion

The United States has the most complex and variegated system of higher education in the world. We have colleges where the dominant form of instruction is the large lecture and colleges whose largest class enrolls ten students. We have schools that deliver instruction primarily through hands-on internships and others that are primarily online. We have commuter colleges geared for the working adult and residential colleges tailored for the full-time student. We have schools that are highly selective, while others admit all comers. We have public institutions run by the states, ranging from local community colleges to world-renowned research universities. We have private non-profit institutions, including small liberal arts colleges, polytechnics and conservatories, religiously affiliated colleges and seminaries, and large, full-service universities. And we have a growing for-profit sector: from long-established technical institutes, to new, predominantly online universities.

This variety is the source of extraordinary strength. It provides an unparalleled range of institutions that differ widely in programmatic purpose, pedagogical approach, target student body, and underlying financial model. It gives rise, on the one hand, to intense competition for highly qualified students, but on the other, also provides options for students who stumble and need a second chance. It is a resilient and flexible system, unlike any other in the world.

I titled this essay, "Are our colleges and universities failing us?" At this point, a reader might expect my answer to be *no, not really*. But this answer would be as simplistic as those I've criticized. Indeed, the very complexity and heterogeneity of the U.S. system means that it defies broad generalization along almost any dimension.

Consider, for example, the issue of college cost. Suppose we ask what the primary driver of tuition increases has

[29] *Liu, Bridgeman, and Adler (2012), p. 360.*
[30] *Arum and Roksa (2011), p. 35.*

been during the past decade. In fact, although tuition has increased faster than inflation in every sector, there is no single reason why. For example, at one end of the spectrum, community colleges, the expenditures on education and related activities in fact declined almost a thousand dollars per student between 2000 and 2010. These colleges have not only contained expenses but reduced them. Yet the cost to students still increased faster than inflation, because state appropriations to the colleges declined even more than expenses.[31] The reduced student subsidy provided by the states more than counteracted increased efficiency on the part of the colleges.

In contrast, at private colleges and universities the situation was effectively reversed. These schools spent substantially *more* on education and related expenses, yet their *net* tuition costs—that is, the average tuition a student pays after financial aid—remained almost exactly the same after adjusting for inflation.[32] Indeed at many private institutions, the *net* cost of attendance actually declined, thanks to much more generous financial aid programs. Here, while the *published* tuition increased, the subsidies provided by college endowments more than made up for that increase.

It is even harder to broadly generalize about the educational effectiveness of such an extraordinary range of institutions. There are doubtless institutions in every sector—public, private, and for-profit—that fail to deliver acceptable educational outcomes, whose graduates are not well prepared for the jobs available in today's marketplace. But on the *extent* of the problem, the economic data speaks volumes: There is clearly no systemic or widespread problem with the educational effectiveness of U.S. colleges and universities.

The only reliable measure of how prepared college graduates are for the workforce is how they actually perform on the job. And the best, broad-based measure of that is the college premium: how much employers are willing to pay for the incremental skills the college graduate brings to the job. There is no evidence that the skill gap between high school and college graduates in the U.S. has narrowed. On the contrary, the data suggest precisely the reverse.

The recent recession and virtually jobless recovery have taken a toll on wages in the U.S. This, along with the pervasive sense of crisis in higher education, has led to many popular articles focused on college graduates who find themselves unemployed or underemployed. These anecdote-driven stories often conclude by questioning whether college remains a good investment. They tend to ignore the (easily available) *comparative* data concerning wages and employment rates for young people without a four-year college degree. The truth is that while wages for recent college graduates have indeed declined about 5 percent, wages for high school and associate degree holders have declined 10 and 12 percent, respectively. Similarly, the proportion of recent college graduates who successfully transitioned into employment barely changed during the recession, while the rates for high school and associate degree holders dropped by 8 and 10 percent.[33] Again, the actual data *do not* show that the value of the bachelor's degree has recently declined, but rather that the value is more than holding its own, despite difficult economic times.

But none of this is cause for complacency. Our system of higher education is not without serious problems. But again, we need to treat the real problems, not imagined ones. At the top of the list is cost and accessibility: we need to find some way to bend the cost curve in higher education *without* making large sacrifices in education quality. This is not an easy problem to solve, because the cost crisis is not driven by lavish student amenities, high administrative salaries, or other popular diagnoses, but by far more fundamental economic forces.

Of equal concern are college completion rates—the proportion of students who begin college and go on to graduate with a bachelor's degree. Nationwide, less than 60 percent of students who enter a four-year college successfully complete a degree after six years. The other 40 percent spend considerable time and money, both their own and the taxpayers, pursuing a college education, but then end up with little to show for it. This is the real wasteful spending in higher education, and unless we address it, there is little hope we can substantially increase the proportion of college-educated employees in the workforce.

Addressing these real problems should be the focus of our national education policy, regional accreditation boards, and university administrations. Concerns about whether those who successfully graduate are adequately prepared for today's job market, or whether they have achieved appropriate "learning outcomes," are largely a distraction from the actual problems of higher education in America. There is overwhelming evidence—evidence from the job market itself—that our colleges and universities continue to do well on that particular score. ■

[31] *Spending: Where Does the Money Go? A Delta Data Update 2000-2010, Delta Cost Project, American Institutes for Research, 2012, p. 10.*
[32] *Trends in College Pricing 2012, The College Board, 2012, Figure 10.*
[33] *How Much Protection Does a College Degree Afford?: The Impact of the Recession on Recent College Graduates, Economic Mobility Project, The Pew Charitable Trusts, 2013.*

by Henry Rosovsky,
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RESEARCH UNIVERSITIES: *American Exceptionalism?*

Editor's Note: *These remarks were prepared for the Carnegie Corporation/*TIME *Summit on Higher Education, September 20, 2013.*

I. A Paradox

Domestically, American higher education is the subject of almost unprecedented criticism. "Too expensive and inefficient and not a good investment" is a common conclusion. Students are said to be unprepared for the job market. Higher education is accused of being too permissive in tolerating low faculty productivity and in resisting the technological revolution. In general, the current "business model" is judged unsustainable: some think that we are riding on the road to self-destruction. The United States confronts great social and economic problems, yet—in Arthur Levine's gloomy words—"public and opinion leaders alike view [universities] as more of a problem than a solution."[1]

But in international discussions and evaluations of higher education, American universities are frequently called "the envy of the world." Not by any means all our universities. Indeed not very many, but *some*—and that is my point.

In the United States, it makes no sense to speak about "higher education" or "universities" in general—yet it happens all the time. (The December 1, 2012, issue of *The Economist* provides a recent example. The headline announced: "Not what it used to be: American universities represent declining value for money to their students." In the text there is little recognition of the tremendous diversity of higher education in the United States.) The label "American universities" has little meaning when our country is home to more than 4,000 tertiary institutions, ranging from those that might actually be the envy of the world to those barely distinguishable from high schools—with a tremendous variety in between.

At the top of our higher education pyramid we find the public and private research universities with their special role of creating and maintaining knowledge, training graduate students in arts and sciences and professional schools, and offering a liberal education to undergraduates. According to Jonathan Cole, there are about 125 diverse universities that fit this description and they "…are able to produce a very high proportion of the most important fundamental knowledge and practical research discoveries in the world. It is the quality of the research produced, and the system that invests in and trains young people to be leading scientists and scholars, that distinguishes them and makes them the envy of the world."[2] These 125 universities play a less singular role in undergraduate education. As Cole again points out, some American liberal arts colleges are able to offer undergraduate education of equal quality. I agree, but the nature of the educational experience is different:

In the United States, it makes no sense to speak about "higher education" or "universities" in general—and yet it happens all the time.

[1] *"Today's Unpresidential Presidents,"* The Chronicle of Higher Education*, October 26, 2012.*
[2] The Great American University*, 2009, p. 5*

for undergraduates, the research university might be compared to life in a big city with a great diversity of inhabitants—undergraduates, graduate students, professional school students, and faculty reflective of that diversity—and the liberal arts college comparable to a more homogeneous and community-oriented small town populace. Each has its own advantages for undergraduates.

A major component of education is real as opposed to virtual encounters between students and teachers to encourage participation and critical thinking.

"Top of the pyramid"—my sole focus here—does not mean that institutions below the top are less worthy, less deserving of private or public support, or less essential in the national scheme of higher education. Nor does it imply that the current storm of criticism is irrelevant for research universities. I completely understand the need for controlling costs and expanding capacity. But it does mean that criticisms have to be as differentiated as the range of institutions: unless that happens, inappropriate remedies may damage a sector of American higher education where we are using accepted but necessarily questionable measures with the potential to lessen our status as world leaders. All systems of international university rankings agree that U.S. universities dominate the top twenty or thirty places. (Twenty-two out of thirty in the Times Higher Education survey and twenty-three out of thirty in the Shanghai Jiao Tong ranking; both in 2013.)

It is unlikely that American dominance is accidental, but a convincing explanation would have to be extremely complicated. History, wars, culture and customs, and resources are all involved. But all the institutions at the top of the American educational pyramid—and some others as well—share six characteristics closely associated with high quality. (My initial preference was to call these "necessary conditions," but that seemed a bit too rigorous.) Their absence would preclude—or make it much more difficult—for research universities to achieve the highest quality, not just in this country but anywhere else. Indeed, their partial or total absence abroad helps to explain why there are relatively few foreign—especially non-Western—institutions represented at the top of the accepted surveys.[3] None of the six characteristics is wholly unambiguous; all are blurry. But is not difficult to detect their presence or absence.

II. Six Characteristics of Quality

■ **Shared governance.** First, these institutions all practice shared governance: the trustees and president *conditionally* delegate educational policy to the faculty. That would primarily include curriculum and the initial selection of those who teach, are admitted to study, and do research. The administrative style is collegial rather than top-down, faculty sharing authority in specified areas with appointed administrators and trustees, the latter holding final authority. This is a distinctly American form of shared governance, which relies on a strong executive. Presidents, provosts, and deans possess and exercise considerable authority over budgets, institutional priorities, and many other matters of consequence. This may be contrasted with the so-called "continental model" that features what, in its purist form, can only be described as "participatory democracy"—faculty elections of rectors and deans, and policy decisions sometimes placed in the hands of assemblies based on the principle of parity: faculty, students, and employees sharing authority. In my opinion, this form of governance has been a great obstacle to progress, and while it is very difficult to generalize, it seems that even continental practice is moving toward greater executive authority.

More than a decade ago, I had the opportunity to study universities in developing countries all over the world while preparing a report for the World Bank and UNESCO.[4] Problems and issues varied enormously depending on economic conditions, political system, history, etc. But those who were in charge of universities almost always agreed on one point: poor systems of university governance were the greatest obstacles to institutional improvement—more so than inadequate financing or *anything* else. Of course, poor governance meant many different things but certainly included interference by ministries of education, unclear lines of authority and perhaps, most important, barriers to faculty input or initiative. It would be a mistake to believe that poor governance applies only to the developing world. Similar obstacles

[3] *For a very recent confirmation of this point, one need only look at Michele Lamont and Anna Sun's op-ed, "How China's Elite Universities Will Have to Change," in* The Chronicle of Higher Education, *December 14, 2012.*
[4] Higher Education in Developing Countries: Peril and Promise, *2000.*

have slowed quality growth in European and American higher education.

What makes shared governance so important? There are many possible answers, but these are among the most frequently mentioned: universities are extremely complex organizations in which centralized decision-making does not achieve the best results; in universities the proportion of self-motivated people is large and to capture the full measure of their "creative juices" requires a sense of ownership. Susan Hockfield, former president of MIT, puts it very well: "Faculty travel the frontiers of their disciplines and, from that vantage point, can best determine future directions of their fields and design curricula that bring students to the frontier. No academic leader can chart the course of the university's discipline independent of the faculty."

These reasons apply in general to organizations in which profession-based authority is important, a good example being law firms and large consulting firms. Shared governance may frustrate administrators intent on implementing rapid change, but a slower pace may also lead to wiser choices and certainly has not—in light of university histories—prevented fundamental changes. (It should be added that the current use of adjuncts, offering over 50 percent of instruction in many universities, has surely undermined the integrity of shared governance. A corps of instructors in which half are employed on a yearly basis and without rights or sense of ownership will not be doing much creative thinking about the future.)

■ **Academic freedom.** Second, despite periodic challenges, American research universities enjoy academic freedom—"the right of scholars to pursue their research, to teach, and to publish without control or restraint from the institutions that employ them"—and, in addition, all rights granted to inhabitants of this country, especially those associated with the First Amendment.[5]

■ **Merit selection.** Third, admission of students and selection and advancement of faculty is based on merit measured by recognized and accepted institutional standards. Some form of prior achievement would define merit: assuredly not an issue devoid of numerous ambiguities. One cannot ignore legacies, affirmative action, athletic scholarships, and similar deviations from the simplest notions of merit for students, such as scores on a standardized national test. Similarly, gender, race, and old-boy networks can create other deviations from a straightforward standard for selecting and promoting faculty. Nevertheless, objective measures of merit remain at the very least the first approximation.

■ **Significant human contact.** Fourth, a major component of education is now and is intended to remain significant human contact: real as opposed to virtual encounters between students and teachers to encourage participation and critical thinking. In his 2012 Tanner Lectures, William Bowen calls this "minds rubbing against minds." The proportions may change over time but the basic principle has to be retained: it has to be *part* of liberal education for undergraduates who need guidance and contact in making choices, and it is a self-evident part of the mentor-mentee relation for those aspiring to reach a PhD Leon Wieseltier, in language that is both valid and vivid, captured the spirit of this characteristic extremely well in a recent *New Republic* essay:[6]

> *When I look back at my education, I am struck not by how much I learned but by how much I was taught. I am the progeny of teachers; I swoon over teachers. Even what I learned on my own I owed to them, because they guided me in my sense of what is significant. The only form of knowledge that can be adequately acquired without the help of a teacher and without the humility of a student is information, which is the lowest form of knowledge. (And in these nightmarishly data-glutted days, the winnowing of information may also require the masterly hand of someone who knows more and better.)*

One might quarrel with some specific phrases, but it is not easy to imagine these sentiments being addressed to a screen. Few would deny the great value of digitization, virtual course materials, or occasionally flipped classrooms but they remain complementary rather than primary.

■ **Preservation of culture.** Fifth, all these universities consider preservation and transmission of culture to be one of their missions. This would include representation of the humanities in curriculum (mandatory for undergraduate liberal arts), as well as, for some, more specialized activities including research and language studies, and the maintenance of libraries and museums. Preservation of culture applies as much to MIT, Caltech, and Purdue as it does to the more traditional Yale and the University of Wisconsin. Indeed, many "polytechnics"—certainly including the ones mentioned here—have been the source of major innovative scholarship in the humanities and social sciences. The history of science and economics are excellent examples. It is a simple fact that our most prominent universities specializing in science have programs and/or departments that transcend traditional definitions of science. But why? Because they believe

[5] The Columbia Encyclopedia, *6th edition, 2001.*
[6] *December 31, 2012*

that this both improves the education of their students and the research of the faculty. Interdisciplinary approaches in all fields have been gaining favor for many years and that may be the most powerful driver of all.

