SCENARIOS FOR THE FUTURE OF
HIGHER EDUCTION

Digital information technologies are transforming higher education. From distance learning, to online collaboration, to the Internet Public Library, to the virtual university, it's clear that the pace of change in teaching, learning, and research is being kicked up from *evolution* to *revolution*.

Will the revolution be interactively televised? Displayed on PowerPoint? The World Wide Web? Claim students as its victims, or exalt them as its victors? Will it gut the university?

VisioN 2010 is a discussion dedicated to answering these questions. We aim not to predict the future, but to anticipate and explore which futures seem plausible. All of this with the belief that universities--faculty, students, staff, administrators--must be active rather than reactive in marching into the digital revolution. We are less interested in what the university's future may be than in what all of us would like it to be.

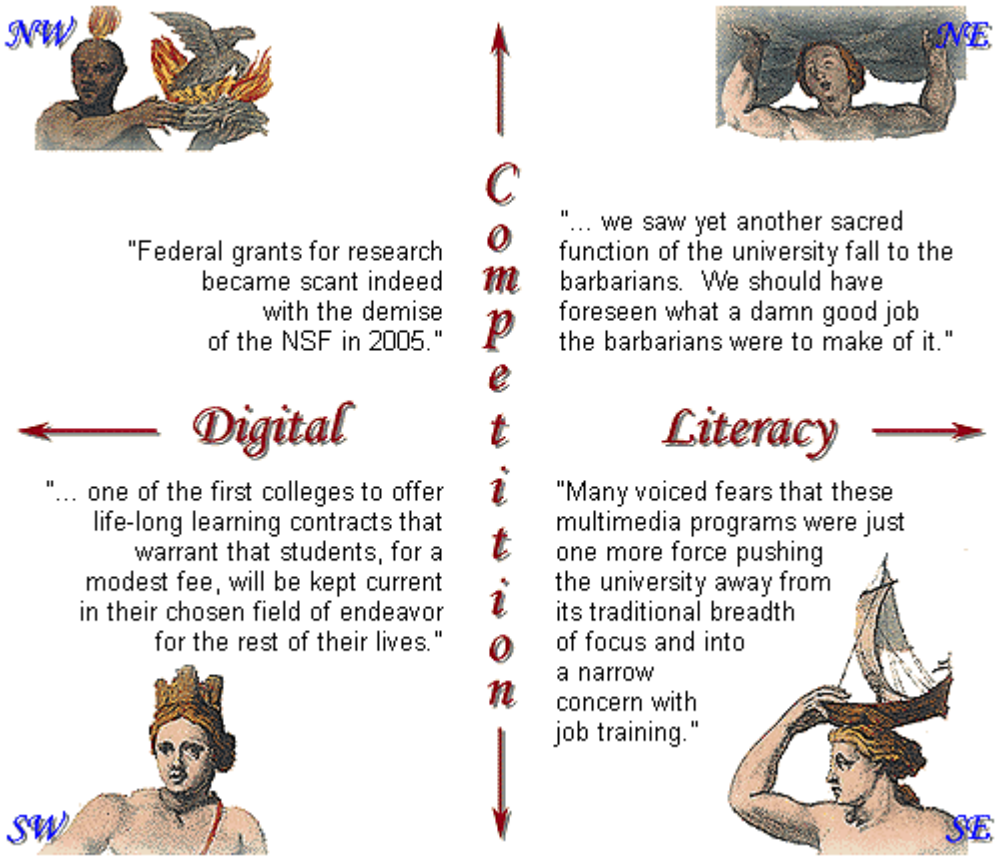
What is the purpose of the four Vision 2010 scenarios?

Scenarios are designed to be used as planning tools. The authors of the attached scenarios don't claim to have predicted the future. We have predicted *a* future, or rather four possible futures. Of course 2010 will not look like any of these scenarios. But the point is not simply to expose you to our vision of the impact digital information technologies may have on higher education. The point is to have you consider the impact these technologies may have on daily life at your institution. The point is to have you anticipate developments and changes you may not otherwise have anticipated. The point is to have you consider which strategies will be most effective or prudent given any of four different directions toward which the future may lead us. And to identify those developments that may be the first indicators that the future is headed east rather than west, or north rather than south.

The four Vision 2010 scenarios were organized around the structure of the matrix below. The two axes of the matrix represent two of the most significant sets of factors to be considered when trying to imagine the future impact of digital technology on scholarly communication.

The **Competition** axis represents the spectrum of challenges to the university's traditional role. At the *low* end there is competition among universities, but the competitive environment is much as it is today. At the *high* end the field has become wide open: as one Vision 2010 seminar participant put it, "It's no longer Yale versus Harvard; it's Yale versus Microsoft."

The **Digital Literacy** axis represents the degree to which information technology has transformed not only the essential set of skills required of the student, but also the very nature of knowledge creation and dissemination within the university. At the *low* end the idea of literacy and the processes of knowledge creation and dissemination are--at least within the walls of universities--much the same as they are today. At the *high* end, however, literacy has moved away from its traditional tight focus on text and has come to encompass a wider range of media. Students are expected to be fluent in reading, and creating, digital documents that communicate through an interactive symbiosis of text, graphic, sound, and video. At this end the process of knowledge creation, the notion of scholarly community, and the means of teaching and learning have all been transformed by technology.



The four scenarios that grew out of this structuring matrix can be seen as explorations of the four corners of the possible. They are meant to provoke thought and discussion about the future of higher education and scholarly communication.

