ISSUES
IN SCIENCE AND TECHNOLOGY

NATIONAL ACADEMY OF SCIENCES
NATIONAL ACADEMY OF ENGINEERING
INSTITUTE OF MEDICINE
THE UNIVERSITY OF TEXAS AT DALLAS
ARIZONA STATE UNIVERSITY
SPRING 2015

A New Model for the American Research University

Clean Energy Diplomacy from Bush to Obama

Physics Envy: Get Over It

The Limitations of Climate Models as Guides for Policy

Welcome to the Anthropocene

Empowering Social Science

An Excess of Research Space?

First Science Fiction Contest Winner

USA $12.00 / CAN $13.00
5 1>
0 56698 57433 0

MICHAEL M. CROW
WILLIAM B. DABARS

A New Model for the American Research University

The supposed conflict between research intensity and increased student access serves the branding needs of our elite universities, but not the social and economic needs of the nation. A new institutional design is emerging that meets the dual obligations of equity and excellence without compromising on either.

Headlines and pundits proclaiming a crisis in American higher education seem to proliferate on a daily basis. Accounts of skyrocketing sticker prices at our nation's colleges and universities vie for attention with dire pronouncements about the value of a college degree in today's challenging economy. There is a "crisis on campus" and the "education bubble is about to burst," religions scholar Mark C. Taylor confidently informs us in his recent book, and according to sociologists Richard Arum and Josipa Roksa, America's students are "academically adrift." This apocalyptic genre has become so commonplace, with assaults coming from all quarters and in so many creative guises, that it would be superfluous to cobble together even a representative compilation. As just one more random, high profile sample, consider Peter Thiel, cofounder and former CEO of PayPal, whose Thiel Fellowships provide $100,000 grants on the condition that recipients drop out of college to pursue entrepreneurial endeavors. As Thiel reassures us in the *New York Times*, "Before long, spending four years in a lecture hall with a hangover will be revealed as an antiquated debt-fueled luxury good." Cultural commentators and academics alike find it easy enough to represent higher education in various stages of catastrophic decline, but they have been less cognizant of the deeper phenomenon: the challenges that confront universities reflect a confluence of societal trends that threaten to undermine the egalitarian conception of higher education that has been integral to our national identity and success from the outset of the American republic.

A cover article in *Forbes* magazine asked: "Is Higher Education Still Worth It?" and concludes: "For many students, the answer is probably not—unless they are accomplished enough to be accepted by one of the schools ranked near the top of our annual list of America's 650 Top Colleges." This remarkably narrow perspective seems close to becoming consensus opinion. Yet the idea that higher education is only worth the investment for the rarified few admitted to one of our nation's most selective institutions threatens to undermine the future of our collective quality of life, standard of living, and national economic competitiveness. In this article, we briefly describe one possible path forward and one full-scale, real-time experiment to move down this pathway as decisively as possible.

Although there are many types of colleges and universities, few critiques differentiate among the plurality of institutional types that constitute a heterogeneous academic marketplace. There are roughly 5,000 institutions of higher education in the United States, of which the Carnegie Foundation for the Advancement of Teaching categorizes only 108, both public and private, as major research universities. Approximately 100 additional universities with less extensive research portfolios comprise a second research-grade cohort. This aggregation of universities is held in considerable worldwide esteem. American institutions consistently occupy 17 of the top 20 slots in the authoritative ranking of world-class universities conducted by the Institute of Higher Education at Shanghai Jiao Tong University, and 14 of the top 20 in the *Times Higher Education* World

University Rankings. The number of international students seeking enrollment at American colleges and universities attests to the perception that these institutions offer opportunities found nowhere else.

The top 100 major research universities constitute the academic gold standard in American higher education. Apart from their role in the formation of successive generations of our nation's scholars, scientists, and leaders in every sphere of endeavor, these institutions serve as the primary source of scientific discovery and technological innovation that fosters economic growth and social development across the global knowledge economy. But just as important are scholarly and creative endeavors in the arts, humanities, and social and behavioral sciences that too often escape notice, precisely because their influence already so fully informs our intellectual culture, as Columbia University provost emeritus Jonathan Cole points out in his indispensable volume, *The Great American University*.