■ **Nonprofit status.** Sixth—and finally—all research universities operate on a not-for-profit basis. If maximizing profit or increasing shareholder value were the goal, all the previous conditions become unwelcome obstacles and inefficiencies that could not be tolerated by a competent management. But this condition is not as cut and dried as it may seem. Decisions in not-for-profit universities can be influenced and possibly distorted by considerations of revenue. For example, activities that generate research or operating funds in return for certain privileges obtained by a funder may require exclusive access to specific scientific results for a limited period of time. In this sense, no research university today is purely not-for-profit. None, however, is mainly directed by the business aims of outside supporters.

The six characteristics are neither canonical nor subject to rigorous mathematical proof. They are based on my (I believe uncontroversial) reading of our historical experience.

III. Understanding and Misunderstanding the Quality Requirements

Many academics will consider a listing of these characteristics individually familiar, obvious, and of little interest. Non-academics, on the other hand, may have a quite different reaction. The list could easily be interpreted as a plea for the *status quo*, typical of the academic establishment that stubbornly resists all change.

Both perspectives are wrong. The characteristics of quality are almost never considered *as a system* even though the absence of any one of them will affect the integrity and quality of a research university. Faculty wishing responsibly to exercise rights of shared governance should have the whole group clearly in mind.

Turning to the non-academic perspective, none of these characteristics, singly or as a group, make—to use the term beloved by our critics—*disruptive* change impossible. This is an important point because, I think, it runs counter to widely held beliefs.

For example, tenure is perceived to be an obstacle to change. It may indeed be desirable instead to adopt a system of long-term contracts—particularly because federal law prohibits mandatory retirements. Faculties are aging and so are their ideas, in turn raising costs and keeping out the young. But it is not the enumerated characteristics that stand in the way of change. To take the most relevant, in the American tradition, employment contracts have *never* been within the purview of shared governance. Faculties don't determine their own pay or conditions of employment; these are in the hands of the administration—even when union negotiations are involved. A main barrier to change has to be the fact that—noted by Bowen in his second Tanner Lecture—that competition between non-profit peer institutions currently drives up cost. No ambitious and quality-centered research university can afford, on its own, to abandon tenure and move (say) to long-term contracts. Only an understanding with peers would make it possible and that is illegal. Bowen wonders if some collusion would now be in the public interest.

Internal and external critics have suggested various other cost-cutting measures. For example, raising teaching loads or a rising student-faculty ratio—I do not necessarily suggest either one—would lower cost. A three-year bachelor's degree would have the same result. More machines, fewer humans, and an increase in online learning (MOOCS) may also decrease expenses. Again, these may be good ideas or not— but respecting the six characteristics does not prevent their implementation (so long as shared governance is clearly understood *not* to be participatory democracy).

Shared governance does, from time to time, increase the burden of administrators. Bowen, in his Tanner Lecture, asks if shared governance is suitable for a digital world in which decisions about educational policy can frequently go beyond individual professors or departments and need to include a great mix of constituencies. As he suggests, individual or groups of faculty should not have veto power over change. Have they ever in a well-administered institution? Bowen is right: the definition or concept of shared governance may have to change with the times, while the principle of faculty voice and participation is vigilantly maintained. The important words are *sharing* combined with good *leadership*. The notion that research universities are "unchanging" has always struck me as bizarre. Our products are education and research, and the vital element is not the format or setting (the bottle) but the content (the wine.) And that is forever changing.[7]

Conditions that are at the core of what it means to be a university are, for many people, counterintuitive, especially for those with a background

[7] *A brief digression. In* The Great American University*, previously mentioned, Jonathan Cole suggests a list of thirteen items under the title "What Makes Great Research Universities," p. 109. There is very little overlap with our list—the main common point being academic freedom—because what I call "characteristics of quality" all pertain to* internal *governance and, subject to constraints, are controlled by the university and ultimately by the trustees. And that becomes very consequential when trustees and their responsibilities are considered.*

primarily in business. This was vividly illustrated by the recent events at the University of Virginia where a few board members, mainly from the private sector, believing that the new president was making changes too slowly, engineered her abrupt dismissal after three years on the job. It seems to me that this kind of coup would not be considered good practice even for a private corporation, but for an institution in which shared governance was the assumed norm it proved to be disastrous. The UVA board may have acted within its legal authority, but the total absence of consultation created a faculty-student revolt that forced a reversal of the original action. All emerged worse off.

Shared governance is perhaps the classic source of "misunderstandings," but it is not by any means the only one. Academic freedom is a perpetual sore point, especially when it comes to the expression of political opinion by faculty. To take one more example, preservation of culture may be seen by those exercising sound business judgment as an entirely discretionary luxury when it is, in reality, an integral part of research universities.

Harvard President Drew Faust framed the issues eloquently in a recent address at Boston College:

> *Universities are a set of institutions unlike any others in our society. Certainly our budgets must balance, our operations must be efficient, but we are not about the bottom line, not just about the next quarter, not even about who our graduates are the day they leave our walls. Our task is to illuminate the past and shape the future, to define human aspirations for the long term. How can we look past the immediate and the useful… to address the larger conundrum of: How shall we best live? What do I want to be today—and tomorrow? To discover not only the ways in which human civilization plans to get somewhere, but to ask the question, Where does it—and where should it—hope to go?*[8]

Those are not questions likely to arise in many corporate boardrooms but they should be raised regularly among university trustees.

IV. Addressing the Present Moment

We come now to some of the real difficulties of the moment. To fulfill their role in society—creating knowledge and educating graduate and undergraduate students— the university community makes assumptions that may not always be, and almost certainly are not now, obvious either to the trustees who are their governors or to the wider public. For example, the characteristics associated with quality can be seen as pleas for special *privileges*. In business or in government neither the freedom of expression nor a voice in governance is the practice. Decisions are largely profit-based or necessarily political.

Another reality to consider is that American universities only rarely have written constitutions or long-lasting traditions of common law. The guarantors of their privileges and practices are trustees, most of whose life experiences have been in private business, admittedly a category possibly so broad as to be largely meaningless. (Currently, around 50% of trustees come from "business," 22% from professional service, and 13% from education.) Furthermore, in the case of state universities appointment to positions of governance can be political, frequently in the hands of governors, and sometimes subject to state elections.

At a time of contentiousness and criticism current practices raise questions: do those who constitute the court of last resort understand the unusual entity with which they have been entrusted? When trustee initiative is necessary and appropriate and when it is not? Do we do enough to prepare trustees for their responsibilities? Are those who make the appointments more concerned about the candidate's ability to read balance sheets than their appreciation of university values? Or do we look primarily at the capacity of potential trustees to make large donations? Or are those who have the power of appointment primarily interested in a candidate's political affiliation? The same point can be made about faculty. We take great care to examine research credentials and—these days, and that is a major and welcome change—we look more closely at teaching capacities. But do we do anything to prepare faculty to participate productively in shared governance? Both of these tasks will grow in urgency as the American research university—"the envy of the world"?—navigates very stormy seas predicted by nearly all observers. ■

Universities are a set of institutions unlike any others in our society. Our task is to illuminate the past and shape the future.

—Drew Faust
President, Harvard University

[8] *"Scholarship and the Role of the University: Remarks at the Boston College Sesquicentennial," October 12, 2012.*

by Richard Ekman,
President of the Council of Independent Colleges

A 21st Century Education: WHAT DO STUDENTS *Need to Know?*

Editor's Note: *These remarks were prepared for the Carnegie Corporation/TIME Summit on Higher Education, September 20, 2013.*

Our panel's topic today is what an educated person of the 21st century ought to know and what that means for the ways in which U.S. research universities—which educate a very large percentage of all American undergraduates—ought to do to strengthen their teaching effectiveness.

I want to make six observations.

First, it's difficult to talk about the role of research universities without acknowledging that there is an American "system" of higher education that includes approximately 100 research universities, another 1,800 traditional four-year public and private colleges and universities that treat teaching as a more important part of their missions than research, and more than 1,000 two-year colleges that place their greatest emphasis on increasing access to higher education. The community colleges are now the fastest growing sector of higher education and account for ever-larger percentages of juniors and seniors at research universities. Many students, for example, will start at a community college, then transfer to a four-year college or university. Other students will begin at one four-year college then transfer to another. The large amount of mobility among students creates difficulties in record-keeping so the patterns of success and failure for students who transfer among institutions are often difficult to discern.

The biggest complication for improvement of teaching and leading posed by the porousness of the American system is the challenge of preserving coherence in general education for the 21st century when students move among institutions to the extent they do. Take California as an example. The stringent public university budgets in recent years have forced many exceptionally bright students to complete their first two years of college at a community college. If they excel there, they may be admitted to leading campuses of the University of California, such as Berkeley or UCLA. There is no doubt that a transfer student to Berkeley will enjoy a first-rate education in his major field, but the extraordinarily rich Berkeley experience of general education is likely to be minimal because most of the student's general education requirements will have been satisfied at the community college.

My second observation is that any discussion of what a well-educated person in the 21st century ought to know runs the risk of slipping into a replay of the "culture wars," with every person in the room having his or her favorite new subject to add to the ideal curriculum. (My own contribution to the endless discussion, by the way, would be that there ought to be a required course on bureaucracy since bureaucratic institutions are so much a fact of modern life and our students need to learn more sophisticated ways of coping with the large institutions that shape almost everything they do.)

Getting mired in a discussion of which courses are most important to require is a thankless task. We can stipulate that any good college education should include both rigorous depth of study in one field, whether it is a discipline of the arts and sciences or a professional major, and a demanding general education program that explores many modes of thought, per-

spectives, bodies of knowledge, texts, and methodologies.

At the heart of any discussion of the content of undergraduate education in a research university is the problem of achieving an appropriate balance between the faculty's teaching and research responsibilities. Sometimes, courses are not offered in timely sequences when students need them because faculty members are on research-related travel. A student's sequence of study, especially in the sciences, if interrupted by a faculty member's sabbatical, may force a lengthening of the college experience beyond four years. Fortunately, today's large-scale digital scholarly resources not only make possible advanced research without the necessity of long absences from campus but can simultaneously serve the purposes of advanced research and of teaching at multiple levels of specialization. Just as a faculty member at a college in a remote location can now have effective online access to major research collections, so can a faculty member anywhere use the same online resource to select what will be suitable for a course at a particular level.

My third observation is that a good 21st century education ought to take into account both what happens in the formal curriculum and what happens in the rest of the student's experience. Small colleges are particularly good at linking the curriculum with the cocurricular experience, purposeful about the organized extracurricular life of students, and, to some degree, even try to shape the informal interactions among students and between students and faculty members. It is much more difficult for large universities to influence these interactions. Technology-based courses, if they follow Candace Thille's exemplary, highly interactive statistics course at Carnegie Mellon University, can help to individualize instruction. But less imaginative, passive online presentations are no better than giant lectures at encouraging active learning nor do these technologies have much positive impact on the cocurricular dimensions of education.

In practice, it is graduate teaching assistants at research universities who often serve to bridge the gap between undergraduates and more remote senior faculty members. Some teaching assistants are talented teachers, mentors, and advisors, while others are so focused on their own doctoral studies that they neglect even the formal responsibilities they have as teachers or advisors. Full-time, tenure-track faculty members are not always better teachers than graduate students, nor is the opposite true. The lesson for research universities is to be more deliberate in encouraging everyone who teaches or advises undergraduates to be more perceptive about the totality of the student's experience and not just what goes on inside the classroom for which he or she is responsible. The sprinkling of honors colleges among research universities offers a pedagogical improvement for a small number of students, but also raises a question of equity for state officials about the use of public funds.

Fourth, there is very good evidence—especially from Richard Light's studies and from George Kuh's National Survey of Student Engagement—that "active" learning translates into more learning and improved persistence toward timely degree completion. A large lecture course is not a bad way to teach, but it should be used sparingly, in combination with the more effective discussion sections, seminars, and tutorials. Kuh and Light also have found, in their separate studies, that active pedagogies, such as requiring many written papers, expecting students to take advantage of a faculty member's office hours, and arranging internships or other experiential forms of education are all correlated with better grades and improved progress toward degree completion.

The growing pedagogical movement of encouraging undergraduates to undertake research projects in cooperation with faculty members has been especially helpful. Surprisingly, small colleges have exploited the undergraduate research movement most frequently, even though it is a practice that could easily be adopted by all colleges and universities. Because undergraduate research has proven to be particularly effective in preparing career scientists, it ought to be a pedagogy in wider use at research universities, but isn't. One result is that smaller colleges now prepare a proportionally larger share of America's career scientists than most large universities do.

In practice, it is graduate teaching assistants at research universities who often serve to bridge the gap between undergraduates and more remote senior faculty members.

My fifth observation is that to improve undergraduate education in research universities, we will need to focus more deliberately on the role of graduate students. Thanks to a 30-year PhD glut in many fields, new PhDs from leading universities increasingly will make up the faculties of non-elite

colleges and universities—that is, they will if an enterprising president or dean takes advantage of the market. Almost all new PhDs aspire to careers in which teaching will be a major component. Research universities need to be more tenacious in helping graduate students learn to be effective teachers. This is not rocket science. Encouragement to graduate students to participate in activities organized by a center for teaching and learning, to read in the literature of cognitive science and about learning styles, or to seek help in preparing a syllabus or an exam gives signals that teaching is important. It sends a message that the graduate student who spends time helping undergraduates is not doing something inappropriate, detracting from the only important task, which is writing a dissertation. I would argue also that research universities ought to organize continuing interactions at the department level with former students, now faculty members elsewhere, to sustain an ongoing community of scholars in their professional development.

The major case made for MOOCs at research universities—that they relieve the lecturer in a room of 500 students from lecturing so that he or she can work closely with students less formally—does not reflect the reality of most colleges and universities.

There is one new dimension in preparing graduate students to be the next generation of teachers with which no university has yet to come to grips—namely, MOOCs. The major case made for MOOCs at research universities—that they relieve the lecturer in a room of 500 students from lecturing so that he or she can work closely with students less formally—does not reflect the reality of most colleges and universities. If a course can be transferred to a less labor-intensive technology-based format, most universities will find it difficult to resist the temptation to eliminate the expense of that member of the faculty. Carried to extremes, a large number of faculty positions could be eliminated. That's not only a bad thing in its own right, but would have a chilling effect on the brightest graduate and undergraduate students, some of whom choose now to enter PhD programs in all fields of knowledge and aspire to become members of the next generation of scholars. If the number of traditional, full-time teaching positions at colleges and universities continues to contract—and MOOCs could cause them to contract more rapidly—the incentive will be reduced significantly for bright undergraduates to start on career ladders that will hardly exist in the future. We likely will be drawn into a situation that looks very much like today's world of K-12 education. K-12 teachers currently do not, unfortunately, come from the top ranks of academic performance among undergraduates. They enter a profession in which they have little intellectual control over what goes on in the classroom because there is a centralized curriculum. We should not want that future for America's research universities.

And sixth, despite the precariousness of most university presidencies in this era of overzealous trustees, a lot still can be achieved by bold executive action. If a research university wants to be viewed as a national resource, not merely a statewide agency, it needs to be clearer about the specific national interests it serves. Here's a cautionary tale. Five universities pooled resources about a decade ago to teach Southeast Asian languages because an adequate number of interested students could not be enrolled on any one campus. That's the good news. But during a recent budget crunch, the universities took the position that if the federal government relies on these universities for the supply of experts in these languages and cultures, the federal government must pay for the language program, and if the government didn't pay, the universities would close the program. Doesn't a university that has pegged its national distinction in part on its expertise in this field have an obligation to treat the field as a high priority for the use of its own money? An effective president should be expected to lead the effort to clarify the institution's mission and its relation to national priorities.

