The Education of a Chancellor

Those were wonderful days that shaped my views about the nature of a great university and the concept of a liberal education. The University of Chicago may not have produced its share of Wall Street financiers or corporate lawyers, but it has produced more than its share of academics. . . . I spent part of my career in La Jolla, California, at the University of California, San Diego, helping build what has become a world-class institution. And in the building process, the image of the University of Chicago was always very much in my mind.

—RICHARD C. ATKINSON, 2003

Richard Atkinson became an undergraduate at the University of Chicago, as he put it, “by pure happenstance.” He was a sophomore in high school in February 1944, the child of immigrant parents—an English father and a French mother—neither of whom had attended college. One Saturday he went to an older friend’s house to play basketball. His friend had bigger plans, however—an appointment at the University of Chicago campus to take the entrance examination. Having nothing else in particular to do, Atkinson tagged along, hoping for a basketball game later in the day. A friendly University of Chicago proctor told him he should take the exam even if he did not plan to enroll; after all, he was already there. He did, and although his friend was not admitted, Atkinson was awarded a partial scholarship. He decided to give college a try for the summer session and return to high school in the fall if things did not work out.1

THE UNIVERSITY OF CHICAGO AND BEYOND

Tests, with all their implications for opportunity, success, and failure, were to play an important role in Atkinson’s career. So was the University of Chicago. The institution Atkinson entered in summer 1944 had already played a key role in the development of the atomic bomb; in the postwar years, science was prospering more at the University of Chicago than at any other American university, except perhaps the Massachusetts Institute of Technology and the Berkeley campus of the
University of California. Yet Chicago was also passionately committed to liberal education, embodied in its vigorous president, Robert Maynard Hutchins, and its Great Books curriculum, presided over by Mortimer Adler. It was a place bursting with excitement and energy; few campuses in the United States could offer the same intoxicating blend of classical learning and intellectual stimulation. For Atkinson, the University of Chicago was a life-changing revelation.

During his third year, Atkinson rented a room in the home of the renowned sociologist David Riesman. Riesman often included him in parties, where he met some of the era's most distinguished social scientists. His fellow students included future Washington Post columnist David Broder, Nobel Laureate James Watson of DNA fame, and cultural conservative Allan Bloom, whose jeremiad on the decline of intellect in America, *The Closing of the American Mind*, became a 1980s best-seller. One of Atkinson's most vivid memories was of a class called Observation, Interpretation, and Integration, taught jointly by Hutchins and Adler. One day the class discussion turned to the nature of a liberal education. Atkinson argued that any educated person should know the calculus. This was a minority position in that highly humanistic environment, and the student who argued most fiercely against it was Allan Bloom.

At Chicago Atkinson developed the clear and unadorned style that came to characterize his later writing as a social scientist and administrator. He preferred nonfiction to novels—perhaps a reason his own writing is sparing in its use of metaphors. Stimulating as he found the discussions of Plato's *Republic* and Aristotle's political theories, Atkinson was especially drawn to mathematics. He had the good fortune to work as a research assistant to Nicolas Rashevsky, a physicist and Russian immigrant who had joined the University of Chicago faculty in the 1930s. Rashevsky was convinced that mathematics was a crucial but neglected tool for understanding a variety of complex phenomena, including biological and social processes. Physicists laid the foundation for spectacular discoveries by creating simplified models of light or ocean waves, he argued, and then drawing conclusions about them that could be tested. Biologists and physiologists could employ mathematical models of body processes like cell division or nerve activity to do the same thing. Rashevsky began by theorizing about cells, the smallest units of an organism, but did not stop there. Eventually he applied his theory of "mathematical biophysics" to historical and sociological issues, among them the question of whether altruistic or selfish behavior yields more "satisfaction" to individuals—an emotional state Rashevsky believed could be quantified and measured. It was a perspective that would have endeared him to Jeremy Bentham, the eighteenth-century father of utilitarianism and inventor of a method for quantifying happiness that he called the "felicific calculus." As Atkinson told a University of Chicago audience in 2003:
I did endless computations for [Rashevsky] on equations that were basic to his theories. This predated digital computers, and the work was done on a hand-cranked calculator. We ran into real problems that we never quite solved, because the equations proved to be too disorderly. For the mathematicians among you, they were second-order-difference equations, and years later, they were to become part of what is now called "chaos theory." If only I had known then what I know today. 