The objective of the new model is to produce not only knowledge and innovation, but also students who are adaptive master-learners, empowered to integrate a broad array of interrelated disciplines and negotiate over their lifetimes the changing workforce demands and shifts in the knowledge economy driven by continual innovation.

There is no single model for the American research university—a set of institutions that includes public and private variants that range considerably in scale, from small private institutions, like Dartmouth and Caltech, to large public universities, like Ohio State. But for our purposes they bear a striking family resemblance that justifies our reference to the gold standard model. Yet despite their accomplishments, their institutional evolution since the 19th century has been only incremental. To an alarming extent, the American research university is captive to a set of institutional constraints that no longer aligns with the changing needs of our society. Despite the critical niche that research universities occupy in the knowledge economy, their preponderant commitment to discovery and innovation, carried out largely in isolation from the socioeconomic challenges faced by most Americans, will render these institutions increasingly incapable of contributing decisively to the collective good.

The institutional model that we delineate in our new book, *Designing the New American University* (Johns Hopkins University Press, 2015), is intended to provide an alternative to the highly successful major research universities, and is only one among many possible variants on this institutional type. Thus, we use the somewhat infelicitous term "academic platform" to suggest that there are many unexplored and unexploited institutional models for higher education—especially those that can provide an excellent education while advancing knowledge and innovation at the scale and timeframe necessary to progress toward desired social and economic outcomes. Our model thus combines three foundational design components: 1) an academic platform committed to discovery and knowledge production, as with the standard model, linking pedagogy with research; 2) broad accessibility to students from highly diverse demographic and socioeconomic backgrounds; and 3) through its breadth of activities and functions, an institutional commitment to maximizing societal impact commensurate with the scale of enrollment demand and the needs of our nation. The model, that is, embodies a reconceptualization of the American research university as a complex and adaptive comprehensive knowledge enterprise committed to discovery, creativity, and innovation, accessible to the demographically broadest possible student body, socioeconomically as well as intellectually, and directly responsive to the needs of the nation and society more broadly. The objective of the new model is to produce not only knowledge and innovation, but also students who are adaptive master-learners, empowered to integrate a broad array of interrelated disciplines and negotiate over their lifetimes the changing workforce demands and shifts in the knowledge economy driven by continual innovation.

Accessibility to research-grade academic institutions

The confluence of economic, political, and social currents that propelled America to global preeminence in the 20th century engendered a social compact that produced world-leading levels of educational attainment. As economists Claudia Goldin and Lawrence Katz assess in *The Race Between Education and Technology*, public sector investment in higher education during the first three quarters of the 20th century served for millions as a springboard to economic mobility, and more broadly as the foundation of an increasingly widely shared prosperity built on the rapidly rising productivity made possible by an educated and innovative society. During the three decades following World War II, a period of expansion for colleges and universities that Louis Menand has termed the "Golden Age" of

American higher education, growth in undergraduate enrollments, including community colleges, increased fivefold and nearly 900 percent in graduate schools.

Yet despite the success of this model, public investment in higher education has progressively declined ever since. In a 2014 working paper for the National Bureau of Economic Research, Robert J. Gordon finds that between 2001 and 2012, funding for higher education from states and municipalities fell by one-third when adjusted for inflation. Since 1985, state funding for the University of Colorado, for example, has declined from 37 percent to 9 percent of the institutional budget. Research by Phillip Oliff and colleagues at the Center on Budget and Policy Priorities (CBPR) found that state appropriations for higher education declined 28 percent between fiscal years 2008 and 2013: "Eleven states have cut funding by more than one-third per student, and two states—Arizona and New Hampshire—have cut their higher education spending per student in half." A 2014 CBPR update found that during the past year funding has been restored by an average of 7.2 percent, but state spending still remains 23 percent below prerecession levels: "Per student spending in Arizona, Louisiana, and South Carolina is down by more than 40 percent since the start of the recession."