These modest suggestions are incremental and feasible. They respect both existing strengths of the American research universities, which are substantial, and acknowledge the realities of fostering change in large, decentralized institutions. But tenacity will be necessary in any process of evolutionary change toward improved teaching in research universities. Without tenacity, the calls for disruptive change will grow much louder. ■

by Phyllis Wise,
Chancellor of the University of Illinois at Urbana-Champaign

Research Universities POWER U.S. *Innovation and Prosperity*

We need to invest in these institutions to fuel future progress.

Editor's Note: *A version of this article originally appeared in* TIME*, October 7, 2013.*

If you use a GPS device, a mouse, or a microwave oven, take antibiotics, have an eye implant, or are reading this on a tablet, you can thank America's research universities.

These institutions, which have become a national network for innovation, are the envy of the world and are responsible for many of the products, services, and industries that have changed the way we live and yet we often take for granted.

The impact of our universities also is evident in how we address national priorities from security and defense, to public health and economic prosperity at home and competitiveness abroad.

Research universities—with their multifaceted mission of research, teaching, and service—are the key to educational access for millions and constitute the first link in a chain of basic knowledge leading to applications that have revolutionized modern life. They also underlie the economic and social growth that has seen our nation climb from a colony in rebellion to a global leader.

The future of this engine for innovation is uncertain—as the nation's long commitment to investment in scientific research and development has begun to erode under the pressure to provide short-term budgetary relief.

The concept of the research university in America emerged in the 19th century, but it was the Morrill Act of 1862 that established the nation's land-grant colleges and the first—uniquely American—*public* research universities. Not only did this landmark legislation serve to democratize educational opportunities and create new expectations of public access, it also charged these public universities with the responsibility of actively putting knowledge into practice. One hundred and fifty years later, these universities are home to the basic scientific research that is a foundation for both breakthroughs in technology and for economic development. Together with private universities, public research universities generate the vast majority of the nation's study of the pure basic science that is vital to our knowledge base.

The main source for investment in this endeavor is the federal government. In 2009, academic institutions accounted for more than half of the nation's basic research. And of the $32.6 billion in academic research and development funding from the government that year, about 60 percent was invested in public research universities.

I'll use my university as an example of the economic impact of public research institutions: A 2009 study of

Funding for our public universities, which educate 70 percent of all undergraduates, has declined to the point where the cost of a college education rests increasingly on the backs of our students.

the University of Illinois and its medical enterprise showed a $13.1 billion impact on our state economy, including the creation of more than 150,000 jobs. Innovative research at the University of Illinois alone has led to 34 start-up companies and nearly 300 new patents over the last five years. This is a return from one university.

The numbers are compelling, but they don't tell the full story of how university-based research touches lives. Consider just a few of the products resulting from basic research by universities and colleges funded by the National Science Foundation: bar-code scanners, computer-assisted design, improved biofuels, fish farming, tissue transplants, forensic DNA analysis, revolutionary weather-sensing networks, and, from the University of Illinois, nuclear magnetic resonance imaging and the first graphical Internet browser.

The work of research universities is the bedrock of our nation's scientific, technological, and economic growth and of much of our commercial R&D. When industries have been unwilling to invest in the early stages of research where risks are high and returns are unknown, universities step in. And when their gambles are rewarded, the outcomes are added to the public domain where industries and corporations and private individuals build on them. Lasers, MRI technology, restriction enzymes, and many computer technologies are all discoveries that have been

A selection of innovations, supported through university research, that have improved our lives.

Product, University, Inventor	Use Today	Development	Impact	Fun Fact
MRI machine SUNY (Brooklyn, N.Y.) 1972 Raymond Damadian	MRI scanners are widely used to detect injuries, diseases, and other health issues.	Damadian published a 1971 paper claiming doctors could diagnose cancer by using nuclear magnetic resonance (NMR). Because tumors contain more water than healthy tissue, they can be identified in NMR images.	MRIs are useful in identifying tumors and other maladies. They also show soft tissues, such as the brain and other organs, much better than X-rays.	In 1937, Columbia University professor Isidor I. Rabi discovered NMR, which led to the invention of the MRI machine and helped earn him a Nobel Prize.
Polio vaccine University of Pittsburgh (Pittsburgh, Penn.) 1955 Jonas Salk	The polio vaccine is one of the most common immunizations given to children worldwide.	In 1952, Salk developed the first effective polio vaccine, which was then tested in the largest medical experiment in history, which involved 1.8 million U.S. children. Following a massive child immunization campaign launched in 1955, by 1961, there were only about 160 polio cases in the U.S.	The polio vaccine has virtually eradicated the once-common childhood disease. In 2010 there were fewer than 1,300 polio cases worldwide.	Salk also worked on vaccinations for influenza and AIDS.
General use computer University of Pennsylvania (Philadelphia, Penn.) 1946 John Mauchly and J. Presper Eckert	Computers are used in nearly every facet of our lives and have revolutionized communication, technology, and medicine.	The development of the first computer, called ENIAC, was originally designed to calculate artillery firing tables for the U.S. Army's Ballistic Research Laboratory. The machine was called the "Giant Brain" in the press and could be reprogrammed to solve a host of computing problems.	The creation of ENIAC led to continued development in computer science and engineering. More than 95 million computers were sold in the U.S. in 2011, leading to $85.5 billion in revenue.	Designing and building ENIAC cost $500,000 in 1946, which would be about $5.9 million today.
Internet MIT (Cambridge, Mass.) 1965 Lawrence G. Roberts	The Internet connects computers and users worldwide and has changed the way we communicate and how information is spread.	Building off of a fellow MIT colleague's research on packet switching theory, Roberts established the first computer connection between computers in Massachusetts and California with a dial-up telephone line. The Department of Defense then funded the development of ARPANET, a network of computers at research universities and laboratories across the nation, which was an early iteration of the modern Internet.	Over 30 percent of the world's population uses the Internet. Nearly 72 percent of U.S. households have Internet access.	The first four locations in the ARPANET network were UCLA, Stanford University, UC Santa Barbara, and the University of Utah.
Richter scale California Institute of Technology (Pasadena, Calif.) 1935 Charles Francis Richter, Beno Gutenberg	The Richter scale was the precursor to current systems used to measure the magnitude of earthquakes.	Inspired by the apparent magnitude system, which measures the brightness of stars, Richter designed the scale and originally intended it to only be used in a particular study in California. Gutenberg later modified the scale to measure earthquakes at great distances, thus creating the moment magnitude scale used today.	While the original Richter scale has been updated several times since its inception, it has changed the way earthquakes are measured worldwide.	While most people today still refer to earthquake magnitude measurements as being on the Richter scale, earthquakes are now technically measured on the moment magnitude scale.
GPS (global positioning system) Johns Hopkins University (Baltimore, Md.) 1959 William Guier, George Weiffenbach	GPS is most commonly used in cars as a navigation tool, but it is also used by hikers, sailors, and the military.	Following the launch of Sputnik, physicists Guier and Weiffenbach discovered they could identify and track the satellite's exact location. They then developed a way to pinpoint a specific location on Earth via a satellite. This project, later called Transit, was used by the U.S. Navy to track submarines and was the precursor to current-day GPS.	GPS is common in most cars and cell phones. The military uses GPS for search and rescue, reconnaissance, tracking, and missile guidance.	As of May 2013, 64 GPS satellites have been launched. The oldest GPS satellite still in operation was launched in November 1990.

used in ways that would astound those who discovered them. This is what some call the Innovation Ecosystem, which is essential to America's global economic and innovation status and rests on the nation's collective investment in research universities.

Yet funding for our public universities, which educate 70 percent of all undergraduates, has declined to the point where the cost of a college education rests increasingly on the backs of our students.

The Budget Control Act of 2011 mandates reductions in federal spending of about $1 trillion over the next nine years. This is a short-term budget fix with a devastatingly high cost to the long-term productivity of our economy and the vitality of our society. The result in 2013 alone: a $12.5-billion reduction in federally financed research and, according to the Information Technology & Innovation Foundation, the loss to the economy of an estimated 200,000 jobs.

America's global standing is enviable, but in danger of eroding. We simply can't afford to curb key research efforts and undermine university-powered economic activity. It is ironic and alarming that other nations are fast emulating the federal-government/research-university partnership that has made the United States the world's technological and scientific giant even as the danger of that model's systematic dismantling here at home becomes increasingly apparent.

Our strategic federal investment in our universities has provided immense dividends to the nation and to the world for generations now. It is a commitment we cannot abandon. ■

Top 25 research universities, 2013

1	**Harvard University**
2	**Stanford University**
3	**University of California, Berkeley**
4	**Massachusetts Institute of Technology (MIT)**
5	University of Cambridge (U.K.)
6	**California Institute of Technology (Caltech)**
7	**Princeton University**
8	**Columbia University**
9	**University of Chicago**
10	University of Oxford (U.K.)
11	**Yale University**
12	**University of California, Los Angeles (UCLA)**
13	**Cornell University**
14	**University of California, San Diego**
15	**University of Pennsylvania**
16	**University of Washington**
17	**Johns Hopkins University**
18	**University of California, San Francisco**
19	**University of Wisconsin, Madison**
20	Swiss Federal Institute of Technology Zurich (Switzerland)
21	University of Tokyo (Japan)
22	University College London (U.K.)
23	**University of Michigan, Ann Arbor**
24	Imperial College of Science, Technology, and Medicine (U.K.)
25	**University of Illinois at Urbana-Champaign**

U.S. INSTITUTIONS IN BOLD
SOURCE: SHANGHAI JIAO TONG UNIVERSITY

Top 10 universities reporting most R&D spending in all fields, 2011

1	Johns Hopkins University	$2.14 billion (includes Applied Physics Lab)
2	University of Michigan	$1.27 billion
3	University of Washington	$1.14 billion
4	University of Wisconsin, Madison	$1.11 billion
5	Duke University	$1.02 billion
6	UC San Diego	$1 billion
7	UC San Francisco	$995 million
8	UCLA	$982 million
9	Stanford University	$908 million
10	University of Pittsburgh	$899 million

SOURCE: NATIONAL SCIENCE FOUNDATION

by Arthur Levine,
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Higher Education in a GLOBAL, DIGITAL *Information Economy*

Editor's Note: *This essay draws on portions of an article published in April 2013 at InsiderHigherEd.com.*

The lot of higher education in the years ahead will be that of every other social institution in the country. Every single institution will undergo profound change.

Driving this transformation is America's transition from a national, analog industrial economy to a global, digital information economy. Our social institutions—government, media, healthcare, finance, and education—were all created for the former. As a result, they appear to be broken today, working less well now than they once did.

In the years ahead, consumers and stakeholders will demand that all these institutions be updated to meet contemporary needs. This can occur either by repairing the existing institutions or by creating new institutions to replace them.

This is what occurred in American higher education in the past, as the United States made the transition from a local agricultural to a national industrial economy. The classical agrarian college, imported by colonists from 17th-century England along with its curriculum rooted in the ancient trivium and quadrivium, was established in order to educate a learned clergy to govern the colonies. This model held sway through the antebellum period. In the years before the Civil War, however, criticism mounted as the gap between the college and society grew larger.

For the most part, higher education resisted significant change. Indeed, Yale, the college with the largest enrollment in the country, was an articulate and forceful proponent for maintaining the status quo. In 1828, faced with a blistering attack by the Connecticut legislature for its programmatic irrelevance, Yale issued a powerful defense of the classical curriculum, which was embraced by colleges around the country.

At the same time, there were efforts to repair or reform the college, mostly small ones. A typical example: adding to the curriculum instruction in modern language and science. Larger initiatives were generally unsuccessful. Attempts to inaugurate graduate education repeatedly failed, costing more than one president his job. Brown—which in 1842 adopted one of the most visionary programs of the era, transforming its curriculum, programs, and student body with initiatives 25 years ahead of their time—was nearly bankrupted when there was little public interest. The president who authored the reforms was fired. Union College was an exception that thrived by embracing science and engineering. It created the secret sauce blending the old and new, eventually achieving an enrollment greater than Harvard's and Yale's combined.

During and after the Civil War, rather than incremental reforms, replacement initiatives boomed. New institutions were created. The Massachusetts Institute of Technology was created specifically for the study of science and industrial technology. Cornell University opened its doors proclaiming it would offer "any person, any study." The first graduate school in America was established in Baltimore—Johns Hopkins. The University of Chicago brought together the major reforms of the era on a grand scale, including coeducation, graduate and professional schools, the PhD degree, research institutes, a summer school, a university press, and much more.

These were new institutions that better met the needs of an industrial-

izing America. An entity called the university, imported from Germany, was established with what would become a mission of teaching, research, and service. It offered instruction in the professions essential to an industrial society, organized knowledge into relevant specialty areas, hired faculty with expertise in those areas, and not only transmitted the knowledge of the past, but advanced the frontiers of knowledge for the future.

At the same time, a number of specialized institutions emerged. Institutions focusing on technology and engineering—epitomized by MIT and modeled on the European polytechnics—were created to promote the science and technology of the industrial era and prepare its leaders. As the evolving economy demanded more education of its citizenry, so the normal school was also introduced to prepare more and better teachers. In the same spirit, the two-year college, originally called a junior college and later a community college, was established initially to offer lower-division undergraduate education in the local community. And the federal government created a bridge between the old and emerging worlds, agrarian and industrial America. The land-grant college, now found in all 50 states, was designed to provide instruction in agriculture and the mechanic arts without excluding classical studies. Colleges were also established for populations largely excluded from traditional higher educations; institutions for blacks and women opened their doors. Catholic higher education mushroomed.

A second round of larger repair initiatives followed, many of them modeled on the replacements, but certainly not all. Exemplary of these efforts is the work of Charles Eliot, who carried out 40 years of reforms during his presidency that remade Harvard from a college to a leading university. In the pantheon of leaders of the industrial transformation, Eliot, who championed and carried out change at the oldest and one of the most esteemed colleges in the nation, was a giant.

By the early decades of the 20th century, American higher education had changed. Graduate studies and advanced degrees were adopted. These became requirements for faculty positions. Research and public service were added to the teaching mission of the college. Professional schools in fields like engineering, business, and education became staples. Continuing education and correspondence courses were added. Elective courses and majors evolved. Disputation, recitation, and memorization, the pedagogies of the agrarian college, gave way to lectures, seminars, and laboratories. Enrollments soared, as 4 percent of the college-aged population attended college.

The colleges persisted, but they were no longer the classical colleges of yore. They adopted many of the changes of the era. With the exception of a tiny number of colleges, programs based in the trivium and quadrivium disappeared.

This outpouring of repairs and replacements over nearly a century coalesced into America's contemporary industrial-era system of higher education. It was codified in the 1960 California Master Plan, establishing three sectors of higher education—elite, mass, and universal access, composed of universities, colleges, and community colleges. Other states similarly restructured their public institutions, while private institutions sustained a wide range of programs and approaches. A for-profit sector has also grown in the years since.

This is the history of higher education in America. Change has occurred by accretion. The new has been added to the old and the old, over time, modernized to meet the needs of the times. Change has occurred with no grand vision of the system that the future will require. With society's future evolving and still unknowable, what occurs instead is experimentation in higher education to meet the perceived needs of the times. New ideas are tried; some succeed, many fail. By successive approximations what emerges over time is the higher education system necessary to serve the evolved society.