The Network Times
ON THE WEB
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Higher Education: It's Not Just for College Students Anymore

It is a magnificent autumn day in the mountains, but the Sawtooth Range is no longer enough to keep Robert Belletzkie here. After 26 years in academia, the last eight as chair of the psychology department at Boise State University, he is packing up. The books and paper records from his carpeted, mahoganied office fill three liquor cartons. His computer and the software he has collected, most of it multimedia CD-ROMs and DigiDocs, require eight cartons. He is a voluble but fastidious man, one who still wears his hair above his ears, and this morning he waxes philosophical about this ratio of analogue to digital.

"Three paper to eight electronic. As it ought to be. Unfortunately, in this world I'm leaving behind, that ratio is inverted." To emphasize his point he flips through the most recent catalogue from the Boise State Press. "The works in blue background boxes are digital. The works in white are paper." The effect of the blur of pages is that of the lightest shade of blue, much lighter than the stunningly bright sky outside the window behind Belletzkie. "Not much blue, is there?" he asks. "Eight to three. Just one of the reasons universities are unraveling."

The unraveling Belletzkie speaks of has become maddeningly apparent in recent years throughout the nation's university system. It is the unraveling of what he sees as the three primary functional strands in the braid of the traditional university: 1) the preparation of the young for economic usefulness; 2) the fulfillment, especially since World War II, of society's research needs; and 3) the provision of values and ethics to the good citizen, a function that holds over from the university's origins in the medieval European church. This braid has become so frayed that in many cases it is only the final strand that any longer bears weight.

The first strand, the university's role as creator of careerists, has been frayed for decades as most professions have become specialized beyond the reasonable reach of an institution whose very name speaks of breadth. In the past decade or more, though,

outside competitors have been actively picking at this strand, unraveling it further by providing the specialized educations necessary for individual professions. And more and more students are signing up with these other providers. When adjusted for demographics, the enrollment at U.S. universities has been dropping 2-3% each year for the past five years.

Why are these students going elsewhere? The reasons are largely financial. Skills training offered by corporations and other providers promise a more marketable alternative than the traditional college education. Also, the expense of a university education now proves prohibitive for many young families, especially given that student loans are more difficult to come by and cost more to pay off, and that a university degree does not guarantee a respectable income that will allow one to climb out from under the debt load.

But financial reasons are not the only reasons. One truth unmentionable at faculty meetings is that these corporate training programs are doing a good job of professional certification. General Electric's Career Path program is indicative of the nature of many of these endeavors. Career Path assigns each student a multimedia notebook computer, the primary learning tool. The pedagogy itself, presented both on DigiDoc plug-ins and on GE's Digital Learning Network, involves learning while doing and is cutting edge. Indeed, most research into human cognition and education these days is done by corporations interested in more efficient training and more productive workers. The trainees of these corporations are the beneficiaries of that research. GE now graduates almost 2000 students each year with associate's or bachelor's degrees in narrow fields of professional competency. GE itself hires on almost a third of these graduates. Hundreds of other companies line up for a chance at the remaining 1400.

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Observers such as Robert Belletzkie believe that financial reasons are secondary. According to them, universities are losing students because they fail to fully espouse the new digital information technologies that are springing up around them and transforming the world, the very technologies that have apparently brought such success to GE's Career Path program. Belletzkie charges arrogance.

"Universities are mistaken when they consider themselves above 'edutainment,'" he says. "Since time immemorial all good educators have tried to entertain as they instruct. You can't teach someone unless you first have her attention."

By that measure the technology is succeeding eminently. It has riveted much of the primary and secondary education market in the U.S., for example. The runaway success here has been Apple Computer's Holistic Learning Program, now the centerpiece in more than 70,000 elementary classrooms worldwide, both public and private, especially in Asia. It has replaced blackboard, desk, books, and, to some extent, teacher. This last aspect of the program--publicly it's advertised as "all the HeLP a learner ever needs," while privately it's referred to as "teacher-proof"--has made it so popular among the homeschooling crowd that Apple claims to have single-handedly tripled the number of homeschooled children in the United States.

Joan Sitomer, now visiting professor at Tulane University, grants that Apple's HLP is the best of the lot.

"There's a great deal of *dreck* out there," she says, "but there are also gems. The problem is that universities tend to lump these technologies into the former category and to overlook the latter."

Sitomer's experience with these learning technologies--and with university evaluation of them--is long and arduous. Her failure to earn tenure in Yale's political science department in 1998 became something of a cause celebre in academia. Sitomer's tenure committee refused to consider two interactive multimedia CD-ROMs she had published on political decision-making. The CD-ROMs allowed the viewer to role-play in making a series of political decisions. The CD then analyzed the patterns of reasoning applied across those decisions and pointed out examples of classic inconsistencies and fallacies in decision-making. Reffik Cern, chair of the political science department and chair of Sitomer's tenure committee, called the CDs more entertainment than scholarship.

"The CDs are fine and useful tools and are impressive achievements in their own right," Cern said in an interview that year, "but they don't constitute academic endeavors of the first order."

Sitomer's supporters charged that the department railroaded her because she had chosen to avoid traditional paper and text-based venues when creating and publishing her academic work.

"Both of those works were outstanding and became instant classics in the field," claims Brookings Institute Fellow Julie Novkov, who was a colleague at Yale at the time. "Even today every undergrad who studies how citizens make political decisions relies on some edition of those CDs. Cern and his crew were really acting out of fear of change and out of prejudice against anything that was popular."

It would be another ten years before Yale's political science department would grant tenure based partly on a multimedia work published on digital media. Meanwhile, Sitomer's CDs have made her widely-sought in a world of faculty that has increasingly split into the categories of star and drone.