Such disinvestment—often concentrated in places most in need of precisely the opposite—is just one of the many factors stemming the momentum of increased accessibility to our nation's colleges and universities that marked the course of previous decades. As a result, many of the students who would most benefit from this most obvious avenue of upward mobility—those whom we broadly categorize as "socioeconomically disadvantaged" or "historically underrepresented"—cannot gain admission to a research-grade university. The decline comes at a time when more and more Americans of all ages, socioeconomic backgrounds, levels of academic preparation, and types of intelligence and creativity seek enrollment, overwhelming a set of institutions built to accommodate the needs of our country prior to the Second World War, when the population was less than half its present number, and only slightly more than one percent of Americans enrolled in college. The National Center for Education Statistics reports that over the past quarter century, total enrollment in institutions of higher education has grown from under 13 million to more than 21 million, both undergraduate and graduate. Roughly three-fourths of high school graduates now enroll in some form of college, including community colleges and for-profit institutions—a fourfold increase since midcentury. By one estimate, community colleges enroll 45 percent of all U.S. undergraduates, and for-profit schools enroll 10 percent. Although such burgeoning enrollments would suggest progress in meeting demand, degree completion rates have fallen and the outcomes of attendance are drastically uneven, varying according to institutional type.

As nations worldwide invest strategically to educate broader segments of their citizenry for the knowledge economy, America's educational infrastructure remains unable to accommodate projected enrollment demands, particularly at the level of research-intensive universities. America's leading institutions have become increasingly exclusive and define—indeed, precisely quantify—their excellence through admissions practices based on the exclusion of the majority of applicants. Prestige is thus attained through the maintenance of scarcity. But if education is a public good, then this meritocratic pretense is a defensive posture and an abdication of implicit responsibility. Although our leading research universities, both public and private, consistently dominate global rankings, our success in establishing world-class excellence in a relative handful of elite institutions does little to ensure the broad distribution of the benefits of educational attainment, nor does it sufficiently advance the innovation that contributes to our continued national competitiveness, especially if we stop to consider the disproportionately few students fortunate enough to be admitted to these top schools. When Princeton historian Anthony Grafton referred to the "little group of traditional liberal arts colleges, all of whose students could fit in the football stadium of a single Big Ten school" in the *New York Review of Books*, he was not engaging in hyperbole. IPEDS (Integrated Postsecondary Education Data System) data show that the top 50 liberal arts colleges (as ranked by *U.S. News & World Report* for academic year 2012–2013) collectively enrolled 95,496 undergraduates. Michigan Stadium in Ann Arbor seats roughly 110,000. The eight traditional Ivies enroll 65,677. Yale Bowl holds 61,446. These 50 top liberal arts schools, plus the Ivies, make up less than one percent of the total U.S. undergraduate population of 18.2 million students.

Perhaps this comparison unfairly circumscribes the size of the elite student body. If we take institutional membership in the Association of American Universities (AAU), which represents 60 leading research universities in the United States, both public and private, as proxy for academic quality, available

seats for undergraduates climbs to 1.1 million. AAU reports that in 2011 its public member institutions enrolled 918,221, whereas AAU privates enrolled 211,500. This brings us to approximately 6 percent of college students in the United States.

Still too narrow a gauge? Adding the rest of the first-tier research universities to the 60 AAU schools gets us to a little more than 2 million, or roughly 11 percent of American students. And unlike schools devoted primarily to teaching, these institutions offer opportunities found nowhere else. As the late Charles M. Vest, then president of the Massachusetts Institute of Technology (MIT), observed in a 1994 letter to parents, the distinctive character of a research-grade university permits undergraduates to participate in research with scientists and scholars working at the frontiers of knowledge: "Our society will ask much more of these students—and they will ask more of themselves—than just to know what others have accomplished. If they are going to help us expand our knowledge and solve our problems, they are going to have to know how to research, to analyze, to synthesize, and to communicate. They must learn how to gather data, to develop hypotheses, to test and refine them, or throw them out when necessary and start over."

The gold standard in American higher education represents an immensely successful institutional platform that invariably combines world-class teaching and research with modest levels of enrollment. During the current academic year, for example, undergraduate enrollment in Harvard College numbers roughly 6,700 and at its 363rd commencement in May 2014, the university awarded 1,662 baccalaureate degrees. In March 2014, Harvard College offered admission to 2,023 prospective students—5.9 percent of the pool of 34,295 applicants. Of these, we estimate that approximately 1,600 were likely to enroll, based on the pattern of yields obtained during the preceding three academic years. Harvard does maintain one of the larger graduate and professional student enrollments among the Ivies, however, which exceeds twice its undergraduate population and approaches the number of graduate students attending the University of Michigan.