We are witnessing precisely that kind of experimentation today. Massive open online courses, or MOOCs, are a good example. They have captured the attention of higher education and the imagination of the nation. However, we have no idea whether they will or will not persist or be recognizable in the future that unfolds. Next year, they may give way to COOCs or ZOOCs.

Social change is a constant, and so is higher education's adjustment to it. When the change in society is deleterious, as in the McCarthy era, it is the responsibility of higher education to resist it and right the society. This is a natural process, almost like a dance. However, in times of massive social change like the transformation of America to an industrial or information economy, a commensurate transformation on the part of higher education is required.

What does seem likely is this: As in the industrial era, the primary changes in higher education are unlikely to occur from within, although some existing institutions will certainly transform themselves as Harvard did in the decades after the Civil War. Rather, the boldest innovations are more likely to come from outside or from the periphery of existing higher education, where they are unencumbered by the need to slough off current practice. They may be not-for-profits, for-profits, or hybrids. Names like Western Governors University, Coursera, and Udacity leap to mind.

We are likely to see one or more new institutions emerge. Each revolution created new needs for higher education and unique institutions to meet them. The agrarian era was characterized by elite higher education, meaning only a tiny percentage of the population needed to attend and the college was the vehicle for educating them. Industrial America required more education and mass access to college. Two major institutions were established to advance the industrial nation and increase access to college—the university and the community college.

The information economy, which requires a more educated population than ever before in history, will seek universal access to postsecondary education and is likely to create a new institution to provide it. The goal will be to establish access to college for all at low cost. Digital instruction will make this possible. The locus of operation will be global. Industrial economies focus on common processes over fixed times, while information economies emphasize time-variable, common outcomes. The universal access institution will offer instruction that is time-variable, individualized, and mastery-based, rooted in explicit learning outcomes. Degrees and credits are likely to give way to competency certification and badges.

Traditional higher education institutions—universities and colleges—can be expected to continue, though they will evolve as did their colonial predecessors and their numbers will likely decline. At greatest risk will be regional, part-time commuter universities and less selective, low-endowment colleges, particularly in New England, the mid-Atlantic states, and the Midwest, where there are too many institutions and too few future students. The future of the community college and its relationship to the universal access university is a question mark. It is possible that those with sprawling campuses will shed real estate in favor of more online programs, more compact learning centers, and closer connections with employers and other higher education units.

So what do we do? There is a greater sense of urgency today than in the industrial-era transformation of higher education; perhaps the criticism of higher education is more consequential now, given the dependency of colleges and universities on government. More importantly, this urgency comes from the pace and scope of socioeconomic change. In industrial America, progress was determined by natural resources and physical labor. In an information economy, the drivers are knowledge and minds. This makes higher education the dynamo that will power the nation's future and determine its capacity to compete in a global economy—one in which the United States appears to be losing ground educationally.

Change in higher education is also more urgent because we can see the consequences of inaction in other industries. The failure of print news media to respond to the digital revolution produced sharp declines in newspaper readership and advertising revenue. It rendered the historic business model obsolete. The inability to repair these organizations gave rise to digital replacements such as the *Huffington Post*. The newspaper business has been decimated. Major metropolitan dailies have closed. Print editions have been curtailed or ceased to be published. Long-respected institutions like the *Washington Post* and the *Boston Globe* were sold for bargain basement prices.

We cannot allow higher education to fail similarly, through inaction or unresponsiveness. At the same time, the stakes are too high to permit the long, drawn-out, herky-jerky evolution of higher education which occurred during the industrial revolution. Instead, it would be valuable to plan for the future.

At watersheds in the nation's and higher education's history, national task forces and commissions have been created either to reexamine and strengthen or reimagine and reinvent higher education. In terms of reimagining and reinventing higher education, in the years following World War II, President Truman established a White House Commission on Higher Education. The Truman Commission produced the six-volume report *Higher Education for Democracy*, which successfully created a higher education blueprint for America's post-war industrial economy, including the need for dramatic expansion and targets for accomplishing this; the end of barriers to access and the establishment of a system that guaranteed able young people both the opportunity to attend college and choice among institutions; the creation of a new institution, the community college; a design for financial aid; and much, much more.

In terms of reexamination, Carnegie Corporation in 1967 established the Carnegie Commission on Higher Education, which had the assignment of reviewing the industrial-era system of higher education to make recommendations on how to polish and improve it. Chaired by Clark Kerr, the architect of the University of California and the 1960 California Master Plan, the Commission issued a bookcase of reports on seemingly every aspect of higher education, offering analysis and recommendations targeted to institutions of higher education and their stakeholders with the goal of completing the development of the higher education system America needed for the industrial age. The results were as-

tounding in shaping higher education policy and practice for the nation.

This is once again a time for reimagining and reinventing higher education. A task force combining the best of the Truman and Carnegie Commissions offers a vehicle for doing this. In the manner of the Truman Commission, it should offer the nation and the higher education community a vision of the postsecondary education needed for a global, digital, information age, along with a set of broad policy recommendations for accomplishing this. Like the Carnegie Commission, it should offer a multiplicity of data-based reports on key issues, targeted specifically to the stakeholders who need to enact them. At the very least, such an effort promises a common vocabulary, vision, and set of recommendations to permit shared discourse about the future of higher education. It could provide much more, serving as a catalyst for action and offering a roadmap for concerted engagement.

Precisely because we live in a digital era, conversation about how to change higher education is ubiquitous. From tweets about federal higher education policy to blog posts about local college and university concerns, we have more dialogue than ever, though the relative value of each contribution remains to be seen. Now it is time to form the group of thoughtful, informed, influential stakeholders who will create a specific blueprint for American higher education in a new era. ■

PRESIDENTIAL LEADERSHIP

Continued from page 39

self-understanding of your institutions. There are a number of ways to do this; I'll briefly suggest four of them.

First and most obvious, you should use the bully pulpit of the college presidency deliberately and effectively to make the case for the liberal arts. You should consider how you can use the occasions of convocation, commencement, ground-breakings for new buildings, speeches to the local Rotary Club or the state 4-H club convention, addresses to alumni clubs, all the kinds of events where you are called upon to speak. This is a truly precious opportunity that few other leaders have, to address your community in situations where there is likely to be respectful attention to your message, at least for awhile! Use the opportunity with zest!

A few minutes ago I referred to my having cited Montaigne on the "back room of the mind" at several convocations, and mentioned how many students and their parents had later recalled this phrase and how it had helped shape their lives. I remember also the speech I gave to the faculty of Duke soon after 9/11. I was scheduled to present the annual report of the president to the Academic Council, and I used that opportunity to speak from the heart about the crucial importance of the liberal arts to help us deal thoughtfully with the horrors of that day. I paid homage, of course, to the scientists and engineers who would help us understand how buildings can be built to withstand shocks and exitways constructed; but I noted that nothing the engineers could teach us would keep crazed men from smashing large jets into tall buildings to make a point about their political views. I talked about the importance of the social sciences in helping us understand that human, social dimension of 9/11 and do our best to prevent a repetition of the day, and also understand and appreciate the motives and sacrifices of the people who gave their own lives to save others. But I reserved my deepest praise for the humanities, which provided the context and frameworks for sharing and dealing with our grief and shock. So many people spoke of how poetry or music had provided for them the best, indeed the only way to grapple with what had happened.

As part of my speech I told a personal story, as one can sometimes do very effectively on such occasions. Shortly after 9/11, when all our Duke obligations and events had been cancelled to allow everyone to focus on understanding what had happened and honoring the dead, Bob and I decided spontaneously to drive to Wilmington, to walk along the ocean at Wrightsville Beach. I was driving at one point, Bob was napping, and the local classical music station played the Fauré *Requiem* somewhere along a stretch of Interstate 40 in eastern North Carolina. I listened with intense emotion to the movement entitled "Dona Eis Requiem," "Give to Them Peace." I was overcome with emotion and had to pull over to the side of the road. And as I told the Duke faculty, that was the first time I fully acknowledged the sorrow and shock of the events, and found solace.

This is the kind of use you can make of the bully pulpit: in your speeches you can draw on the particular credibility and dignity of the president, and use it to make the case for the education your college provides.

The second way you can use your presidential leadership in supporting the liberal arts is to "put your money

where your mouth is." That means using your fund-raising skill and obligations to raise money for exciting programs like Greenblatt's "Imaginary Journeys." You can make this case effectively to foundations and generous alumni who remember their own liberal arts education fondly, and thus enhance the resources available for this purpose.

I remember with particular delight a fund-raising conversation with Kathryn Wasserman Davis, a dedicated Wellesley alumna and close friend. Kathryn wanted to make a major gift to the college to advance international understanding, which had been her own PhD field many decades earlier. Together we worked to an outcome that gave joy to both of us and many other people: Kathryn's gift would be the naming, foundational gift for a new art museum at Wellesley, a badly needed enhancement of our liberal arts mission. We had one of the earliest and best art history departments in the country, and a fine collection mostly donated by alumnae and their families, but only paltry and badly designed space to show and study these works of art. Kathryn and I agreed that art is a truly international language and that Wellesley's museum would include works that would speak directly to that purpose, works from many countries and eras. And after our partnership in building the museum Kathryn herself took up painting in her 80s, and has become a highly respected artist on Mt. Desert Island, Maine.

In addition to using your bully pulpit wisely and putting your fund-raising acumen where your mouth is, the third example of presidential leadership in support of the liberal arts could be the way you honor faculty members. With the teaching awards and other distinctions your college offers, make sure to single out for praise and support those who have been most effective in advancing the liberal arts mission of your institution through their teaching. You can cite their innovative course work and impact on the lives of their students, linking this specifically to the power of the liberal arts. You can ensure that these awards and recognitions are appropriately highlighted in college publications and in messages to parents and prospective students.

One more way in which you can use your leadership as president, perhaps the most effective of all: you can be a model for emulation, by others on campus and by the outside world, in the ways you use and embody liberal arts learning in your own discourse, both formal and informal. If you cite examples of fine literature, draw on instances from history, refer to the arts and describe learning in the sciences in liberal terms, you will set an example for others and have an influence greater than you may expect. Rhetoric was one of the original *artes liberales*, and it can still be one of the most transformative.

Conclusion

Taking my own advice about larding your language with liberal learning, I will conclude by quoting from three poems I discovered in a brochure on a recent visit to the Georgetown University School of Foreign Service in Doha, Qatar. Each poem is about journeying; I was myself on a fascinating journey, visiting universities in the Gulf States, where I had never been; and I was impressed to find ten poems in different languages featured in the admissions brochure for a school of foreign service in the Middle East. Because journeying is an apt metaphor for a liberal arts education, one that I and many of you often use, these three fragments provide an especially appropriate conclusion to this speech.

The first lines were written in Greek by Constantine Cavafy, a late-19th/early 20th-century poet who lived in Alexandria, from one of his best-known works, *Ithaca*. In translation: "When you start on your journey to Ithaca,/then pray that the road is long,/full of adventure, full of knowledge." This captures for me the lifelong learning aspect of a strong liberal arts education, full of adventure, full of knowledge, and we hope that the road is long.

The second citation is a few lines from Emily Dickinson, 19th-century American, written to a grieving friend: "Intimacy with Mystery, after great Space, will usurp it's place/Moving on in the Dark like Loaded Boats at Nights,/though there is no Course, there is Boundlessness." A good liberal arts education makes us intimate with mystery, and also helps us move in the dark by providing a sense of byways through the boundlessness.

And the final poem, in Arabic, is by Al-Sha'afi:

According to the measure of hardship are heights achieved,
And he who seeks loftiness must keep vigil by night;
As for he who wants heights without toil,
He wastes his life seeking the impossible—
So seek nobility now, then sleep once more (finally),
He who seeks pearls must dive into the sea."

As this final poem reminds us, a liberal arts education is not always easy; it involves close attention, taking risks, exploring uncharted territory, diving into the sea. But despite these challenges, the deep rewards of a liberal education are surely worth it, for all the reasons I've mentioned and many others that you will each devise to make your case vigorously as presidents committed to this cause. Good luck with your task, and happy journeys! ■

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Fault Lines in the Compact: HIGHER EDUCATION *and the Public Interest in the United States*

Editor's Note: *This essay was originally prepared for the IXth Glion Colloquium held in June 2013 in Glion-above-Montreux, Switzerland.*

The research university stands as one of the most admired and emulated of American institutions.

Year after year, American universities dominate the international rankings of institutions of higher education. The demand for places in American programs continues to grow, and the quality of matriculating students continues to improve. The prospects for students graduating from American universities continue to strengthen, as measured along dimensions as varied as enhanced lifetime earnings, life expectancy, and quality of civic participation. And the research contributions of American universities continue to command scientific recognition and fuel economic innovation and life-saving discoveries.

And yet, in spite of these achievements, the relationship between government and the university in the United States is, in the minds of many commentators, fraught. The points of conflict are many: federal governmental failure to protect the real value of research investment; marked reductions in state support for public universities; non-trivial university tuition increases that have raised vexing issues of access and affordability (and triggered threats of governmental intervention); and highly publicized and acrimonious governance conflicts that have pitted publicly appointed state governing boards against university leaders (on subjects ranging from program priorities, to the use of technology, to cost control and pricing).

There is no gainsaying that throughout American history the role of the university has commanded the attention and intervention of government. This is to be expected. Under the neo-classical framework, government has a central role to play in addressing a host of market failures involving higher education and in ensuring the Jeffersonian promise of equality of opportunity.

And indeed, over the years, governments and universities had forged a robust and dynamic compact in the United States. Public institutions and instruments have shaped the growth of the modern American university: The federal government has invested over $500

The relationship between government and the university in the United States is, in the minds of many commentators, fraught. The points of conflict are many.

billion in academic research and $1.7 trillion in student aid since 1970, has created and financed a range of grant and loan programs aimed at subsidizing student participation, and oversees a vast system of regional accreditation that seek to address quality and related concerns. State governments—in many cases, aided by federal legislation and support—have founded state public universities and actively supported their activities, providing direct appropriations to institutions as well as grant aid to students. At the same time, our universities have returned countless benefits to the communities in which they reside, anchoring and accelerating the economies in the surrounding areas, serving as an engine for upward mobility and economic advancement, and birthing countless world-altering discoveries for the betterment of humanity.

It is against the backdrop of decades of constructive collaboration that the current malaise between university and government is so disturbing.

It is against this backdrop of decades of constructive collaboration, one that has conferred staggering benefits on American society, that the current malaise between university and government is so disturbing.

In this paper, we explore the state of the compact between the government and the university in the United States and the prospects for constructive reengagement. In the first part of the paper, we discuss the rationales for government intervention in the higher education sector. In Part II, we briefly sketch the history of the compact between the government and universities, and the ways in which government has shaped and supported the flourishing of the sector. In Part III, we canvass the sources of the contemporary conflict between the government and higher education, which we argue has been exacerbated by the economic and social impact of the Great Recession. In Part IV, we identify several ideas for institutional and policy reform, while also locating these questions in a broader debate about inter-generational equity and the capacity of government to invest in our future. We argue that, although there is scope for more creative use of policy instruments to redress some of the current tensions between the state and research universities, ultimately a broader and more systematic set of interventions aimed at redressing rising inequality in the United States is necessary.