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Going slow on the digital revolution may be part strategy, part inertia for universities. As Sitomer puts it: "It's the old problem of turning the ocean liner, only made even more challenging by the fact that the captain--the university president--has one hand tied behind his back and lives in constant fear of pissing off the crew." And though such programs have been resisted within most universities, this institutional resistance has not kept individual professors from capitalizing on their popularity. While Joan Sitomer's CD-ROMs were specifically developed for use within the larger context of a college course, other faculty have created programs for the do-it-yourselfer. David Shereshefsky, a professor of biology at the University of California at Santa Cruz, has his own agent to represent him in negotiations with multimedia publishers. His most recent works have been produced by Autodidact, a blossoming San Francisco company. Shereshefsky's *The Life and Times of a T-Cell* claims to be a complete introductory course in immunology as taught by an immune system cell on its daily rounds.

Shereshefsky's colleagues at Santa Cruz publicly state that such programs cannot replace the professor and the human element in lectures, laboratories, and discussion groups. In private, though, many say not only that they themselves are developing digital teaching tools of their own, but also that such tools can and should replace the lecturer in many cases. This conflict between the institutional self and the private self on the part of faculty is a major source of the inertia in universities today, according to Susan Gilman, dean of the Annenberg School of Communications at the University of Pennsylvania.

"You talk to faculty one by one--on the streets, at social functions, even in my office--and they're brimming with ideas on how to improve the university, how to restore the institution itself to preeminence. You get them in a departmental meeting, though, and forget about it--their feet are so firmly planted in the mud you'd need a backhoe to dig them out."

The blame for the troubles of universities cannot be laid entirely at their own feet, though. By 2000 the deficit barbers in Washington had shaved away most federal funding for universities, students, and research. These funding cuts, at a time of increasing costs and after years of habitual budget increases, meant only the strong were going to thrive. Most universities have demanded--and seen--more productivity from their faculty in the form of more teaching. So great has been the increase in course load and the decrease in research funds that today many faculty find themselves with neither

the time nor the money to progress in their own research. Happily for those seeking tenure or promotion, research and publication have become less important factors in those decisions, while teaching success is much more significant than it has been for decades.

In recent years, as the shakeout has intensified, those universities with the largest endowments have of course been the most insulated from the pain. Large research universities have also fared better, contracting out their research facilities and faculties (a dichotomy between teaching faculty and research faculty has arisen at many of these institutions) for corporate or government work. Federal grants for research became scant indeed with the demise of the NSF in 2005. Most research that had been performed by federal agencies, though, has been privatized, and universities have sunk their teeth into a respectable chunk of this work. Much of the research once done by the National Institutes of Health, for example, has been taken on--in attenuated form--by Johns Hopkins and the University of Texas.

The grimmest evidence of the university crisis has been the attrition rate. The number of colleges and universities in the U.S. has fallen by almost 20%, from a peak of 3600 in 1995 to just over 2700 today. About half of these colleges have closed their doors for good. The rest have been folded into other institutions. Community colleges, increasingly devoted to employment training, have fared well enough, but small liberal arts colleges in particular have taken it on the chin. Oberlin, the first coed college in the nation, is no more. The fabled Seven Sisters are now four--one deceased, two merged into sibling institutions.

A particularly insidious sign is that many universities seem to regard each entry in this litany of closings as unique. As Robert Belletzkie puts it, "Colleges have been closing at an alarming rate, but there's a structural unwillingness in universities to see this as systemic. Oberlin closes and everyone just says, 'Oh, that's because they were too liberal arty, or spent too much time navel-gazing,' when they should be saying, 'My god, we could be next.'"

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The news is not all grim, however. Belletzkie's final strand in the braid--the provider of values--remains within the university's purview. In the face of revolution, universities as a whole have become reactionary, harkening back to the 18th- and 19th-century model of the liberal education of both mind and heart. There is certainly a niche for such education with a moral focus--witness the rise of religious colleges in response to the resurgence of religions in America. Enrollment at religious-affiliated institutions has increased by

120% since 1990, and old institutions are being taken over by religious or spiritual organizations. Since the University of Bridgeport in Connecticut was rescued in 1990 by funding from a group associated with the Reverend Sun Yung Moon's Unification Church, more than 180 other American universities and colleges have found that a spiritual emphasis can increase both enrollment and endowment. In 2006 Brooklyn College became the Ethical Culture College. Four years later, the college has seen a 35% increase in enrollment even while it has increased tuition by more than 50%.

But in Belletzkie's view--and in the view of many others--this final strand is not enough to bear the entire weight of the university.

"Without the *practical*, quotidian role of training, and without the integration of research and teaching," he says, "the university will relegate itself to the margins."

In spite of the closings, though, and the ferocious competition from new rivals, universities are still doing well what they do, according to most in academia. Belletzkie speaks for the majority when he says, "If you want rigorous, disciplined instruction . . . if you want a full education, full development of the mind in all its abilities, a university is still the only place to go, and that's because no one else can do that as well. And despite everything we've been tossing around here today, there are still great ones out there, universities as magnificent as ever." This said, the psychology professor smiles ruefully. He is moving his three cartons of analogue and eight cartons of digital east to Connecticut, where he will have a small, windowless cubicle in GE's international headquarters, and where he will develop pedagogy for GE's Career Path program. Looking for perhaps the last time on the view of the Idaho mountains from his office's casement window, he sets his jaw against what will be left unsaid: that there are fewer and fewer students out there who want--or who are able to afford--what only a university can provide.

NORTHEAST SCENARIO

A Particularly Open Letter to the Faculty from the Provost on the Occasion of the Closing of _____ University's Doors Forever

May 2010

You are all aware of my deep regret, my personal sense of loss on this occasion. I've been with this institution for 22 years, and it's a small enough place that I know all of you personally. So enough of

the official talk of declining enrollments and bad investments and infrastructure debt overload. I owe it to all of you to explain more particularly why we are closing our doors after a century and a half, and why this demise is taking place on my watch. Friends, we have failed. We have been followers in a world that demands we be first. With hindsight our missteps seem clearer and the signposts to the road to success are better illuminated. But only with hindsight. So with these remarkable optics of hindsight, I give you a litany of what we *should* have done.