Harvard's undergraduate enrollment levels are generally typical of the platform type. In the fall term of 2013, MIT enrolled 4,528 undergraduate and 6,773 graduate students. A three-to-one student-faculty ratio at Caltech comes by dint of enrollment of 997 undergraduates during the academic year 2012–2013, along with 1,253 graduate students. Bard College enrolls roughly 2,000 undergraduates; Williams College about the same number; Bowdoin roughly 1,750; Swarthmore approximately 1,500.

Enrollments in public colleges and universities are normally far higher, of course. The entire student body of Harvard College corresponds roughly in number to the total of undergraduate degrees conferred yearly at the University of California (UC), Berkeley, or the number of undergraduates enrolled in the School of Engineering at the University of Texas at Austin. Yet, even these public institutions have not scaled up their enrollment capacities commensurate either to the requirements of the workforce or levels of population growth.

And how could they? The entrenchment of the present model is the very measure of its success. Because the prestige of these schools remains unrivaled, there is little incentive for them to seek change. As a consequence, these institutions have become so highly selective that the vast majority of academically qualified applicants are routinely excluded. According to one estimate based on IPEDS data, the number of bachelor's degrees awarded by the eight institutions of the Ivy League during the academic year 2012–2013 totaled 15,541, whereas the top 50 liberal arts colleges awarded 23,672. In the same academic year, the Ivies rejected 222,279 applicants and the liberal arts colleges turned away 190,954.

This pattern of exclusion is consistent with the trend among leading public universities, which continue to raise standards even while enrollment demand increases. The ratio of California resident freshman applicants to students admitted at UC Berkeley from 1975 to 1995, for example, declined from 77 percent to 39 percent, according to John Aubrey Douglass. Institutional data show that between the fall semesters of 1989 and 2013, the ratio of admissions at Berkeley declined from 40 percent to 16.35 percent. The comparable figures for the University of California, Los Angeles (UCLA) show a decline from 46.5 percent to 17.6 percent. The actual numbers present the scenario even more starkly. Of 43,255 resident applicants to Berkeley in the fall semester of 2013, only 7,073 were admitted, which means that 36,182 were turned away. At UCLA, 55,079 applied, but only 9,741 were admitted, which means that 44,338 were excluded. Although the UC system as a whole accepted 76.6 percent of resident freshmen in the fall semester of 1989, by 2013 the acceptance rate had declined to 63 percent. If leading research universities deem it appropriate to maintain limited enrollments while excluding the majority of applicants, other research-grade academic platforms

must emerge that offer accessibility to substantially greater numbers of students—especially among public research universities, which typically serve more first-generation and socioeconomically disadvantaged students.

The implications of lack of accessibility

Such limited accessibility to research-grade institutions is out of proportion with workforce projections that indicate a shortfall by 2018 of three million educated workers. Anthony Carnevale, director of the Georgetown University Center on Education and the Workforce, and colleagues estimate that degree production would have to increase by roughly 10 percent each year to prevent that shortfall. For our nation to achieve the ambitious objectives for educational attainment specified by President Obama in his first address to a joint session of Congress in February 2009—the president envisioned an America that by the end of the present decade would again boast the highest proportion of college graduates in the world—our colleges and universities would have to produce an additional 8.2 million graduates by 2020. Another study led by Carnevale and Stephen J. Rose underscored the interrelationship between an "undereducated" society and increasing income inequality: "The undersupply of postsecondary-educated workers has led to two distinct problems: a problem of efficiency and a problem of equity." At issue is the loss in productivity that comes with a workforce lacking advanced skills. At the same time, "scarcity has driven up the cost of postsecondary talent precipitously, exacerbating inequality." The upshot, according to Carnevale, is that "to correct our undersupply and meet our efficiency and equity goals for the economy and for our society, we will need to add an additional 20 million postsecondary-educated workers to the economy by 2025."

America's leading institutions have become increasingly exclusive and define—indeed, precisely quantify—their excellence through admissions practices based on the exclusion of the majority of applicants. Prestige is thus attained through the maintenance of scarcity.