Part I: The Role of Government

The market for higher education is beset by several frailties—public goods, human capital market failures, information asymmetries, and equity concerns—that demand government intervention.

To be sure, the state has not always produced efficacious regulation in this domain. And yet, this should not be seen as an argument for an end to government's role altogether. One must instead ask how it can intervene in a targeted manner that responds to the risks posed by institutional actors, so the public can obtain the benefits of private initiative, investment, and ingenuity in this area without distortion of incentives or danger of abuse.

Public Goods and Positive Externalities. Some share of the benefits of post-secondary education—promotion of research and discovery, inculcation of civic values, and economic growth—accrue to the public good and not to individual students alone. This means that without government support, the education and research activities associated with higher education will be under-supplied from a social welfare perspective. Take, for example, basic research activity. Without supplementary funding, it is unlikely that private parties will dedicate a significant amount of their resources to such research, which has grounded much of the industrial innovation and other achievements whose benefits extend far beyond the university itself. Columbia University Provost Emeritus Jonathan Cole estimated that "perhaps as many as 80 percent of new industries are derived from discoveries at American universities." The widespread social benefits of these research activities provide a clear rationale for government investment.

Wholly apart from its contributions to basic research, universities are among the most powerful engines for economic growth and development. Higher educational attainment has been connected to reduced crime rates, lower unemployment rates, and reductions in public spending on assistance and social support programs. One recent study shows that an additional year of average university level education in a country raises national output by a remarkable 19 percent. The university is also a powerful source for upward social economic mobility for its students and their families (this rationale overlaps with the equity rationale below). For all of these reasons, the state

has a prevailing interest in nurturing the sector.

A range of intangible benefits can also be traced to higher education. For example, volunteerism and voting rates are higher among those with bachelor's degrees than high school graduates. Universities also play a central role in advancing civic culture and community cohesion. These non-pecuniary benefits to society provide yet another powerful set of rationales for government involvement.

Imperfections in Human Capital Markets. The state also has a strong interest in intervening in higher education to right failures in human capital markets that constrain the ability of students to finance their education.

Banks are often reluctant to provide private loans to students, due to their inability to secure collateral in the students' prospective human capital, and their difficulty of anticipating students' likelihood of academic success and future economic prospects. In the best of circumstances, banks will charge a risk premium that will often price students—who are reluctant to accumulate substantial amounts of debt at such an early age—out of higher education. This is a particular challenge for students of lower socioeconomic backgrounds, leading to distributional effects. All of these problems lead to suboptimal private lending in higher education, and a need for government intervention to compensate for these failures by reducing the amount students need to borrow.

Information Asymmetries. Since post-secondary education is inherently optional, and potential post-secondary students are of an age where they should be regarded as being capable of making rational and informed decisions regarding the future course of their education, the government should perhaps be wary of exercising a paternalistic role in shaping those decisions. However, there may be some modest scope for government intervention to resolve information asymmetries between students and post-secondary institutions. Accordingly, the state has a role in requiring those institutions that receive public funds to publish information respecting the quality of the entering class, the quality and character of the academic program, student completion rates, faculty research activity, and career placement patterns for graduates.

Equity. Given the considerable role that institutions of higher education play as gatekeepers to economic opportunity and professional advancement, the representation of various communities in these institutions and the social consequences of admissions policies must be taken seriously. Most universities are committed to recruiting the strongest possible student body, and the admissions decision is typically merit driven. Even so, universities present a unique capability to remedy persistent and self-perpetuating ethnic or socioeconomic imbalances in higher education and society at large. States have an interest in supporting and preserving the unique role of universities as a force for equal opportunity for its citizens, and making sure that all citizens are given a chance to obtain the skills and training that are essential to upward mobility in our knowledge-based society.

Part II: The Forging of the Compact

For each of these reasons, and in each of these ways, the state has played a fundamental role in shaping higher education in the United States. The compact we know today was forged over time across the sweep of American history: The university did not always act in response to the needs of the state, and the state did not always act in the interest of the university. However, over time, history reflected a dawning recognition of the two institutions' indispensable relationship.

Even before the American Revolution, colonial governments dedicated transportation taxes, sales taxes, and other sources of revenue to the founding and maintaining of a college in each colony. The methods and types of institutions varied from state to state, but there was, even then, a commitment to supporting the provision of higher education, and a belief that education was a fundamental state interest.

The relationship only grew stronger during the first century of the republic. One key moment in this relationship occurred in 1862, when Congress enacted the Morrill Land Grant Act, through which the federal government would provide land grants to certain eligible states to support collegiate programs in "useful arts" such as agriculture, mechanics, and military instruction. Over the next thirty years, Congress would expand the sweep of the Morrill Act to the entire nation. These statutes set a powerful precedent: they expanded undergraduate colleges into the university model across the United States with multiple programs beyond the liberal arts, and they enlisted the states in an effort to make higher education accessible to groups outside of the privileged elites, making them available to the working classes of the period.

The first half of the 20th century saw the emergence of state legislatures as major players in their own right in the funding of higher education: states in the Midwest and the West in particular used tax revenues to fund and grow universities into the tens of thousands of students. The levels and types of support varied considerably from state to state. California, for example, made access to education a priority and

charged no tuition, while other states saw higher education as a privilege and kept tuition at public institutions higher. Nonetheless, this area saw the expansion of state support that would eventually lead to the creation of renowned public research universities that operate at the level of private institutions while working to serve a larger segment of the state's population.

The federal government would stake out an even more influential and striking role in expanding access to higher education with the GI Bill in 1944, which guaranteed up to four years of tuition, fees, and a stipend at a U.S. institution of higher education in exchange for service in the U.S. military. By 1947, veterans accounted for 49 percent of college admissions. The increases in enrollments spurred by the GI Bill and continuing through the 50s and 60s led to the acceptance of enrollment-based funding at the state level, allowing public universities to absorb the new students without dramatically increasing tuition levels. The federal government, concerned about the growth of diploma mills and looking to protect veterans and taxpayer dollars, also began making eligibility for funds contingent on accreditation. This program laid the foundation for increasing access and affordability through portable student grants, which would become one of the most important forms of federal support for higher education in the next half of the century.

Soon after the GI bill, two documents set the modern trajectory for the federal government's involvement in U.S. higher education for the next fifty years, one on the issue of research support, the other on funding: Vannevar Bush's *Science: The Endless Frontier* in 1945 argued for the essential role of federal support for basic research, using competitive grants to universities. Over the next several decades, a host of federal agencies would harness the research talent at universities to create what Clark Kerr would later call the "Federal Grant University"—about 20 institutions received almost 80 percent of federal research funds. Support for university research is still one of the federal government's most important avenues of support for higher education.

At the same time, the Truman Commission Report on Higher Education chronicled fundamental concerns with equity and access in higher education. Among its influences, the Truman Report would lay the groundwork for future financial aid policies. One of the most historic steps along this path at the federal level was the passage of the Higher Education Act of 1965, and then the amendments to it in 1972, which established direct grants and loans to students. The Basic Educational Opportunity Grant, later renamed the Pell Grant, remains a major source of aid for low-income students. These grants are portable, allowing students to become consumers of education and forcing institutions to compete for their aid dollars. The federal government has continued to raise the maximum grant amount, and spending on the program more than doubled between 2000 and 2010. Many state governments also took steps in this period to make higher education more affordable and accessible to a significant portion of the population through appropriations to institutions and low tuition.

Part III: Fault Lines and the Great Recession

And yet, despite these energetic state interventions in higher education, fault lines have emerged in the relationship in recent years.

One area of very real tension concerns the level of government financial support for higher education. The many reasons for the state to invest in higher education remain as true today as they did in earlier times (perhaps even more so given the rise of the human capital economy), and yet the willingness and/or capacity of government to invest in higher education has waned. On average, state level support for higher education has declined 25 percent in the last decade, while in many states, the cuts have been steeper still (National Research Council, 2012). What is more, the level of state support for higher education is significantly lower than it was a few decades ago: in 1990 states spent an average of $9,100 per student on higher education, while in 2011 the number has dropped to $6,700 per student, both in 2011 dollars.

A similar (although softer) trajectory can be seen in federal research investment: After the dramatic doubling of government investment in NIH research during the Clinton administration, the real value of support has declined almost 20 percent in the last decade. As a consequence, the average age of a first RO1 research award has risen steadily, while the success rate for applications has steadily declined. The consequences of this government withdrawal have been profound for our universities and their research mission, as well as the status of the United States as the world's leader in research (and industrial competitiveness): As other countries continue to increase their research expenditures, the U.S. share of world R&D expenditures has declined significantly. All of this has occurred at the precise moment when universities with academic health centers in the United States are also wrestling with significant changes to health care models and declining clinical revenues, making it even more difficult for them to weather these financial shocks.

Another fault line has surfaced around issues of cost and affordability. Universities have raised tuition significantly in recent years: While median family income rose 147 percent from 1982 to 2007, tuition and fees rose 439 percent over the same period. The share of income families spend on higher education has risen for decades, and the rise has been sharpest for low-income families, who need to spend about half of their income to send a child to college. Despite efforts by several of the leading American research universities to augment financial aid, and the expansions to Pell Grants and other federal aid programs instituted by the Obama administration, there has been a declining level of participation by low- and moderate-income students in four-year university programs. In 2010, the Advisory Committee on Student Financial Assistance presented a report to Congress on increasing inequality in college access: While total college enrollment had increased over the past few decades, their study found that between 1992 and 2004 enrollment rates of academically qualified low-income high school graduates in four-year colleges decreased from 54 percent to 40 percent (Advisory Committee on Student Financial Assistance, 2010).

Still another area of tension has concerned value and innovation. Empirically, the benefits of higher education have clearly been shown (particularly in relation to lifetime earnings and risks of unemployment). However, many have begun to question the objective and mission of a university, and the pedagogical approach of universities, and inserted themselves into academic decision-making. Universities are increasingly viewed as engines of job creation and wealth. More than ever, their essential role as wellsprings of citizenship and social welfare is overlooked. Governors have sought to scale back low-enrollment programs or fields with less perceived utility post-graduation, such as the humanities, and have sought to tie funding to job placement and similar metrics. Critics have also pointed to declining completion rates as evidence that universities may not be accomplishing their fundamental education mission, as well as recent studies that reach a similar conclusion. One recent analysis by sociologists Richard Arum and Josipa Roksa (2011) maintains that 45 percent of students had effectively made no progress in critical thinking, complex reasoning, and writing in their first two years at U.S. colleges and universities. (Notably, two recent studies by the Council for Aid to Education contradict that finding, arguing that there is a significant improvement in students' performance between their freshman and senior years.)

Each of these concerns might have continued to vex the relationship between the state and higher education, but would not have commanded the policy salience they do today, if not for the devastating impact of the Great Recession. In 2008 and 2009, the U.S. labor market lost 8.8 million jobs and total wealth declined by $15 trillion. The median household income fell to its lowest level since 1996, meaning that the recession effectively wiped out the middle class income gains for the last 15 years. The effects of the contraction on the higher education sector have been profound and varied. At one level, the Great Recession placed enormous financial stress on the states' fiscal capacity and constricted their ability to maintain their investments in higher education. At another level, the Great Recession impaired the ability of many families who suffered wealth and income reductions to provide the level of anticipated support for their children's enrollment in university. Finally, universities themselves were directly buffeted by the effects of the Great Recession in the form of significant decreases in private donations, endowment reductions, and increased demands for financial aid support.

And although the country has started to recover from the Great Recession, the challenges surrounding the federal government's fiscal pressures continue to impact the sector. For instance, federally mandated sequestration will reduce NIH funding by another 7.8 percent, the largest cut in its history. The price of attending a four-year public university in the United States will have increased 27 percent above the rate of inflation across the last five years, even though average family incomes will have actually declined during that period even when adjusted for inflation (Oliff, Palacios, Johnson, & Leachman, 2013). Colleges are downsizing: some have cut as many as 200 academic programs, while also slashing funds for instructional staff, library, and student services. More and more students are choosing to enroll first in community

Empirically, the benefits of higher education have clearly been shown (particularly in relation to lifetime earnings and risks of unemployment).

colleges instead of four-year schools, but these schools also face significant budget cuts. Sixty-nine percent of Americans now feel that college is unaffordable and that there are highly qualified students who cannot gain access to a university education (Immerwahr & Johnson, 2010).

All of this in turn has fueled mounting concern and heightened rhetoric on the part of government officials regarding questions of rising costs, declining completion rates, and the value of a college education. State officials in Wisconsin, Virginia, Montana, and others have all attacked universities for rising costs and have imposed tuition freezes, even as state spending declines. Florida Governor Rick Scott has proposed charging different rates of tuition for different majors in an effort to drive students toward STEM fields, saying, "If I'm going to take money from a citizen to put into education then I'm going to take that money to create jobs." North Carolina Governor Patrick McCrory has argued that there is no value to the humanities, and said, "If you want to take gender studies that's fine. Go to a private school, and take it… But I don't want to subsidize that if that's not going to get someone a job." And President Obama has made college affordability one of the centerpieces of his second term agenda, emphasizing that government "can't just keep on subsidizing skyrocketing tuition," and even suggesting that universities would need to keep costs down or lose federal funding.

We must explore new approaches to financial assistance that do a more effective job of addressing market failures and aligning resources to areas of need.

Part IV: New Approaches and Enduring Questions

It may be tempting to dismiss many of these tensions as cyclical, and believe that when the economy rebounds, states will reinvest, tensions will cool, and the earlier equilibrium of constructive collaboration will return.

However, there are reasons to believe that these recent tensions reflect deeper structural issues, and the Great Recession has raised fundamental and vexing questions surrounding the strength, durability, and content of the compact between state and university that command attention and resolution.

At one level, addressing the conflict will require renewed federal and state efforts in devising innovative and thoughtful regulatory approaches.

For instance, we must explore new approaches to financial assistance that do a more effective job of addressing market failures and aligning resources to areas of need. One promising set of options that has won favor in recent years involves income-contingent loan repayment programs, through which students pay what they can up front, and contract with the government to defer any remaining payments until they graduate and are working. At that time, they pay any deferred fees as a fixed percentage of their income, an obligation enforced through the tax code. The loans address concerns of liquidity, enforceability, and complexity in the current system and the daunting fear of students that they will not be able to pay back loans. This approach to student debt has been popular in Britain and Australia for years; although the United States has offered an income contingent plan for federal loans, it is not widely used by students, many of whom are not aware of their repayment options or are put off by the program's complexity. The Obama administration has taken steps to simplify the process and make information more available to borrowers, and the administration's proposed 2014 budget included an expansion of the option to all borrowers, eliminating the income caps and other barriers that currently make some students ineligible.

We can also do a better job of addressing the scope of states to undermine the U.S. government's expenditure of funds through the opportunistic substitution of federal for state funds. As one example, the 2009 federal stimulus created a $48.6 billion State Fiscal Stabilization Fund that provided direct formula-based grant aid to states to advance essential education reforms. However, 23 states cut spending on higher education in the first year that they received the federal funds. And six of those states slashed spending on higher education while increasing their total state spending, suggesting that rather than using stimulus funds to offset necessary cuts, the grant allowed them to divert education spending elsewhere (Cohen, 2010). We need to explore methods of federal funding that limit the opportunities for this substitution, including rewards to states that increase their spending, directives to states to maintain certain levels of investment to receive federal funds, or the provision of funds to states through competitions that are keyed to appropriate criteria rather than formulas.