- When Newt Gingrich was elected president a decade ago we should finally have seen the permanence of the stand Congress had taken several years earlier: that the new concept of public support for higher education had less to do with funding for student loans or universities than with opening up the "learning market" to new, leaner competitors who could deliver the specialized training programs corporations were looking for. And that Gingrich's tongue-in-cheek promise of "a laptop in every lap," coupled with his appointment of Al Gore as Digital Information Czar, meant that the government itself was ready to do business with the CD-ROM makers and the edutainers because they could deliver skills training at low-cost and high-glitz. We should have recognized that the digital age was overtaking us.
- When this university gave Bill Gates--a dropout--his eighth honorary doctorate, we should have recognized *who* in this digital age was overtaking us, and we should have listened to what he told our graduates: "Insist with both fists that your education put you at the gate to your career." We should have remembered that in our age the prey always invites the predator to come give a talk.
- Gates's focus on being career-ready should have been our focus a decade ago when the Univeristy

of Minnesota offered the first "guaranteed for life" degrees--life-long learning contracts that warranted students would be kept current in their field. Instead we looked skeptically and decided this was something only professional schools could sell. But we underestimated both the drop in the life span of a college degree and the price students would pay to have that degree renewed again and again. Now Princeton, of all places, has had great success providing this "maintenance ed" to its graduates through its for-profit Princeton Professional Institute. We should have had a more accurate appraisal of the value of the degree we offer, for we have discovered too late in what low esteem it is held.

- When the Gingrich administration pushed through Congress its voucher system for K-12 education in this country, we should have realized that economism was so rampant there was no reason to expect higher education to withstand the buffeting intact. Competition and choice became the buzz words in education--from Idaho's tax credits for home-schooling to the Nation of Islam's dominance of urban education. We couldn't have predicted that Tennessee would close its state universities and buy its higher education from a Southwest consortium, but we should have foreseen that such closings and failures lurked in the dark just ahead. We should have understood that the stakes were that high.
- When ETS and Stanley Kaplan won in court the right to offer competency-based certification in medicine, we saw yet another sacred function of the university fall to the barbarians. What we should have foreseen was what a damn good job the barbarians were to make of it. Their online exams can be taken anywhere in the world by anyone who wishes, and they've teamed up with suppliers of various online and CD medical-education programs to guarantee student success.

No longer do you have to go to medical school; instead you have to diagnose pixelated patients and dissect digital cadavers. We should have better appraised the quality of our competition and met them head-on.

- When those pixelated patients first became available in the 90s--and I remember my 12-year-old daughter conducting simulated surgery, mask and all, on those ADAM and EVE anatomy programs--we should have simply sat down and spent some time with them ourselves. We would have seen how completely engrossing they were *and* that they actually did teach, a mixture we as professors struggle mightily to achieve in the classroom. We would have also noticed that their interactive, hyperlinked, and multimedia nature allowed the student to learn at her own pace and in her preferred style--visual, textual, aural, whatever. Had we taken a closer look, we might have foreseen that most calculus classes in this country would today be taught in one semester instead of two--that the Newton's Whimsy program would let students approach the subject in the manner they found most efficient. And we might have anticipated the interdisciplinary multimedia chairs that are now being endowed at so many universities. We might even have dreamed up Microsoft's announcement last week that it was endowing a Nobel prize in multimedia education. Our greatest failure on this front was our failure to realize that freedom of choice was something the American collegiate population desperately desired. So now Motorola-Apple University--a university run out of an old warehouse in Hoboken--dominates multimedia education, and our beloved ivied walls are about to become barracks for our state's pettiest criminals.
- Finally, when I compared the recent college experience of my son Aaron on this campus to the college experience of his girlfriend, Julianna, it was already too late. Aaron's experience was

much like my experience 30 years earlier. But Julianna's . . .. She decided to live at home because the thousands she saved on room and board allowed her to accept admission to a more prestigious university. She took most of her courses in her family's den: broadcast courses, online courses, and interactive multimedia CD-ROM courses--what we once disparagingly called "edutainment." She passed exams given online by a company that used to be involved exclusively with SATs. Her Big Ten university, three-fourths of whose student body of 100,000 were distance-learners like her, gave her degree credit for this work. When she signed up for Physics 110 she was of course hooked into Rensselear's gold mine--Physics 110 Online, now *the* introductory physics course for the majority of our nation's undergrads. (I suppose the fact that ours is one of the few universities in the country that hasn't lost half of its physics faculty to Rensselear's course is now a moot point.) She majored in chemistry, spending eighteen months as an apprentice to a government researcher who worked halfway across the country and who freelanced as a student mentor. Aaron also majored in chemistry. He attended lectures, took notes, performed experiments in antiquated labs under the tutelage of TAs. Julianna had unlimited access to the Big Ten Digital Library. No doubt you're aware that my son's university paid millions of dollars to the Big Ten consortium to give him access to the world's largest virtual library. When Julianna graduated in 3 1/2 years--now the national average for undergrads--she turned down three job offers so she could continue her research as a graduate student. Aaron had spent too much time in classrooms and was eager to do "real" work, as he called it. He had a hell of a well-rounded education behind him, but the only work he could find was as a lab assistant. I realized then that we had failed him and his fellow students,

for all of the above reasons but also because we had failed to notice that a new form of literacy had arisen, a form in which text was only one in an array of media to be mastered by the educated person. I realized that we were no longer graduating *literate* students, and that realization has brought me to the greatest sorrow of my life: the realization that perhaps it is best we close our doors. To finish off the tale and make it mean more than it should, I'll add that Julianna is now a post-doc working with DuPont and the University of Maryland on photoactive molecules. Aaron has returned to school. He is working toward an MS/MFA in scientific visualization at Wisconsin. I may follow him.