For Atkinson, the exciting thing about Rashevsky's approach was not its applicability to the imponderables of sociology but its implications for American psychology. The field had been dominated for almost fifty years by the behaviorism of B. F. Skinner, J. B. Watson, and E. L. Thorndike. Behaviorism was grounded in the idea that the major questions of psychology could be answered by observing and describing how people act, not how they think or what they feel. Environmental factors were seen as within the purview of scientific psychology because they reinforced or inhibited particular behaviors. But thinking, imagining, choosing, intending—what went on behind the scenes—were considered off limits because they could not be directly observed, measured, and tested. It was a climate inhospitable to theorizing about the mind's apparently inaccessible inner landscape.

In 1948, the year Atkinson graduated from the University of Chicago, a conference at the California Institute of Technology threw down a challenge to the prevailing orthodoxies of behaviorism. The Hixon Symposium, named after the foundation that sponsored it, brought together such scientific luminaries as the mathematician John von Neumann, the physiologist Warren McCulloch, and the psychologist Karl Lashley, who argued in an incendiary speech that behaviorism's focus on stimulus and response had failed to address a central question in psychology: the internal organization of the nervous system that allows humans and animals to orchestrate their own behavior. Several of the themes discussed at the conference, among them thinking as information processing and the mind as analogous to a computer, became the starting point for an explosion of revolutionary, theoretically grounded, and enormously productive research.

The Hixon Symposium ultimately came to be seen as the symbol of the cognitive revolution in psychology. Rashevsky's bold theorizing that mathematical models could be applied to psychological processes was part of this revolution—a radical and exciting step toward an entirely new approach to dealing with psychological phenomena. Atkinson's later research on learning, cognition, and memory was representative of the innovative ferment in the field of psychology that began in the postwar years. His student work for Rashevsky, limited as it was, gave him a glimpse of this world early in his education.

Although he flirted with the idea of graduate study in biology at Chicago when his undergraduate years were over, Atkinson ultimately chose a different direction.
A friend invited him to attend a lecture by William K. Estes, a psychology professor at Indiana University who was becoming known for his work in mathematical models of human learning. They stayed after the lecture to speak with Estes, who, it turned out, was looking for graduate students with mathematics training. Estes encouraged Atkinson to enroll at Indiana University with the offer of a graduate fellowship, which he did in fall 1950.

Reserved and unhurried in manner, Estes spoke so quietly that students had to sit on the edge of their chairs to hear him. It was worth the effort; he was a stimulating thinker and mentor and an early pioneer in the field of mathematical psychology. Estes had been one of B. F. Skinner's brightest and most promising students, working with the master on measuring emotional reactions in animals. But he was not a committed behaviorist, even as a graduate student, and by the late 1940s he was employing mathematical models in his efforts to study human learning. Atkinson worked with Estes as he pursued his Ph.D. degree in experimental psychology. In a seminar, he met a fellow graduate student named Rita Loyd. They got to know each other at the psychology lab, where on one occasion she helped him with an experiment running rats through a maze. From that less than romantic beginning, their relationship ripened into a long and productive marriage that soon included a daughter, Lynn.

Once his dissertation was finished, Atkinson's professional life was on hold until he fulfilled his two-year military obligation, a rite of passage in the years before the draft was abolished. He chose the US Army. In 1954 he and Rita left Indiana for Fort Ord, California. With his background in mathematics and statistics, Atkinson was assigned to a group called HumRRO—Human Resources Research Organization—that conducted many research projects for the army requiring extensive data analysis. The Fort Ord unit had about twenty civilian Ph.D's and a military contingent of eight enlisted men, all with Ph.D's, reporting to a colonel with a master's degree. Atkinson was sent to work at the nearby Naval Postgraduate School (NPS), which had one of the few digital computers available anywhere in the country apart from a few federal research laboratories or academic institutions like Harvard and the University of Illinois. NPS's largely civilian faculty engaged in military research and offered graduate courses in technical fields to young naval officers.