And, we should seek policy tools to redress the widening gap between the magnitude of state investment in, and state regulation of, higher education. Often, states will provide relatively little in the way of investment in its higher education system, but involve itself extensively in the internal affairs of its universities. For example, the University of Colorado receives only four percent of its budget from the state (the average public university received about 20 percent), and finds itself the target of significant and obtrusive regulations and intervention. The state approves and reviews all academic programs, establishes admissions standards, and prescribes standards for construction and capital improvement. It is time to start a conversation about the importance of parity in the scope of funding and intervention. This could include incentives for states to withdraw from governance in situations where they have a *de minimis* stake in operational support, or even a national conversation to develop norms and expectations for state regulation in a sector under strain.

And yet, universities also must shoulder their share of the burden for addressing the tensions in higher education. The call has gone out for universities to reduce tuition and control costs, and they must respond with purpose. Of course, the precise cause of rising costs in higher education is a matter of some debate. One theory blames rising costs on stagnating productivity, and says it is difficult for a labor-intensive industry such as education to substitute capital for labor, and so as wages rise, so inevitably do costs. Another theory, proposed by Howard Bowen (1980), argues that universities' principal goals are excellence, influence, and prestige and they are prepared to spend whatever is necessary to achieve these goals—in particular, as revenues increase, from tuition, endowments, and donations, so unavoidably will expenditures and costs. William Bowen (2012) argues that there are inefficiencies too fundamental to how universities are structured to be easily resolved, including fixed costs such as specialized laboratories and faculty with highly specialized talents.

Whatever the cause, universities cannot remain unstirred much longer to the changes roiling the industry around them. These changes include not only the enormous financial strain in the U.S. economy, with the accompanying calls for higher education to reduce tuition and control costs. It also involves the manifold changes occasioned by the information age: Higher education is famously one of the few industries that until now have managed largely to hold at bay the disruptive and potentially transformative effects of technological development in the information age. Universities have still largely unexplored the opportunities of this age, ones with the capacity not only to reshape and reduce administrative costs and improve services to students, but also expand mission and reach, augment revenue and reshape pedagogy in ways we have never seen before.

And yet, in truth, all of the above approaches can only take us so far. The problems we face are broader than only higher education, and cannot be solved by higher education policy standing alone.

The Great Recession exposed in a profound way the weakening of the middle class in America. Low- and middle-income families were hit the hardest by the downturn, and they have been the slowest to recover. Families in high-poverty areas lost the highest percentage of their wealth and were the most likely to be unemployed during the recession. According to a recent report from the Russell Sage Foundation, Americans are now less socially mobile than the citizens of a number of other countries around the world. A middle class upbringing is no longer a guarantee of lifetime success, with a third of Americans raised in the middle class falling below the middle class as adults.

For most of U.S. history, higher education was one of the most powerful mechanisms for social mobility in the nation, and served as a powerful counterforce to rising stratification. However, caught in a spiral of rising tuition and declining state investment, compounded by the fiscal effects of the Great Recession, the capacity of higher education to play this role is itself in jeopardy. The historic rate of growth in educational attainment has slowed—the percentage of those under 34 with a bachelor's degree has remained virtually unchanged for decades—and the gap in enrollment rates between students from low- and high-income families has risen steadily over the last forty years. Only 11 percent of students from the bottom quintile ever graduate, compared to 53 percent from the top. Our education system is not helping low-income students reach the same attainment as their higher-income peers.

As economists Claudia Goldin and Lawrence Katz (2008) argue, these trends in educational attainment deeply compound the problems of income equality across the American economy. The Great Recession has only widened this gap, with the college educated recovering more quickly and bearing less of the brunt of the crisis. Those with a college degree actually gained 187,000 jobs from December 2007 to January 2010, while those with high school diplomas or less lost 5.6 million jobs in this period, and another 230,000 during the recovery (Carnevale, Javasundera, & Cheah,

2012). More than half of the jobs created during the recent recovery from the recession have gone to workers with a college degree or higher, even though they make up only a third of the labor force.

One of the principal ways to narrow this divide is to invest in pre-K, K-12 education, higher education, training, and technology—in short, invest in tomorrow. And yet, the government is ill equipped to take these steps. There is perhaps no greater impediment to addressing the endemic problems plaguing society than the crushing growth in entitlement spending (particularly health care). This fiscal burden is subverting the scope for federal and state investment in education and starving the country of the investments that—at each stage in U.S. history—has nourished a cycle of innovation and growth that has accrued to the benefit of all. The current approach to retirement funding is nothing less than a dramatic inter-generational transfer. To take only one example, the Medicare funding formulas mean that male recipients only paid a dollar for every three received. Because they live longer, the discrepancy is even greater for women.

Since the founding of the Republic, universities have been a powerful force for upward social mobility and forward economic progress, just as the state has been a powerful force in building and shaping the modern university.

Without meaningful reform of these sorts of spending pattern, we are tilting our priorities toward consumption at the expense of investment. We are, simply put, forfeiting our capacity to invest in the next generation, in their capacity to create and converse and experiment and innovate. Ironically, universities are better positioned than most to drive the innovations that will bend the health care cost curve, at the very moment when this is leading to disinvestment. Unless and until the core issue of inter-generational equity and, more specifically, entitlement reform is addressed squarely by government, the likelihood that either the federal or state governments will be able to resume their vanguard role in ensuring the next stage of the great American experiment with higher education is dim indeed

Conclusion

Since the founding of the Republic, universities have been a powerful force for upward social mobility and forward economic progress, just as the state has been a powerful force in building and shaping the modern university. For much of our history, this cooperative arrangement has been at the heart of the American experiment and the American dream.

Nevertheless, it is the thesis of this paper that several forces are conspiring to test the stability and durability of this compact, and pose significant risks to the strength of American higher education and to the country as a whole. To some degree, we believe that the preservation of the compact requires a willingness of government and university to adopt more innovative instruments to ensure alignment of universities with well-established public goals. It also requires energetic public leadership that is aimed at preserving (and, indeed, enhancing) the level of state investment in higher education given the sundry public benefits associated with this sector. But, most significantly, we believe that the durability of this compact cannot be isolated from the broader debates and concerns over growing inequality in the country (which were given particular salience by the wrenching economic losses associated with the Great Recession). Simply put, in the absence of a vigorous and systematic approach to the challenge of income equality in a human capital society, the more likely it is that universities will be saddled with the symbolic burdens associated with the failure to live up to the Jeffersonian ideals of equal opportunity. This is a lesson that stakeholders in modern research universities ignore at their peril.

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UNIVERSITY

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Newman's terms, more emphasis on learning, less on knowledge. That's not a nightmarish outcome, but it will mean that the lucky minority of students who get to attend true research universities will have a profoundly different, and profoundly more advantageous, education than the majority who don't. It was America's democratizing tendency, not the intent of the leading planners of the higher education system, that brought us a substantial number of nonelite universities with research aspirations. If cost pressures extinguish those aspirations, then the resulting system will be less democratic.

Universities can be counted on to advocate for themselves. They will always ask for more independence and more resources. They may or may not try to get out ahead of events and change voluntarily, calmly, in a noncrisis atmosphere. But if they did, what should they do? Most of the changes that are coming will be necessities, imposed from without. What changes would be desirable, and ought to come from within?

I have already said that I've been struck by how little most of the university's stakeholders—everybody, really, except faculty, senior administration, and research funders—understand and embrace the research mission of the university. What has struck me about the people who do embrace research is a fundamental difference among them in institutional orientation. Most people work for their employer. Faculty members at research universities work for their discipline. If you want to advance in your career, your stature within your discipline is far more determinative than your status within your university. A faculty member at a research university will self-identify by discipline, not by university: "I'm an economist," not "I work for the University of Alabama."

Collectively, academic disciplines represent an amazing achievement. They are robust, global, intensely networked, and collaborative communities. They are self-governing and highly productive. They are also an excellent example of how to make a socially useful nonmarket activity economically self-sustaining—partly through outside funding, and partly through the disciplines' having made their internal peer valuations into the hiring and promotion standards of universities. Disciplines can't pay salaries, but universities do.

This system is not especially advantageous for presidents, provosts, and deans, who must answer to additional constituencies and who are paid to look after entire schools and universities. A research university is often, in the aggregate, a stunning collection of expertise and talent across a dazzling range, which is not getting full advantage from its own intellectual resources because they are situated inside departments and schools that are more oriented toward the same departments and schools at other universities than toward their local colleagues in other disciplines. Because the reward system for faculty members at research universities so strongly privileges research over teaching, students are often not getting the full advantage of the faculty talent that surrounds them either.

If university research were more oriented toward the institution where it takes place, and less toward the discipline, there would be a number of powerful benefits. It is very expensive for colleges and universities to compete ferociously with each other, school by school and department by department, for incremental advantages in research prestige. If, as Columbia University's former provost, Jonathan Cole, has been suggesting lately, individual universities were able to specialize more by forming alliances that would concentrate expertise in one location rather than trying to replicate it everywhere, that could be a way to control costs. As specialties were parceled out, online education would make it possible for students in one university in the alliance to take locally unavailable courses from another university in the alliance.

Within each university, more cooperation across disciplines could generate new intellectual ferment that could produce both research breakthroughs and a richer, more interconnected curriculum.

Within each university, more cooperation across disciplines could generate new intellectual ferment that could produce both research breakthroughs and a richer, more interconnected curriculum. It could also lead to more collaboration on research applications with the outside world, either locally in the university's hometown, or globally. That would make it much easier for university leadership to make the public case for research. And making research more institution-oriented would also give universities a way to make teaching a more genuine determinant of faculty careers, rather than a mainly notional one, and to explore more vigorously the pedagogical potential on online education, including for resident students.

The academic disciplines became so strong thanks to a set of structures that were designed artfully enough that over time they were able to become quite powerful. These include each individual disciplinary association, with its all-important annual convention where careers can be meaningfully advanced; the key academic journals within each discipline; the university presses; the logistical substructure that makes it easy for professors to move around from institution to institution, such as the retirement-account system, uniform student admissions tests, and systemic means of handling library resources (all of these were creations of the Carnegie educational philanthropies); and the practice of making tenure decisions substantially on the basis of evaluations of published work by within-discipline colleagues at other universities. For all the talk about higher education not getting the Internet, the advent of the online world has tremendously strengthened disciplinary life by making the global peer-to-peer communication that has always been one of its key features so much easier.

To orient academic research more—not completely, but more—toward the needs of the home institution would require not just exhortation, but the building of a similar set of structures that alter the incentives for individual faculty members. These would fall into two broad categories: hiring and promotion (especially tenure) standards, and enabling mechanisms for conducting and disseminating research. The first of these could give special weight to interdisciplinary or applicable research, to written evaluations of intellectual quality from people in other, related disciplines, and to advances in pedagogical technique. The second could provide funding from university-resident sources and create prestigious new publishing venues for valuable research that the traditional discipline-resident funding and publication venues would be unlikely to support.

Clark Kerr remarked that the oldest European research universities, established during the Middle Ages, were among the least changed institutions in all of human experience. He meant that as praise, mostly; in the current moment of reverence for innovation, people would hear it as a rebuke. In any event, it is inescapable that universities' peculiar survivability and their slow-moving quality are inextricably linked. They ignore almost no important development in society, but they assimilate no single development instantly and totally. So predictions that some aspect of higher education is about to change systemically in a dramatic, utterly landscape-altering fashion should be treated with skepticism. (The rhetoric linking the advent of massive open online courses to academic institutional apocalypse is already cooling off, for example.) What I am proposing here is meant as an incremental change of the kind that is always taking place in higher education. I don't want to say, ominously, that if it doesn't happen, there will be dire consequences. But I do believe that integrating the research life of universities more fully into the way society understands and experiences these wondrous institutions would be the best way of maximizing their benefit, and of securing their future. ■

American Higher Education: An Obligation *to the* Future

Vartan Gregorian—continued from inside front cover

of this. In fact, it is interesting to note there is yet another choice that various pundits have recently suggested students should consider—not going to college at all. The rationale behind that notion is that while the knowledge gained in college and university classrooms may be both wonderful and enlightening, it is not necessarily useful in "real life." That seems an empty argument to me and one that is refuted, for instance, by a quick glance at a recent list of the Forbes 400 richest people in America, which shows that 84 percent hold postsecondary degrees. Similarly, of the Fortune 500 CEOs, 93 percent have a college degree—many in the humanities and social sciences.

The success of these individuals and others underscores a point I have often made to students: that one of the immeasurable values of a liberal arts education is how it can open up a world of possibilities, including life and career paths to follow that might otherwise have seemed unimaginable to a young man or woman just starting out. But that is a wonderful challenge for someone who is motivated to explore their own potential: after all, if the only purpose of education is to train an individual for a specific job or skill, life would be much simpler—and, I might add, perhaps much less interesting.

It is still useful to remind ourselves that the greatest service technology can provide us is as an adjunct to knowledge, not as a replacement for it.

With all that said, it remains clear that increasing our expertise in technology and related fields is critical to the progress of our society. Nevertheless, it is still useful to remind ourselves that the greatest service technology can provide us is as an adjunct to knowledge, not as a replacement for it. Technology by itself is not a creator of content. Though the Internet and all the technological devices that now connect us to it have made it possible for much of humanity to have access to a virtual Library of Alexandria, access alone does not equal knowledge. The ability to carry around the entire corpus of Greek literature on an iPhone or some similar device may be astonishing, but that does not mean that the individual who possesses such a device actually *knows* anything about Greek literature. One still has to read. One still has to listen and see with one's own eyes. One still has to ponder ideas, explore the realms of both material and spiritual knowledge, and discuss these matters with other people.

In that connection, I would argue that the deep-seated yearning for knowledge and understanding endemic to human beings is an ideal that a liberal arts education is singularly suited to fulfill. Albert Einstein, in his inimitable fashion, went right to the heart of the matter, asserting that the practical men and women among us try to explain all phenomena by cause and effect. But, Einstein said, "This way of looking at things always answers only the question 'Why?' but never the question, 'To what end?'"[4] To search for even a glimpse of the answers to such great philosophical conundrums one needs to know not only what is taught in a classroom, but also how to think for oneself.

Of course, one also has to know history, particularly the history of one's own nation. In that regard, as Americans, we have an obligation, as citizens to whom the future of our country has been entrusted, to understand the obstacles we have faced in the past and both the problems and opportunities that lie ahead. As Benjamin Franklin said, issuing a still-timely challenge in response to a query at the close of the Constitutional Convention of 1787, what the Founding Fathers had created was "A Republic, if you can keep it."

Keep it we must, and we will, but to do so we need an informed and educated citizenry who can take full advantage of the almost 4,200 colleges and universities in our country, including some 1,700 public and private two-year institutions. And let me point out that computers and Web sites have yet to put those colleges and universities out of business. Why is this? Because of one simple reason: we are not a virtual society yet. Not yet. Human beings, by their very nature, are rational, spiritual, and social beings. They are not abstractions. They are not socioeconomic, consumer or entertainment units destined to be confined inside the small world of their cubicles and subject to what I call "cubicle alienation." Even though people can watch almost any

[4] The Born-Einstein Letters 1916-1955 *(MacMillan Press Ltd. 1971; 2005).*

movie they want on-demand from their cable service or on DVDs, men and women still go to movie houses to share the experience of being immersed in a story told through sound and images in the company of other human beings. People have Bibles, Talmuds, and Korans in their homes but they still go to churches, synagogues, and mosques to share their common bonds and traditions. People need to be part of a community—and for many, the college classroom provides an invaluable experience of community and collaboration.