SOUTHWEST SCENARIO

Possibly the only thing worse than millennial hype or millennial crash is millennial fizzle--nothing new under the sun. In this quadrant, we have millennial fizzle. This is the quadrant in which we see older, wiser versions of ourselves stumbling upon these Vision 2010 materials fifteen years from now and chuckling at the cheek of the other three scenarios. Given no great impetus for major change, universities in this scenario exist in a holding pattern, hoping for clear weather and happy landings, but for the time being just circling, praying they're still over the airport.

The time frame dawns partly cloudy. Simple demographics indicate shrinking freshman classes in the coming few years, while the political climate seems to be not at all enthusiastic about public support of higher education. It's not that the political will or the public sentiment has turned against higher education. Rather it's that other concerns have the public's attention and therefore its resources. The number of young people in prison in our nation exceeds for the first time the number of young people in college, so "corrections" must have a greater claim to the public purse. At 15% of the U.S.'s GDP, with a 20% share looming just around the millennial corner, health care also has a greater claim

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on the public purse. With the Social Security shell game, our society puts its dollars into caring for the growing sector of elderly citizens rather than the shrinking sector of post-adolescent citizens. Higher education suffers from a less-than-benign neglect.

While federal support drops--student loans and research grants both become harder to come by--costs at universities continue to rise, though not at the breathless rates of the eighties. These chronic financial pressures are addressed in a variety of ways. Public universities are subject to the tempestuous and changeable winds of statehouse politics. In 1998, Albany cuts costs by mandating year-round operation of the State University of New York system, a move that creates years of chaos in the SUNY system and that leaves tenure-track faculty scrambling for positions in other states. Intrigued by Albany's lead, Texas follows suit in 1999 and goes New York one better by establishing the standard undergraduate program throughout the UT system as a three-year program. The folks in Carson City wish to cut costs while avoiding the upheavals seen in New York and Texas, so they establish productivity requirements for academic departments within the University of Nevada. These productivity requirements are effectively along the lines of K-12 funding guidelines--each department gets a set amount of money for each student credit-hour its faculty teaches.

Public universities afraid of the rumors they hear from the western desert, and private universities facing decreased alumni support from their baby-boom alumni initiate productivity quests of their own. These changes often incorporate a modicum of mid-level technology. The Pac 8 universities use fiber-optic links to connect professors on video to classrooms throughout the consortium. Primarily used for introductory and survey courses, this distance-learning does save Pac 8 universities some money, though some students--and some parents--grumble. Multimedia makes isolated inroads in the classroom, but generally doesn't offer productivity increases, so its use remains sporadic.

Financial pressures and declining enrollment set many universities to casting a wider net. The Ivies begin a well-organized campaign to recruit the best and brightest from throughout the Pacific Rim, while the University of Arizona and several of its southwestern compatriots turn their eyes southward, sending recruitment officers to Mexico and throughout Central and South America. Among these is the University of Texas at El Paso, the first in the country to implement a fully bilingual English/Spanish curriculum. The following year it arranges an open enrollment deal with the Free University of Mexico.

The search for new revenues sends increasing numbers of universities to contract with corporations to provide continuing education for their employees. The University of Michigan's College of Engineering, for example, arranges with the university's Transportation Research Institute to provide week-long minicourses each summer to keep Ford's engineers up-to-date on advances in computer-aided design. This is just one of many new cozy relationships between higher education and industry.

The incessant quest for new sources of income also sends universities back to their alumni. The University of Illinois acquires a condominium complex in Champaign to serve as housing specifically for alumni who have returned to the school for refresher courses. Swarthmore extends the trend by being one of the first colleges to offer life-long learning contracts to its alumni, contracts that warrant that students, for a modest fee, will be kept current in their chosen field of endeavor for the rest of their lives. Growing problems with the economic status of a college degree--decreasing value, increasing cost--have combined by the late 90s to make such contracts attractive. By 2003, fully one- third of Swarthmore's students have signed such contracts, a success rate that lures dozens of other schools into the market. A coda: several class-action suits are brought by early takers of guaranteed-for-life degrees who try to get some form of compensation from universities whose "lives" turned out to be much shorter than anyone had anticipated.

Distance-learning is jokingly referred to as yet another video phone, a technology used only by futurists.

Throughout the 90s and into the first years of the new millennium, digital information technology remains largely ancillary to what goes on in most university classrooms. The implementation of distance-learning technologies, much touted early on, has stagnated, in part because of student distaste for its impersonal aspects. It is jokingly referred to as yet another video phone--a technology used only by futurists. Faculty and students do, however, use such technologies in their research and to aid in collaboration. These technologies also provide universities new money-making opportunities. The libraries at the Big Ten universities, for example, move from linking their card catalogues to digital consolidation of their holdings, eliminating redundant works and staff members. By 2006 the Big Ten library is the world's largest and it begins to

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offer its holdings--for a fee--to other universities, to corporations, and to the government. Its revenues are impressive, but they are not sufficient to save at least one Big Ten school from bad investments, a depressed state economy, and demographic doom. In 2008 the University of Wisconsin becomes the largest American university ever to go under.

Other universities have been hedging against such possibilities by merging with sister institutions or by acquiring smaller colleges. Smaller colleges, though particularly vulnerable, have begun to look more and more attractive as they play to their strengths--intimate learning communities made intellectually intense by a high level of access to faculty. When larger universities are not trying to swallow them whole they are often busy trying to recreate them as islands of refuge on their own huge campuses.