NPS was set amid the coastal splendor of the Monterey Peninsula overlooking the Pacific, but for the next few years Atkinson spent most of his time in the computer laboratory, working on such topics as simulations of gamelike combat scenarios and large-scale statistical analyses of the psychological factors that influence soldiers in combat. The assignment was a stroke of luck for him—an opportunity to immerse himself in the world of digital computers at an early stage in their development.
The Stanford Years

One Saturday Atkinson drove to Palo Alto to visit Bill Estes, who was spending the 1955–56 academic year as a visiting fellow at Stanford University's Center for Advanced Study in the Behavioral Sciences. The Center sits high above the university, with a commanding view of the campus and the surrounding hills designed to engender thought and scholarly contemplation. On that sunny, tranquil morning, Atkinson's conversation with Estes was interrupted by a pounding at the door. In burst a young man Atkinson did not know who immediately started expounding on a mathematical problem he was wrestling with. Estes leaped to his feet, and the two began writing equations on the blackboard, arguing back and forth as chalk dust flew. The young man was Patrick Suppes, a Stanford professor of philosophy and logic with an interest in theories of decision making. Like Estes, he had a yearlong appointment at the Center. The two men hit it off and collaborated on research focused on mathematical models in the social sciences. It was a fortuitous meeting for Atkinson that led to his appointment at Stanford University in fall 1956 as a lecturer in applied mathematics and statistics and a research associate in the Department of Psychology.

Atkinson's career at Stanford lasted until 1980, interrupted only by a three-year stint at UCLA in the late 1950s and a five-year leave of absence at the National Science Foundation in the 1970s. It was an exciting time to be involved in mathematical psychology, which was beginning to find its wings, and an exhilarating time to be at Stanford. In the 1960s its famous provost, Fred Terman, was transforming Stanford from a good regional institution to a national presence through his "steeples of excellence" strategy. Terman was an active national figure in the engineering profession, the author of a popular textbook on radio engineering, and, for four years during World War II, the head of the MIT/Harvard Radio Research Laboratory, a government-sponsored project whose top secret work on radar was an important contribution to the war effort. Terman had earned his doctorate at MIT, and it seemed to him that despite the quality of some of its academic areas, MIT was poorly managed; there was no organized effort to decide what it did best, or could become best at doing. As dean of engineering and later provost, Terman was convinced that Stanford should decide what its academic strengths were and concentrate on developing them, "focusing largely on carefully selecting faculty in carefully selected fields," according to a recent biographer. The idea was not original with Terman, but he applied it with unwavering focus and tenacity. He was a skilled judge of fields outside his expertise and of the intellectual potential of young faculty in those fields. One of his strategies for attracting the caliber of faculty he wanted was to check the annual list of nominees to the National Academy of Sciences, which awarded membership to the top forty
of roughly a hundred candidates. Those who just missed the cutoff were highly likely to be chosen in the future. Terman would target a few of them for recruitment to Stanford every year.8

The postwar era of federal support for university research was beginning to unfold, and with good planning there were opportunities for the social and behavioral sciences, especially for faculty interested in quantitative approaches. During the 1950s, Stanford conducted a number of assessments of the teaching and research performance within these departments. Psychology was the department of Fred Terman's father, Lewis Terman—one of the fathers of IQ testing—and it had long been among the university's strongest. It was one of the few social science departments that got high marks in the national assessments of the 1950s.9 Fred Terman and his close associate, Albert H. Bowker, were prepared to take psychology to the next level.