The diversity of talents, interests and aims of the men and women who look to higher education to help them reach their goals is mirrored by the diversity of our colleges and universities, from which our system of higher education draws great strength. Individual institutions have traditionally emphasized different local, regional, national and international needs by providing educational opportunities to diverse populations, expanding scientific and technical knowledge, providing opportunities for continuing education, and other means.

But that certainly wasn't always the case. Higher education was actually available to only a small proportion of America's population until Congress enacted the Land Grant College Act in 1862. This legislation—the first Morrill Act—which was, astonishingly passed in the middle of the Civil War (making it clear how strongly both President Lincoln and Congress felt about the importance of education, as well as about the future of the nation) in effect, put universities where the people were. The Act not only provided much greater access to higher education, it also promoted specialized training and spurred the development of both theoretical knowledge and its practical application. The Industrial Revolution was in full swing and the Morrill Act helped to provide the research and the educated workforce that were desperately needed in agriculture, mining and manufacturing.

Today, there are new challenges, and one of the greatest facing higher education is how to protect the diversity of our colleges and universities at a time when it seems that instead of emphasizing variety and competition—which affects all aspects of higher education, from recruiting students to developing curricula—there is a worrisome trend towards uniformity. Joseph Aoun, President of Northeastern University, expressed similar ideas in a recent op-ed[5] in which he discusses how higher education must begin to respond to an increasingly diverse student body, with different needs, different goals, and different expectations. His particular emphasis is on the growing number of students who are not following the path directly from high school graduation to the college campus. As he points out, "The 'traditional' college student aged 18 to 22 is no longer the norm. Many people still think that the typical college student is an 18- to 22-year-old who's attending a four-year residential institution. But according to some estimates, nontraditional students—returning adults, part-time students, midcareer professionals, and every other permutation of learner—now make up 85 percent of all undergraduates."

I believe that startling statistic helps to provide an answer to the question with which I began this essay: is there a value to the kind of education that promotes the ability to become a lifelong learner? Clearly, the answer is a resounding yes, if education is going to be a resource available to all Americans that can parallel their path through life, if that is what they need. Noted author and Columbia University professor Andrew Delblanco addresses similar concerns in his recent book, *College: What It Was, Is, And Should Be*[6], suggesting that higher education should offer more to students than a rigid curriculum and a lock-step parade towards a degree. As he suggests, though more and more students are going to college with "the narrow aim of obtaining a preprofessional credential" (a phenomenon he attributes to the accelerating commercialization of American higher education), guiding young men and women down this path is a mistake. In fact, he argues, it means that they are losing the chance to experience the traditional—and wonderful—attributes of the undergraduate years, "an exploratory time for students to discover their passions and test ideas and values with the help of teachers and peers…" He also worries that this kind of multi-faceted, aspirational education is in danger of becoming available only to the wealthy and privileged, which

The diversity of talents, interests and aims of the men and women who look to higher education to help them reach their goals is mirrored by the diversity of our colleges and universities.

[5] *"To Meet President Obama's Job Goals, Involve All Colleges,"* Bloomberg Business Week*, January 29th, 2014.*
[6] College: What It Was, Is, and Should Be *(Princeton University Press, 2012).*

would pose a great danger to the progress of American society. While science, technology, engineering, and math play an increasingly prominent role in our globalized economy, innovation still requires original and imaginative thinking. The new discoveries that will improve the living conditions, health, and welfare of men, women, and children around the world will not be found without those who have the education to work toward those discoveries. And if we do not nurture the talent among us, who will provide literature and art and music for ages yet to come?

These are some of the purposes for which we, as a society, created, supported, and continue to value a liberal arts-oriented college education. As W.E.B. DuBois said, "The true college will ever have one goal—not to earn meat, but to know the end and aim of that life which meat nourishes."[7]

For myself, I believe that the immeasurable value of American higher education and the potential it has to open doors to a future of one's own making is the proverbial pearl beyond price that we must all cherish. That is one of the reasons I am so gratified that some of our nation's most eminent university leaders, along with prominent scientists, engineers, and others are sharing their thoughts and ideas about higher education in this special edition of the *Carnegie Reporter*. I am pleased to be able to contribute to their work by including an address I gave to the President's Council of the University of Tokyo (below), of which I am a member.

In many ways—and I can attest to this from personal experience—education is the bridge that allows us to travel from where we are to that further place where we can become who we want to be and do all the wonderful things we might otherwise only dream of. Whatever we can do as educators and citizens to strengthen that bridge is an obligation to the future that we all share.

Presentation by Vartan Gregorian to The Seventh President's Council of the University of Tokyo

JUNE 8, 2010

Let me begin by noting that the American university is incomparably the most democratic in the world. It's popular in the best sense of the term, admitting and educating unprecedented numbers of men and women of every race and socioeconomic background. Students from every corner of the world—and here I speak for myself as well—have found a place in the nation's incredible variety of colleges and universities, public or private, large or small, secular or sectarian, urban or rural, residential or commuter. Today there are more than 3,600 colleges and universities in the United States, including some 1,400 public and private two-year institutions.

U.S. colleges and universities enroll more than 19 million students and annually grant nearly 3 million degrees. Higher education employs more than 3.6 million people, including 2.6 million faculty, in what amounts to a more than $380 billion business.

The diversity of our education system gives it strength, great strength. Individual institutions have traditionally emphasized different functions that have complemented each other by addressing different local, regional, national, and international needs. They also provide educational opportunities to diverse populations by expanding scientific and technical knowledge, and providing opportunities for continuing education, and also opening their doors to the world.

Until several years ago, two-thirds of all students from foreign countries studying abroad were in the United States; two-thirds of the entire international student body that went abroad studied in the United States.

In the last century, enrollment in American higher education grew from 4 percent of the college-age population in 1900 to almost 70 percent by the year 2000. Our student body, moreover, is incredibly diverse. Following a long period of little or no growth in total enrollment, the nation's institutions of higher education are now seeing the biggest growth spurt since the baby boom generation arrived on campus in 1960.

Between 1995 and 2015, enrollments are expected to increase 16 percent, and one-third of the increase will be members of minority groups. By 2015, minority enrollment is anticipated to rise by almost 30 percent to 2 million in absolute numbers, representing almost 38 percent of undergraduate education.

[7] *Ibid*

Clearly there is a strong case to be made for the fact that American higher education is a vital and successful endeavor. But let me take a few moments here to review its history and highlight several aspects of higher education in the United States in order to understand the underpinnings of its success.

The first major opportunity for the expansion of American higher education came in 1862. Even in the middle of the Civil War, and despite the fact that 500,000 people died in the greatest tragedy of American history, President Abraham Lincoln enacted the Morrill Act, which established land-grant universities throughout the United States. The Morrill Act coincided with the Industrial Revolution, and it helped to establish universities just about everywhere the people of the United States were, and where they needed institutions of higher education that addressed their particular needs. Some of our current universities grew from these roots such as the University of California, Irvine, which deals with agriculture; in Wisconsin, the state university includes a focus on the fact that the dairy industry is important; in Minnesota, the mining industry, and on and on. Because of the needs of the state, the resources of states were tapped at the time and folded into the educational curriculum.

The second most important revolution that happened, in addition to land-grant universities—which, by the way, have produced, since their inception, some 20 million degrees—was the establishment of the National Academy of Sciences. Again, it is remarkable to note that Lincoln had such faith in the strength and continuity of the U.S. that in 1863, while the Civil War raged on, President Lincoln signed another piece of landmark legislation—a law that created the National Academy of Sciences. The Academy, which was established to advise Congress on "any subject of science or art," has done that job well and expanded to include the National Research Council, the National Academy of Engineering, and the Institute of Medicine.

It was not until World War II, though, that the federal government began supporting university research in a significant way. Prior to that, research was done in Europe and in corporate laboratories. To strengthen U.S. growth in science, President Franklin Roosevelt established a commission headed by Vannevar Bush, a former professor at the Massachusetts Institute of Technology. His landmark report was published in 1945 and adopted by President Truman. In this piece, a beautiful report entitled *Science: The Endless Frontier*, Bush noted that the business of industry naturally took the lead in applied research but was deterred by marketplace considerations from conducting pure research. Bush argued that it was the federal government's responsibility to provide adequate funds for basic research, which pioneers the frontiers of human knowledge for the benefit of society. He also wrote that the nation's universities were, by their very nature, best suited to take the lead in conducting basic research. Public funding, he said, would promote competition among researchers and projects could be selected on the merits through a peer review process. Bush suggested a federal agency should oversee the program, and Congress created the National Science Foundation to do the job in 1950.

The agency got off to a slow start, but after October 1957, when Sputnik was launched, support for science, science education, and basic research rose rapidly. From 1960 to 1966, federal spending on research not associated with defense leapt from $6 billion a year to almost $35- $40 billion. Until recent years, federal investment in research rarely fell below $20 billion a year, and much of this money went to universities. Giving the universities—that's the difference—giving the universities the lead in basic research turned out to be a brilliant policy. Instead of being centralized in government laboratories as science tended to be in other parts of the world, scientific research became decentralized in American universities. This policy spurred a tremendous diversity of investment. It also gave graduate students significant research opportunities and helped spread scientific discoveries far and wide for the benefit of industry, medicine, and society as a whole.

Another revolutionary phase in American higher education came about in 1944 and was known as the GI Bill of Rights. This legislation ranks up there in importance with the Morrill Act because the law, enacted at the height of World War II, opened the doors of America's best colleges and universities to tens of thousands of veterans returning from the battlefields, ordinary Americans who had never dreamt of going to college, and who were now actually being encouraged to do so by their government. The G.I. Bill made an already democratic system of higher education even more democratic in ways that were simply inconceivable in Europe and other parts of the world. In the following decades, the GI Bill—and its legislative offspring enacted during the wars in Korea and Vietnam, and now Iraq and Afghanistan—have resulted in the public investment of more than $60 billion in education and training for about 18 million veterans, including 8.5 million in higher education. Currently, the United States offers an education benefit as an incentive for people to join its all-voluntary military forces.

Shortly after World War II, in 1946, Congress also created the prestigious Fulbright scholarships, which all of you are familiar with, and which have been enormously success-

ful. All in all, there have been some 235,000 American and foreign Fulbright scholars—146,000 alone from countries other than the U.S. The program was created, by the way, as one of the best ways of investing in international education.

In 1947, the democratization of higher education was advanced when the President's Commission on Higher Education recommended that public education be made available up to the 14th grade, thus opening the door to the development of community colleges, or two-year colleges, which are now playing a major role in American higher education, but also point to some of the problems I will discuss later.

The noted sociologist David Riesman said that the greatest contribution to the American economy in the post-war period was the liberation of women.

In a more recent effort to promote international cooperation and security, Congress enacted the National Security Act of 1991, which provides scholarships for undergraduates and graduate students to study many of the less well-known languages and cultures in key regions of the world, including East Asia, Central Asia, and the Middle East, not to mention Eastern Europe, the former Soviet Union, and Africa.

Another major landmark was the creation of federal loan grant guarantees and subsidy programs as well as outright grants for college students. In the decades since its founding in 1965, the Federal Family Education Loan Program has funded more than 74 million student loans worth more than $180 billion. And in the years since the 1973 Pell Grant program—named after Senator Claiborne Pell— was created, more than $100 billion in grants have been awarded to an estimated 30 million postsecondary students.

Last but not least, let me add something important about Pell grants: when they were proposed, there was a big debate about whether to give the money to university presidents or to give it directly to students so the funds would be portable. It was decided—in fact, Clark Kerr of University of California who led the Carnegie Commission on Higher Education recommended—that the money be designated as portable by students because this would create competition among universities. Many of Clark Kerr's friends stopped talking to him after that recommendation, including his president. Thus, we can see that land-grant universities, the National Academy of Sciences, the GI Bill, Pell grants, and a host of other innovative strategies for advancing American higher education and increasing access to colleges and universities played a major role in enriching and expanding American education at the college and university level.

Naturally, the civil rights movement in the United States and the end of formal, legal discrimination also contributed to advancing higher education and educational access. In this connection, I should mention that my late friend, the noted sociologist David Riesman, said that the greatest contribution to the American economy in the post-war period was the liberation of women. He was right, because today, almost 54-58 percent of students enrolled in American higher education are women and that, along with the advancement of minorities—especially Asians and African Americans—is truly revolutionary.

Now, let me turn to the problems facing American higher education. There are many things I can talk about. Problem number one is that when there was no competition, America could afford duplication in its higher education. The nation could afford to have thousands of colleges and universities because they provided educated leaders and skilled labor, but at the same time, unskilled workers—those who could not afford higher education or even dropped out of school, could still find jobs in manufacturing and so on, but today, that's not the case. So duplication in education is no longer affordable, and quality has become very important and a key to competition among educational institutions.

Perhaps the second most important problem is the state of public universities which, as I indicated earlier, were created to be funded by public sources. Private institutions had to rely on private sources, on philanthropy. And parenthetically, ladies and gentlemen, as you know, philanthropy is a big deal in the United States. Annually some $350 billion dollars in philanthropic giving is disbursed by Americans, and not only the rich; 70 percent of those sums come from families with incomes of less than $100,000 dollars a year. Giving has become an American phenomenon. Even during presidential campaigns and debates, candidates now have to reveal the amounts of their philanthropic giving because otherwise they will be known as being stingy, being cheapskates.

But now, the barriers between public and private funding of universities have all but disappeared. Both private and public universities seek support from private sources as well as from the public, with one major difference: when I

came as a freshman to Stanford University in 1956, tuition and fees were $750 dollars at Stanford, $50 dollars at the University of California, Berkeley—yes, 50, five-oh. Now, all the costs have gone astronomically high. Colleges and universities have to keep up with inflation and support the costs of laboratories; technology; of stocking their libraries; building and maintaining dormitories and other facilities; paying for athletics; paying for health and other types of insurance; providing health, food, counseling and other services; legal and government affairs departments, public affairs departments, etc. In short, universities, nowadays, are like city states. But what has changed over the years is that individual states can no longer afford by themselves to pay for public higher education. For example, I'm told that today, only 8 or 9 percent of the funding needed for the University of Michigan comes from the state of Michigan; in Missouri, it's 9-10 percent; Maryland, 9-10 percent; etc. The rest has to come from tuition, fees, federal research grants, federal loans and grants as well as philanthropy, which was not how the system of supporting public higher education was supposed to work.

In addition, when Pell grants were inaugurated, there were two components: loans and outright grants. As time has passed, the proportion of loans and grants has changed so that today, more loans are given than grants. Hence, students often have to borrow money to pay back the loans, and if they are unable to pay their debts or go into bankruptcy as a result of their debt burden, this will adversely affect their future, including their ability to find jobs and advance in their careers. If, on the other hand, they take jobs with low pay and because of their low salaries remain unable to pay their loans, it discourages some people from embarking on careers where the financial rewards are not great but the mission is important to society and the nation. As a former teacher myself, I have first-hand experience of that type of situation. If you become a teacher with a $30,000-a-year salary and you have to pay six-to-ten thousand a year for your college debt, especially if you get a higher degree, that's a very serious challenge.