A few large research universities, though, take the opposite tack--they focus almost entirely on their research functions. Stanford, for example, has contracted out its lower-division undergraduate courses to nearby state colleges and has shifted its focus to the revenues available from intellectual property licensing fees and copyright royalties. By 2010 it is taking in almost half a billion dollars a year from these sources, a staggering sum that sends administrators from other research institutions out to Palo Alto by the busload.

Despite fierce competition among institutions of higher education, competition from outside competitors is blessedly minimal. Corporate training programs enroll thousands, but few corporate programs attempt to capture the "education" market that has been the university's traditional monopoly. A notable exception is the 2000-pound elephant, Microsoft, which has been trying to hire on faculty for a national virtual university. In 2008 the Supreme Court rules against Microsoft's appeal of its accreditation denial, effectively quashing any potential threat it might pose to traditional universities.

Challenges to universities do come from unlikely sources, however. Hard-squeezed parents have finally begun to revolt against outrageous tuition rates. In the Southwest a group of as many as 2000 families of high-school juniors and seniors have formed the Southwest Tuition Alliance. These families have agreed to act as a block in deciding which Southwest schools to send their children to. They have required colleges to bid on credit-hour tuition rates. The three schools the STA finally contracts with offer them an average tuition discount of 15%.

More challenges spring up in Idaho, where the legislature in Boise has enacted the Idaho Young Leaders program, which gives tuition credits to Idaho's state schools for every student the schools channel into a community service job. In each of the program's first three years, the number of graduates taking community service jobs climbs by about 10%, as do the value of tuition credits garnered by the state colleges.

One looming challenge from the 90s that seems to sputter and grow dim in the next decade is the "edutainment" specter. Such programs are hugely popular, especially with college students, who tie up university computer systems with them. But the prevailing social attitude--and the prevailing quality of the programs themselves--keep the emphasis on "edutainment's" latter syllables. When multimedia programs are used in higher education they are generally used simply to expedite the learning process laid out in lectures, labs, and seminars.

Such a premium is placed on hurrying students through the system as quickly (and therefore as cheaply) as possible, that by 2010 Wichita State University in Kansas announces the implementation of "a comprehensive K-14 degree track" that will usher students from finger-sucking through a bachelor's degree by age 20.

The push to shorten the cycle time is accentuated by an unlikely turn of events: the closures and mergers throughout the university system have created a situation in which demand has outstripped available capacity. This leads to increased entrance standards throughout higher education. Yale University, for example, will now admit only students who have scored a perfect 1600 on their SATs.

This situation of increased demand and reduced supply is part of what stimulates the Carnegie Foundation to convene seminars to envision upcoming changes in higher education. The seminars are tentatively titled 2020 Vision, and there is much talk of revolution.

SOUTHEAST SCENARIO

In this quadrant, digital information technology has so transformed education that the notion of literacy itself has broken free of its old moorings: literacy now must include the ability to "read" multimedia, hyperlinked,

interactive "texts," for these new texts have rapidly replaced paper texts as the student's constant companion. Also in this quadrant the institution through which this new literacy is disseminated is solidly the university. Certainly there has been competition, both among universities and from corporations that have seen higher education as easy pickings, but by and large universities have responded effectively to these challenges and have maintained their prestige and preeminence.

By the mid-90s, the promises of digital information technology seemed to know no bounds. Wall Street hurtled along on its wildest streak of bullishness since the 20s, fueled by the allure of technology stocks. Hardly a week went by without a new blockbuster merger of telecommunications giants. When Microsoft, hot on the heels of sweeping the market with its new online service, merged with Disney/ABC, even Ted Koppel couldn't help but joke that now Big Brother was surely "all ears." Although it was still more of a country road than a major thoroughfare, the information superhighway was transforming U.S. society. The ivied walls of higher education were not spared this assault.

Mid-decade many factors came together to raise a collective clamoring within academe for a close examination of the university qua university. The onslaught of digital information technologies was certainly one such factor, but so were cuts in federal funding for research and for students, and the fear that universities were losing ground to institutions that catered to students who were in search of narrow skills training. The proximity of the new millennium also had something to do with this soul-searching; most every university issued some incarnation of the "Meeting the Challenges of the 21st Century" brochure. The unspoken subtext in this self-reflection was the question of whether the university itself could survive in this brave new world.

Though the results of these university discussions usually showed ambivalence about how fully to embrace these new learning technologies, many individual faculty members were already making good use of them. Interactive "edutainment" programs were becoming sophisticated enough to make their appearances in undergraduate classrooms. The University of Indiana began to make use of Broderbund's Composer Supposer CD-ROM in its introductory music theory classes. Faculty there had concluded that the program's melding of graphics and sound illustrated certain musical concepts more readily than either medium alone could have. Indiana's reputation in music encouraged other schools: as went Bloomington, so went the nation.

Those who advocated full adoption of such learning technologies argued that not only were they efficient, engrossing, and self-paced, but they allowed each student to choose the learning style that was best for him. They even argued that such media created new modes of knowledge, knowledge that could not be fully represented in other ways. Such modes of knowledge, they said, represented nothing less than a new paradigm of literacy.

Though these multimedia programs were becoming more and more popular on campuses, many voiced fears that they represented just one more force pushing the university away from its traditional--and etymological--breadth of focus into a narrow concern with job training. This chord of concern would be struck again and again in coming years. These fears of "infotech" were not baseless. By the end of the decade interactive multimedia programs had become the most widely used learning tool in training programs for business. Many were custom-designed to teach new employees the skills necessary to be productive at a particular job. The one program that was the single biggest target for academics' disdain was the program McDonald's put together for its recruits and touted in its TV commercials: it allowed new employees to practice their serving skills on virtual celebrities--Madonna buying a Coke without ice, Ben Franklin ordering eleven Big Macs. Computer simulation at its most inane, it represented to its critics the mindset that would forever limit digital learning technologies, a mindset, they argued, that despite its profitability had no place in the university.