Bowker, the first chair of Stanford's Department of Statistics, had founded the Applied Mathematics and Statistics Laboratory where Atkinson worked during his initial year.10 He was a man of few words but many ideas about Stanford's academic trajectory. On his appointment as graduate dean in the late 1950s, and with Terman's enthusiastic support, Bowker joined forces with Suppes to develop Stanford's strength in quantitative approaches to the social sciences at a time when few other institutions were moving in that direction. Atkinson's recruitment from UCLA in 1961 was part of their plan for the psychology department; so was the recruitment of Estes a year later. Atkinson's background in mathematical modeling and his solid experimental training at Indiana made him an attractive candidate. Early on in his Stanford career, he became coauthor, with Ernest Hilgard, of one of the most successful textbooks in the field, *Introduction to Psychology*. Rita joined as coauthor in 1971.11

In the entrepreneurial Stanford of the 1960s, faculty were expected to search aggressively for research funding, and even secretarial help was not to be taken for granted. Atkinson liked the competitive atmosphere, the bright graduate students, and the sense that opportunities were there for those prepared to work for them. He embarked on a series of studies with Suppes, including a 1960 book, *Markov Learning Models for Multi-person Interactions*, which used extensive experimental data to analyze the application of learning theory to game situations.

But what gained them a national audience was their work in the fledgling field of computer-assisted instruction. In the early 1960s Suppes was the director of Stanford's Institute for Mathematical Studies in the Social Sciences, one of the first university centers in the United States devoted to the application of mathematical methods to the behavioral and social sciences. It was there that he and Atkinson tested ideas for using computers to improve on traditional classroom techniques by making teaching more flexible and more adapted to differences in students' ability and motivation. At the time, the US Office of Education was encouraging
IBM, interested in potential commercial applications, agreed to work with Atkinson and Suppes on what became its pioneering IBM 1500 System. The system, with eighteen student terminals, was installed in East Palo Alto's Brentwood Elementary School in fall 1966.

Brentwood was an overwhelmingly minority school in a very poor area, with students lagging a year or more behind national norms. What Atkinson and Suppes proposed to do was to test the role of computers in teaching beginning reading and arithmetic to first- and second-graders, using programs the two had created. The premise of the Brentwood project was that teachers were compelled to teach to the broad middle of the class, which left less time for students in the top and bottom quartiles. The thesis was that computers could address the needs of these students, fast and slow learners alike, by allowing them to progress at their own pace and in ways adapted to their individual learning styles. The Brentwood experiment was the product of four years of preparation aimed at applying the mathematical models of the learning process that Atkinson had been working on since his graduate student days at Indiana University.

After conquering some initial anxieties, most of the schoolchildren loved the experience. Life magazine called it "an educational revolution . . . being taught by electronic schoolmarmsh—machines that are making an eerie and promising impact at all levels of learning," in a story it ran on the Brentwood experiment in January 1967. "With this technology," Suppes added, "we may be able to give each kid the personal services of a tutor as well-informed and as responsible as Aristotle."

Atkinson was more measured. A year later, in an assessment of computer-assisted learning in Science, he described the remarkably rapid progress of computerized instruction as well as the problems—a combination of cost, technical issues, and the difficulty of evaluating the effectiveness of this new pedagogical tool without a deeper understanding of the learning process itself, a topic he was confident would attract outstanding future scientists.

IBM eventually chose not to pursue the computerized learning market. Atkinson and Suppes decided they would give it a try. Together, they founded Computer Curriculum Corporation; Suppes wrote the software program for arithmetic, Atkinson the one for elementary reading. The computer-based system they developed served as a prototype for the commercial development of computer-assisted instruction in the United States. Their company prospered and was later sold to Paramount Corporation in the early 1980s.

Atkinson's most fundamental contribution to psychology, the one that earned him election to the National Academy of Sciences in 1974, was his seminal work on the structure of human memory. Speculation about how memory works has a long lineage, going back in modern times to such nineteenth-century psychologists as Hermann Ebbinghaus in Germany and William James in the United States. James made a famous distinction between primary and secondary memory—roughly
speaking, short-term and long-term memory—in his 1890 *Principles of Psychology*. His intuitions about these inner processes were brilliant, but they were qualitative descriptions based on introspection. Mathematical modeling offered an opportunity to supplement such verbal accounts with something more quantitative and experimentally based. Atkinson was one of a handful of researchers who created the field of mathematical modeling in psychology.
He and his colleagues started by constructing mathematical models of simple types of learning that could be studied in the laboratory. These models would then be used to make precise predictions that could be tested against the data. In 1964 Atkinson and one of his graduate students, Richard Shiffrin, began developing a more complex model that would explain the structure of memory and how it operates, especially how short-term and long-term memory interact with each other. The model they developed is described in a 1968 paper titled “Human Memory: A Proposed System and Its Control Processes,” among the most cited articles in the history of the social sciences. It argues that the structures of memory are fixed, but its “control processes”—the way memories are handled—are various.