Whatever specific numbers one chooses to adopt, there seems little disagreement that the demands of both equity and prosperity entail a capacity to create millions of additional graduates capable of both catalyzing and benefiting from the knowledge economy during the next several decades. But when academic culture assumes that enrollment growth must come at the expense of reputation and competitive standing, few are the institutions willing to pursue strategies to produce the additional graduates our nation needs. Indeed, scarcity is the brand that our elite universities are selling. The idea that these institutions could exercise their potential to produce millions of highly qualified, workforce-ready critical thinkers threatens the current business model.

Thus, in the Ivies and, more recently, the so-called public Ivies—the set of "flagship" public universities that rival private institutional peers in their pursuit of prestige—admissions policies are predicated on exclusion. The announcement by Stanford University in April 2014 that only 5 percent of applicants had been accepted epitomizes the increasing selectivity of top private universities. But leading public universities are becoming increasingly discerning as well, and the broad access to a quality education that could once be taken for granted is now flatly denied to the majority of qualified applicants. In the mid-20th century, high school students from middle-class families who brought home respectable grades could reasonably expect to be admitted to the leading public universities of their respective states. During the 1950s and 1960s, for example, California high school graduates who completed a set of required courses and attained a cumulative 3.0 grade point average qualified for admission to the University of California. The admissions policies of our top-tier institutions may appear meritocratic, but a significant proportion of alumni who graduated in the 1970s or 1980s—many of whom no doubt attribute their professional success in large measure to the caliber of their education—would be summarily turned away under current protocols. As literary scholar Christopher Newfield aptly put it in a 2010 article: "The entrenched practices, the deep culture, the lived ideology, the life-world of American higher education all point toward defining excellence through selectivity, and would seek to improve any university regardless of mission by tightening admissions standards."

But large-scale enrollment can go hand-in-hand with academic excellence. The University of Toronto, for example, the largest major research university in Canada and a public AAU member institution, enrolls 67,128 undergraduates and 15,884 graduate students at three urban campuses and reports research expenditures exceeding $1.2 billion annually. The institution consistently ranks topmost among Canadian universities, 28th globally in the Academic Ranking of World Universities, and 20th

globally in the most recent *Times Higher Education* World University Report. But whether by design or default, other leading research-grade universities have not similarly scaled up enrollment capacities commensurate with demand or proportionate to the growth of the population. Both the elite private and public research universities continue instead to raise thresholds for admission.

Nearly all leading colleges and universities offer opportunities to students of exceptional academic ability from underrepresented and socioeconomically disadvantaged backgrounds. It is always possible to recruit academically gifted students from across the spectrum of socioeconomic backgrounds. This way, a measure of diversity can be achieved without actually drawing more deeply from the broader talent pool of socioeconomically and ethnically diverse populations. As Robert Gordon observes, "Presidents of Ivy League colleges and other elite schools point to the lavish subsidies they provide as tuition discounts for low- and middle-income students, but this leaves behind the vast majority of American college students who are not lucky or smart enough to attend these elite institutions." But intelligence is distributed throughout the population, and for many it manifests through skills, abilities, and experiences that current admissions protocols disregard. Admissions policies that merely skim from the conventionally defined top shortchange countless gifted and creative individuals. At issue is not the education of students from the top 5 percent of their high school classes, which represents business as usual at gold standard institutions, but rather the imperative to educate the top 25 percent to very high levels of achievement.

The imperative is to ensure that far more students—an order of magnitude more—have access to research-grade academic platforms that deliver advanced skills commensurate with the demands of the knowledge economy.

Economist and former Princeton president William G. Bowen and colleagues Martin Kurzweil and Eugene Tobin have framed this dilemma as a contest between "equity and excellence in American higher education." In their acclaimed 2005 book of that name, they describe a "simmering debate over whether it is better to educate a small number of people to a very high standard or to extend educational opportunities much more broadly—even if this means accepting a somewhat lower standard of performance and, in general, spreading resources more thinly." Equity and excellence are complementary, the authors observe, because talent is distributed throughout the socioeconomic spectrum; national competitiveness in educational attainment depends on extending opportunities to sufficient numbers from all demographic strata; diversity enhances the quality of the educational experience; and the success of our democracy depends on an educated citizenry. "In its most shallow construction, this linkage [between equity and excellence] takes the form of a direct, zero-sum tradeoff between the two ideals." To move beyond this justification for the exclusionary business model, "society at large can build the educational scale that it requires only if its institutions of higher education tap every pool of talent."