Yet another problem that we face is universities of uneven quality because we don't have a national accrediting system. We have a regional accrediting system. In the absence of a steady flow of public and private funds, many higher education institutions rely on increased levels of enrollment as a way of meeting their budgets. This, naturally, affects quality. In addition, universities, by necessity, incur financial aid obligations, which they sometimes cannot fully meet because the more students they enroll, the more financial aid they have to provide. This situation is worsened by the fact that now, there is a new, major enterprise competing for students: proprietary, primarily for-profit organizations along with online institutions such as Phoenix University and others, which have access to federal loans. These entities are expanding their reach exponentially. Currently, the U.S. Congress is investigating why a disproportionate amount of Pell grants are going to proprietary and online schools. Some argue that Pell grants should not go to these institutions at all but those who want specific kinds of job training, such as beauticians and various kinds of technicians and so forth argue that they should have access to the same kind of funding sources as other students.

So these are some of the problems. But there is still another that is among the most important of all, and that is the following: we all agree that what makes universities great is the quality of their faculties. I have always believed that the faculty is the bone marrow of the university. Students come and go, administrators come and go—even visionary leaders, though they be few and far between, come and go—but a university's faculty provides continuity. In that connection, the challenge is that many universities cannot afford to maintain or recruit high-quality faculty nor can they have the same number of top-level faculty that they did in the past. As a result, they resort to replenishing their ranks with adjunct and part-time faculty. Part-time faculty size has increased from 22 to almost 40 percent in many universities, making the overall quality of their faculty questionable. I'm not referring to the Harvards, Princetons, Yales and others of that rank; I'm talking about those small colleges and public universities that cannot afford to maintain an excellent faculty roster and so must rely on part-timers in order to preserve themselves during difficult financial times. Remember, when you have part-time faculty, you save money because you don't have to give them offices, or provide benefits or sabbaticals or other types of resources. It's almost like piecework is being introduced into higher education.

One of the greatest challenges facing our society is how to distinguish between information, which may be true, false or some tangled combination of both, and real knowledge.

In addition, naturally, during times of financial crisis such as we find ourselves in now, another challenge that arises is that there is a growing impulse to do what is expedient, such as reducing the number of academic units required to graduate. Hence, I am not surprised that once again there are also voices raised, asking why can't the time required for BA and other degrees be reduced to three years? After all, some say, Oxford started with four years and then reduced it to three. Harvard copied the four-year system and it has been with us since the beginning of the higher education system in the U.S., but why does it have to remain that way? Let's reduce it. Quality, depth and richness of education don't seem to factor into these suggestions.

This brings me to what may be the core crisis facing higher education today, and that is the onslaught of information that now accosts almost every human being in our borderless, always tuned in, always connected and interconnected globalized world. Perhaps nowhere is this flood of information more apparent than in the university—particularly in the United States. Never mind that much of the information is irrelevant to us and unusable. No matter, it still just keeps arriving in the form of books, monographs, periodicals, web sites, instant messages, social networking sites, films, DVDs, blogs, podcasts, e-mails, satellite and cable television shows and news programs, and the constant chirping of our Blackberries and smart phones—which, by the way, I hope you have turned off, if just for now!

While it is true that attention to detail is the hallmark of professional excellence, it is equally true that an overload of undigested facts is a sure recipe for mental gridlock. Not only do undigested facts not constitute structured knowledge but, unfortunately, the current explosion of information is also accompanied by its corollary pitfalls, such as obsolescence and counterfeit knowledge.

And, if you will indulge me for sacrificing the English language for a moment, another phenomenon we are confronting is the "Wikipedia-zation" of knowledge and education. At least in part, this is a result of the fact that we are all both givers and takers when it comes to running the machinery of the Information Age, particularly the virtual machinery. I am talking, of course, about the Internet. Let me tell you about a notorious event involving Wikipedia that has come to represent how easily false information can virally infect factual knowledge. What has come to be known as the Seigenthaler Incident began in 2005 when a false biography of the noted journalist Robert Seigenthaler, Sr., who was also an assistant to Robert Kennedy when he was Attorney General in the 1960s, was posted on Wikipedia. Among the scurrilous "facts" in the biography were that "For a short time, [Seigenthaler] was thought to have been directly involved in the Kennedy assassinations of both John, and his brother, Bobby. Nothing was ever proven."

This horrendous misinformation—represented as truth—existed on Wikipedia for 132 days before Seigenthaler's son, also a journalist, happened upon it and called his father. Seigenthaler, Sr. then had Wikipedia remove the hoax biography, but not before the same false facts had migrated to many other sites. Probably, somewhere in the estimated 30 billion online pages, it still exists. Wikipedia has taken steps to address this problem, but estimates are that there may be somewhere around two million distinct sites on the Internet, with more being created all the time, and there is no central authority, no group, individual or organization to oversee the accuracy of the information they purvey.

Clearly, therefore, one of the greatest challenges facing our society and contemporary civilization is how to distinguish between information—which may be true, false, or some tangled combination of both—and real knowledge. And further, how to transform knowledge into the indispensable nourishment of the human mind: genuine wisdom. As T. S. Eliot said, "Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?"

Today's universities—along with our colleges, libraries, learned societies and our scholars—have a great responsibility to help provide an answer to Eliot's questions. More than ever, these institutions and individuals have a fundamental historical and social role to play in ensuring that as a society, we provide not just *training* but *education*, and not just *education* but *culture* as well. And that we teach students how to distill the bottomless cornucopia of information that is ceaselessly spilled out before them twenty-four hours a day, seven days a week, into knowledge that is relevant, useful, and reliable and that will enrich both their personal and professional lives.

This is not an easy task, especially in a nation where, as Susan Jacoby writes in her recent book, *The Age of American Unreason*, "the scales of American history have shifted heavily against the vibrant and varied intellectual life so essential to functional democracy. During the past four decades, America's endemic anti-intellectual tendencies have been grievously exacerbated by a new species of semiconscious anti-rationalism, feeding on and fed by an ignorant popular culture of video images and unremitting noise that leaves no room for contemplation or logic. This new form of anti-rationalism, at odds not only with the nation's heritage of eighteenth-century Enlightenment reason but with modern scientific knowledge, has propelled a surge of anti-intellectualism capable of inflicting vastly greater damage

than its historical predecessors inflicted on American culture and politics."

What Jacoby so forcefully points out is that ignorance is absolutely *not* bliss when both the strength of our democracy and the future of our society is at stake. And it may well be, for not only are we distracted and overwhelmed by the explosion of images, news, rumor, gossip, data, information and knowledge that bombard us every day, we also face dangerous levels of fragmentation of knowledge, dictated by the advances of science, learning, and the accumulation of several millennia of scholarship. Writing about the fragmentation of knowledge and the advent of specialization, it was not so long ago that Max Weber criticized the desiccated narrowness and the absence of spirit of the modern specialist. It was also this phenomenon that prompted Dostoevsky to lament in *The Brothers Karamazov* about the scholars who "…have only analyzed the parts and overlooked the whole and, indeed, their blindness is marvelous!" In the same vein, José Ortega y Gasset, in his *Revolt of the Masses*, as early as the 1930s, decried the "barbarism of specialization." Today, he wrote, we have more scientists, scholars and professional men and women than ever before, but fewer cultivated ones. To put the dilemma in 21st century terms, I might describe this as everybody doing their own thing, but nobody really understanding what anybody else's thing really is.

Unfortunately, the university, which was conceived of as embodying the unity of knowledge, has become an intellectual multiversity. The process of both growth and fragmentation of knowledge underway since the seventeenth century has accelerated in our time and only continues to intensify. The modern university consists of a tangle of specialties and sub-specialties, disciplines and sub-disciplines, within which specialization continues apace. The unity of knowledge has collapsed. The scope and the intensity of specialization are such that scholars and scientists have great difficulty in keeping up with the important yet overwhelming amount of scholarly literature of their own sub-specialties, not to mention their general disciplines. Even the traditional historical humanistic disciplines have become less and less viable as communities of discourse. As the late professor Wayne C. Booth put it wistfully in a Ryerson lecture he gave more than twenty years ago that still, sadly, sounds like breaking news from the education front: *Centuries have passed since the fateful moment...when the last of the Leonardo da Vincis could hope to cover the cognitive map. [Now], everyone has been reduced to knowing only one or two countries on the intellectual globe…[In our universities] we continue to discover just what a pitifully small corner of the cognitive world we live in.*

In that regard, I would add that this fragmentation of knowledge into more and more rigid, isolated areas is contributing to a kind of lopsidedness in the way education is organized and a growing disconnect between value-centered education and the kind of training that is aimed specifically at career preparation. What is hopeful is that there is a growing realization among the leaders of the nation's higher education sector that this lopsided system of education is both deficient and dangerous, that we need a proper balance between preparation for careers and the cultivation of values, that general and liberal education is the thread that ought to weave a pattern of meaning into the total learning experience, that unless such a balance is restored, career training will be ephemeral in applicability and delusive in worth; and value education will be casual, shifting and relativistic. I strongly believe that one of the great strengths of American higher education is that it is home for liberal arts education, which is a sound foundation for all the professions and professional schools.

In the words of Albert Einstein, "It is essential that the student acquire an understanding of a lively feeling for values. He or she must acquire a vivid sense of the beautiful and the morally good. Otherwise he or she—with his or her specialized knowledge—more closely resembles a well-trained dog than a harmoniously developed person." That is why I believe, and every year, whether I was a Dean, President or Provost of a University, I always reminded incoming freshmen to remember the famous line in Sheridan's *Critic* (1799), that the number of those who undergo the fatigue of judging for themselves is precious few. It is the task of higher education to increase the number of those who do undergo that fatigue.

Ignorance is absolutely not *bliss when both the strength of our democracy and the future of our society is at stake.*

To sum up, it seems to me that by trying to reduce the requirements for a degree and at the same time, expecting to be able to break down education into specialized parts—each part swollen to overflowing with endlessly and exponentially increasing amounts of data and information—we are going in absolutely the wrong direction. Why? Because all this pushing and pulling and compartmentalizing presupposes that somehow, one's education will eventually be

finished, that it will come to an end where an individual can say, *now I've graduated and I don't have to learn anymore*. But of course, you never graduate from your life and hence, you never really graduate from learning. One's "formal" education is really just an introduction to learning where the skills to go on educating oneself are acquired and inculcated into everyday life—because learning is a lifelong endeavor. In that connection, when I was president of Brown, one day I decided, as a joke or as an ironic act, to propose awarding two kinds of degrees, one certifying that you know the following subjects, the other one certifying the subjects that you know, but most thought it was a crazy idea because parents would say, we paid you to educate our sons and daughters and instead, you're giving us an uneducated person. So I decided that we'd just say the BA degree was, as I've described above, an introduction to learning, an undertaking that must be carried on throughout all the years of one's life.

One of the greatest strengths of American higher education is that it is home for liberal arts education, which is a sound foundation for all the professions and professional schools.

In order to further make my point about lifelong learning, let me share this one last story with you. Some years ago, when asked to give a major speech to an illustrious gathering at Southern Methodist University, instead of a speech, I gave an exam. I said, imagine that you are the last person on earth. Nothing is left, no monuments, no other human beings, no libraries, no archives and hence, you are the best-educated person on the planet. Suddenly, the Martians land and they want to debrief you, the last human being standing, so they can preserve the history of humanity and the civilizations of the planet Earth. They begin by asking you questions such as: We heard that you had some objects that could fly, but that's such an antiquated mode of transportation, so can you explain to us the principles by which these objects were made to fly? After all, your society awarded PhDs and MDs and all kinds of other degrees to people like yourself, so can you just prepare a schematic for us about these flying things? And we also heard that you had some kind of ships that could travel under water, but how was that possible? We also heard that you were able to phone each other, and despite mountains and oceans and so forth, you could talk to each other across thousands of miles; how did that work? And, oh yes, we'd also like to have the maps of all the continents, so can you draw them for us? Please include all the nations along with rivers, counties, capitals, and so forth. After all, we understand that you are an educated person, so these things should be easy for you.

Then I said to the gathering—still speaking on behalf of the head Martian—there's another subject we Martians want to know about. We have a long list of the names of the religions that people on Earth followed, and they were well-represented in the United States. We don't quite understand the differences between these religions and why you argued about them century after century. Here is just part of the list we have: Hinduism, Islam, Judaism, Jainism, Sikhism, Shintoism, Confucianism, the Baha'i faith, and then the different forms of Christianity: Catholics, Protestants, Baptists, Southern Baptists, Lutherans, Pentecostals, Evangelicals, Amish, Mormons, Jehovah's Witnesses, Seventh Day Adventists, Greek Orthodox, Eastern Orthodox, and Russian Orthodox. Could you please pick five of these and tell us where they agree and where they disagree? Of course, there was dead silence in the audience. So I concluded my "exam" by saying, I thank you for not being the last man or woman on Earth, because education is a life-long experience and endeavor, and I believe you might have some catching up to do…!

In a way, perhaps we all have constant "catching up" to do when it comes to finding ways to address the many challenges facing our colleges and universities. But we will find them, I am sure, because in the words of Henry Rosovsky[8], the economist and educator, in higher education, "'made in America' is still the finest label." We all should have a hand in ensuring that continues to be true. ■

[8] *See page 59 of this magazine for Henry Rosovsky's article, "Research Universities: American Exceptionalism?"*

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Carnegie REPORTER
Winter 2014

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Carnegie Medal *of* Philanthropy

Honoring Those Who Use Their Private Wealth for the Public Good

The winners of the Carnegie Medal of Philanthropy 2013, seated in the Debating Chamber of the Scottish Parliament, Edinburgh. Pictured here, from left to right starting in the back row, are Dame Janet Wolfson de Botton, on behalf of the Wolfson family; Dr. James H. Simons; Dr. Dmitry Borisovich Zimin; Sir Tom Hunter; Dr. Marilyn H. Simons. Not pictured: Her Highness Sheikha Moza bint Nasser.

Six leading philanthropists received the Carnegie Medal of Philanthropy during a ceremony at the Scottish Parliament in Edinburgh on October 17, 2013. The event also marked the centennial of the Carnegie UK Trust, a foundation established by Andrew Carnegie to improve the wellbeing of the people of the United Kingdom and Ireland. The most celebrated award in global philanthropy, the Medal is awarded biannually on behalf of the international family of Carnegie institutions. It recognizes those who follow in the footsteps of Andrew Carnegie, and whose sustained records of giving back embody his belief that with great wealth comes great responsibility.

The philanthropic activities of this year's Carnegie medalists span the globe and include support for education, science, entrepreneurship, and the arts. The 2013 Medal recipients are: Her Highness Sheikha Moza bint Nasser, Chairperson of the Qatar Foundation for Education, Science, and Community Development; Sir Tom Hunter, the British entrepreneur; Dr. James Harris Simons—honored along with his wife, economist Dr. Marilyn Simons—American mathematician who established a leading hedge fund; Dr. Dmitry Zimin, founder of one of Russia's foremost telecom companies; and Dame Janet Wolfson de Botton DBE on behalf of the Wolfson family, founders of the Wolfson Foundation. The medalists were selected by a committee of representatives from six major Carnegie institutions. Committee chair Vartan Gregorian, president of Carnegie Corporation, praised the accomplishments of this year's honorees as "a great tribute to humanity and its potential."