The Atkinson-Shiffrin model was a major advance in the field for several reasons. It was, first of all, a general theory of memory, a more ingenious and sophisticated explanation of its structure than the prevailing model, developed by N. C. Waugh and D. A. Norman. “It is as if Waugh and Norman proposed the elements of earth, air, fire, and water, and Atkinson and Shiffrin proposed the elements found in the periodic table—the latter notion being more complex and comprehensive explaining a wider variety of phenomena,” as one commentator put it. The simplicity and elegance of the theory they proposed made the Atkinson-Shiffrin model the “modal model” of memory—widely accepted as the standard in the field. The control processes they described, such as rehearsal, coding, retrieving, and decision rules, are now standard in theories of memory as well. Their work has had a lasting influence on the direction of research in experimental psychology, including the neuroimagery research that has flourished in recent years.

THE NATIONAL SCIENCE FOUNDATION

In spring 1975 Atkinson received an invitation that changed his career. Guyford Stever, director of the National Science Foundation (NSF), approached him about serving as deputy director. Rice University President Norm Hackerman, a good friend and chair of NSF’s advisory body, the National Science Board, called him to second the idea. Atkinson was intrigued but reluctant to leave academia. Ultimately he agreed to a temporary appointment—an academic year plus two summers, or fifteen months—with the understanding that he would be on leave from Stanford. The timing was right, and he was ready for a break from research and teaching. His daughter was entering Brown University in Rhode Island in fall 1975, and the chance to spend a year on the East Coast was a further attraction for him and Rita.

He saw NSF as an opportunity to experience the world of national science policy. It also turned out to be a long exercise in crisis management. The mid-1970s were the era of Senator William Proxmire and his Golden Fleece Awards, presented with much public fanfare to government-sponsored projects the senator
considered intellectually frivolous and fiscally wasteful. NSF grants were among his favorite targets. One was an NSF-funded project on the mating habits of the screw-worm fly; another was a social science project on theories of love. Newspapers from the *National Enquirer* to the *Chicago Tribune* jumped in, with the *Tribune* running a story on an NSF-supported study titled “A Theory of Necking Behavior.” The study turned out to be something far less titillating than its title: an engineering project on the necking behavior of metals, not humans.16

Hostile grilling by congressional committees was routine. Atkinson rarely appeared before a committee on the Hill without first arming himself with a few examples of basic research that had yielded a new drug or a better mousetrap, many of them torn from the day’s newspaper. The sex life of the screw-worm fly ultimately turned out to be a key step toward understanding the biology of pest control, but in the mid-1970s the constant torrent of ridicule was damaging to NSF and to government support for basic scientific research. Proxmire’s attacks were symptomatic of a shift in political winds. In Atkinson’s words:

> At this time considerable criticism was being directed towards science activities of all sorts. Ever since the publication of Rachel Carson’s *Silent Spring* in the 1960s, there was a growing feeling abroad that the purity of science, as it had emerged from World War II, was not quite as pristine as it had seemed. This was immediately after the Vietnam War and there were sizable cuts in science budgets; money was hard to come by, and scientists whose grants were not funded were critical of peer review and in turn of NSF. Proxmire was tapping into this public unease about science, and Congress followed his lead.17