The New American University model attempts to transcend this self-aggrandizing zero-sum trade-off. The model brooks no compromise in the quality of knowledge production and insists that equity is attained only when all academically qualified students are offered an opportunity for access regardless of socioeconomic background. Whereas other assessments underscore focus on the socioeconomically disadvantaged and historically underrepresented, the New American University model embraces equally students from all demographic strata capable of accomplishment in a research-grade milieu, including the gifted and creative students who do not conform to a standard academic profile.

A prototype for the New American University model

Accessibility is by no means the sole dimension to the New American University model, nor the exclusive focus of our book. But inasmuch as access to knowledge underpins every societal objective in a pluralistic democracy, accessibility is at the core of the reconceptualization of Arizona State University (ASU), which represents the foundational prototype for the New American University. In the course of a decade, ASU reconstituted its curriculum, organization, and operations through a deliberate design process undertaken to build an institution committed to the pursuit of discovery and knowledge production, broad socioeconomic inclusiveness, and maximization of societal impact. The academic community has been consciously engaged in an effort to accelerate a process of institutional evolution that might otherwise have proceeded, at best, only incrementally, or possibly in the face of crisis. Initiated in part in response to the unprecedented

shift in the regional demographic profile in one of the fastest-growing states in the nation, the design process constitutes an experiment at full institutional scale and in real time. We offer our account of the reconceptualization as a case study in innovation in American higher education.

To revive the social compact implicit in American public higher education, ASU revived the intentions and aspirations of the historical public research university model, which sought to provide broad accessibility as well as engagement with society. ASU resolved to expand enrollment capacity, promote diversity, and offer accessibility to world-class research and scholarship to a diverse and heterogeneous student body that includes a significant proportion of students from socioeconomically diverse and underrepresented backgrounds, including a preponderant share of first-generation college applicants. ASU thus implemented admissions policies similar to those of the University of California in the 1950s and 1960s. ASU's attempt to realize an academic platform that combines world-class teaching and research with broad accessibility may be likened to coupling the research-intensive milieu of the University of California system with the accessibility offered by the Cal State system.

How is the experiment doing? Soaring enrollment growth has been accompanied by unprecedented increases in degree production, freshman persistence, minority enrollment, growth in research infrastructure and sponsored expenditures, academic accomplishment both for scholars and students, and the transdisciplinary reconfiguration of academic organizations around broad societal challenges rather than historically entrenched disciplines. Enrollment has risen from 55,491 undergraduate, graduate, and professional students in the fall of 2002 to 83,301 in the fall of 2014—roughly a 50 percent increase. Degree production has increased even more sharply—more than 67 percent. ASU awarded 19,761 degrees in the academic year 2013–2014, including 5,380 graduate and professional degrees, up from 11,803 during] 2002–2003. The university has conferred more than 100,000 degrees during the past six academic years. Minority enrollment from the fall of 2002 through the fall of 2014 increased 146 percent, currently constituting 34 percent of the total student population.

Leading scholars are increasingly attracted to and inspired by our academic community. Our faculty roster includes recipients of prestigious national and international honors, including three Nobel laureates and more memberships in the National Academies than during the entire history of the institution. And as a consequence of an ambitious expansion of the research enterprise, research-related expenditures over the period fiscal year (FY)2002 to FY2014 have grown by a factor of 3.5—without significant growth in the size of the faculty—reaching a record $425 million in FY 2014, up from $123 million in FY 2002. This, without a medical school, and during a period of declining federal research and development (R&D) investment, no less. Among U.S. universities with research portfolios exceeding $100 million in expenditures, ASU has hosted one of the fastest-growing research enterprises over the period FY2007 to FY2012, according to data from the National Science Foundation. ASU has outperformed peer institutions in this context, with total research expenditures growing 62 percent from FY2007 to FY2012, more than 2.5 times the average growth rate of its peer institutions.