But the digital boom showed no signs of bust. In 1997 the Supreme Court ruled in *Buchwald v. Broderbund* that the use of short excerpts from copyrighted works in CD-ROMs did not constitute fair use and that copyright owners must be compensated. Rather than putting a damper on multimedia production, this ruling proved a boon for it, for intellectual property owners and creators now had their incomes legally protected. Protection under law didn't guarantee protection in practice, but several technologies combined in the late 90s to bring the real closer to the ideal. Secure "digital watermarks"--electronically imprinted bits of data that, like the watermark on currency, ensure authenticity--were developed and allowed producers to tag their digital information. Buyers of CD-ROMs began to pay for use of all the intellectual property on the disk, but--publishers keeping in mind that pennies add up when volume is in the millions--the cost was kept to a minimum.

All of this digital compensation relied on online commercial transactions, which by 1998 were secure 99% of the time--slightly more often than face-to-face transactions. Even online multimedia documents could now be financially

profitable for their creators. Adding to the multimedia blitz was a deluge of new digital information. Reelected from a field of formerly-Republican competitors, President Bill Clinton in 1997 made good on a campaign promise to open the government's vast troves of information to online access at cost. Within three years all public domain material from the Library of Congress was available through any phone line, as were the public files of most government agencies. The Administration also encouraged competition for databases that had previously been monopolized by one or two suppliers. Westlaw and Lexis, for example, which had charged law firms tens of thousands of dollars for access to their legal databases, were forced to slash their prices to compete with such cut-rate packagers as LawLine.

Galaxies of readily accessible information lured academics into multimedia by the thousands. One of the most successful was Hector Chavez, a professor of history at MIT. All the applications ever filed at the U.S. Patent Office had recently been put online. Chavez used this cheap information as the raw material for his immensely popular Invention Strategies course, a course that enrolled almost 20,000 would-be inventors from all over the world each fall. The arts and humanities, to the surprise of many, engaged in more than their share of these endeavors. George Mason University maintained a home page for the nation's poet laureate that included online poetry workshops and readings for high-school students. And the popularity of a multimedia program by Robert Pinsky that allowed the interactive study and creation of formal poetry, ProzCD, caught even its creator by surprise.

Multimedia pushed Chavez and Pinsky into the new realm of faculty stars. A select few of these digerati pulled in multimillion dollar incomes from their digital packagings, whether CD-ROMs or online courses. Many universities positioned themselves well in this area by taking on the role of "studio" to their stars--acting as production company and distributor. The star system increased competition among faculty and began to make the AAU look in some respects like the NFL--a few superstars demanding and getting outrageous salaries and bonuses.

In a paradoxical twist, this star system also helped to undermine the value of tenure. Tenure, while still guaranteeing a certain degree of stability, no longer guaranteed professors regular raises at many universities, and it certainly didn't guarantee professors a shot at star status. Once the echelon of royalty-rich faculty stars arose, many of whom were free agents, tenure seemed almost the mark of second rank. It was also no longer a benefit universities had to offer to attract top people. Before the first decade of the millennium was out, more than a dozen major universities had cut salaries for all new tenured faculty by 50%

and instituted what were, in effect, large productivity bonuses: the more students a prof's teaching brought in, the larger her lump sum at the end of the semester.

While cheap online information helped create the star system, it also had more mundane benefits. Penn's English department, one of the first to set up a home page on the World Wide Web, soon dispensed with texts for most of its survey courses. Linked "coursepack" materials on the Web proved cheaper for both students and professors. Online materials also allowed students to encounter in their reading hundreds of additional alluring leads they could follow into mazes of related materials. Faculty found that the hyperlinked nature of the Web itself promoted student exploration--all avenues could immediately be traveled without the added work of trips to libraries. Annotated bibliographies--complete with Universal Resource Locators (Web addresses)--became standard undergraduate projects. They also became necessary road maps, for with so much information literally at their fingertips, students increasingly needed guides to help them locate what was useful and reliable.

This growing need for information "filters" brought renewed focus to the role of the reference librarian, who now almost never touched paper books ("flammables," as they came to be known) but who was the person students, faculty, and even the corporate world (for a fee) turned to to boldly go where few others had into the newest reaches of the "infinetwork." It was this same need for filters that eventually led the Pac 8 universities to collectively alter most of their upper-division courses to an Oxford mentoring model: students would engage in largely independent readings, research, and projects--generally on the Web--with faculty providing direction on what should be read, what could reasonably be ignored, and what avenues of inquiry glowed most promising.

More faculty time spent on these upper-division students was to some small extent balanced by less time required for lower-division students. Multimedia packages helped here, as did a greater focus on collaborative work. The greatest savings, though, were achieved through the use of distance-learning technologies. Distance-learning meant larger markets and lower costs, and it increased by an order of magnitude the number of students a university could profitably enroll. Information technologies in general offered universities new economies of scale and greatly pushed up the point of diminishing returns. Florida University, a state-mandated merger of the University of Florida and Florida State, now has an enrollment in excess of 100,000 and has been doing splendidly (though ironically enough its football team has not).

Distance-learning also meant global competition on a new order of magnitude. Such competition was further enabled by widespread use of automatic translation software on the Internet and by the overthrow of the old ASCII computer code in favor of a new 16-bit standard code that could represent all characters of all languages.