The critics of NSF’s peer review portrayed it as a good-old-boy system in which university researchers gave high marks to their colleagues’ grant proposals as a way to ensure a favorable assessment of their own. Two of NSF’s most strident and determined opponents were Congressmen John Conlan of Arizona and Robert Bauman of Maryland. They kept up a steady drumbeat of criticism in Congress, especially against NSF’s science education curricula, which in their view did not embody appropriate American values. These curricula, developed during the post-Sputnik era of generous federal investment in national school reform, were intended to reflect the best and latest thinking on classroom learning. By 1975 NSF had sponsored forty-three curricular projects in mathematics and the natural sciences and ten in the social sciences.18

An NSF-funded anthropology project, *Man: A Course of Study (MACOS)*, gave Conlan and Bauman the opportunity they were looking for. Developed by the distinguished Harvard professor Jerome Bruner, among others, MACOS was intended to teach fifth- and sixth-grade students how values can differ from one society to another. The flashpoint was a MACOS film explaining cultural practices among the nomadic Eskimos living in the harsh environment above the Arctic
Circle. Among those practices were wife-sharing and abandoning old people to die when they could no longer withstand the rigors of long treks. The public hue and cry over this controversial material, and MACOS in general, generated threats to require congressional review of all fifteen thousand NSF grant applications. Director Stever promised a comprehensive review of the science education programs to address the criticisms.

Atkinson arrived at NSF on July 1, 1975, just after the review came out. Instead of defending the educational rationale for MACOS and similar curricular programs, the NSF report justified its business practices and the peer review process involved in funding the science curricula. The result was to entangle two distinct but equally controversial issues—NSF's pedagogical decisions about science curricula and its management decisions about how projects were evaluated and funded. Worse, the document sought to minimize or obscure some careless practices that had crept into NSF's grant procedures, a fact that Conlan and Bauman knew because of leaks from several NSF staffers who shared the congressmen's disapproval of MACOS. It all came to a head in January 1976, when a report by the General Accounting Office (GAO) gave NSF low marks for its poor business practices and haphazard auditing procedures in the science education area.

Atkinson was put in charge of mounting a response. He assembled a few trusted colleagues, and together they spent an entire weekend examining NSF's grant-awarding process for curriculum projects, working practically around the clock. What they found was not evidence for the defense but what appeared to be additional ammunition for their critics: the fiscal and peer review problems in science education not only existed, but were more widespread than the GAO report suggested.

The question was whether to try to keep this new and damaging information under wraps to protect NSF's reputation or to go public with the fresh evidence they had found and risk the consequences. The decision, made after several days of anguished debate, was to disclose everything and to commit to correcting the flaws in the agency's business practices and audit procedures. It was a novel approach for a government agency, one that surprised and disarmed NSF's opponents.

In addition to overhauling the business side, Atkinson began a systematic revision of the problematic aspects of NSF's peer review process. He ordered all project titles and abstracts edited, if necessary, to remove anything that might conceivably be sensationalized by the media. This act incurred the wrath of the academic community, especially the physics community, some of whose members made a visit to NSF to complain in person to the director. Atkinson also commissioned an independent evaluation of the agency's grant procedures. The study, conducted by two brothers—Jonathan R. Cole of Columbia University and Stephen Cole of the State University of New York's Stony Brook campus—included a statistical analysis that validated the soundness and reliability of peer review throughout NSF. Although
the critics had been right about some of NSF's management weaknesses, much of the warfare over peer review was a way of attacking the agency for supporting the teaching of evolution in the schools. The Coles's study, published in *Scientific American*, lent some objectivity and context to the issue.\textsuperscript{20} NSF emerged from the crisis more or less intact if not unscathed.

In summer 1976, when Stever left NSF to become President Gerald Ford's science adviser, Atkinson was named acting director. Sometime later, the White House sent the name of its nominee for NSF director to the Senate for confirmation; it was not Atkinson. The cognizant Senate committee was the Subcommittee on Health and Scientific Research, chaired by Senator Ted Kennedy. He was not inclined to make a new appointment so late in Ford's presidential term and wanted Atkinson to stay on in the acting role at least until the next election. Atkinson had worked closely with Kennedy during his first year at NSF and had gotten to know the Kennedy family years before during a brief stint as an educational adviser to Bobby Kennedy during Bobby's ill-fated 1968 presidential campaign.