We want to emphasize the significant simultaneous progress made by ASU on measures that are supposed to be contradictory. Increases in degree production, socioeconomic diversity, minority enrollment, and freshman persistence; improvements in academic achievement and faculty accomplishment and diversity; and the expansion of the research enterprise have been realized in a university committed to offering admission to all academically qualified Arizona residents regardless of financial need, and to maintaining a student body representative of the socioeconomic diversity of America. Improvement of graduation rates or freshman persistence could readily be achieved by limiting admissions to ever-more handpicked selections of graduating high school seniors. ASU has done it by offering admission to a widening range of academically qualified students of varied and diverse backgrounds to whom admission to a world-class research university would otherwise be denied. And it has done so in a period of both robust enrollment growth and historic disinvestment in public higher education. The New American University model defies the conventional wisdom that correlates excellence with exclusivity, which generally means the exclusion of the majority of qualified applicants.

Toward new models for the American research university

Unable or unwilling to accommodate our nation's

need to deliver superior higher education to millions of new students, most major research universities, both public and private, appear content to maintain the status quo and seek prestige through ever-increasing exclusivity. But success in maintaining excellence in a small number of elite institutions does little to advance our society or ensure continued national competitiveness. The issue of broad accessibility to research-grade academic platforms is far more urgent than policymakers realize, even those on the national stage charged with advancing higher education policy. Our national discussion on higher education must not simply focus on the production of more college graduates. Mere access for greater numbers to rudimentary forms of instruction will not deliver desired societal outcomes—on this point, Peter Thiel is exactly right. The imperative is to ensure that far more students —an order of magnitude more—have access to research-grade academic platforms that deliver advanced skills commensurate with the demands of the knowledge economy.

Our nation must begin in earnest to build a higher education infrastructure proportional to the task of educating to competitive levels of achievement not only the conventionally measured top 5 percent but the most capable 25 percent of academically qualified students representative of the socioeconomic and intellectual diversity of our society. The demand for advanced teaching and research, and for the production of new ideas, products, and processes that are its outputs, is at a fever pitch that far exceeds the current supply. Appropriate historical models from which to derive a course of action do not exist. Entrenched assumptions and rigid social constructs hinder adaptability, even though inherent design limitations hamper rapid change in response to real-time demand. Risk-taking in the academic sector is thus essential if our society is to thrive. As de facto national policy, excluding the majority of academically qualified students from the excellence of a research-grade university education is counterproductive and ethically unacceptable. To accelerate the evolution of our research universities, we must develop new models that insist upon and leverage the complementarities and synergies between discovery and accessibility.

Recommended readings

Richard C. Atkinson and William A. Blanpied, "Research Universities: Core of the U.S. Science and Technology System," *Technology in Society* 30 (2008): 30-38.

William G. Bowen, Martin A. Kurzweil, and Eugene M. Tobin, *Equity and Excellence in American Higher Education* (Charlottesville: University of Virginia Press, 2006).

Anthony P. Carnevale, and Stephen J. Rose, "The Undereducated American," Washington, DC: Georgetown University Center on Education and the Workforce (June 2011).

Jonathan R. Cole, *The Great American University: Its Rise to Preeminence, Its Indispensable National Role, and Why It Must Be Protected* (New York: Public Affairs, 2009).

John Aubrey Douglass, *The Conditions for Admission: Access, Equity, and the Social Contract of Public Universities* (Stanford: Stanford University Press, 2007).

Roger L. Geiger, *To Advance Knowledge: The Growth of American Research Universities, 1900–1940* (Oxford: Oxford University Press, 1986).

Claudia Goldin and Lawrence F. Katz, *The Race between Education and Technology* (Cambridge, MA: Belknap Press of Harvard University Press, 2008).

Michael M. Crow (Michael.Crow@asu.edu) is president of Arizona State University and Arizona State University Foundation Leadership Chair and Professor of Science and Technology Policy. William B. Dabars (dabars@asu.edu) is senior research fellow in the Office of the President and associate research professor in the School of Historical, Philosophical, and Religious Studies, Arizona State University. This article was adapted from their recently published book, Designing the New American University *(Johns Hopkins University Press, 2015).*