The passage of the NAFTA and the GATT, and successful negotiation by the World Trade Organization of repeated U.S.-Japan trade tiffs, enhanced this globally competitive environment for universities, signaling the crumbling of trade walls throughout most of the world. This subsidence of barriers brought advertising by overseas universities eager to lure U.S. students into online lower-division courses. Singapore University was particularly successful at attracting undergrads. Their home page featured Michael Fay using a cane to punctuate his discussion of "disciplined learning" and making prominent mention of Singapore's "graffiti-free" skyscrapers. U.S. students who enrolled in such courses--generally math and science courses--almost always transferred the credit to the U.S. institutions from which they eventually took their degrees, for U.S. institutions still had worldwide prestige.

This prestige was elemental in helping U.S. universities take advantage of the opportunities presented by this new world market. This prestige, the lack of trade barriers, a weak dollar, and increased importance of education in a global information society all served to bring students from other nations, especially from Asia, to U.S. institutions in record numbers. By 2003, Asian nationals represented a majority of the students doing coursework in the University of California system. Many of these students had never set foot in the U.S. Their classes were more often than not satellite broadcasts or World Wide Web packages.

Emory was one of many institutions to contract with foreign governments to deliver online courses. In 2004 it signed on to provide virtually all undergraduate instruction in the English language for the republic of Estonia.

The success of projects such as Emory's Estonia venture convinced many that the "virtual campus" should be not only a growing source of revenues but also a place where the university should commit an increasing proportion of resources. The 90s witnessed, retrospectively at least, perhaps the last great construction boom on American campuses. Many universities had struggled to maintain a deteriorating infrastructure, a struggle typically amounting to hundreds of millions of dollars in deferred maintenance by the end of the decade. More and more of them found it was less expensive to invest in the technologies and

aggressive marketing necessary to promote virtual classrooms. California's Harvey Mudd College went a step further, essentially announcing in 2003 that students would no longer have an on-campus presence.

Harvey Mudd's decision was something of a wakeup call to universities. All the talk in the 90s about how to change the university so it could keep up had been accompanied by an undercurrent of worry: making whatever changes seemed necessary to save the university could end up destroying it, leaving a new and empty edifice in its place. Softer voices had spoken of the university as a community--of scholars, students, even families--and had worried about the effects of the fragmentation of this community. They had pointed out that scholars and researchers rely on a university for a stable base and that, especially in an era of free-agent faculty, stability might become more important then ever. They had fretted over the possibility of universities becoming little more than training grounds for the specialized workforce of the 21st century. These voices had persisted in quietly asking again and again what a university was, and what it should be. After almost a decade these softer voices had grown into a loud majority in universities. The belief grew widespread that universities were perhaps giving up something essential in becoming leaner, quicker, more attenuated, more digital.

Many universities took measures to enhance their sense of community and stability by reaching out to their extended families--the alumni, the parents, the sports fans. They offered free or inexpensive access to their computer networks. Not only did this serve to undercut potential competition from multimedia "edutainment" products provided by America OnLine and Prodigy, it also allowed universities to have regular access to their alumni. This was the infrastructure universities needed to provide continued services to alumni, services that ran the gamut from lifelong learning contracts, to online coursework, to coverage of basketball games. The success of these expanded network endeavors was soon apparent: by 2005 university networks were gaining more new users than America OnLine and Prodigy combined.

This enhanced link to alumni proved a two-way conduit--universities also increasingly tapped alumni for narrowly targeted advising of students and for specialized professional knowledge. Worcester Polytechnic Institute was among the first to require its students to partake in online mentoring programs with alumni employed in their areas of specialization. Such alumni mentoring programs helped stop the depreciation of college degrees in the eyes of employers. It also helped undercut for many companies both the necessity for and the feasibility of establishing extensive educational programs for their job recruits.

Questions about community on campus paralleled questions about community in the larger society. Rapid development of technology and information meant that companies could no longer maintain in-house much of the expertise they needed. They relied more and more on consultants and independent contractors. A globe linked by digital information technologies meant that anyone with an up-to-date multimedia computer could do business anywhere in the world. Often workers collaborating on a project never met. The IRS reported in 2010 that the number of taxpayers filing as self-employed had increased by 280% over the previous two decades.

This growing social fragmentation brought an increased emphasis within higher education on collaboration technologies. Universities finally convinced their undergraduates that, contrary to the strictures set out by fifth-grade teachers, it was not necessary that they always keep their eyes on their own papers. In the late 90s, for example, the University of Michigan's English Composition Program was among the first to offer online classes in collaborative writing--a mode of communication that was widespread in the professional world. Most introductory math and science classes prepared students for upper-level project work by having them complete much of their "homework" in groups.

Collaboration and group work on campus became the norm in part because the number of communities students needed to belong to increased dramatically. Most of these communities were virtual communities. It was not uncommon for all of a student's social interaction in the course of one day to be virtual interaction in online classes, mailgroups, bulletin boards, and the like. For years, Cassandras had harped on the societal disintegration that would result from lives lived in virtual communities. While these communities required at least as much social development and skill as any other, it was true that the skills were somewhat different from those required in real-time communities. Universities came to recognize this and instituted a variety of residency requirements that ensured at least a minimum of face-to-face interaction through the course of an undergraduate education. At most institutions this meant that students had to spend at least four semesters on the "R-L" ("Real-Life") campus.

Despite--or perhaps because of--these residency requirements, U.S. universities continued to attract record numbers of students from around the world to their campuses. By 2010 even Harvey Mudd had become convinced. Its public invitation to its students to return to the R-L campus gained some fame in the academic world by concluding that, "the socialization function of a traditional university--students living within a community of colleagues and scholars who are engaged in a variety of intellectual pursuits at the highest levels--serves two

essential functions that the virtual campus can not efficiently replicate: such a community does serve to round out the educated person's analytical and intuitive abilities in subtle but essential fashion, and such a community allows the educated person to refine her ideas about those fields of endeavor for which she is best suited." Copies of this statement were tacked to faculty office doors all over the country. They will probably remain there for years.