Kennedy delayed confirmation hearings for several months and then, when the administration finally complained, pointed out that the White House had failed to consult with the National Science Board regarding its nominee—a routine matter but one that was nevertheless required by the legislation establishing NSF. By that time, however, the clock had run out on the Ford administration. When Jimmy Carter took office, one of his first official acts was to nominate Atkinson for the directorship. The nomination sailed through Kennedy's committee.

NSF's four previous directors had come from the natural sciences, so the choice of a social scientist to head the agency was unusual. Atkinson told the story of encountering the prominent World War II physicist I.I. Rabi on a visit to New York soon after his appointment as head of NSF. "Congratulations," Rabi greeted him, "and what area of physics are you in?"\textsuperscript{21}

Defending the value of basic research was a long-standing priority at NSF, but Atkinson also took steps to promote ties between industry and research universities. The huge infusion of federal funds into research universities following Sputnik had eclipsed the pre-World War II collaborative relationship between universities and private companies.\textsuperscript{22} American universities were producing a rich array of potentially useful research, but innovations were not moving into the private sector as quickly or efficiently as the economy required. NSF's analysis of the technology transfer process led to an early draft of what became the 1980 Bayh-Dole Act. Bayh-Dole allowed universities to keep the patent rights to inventions resulting from any federally supported research they conducted, and the outcome was an upsurge of technology transfer from research universities to the private sector. NSF also examined other incentives for investing in research, such as tax credits and industry-university partnerships. These studies led the agency to establish a program of joint research projects between industry and
universities. It sponsored an extramural research program, funding projects to study the relationship between investments in R&D and various types of economic growth.

Atkinson dismantled an early 1970s program called Research Applied to National Needs (RANN), established in 1971 to focus on identifying important societal problems and ways to solve them. RANN was different from the kind of basic science research NSF specialized in, and was never completely accepted by the National Science Board. Atkinson's decision to end it was probably his most controversial act as director of NSF. The primary reason was to expand funding for research in engineering, which had not been included in NSF's original mandate. Atkinson believed that engineering had long since transcended its trade school origins and become a full-fledged intellectual discipline fundamental to the future of scientific and technological advance. At the very end of his tenure, he persuaded the National Science Board to elevate engineering to a full directorate.

NSF's responsibilities for science were not just national, but international, and in his second year as director Atkinson found himself in the middle of a diplomatic imbroglio. President Richard Nixon's historic visit to China in 1972 had begun a thaw in relations between the two countries, but it was only after the 1976 death of China's long-term Communist dictator, Chairman Mao Zedong, that momentum for change began to take hold. In 1978 the Chinese government signaled its interest in an exchange of students, scholars, and scientists with the United States. The Carter White House, eager to open up the relationship with China, welcomed the idea and designated the US Information Agency as the American representative in the discussions. The reaction from Chinese officials was negative: they wanted the National Science Foundation.

They got their way. Atkinson traveled to Beijing with a delegation led by Frank Press, director of the Office of Science and Technology Policy and science adviser to the president. The members were housed in a lovely wooded compound used for foreign notables, where they heard that the Gang of Four—Mao's wife and several close associates, now out of political favor—was being held under house arrest in a nearby mansion. When the Americans met with Mao's successor, Deng Xiaoping, they were struck by the spittoons strategically placed around the room and even more by Deng's practiced aim when he used them. Later their Chinese hosts told them that this was the aristocratic Deng's way of "expressing camaraderie with Chinese peasants."

Atkinson's principal instruction from the Carter administration was to see that the exchange agreement was formalized in a memorandum of understanding signed by both governments. The American side was hoping for a large exchange program—an optimistic five hundred per side as a first step—and for a broader discussion that would explore possible joint ventures in science and technology. But Fang Yi, vice-premier of the state council and Atkinson's counterpart,
interested only in an exchange program, and an informal one at that—no memo-
randum of understanding. At first Fang Yi was elusive about numbers. One day, however, he abruptly shifted direction:

Finally, Fang Yi became very assertive and asked how many students other coun-
tries have studying in the United States. A direct question that required a direct
answer. I began with Iran which had about 25,000 students and worked down a list
of six or seven countries. And then being somewhat mischievous, I concluded by
noting that Taiwan had about 9,000 students. A tense moment followed, and then
another direct question. “How many can China have?” I decided to press to the
limit, and said possibly a thousand. Fang Yi shot back, “Why can’t we have as many
as other countries?” The American side was stunned, but secretly delighted. After
that, talks moved quickly and we soon had the basis for an agreement. But the Chi-
nese insisted that it had to be at an informal level, not a government-to-government
agreement. 25

That became the sticking point, still unresolved at the end of the visit. When a
delegation arrived in Washington in January 1979 to finalize an agreement, it was
clear the Chinese were still determined to avoid a formal exchange. They informed
Frank Press and Atkinson that they had stopped off in Los Angeles and San Fran-
cisco along the way, and the leaders of several universities in those cities had told
them an informal exchange, with no government involvement at all, would be not
only possible but welcome. Press, who had heard nothing whatsoever about these
visits, immediately replied he was of course aware of them and could assure the
Chinese that there would be no exchanges without the American government’s
approval. Atkinson signed the memorandum of understanding on behalf of the
United States, the first of its kind in the history of the two countries.

By 1980 the planned fifteen-month leave from Stanford had turned into five
years at NSF. Atkinson had guided the agency through what the Washington Post
called “a rebuilding from the ravages of the Nixon anti-science era,” weathering
attacks on its system of peer review and its administrative integrity. 26 NSF fund-
ing, which had been on the decline when he arrived, grew by nearly one-third
between 1976 and 1980, when the NSF annual budget topped a billion dollars—al-
though the ravenous inflation of the 1970s ate up some of those gains. Even Sena-
tor Proxmire came around in the end, telling Atkinson that he had won not only
Proxmire’s confidence but the confidence of Congress as well. NSF introduced him
to Washington, the politics of science, and the experience of making things hap-
pen in a complex organization. Later Atkinson would remember NSF as one of the
most exciting and challenging periods of his life. Yet in 1980 he was beginning to
think about leaving the agency, and his thoughts were turning to the possibility of
a university presidency.
CHANCELLOR OF UC SAN DIEGO

NSF directors are natural candidates for university leadership posts, and Atkinson had already been approached by several search committees, including Brown University's. Early in 1980 he was invited to interview for the presidency of the University of Southern California. The process turned out to be less than confidential. Details of the search were splashed all over the Los Angeles Times, including Atkinson's name and that of another candidate. The Times also reported that Atkinson had strong faculty support but that one of USC's trustees, a former CIA director, considered him potentially subversive because he had ties to the Kennedy family. Neither Atkinson nor the other candidate welcomed the unwanted publicity or the evidence that USC did not have its search in order. Both withdrew.

Soon after the USC incident, University of California President David S. Saxon came to see Atkinson at NSF. Saxon was a physicist by training, and Atkinson assumed the reason for the visit was the physics community's unhappiness with an NSF decision about funding for a proposed accelerator. Saxon had other things on his mind, however. He wanted Atkinson to interview for the chancellorship of UC's San Diego campus. With the USC experience still fresh, Atkinson hesitated. Saxon then asked if he would be willing to talk with the search committee if the list were pared down to three candidates and the interview kept completely confidential. Two weeks later, Atkinson flew to Los Angeles to meet with the committee. On the day of the interview, he ran into a friend, Bob Adams, in the lobby of the hotel where he was staying. Adams was the provost at the University of Chicago and, as they quickly discovered, a fellow candidate for the San Diego chancellorship. Atkinson went away impressed with the good taste of the search committee. Adams later became secretary of the Smithsonian Institution. 27

San Diego had a number of attractions. It was widely regarded as the best of the American research universities established after World War II. Although a young institution, UCSD was already a force in the sciences, built as a general campus in the 1960s on the foundation of the world-renowned Scripps Institution of Oceanography (SIO). Scripps had been established as a marine research station in 1903 and became part of the University of California in 1912. It took off after World War II, buoyed by the rising tide of federal funds and the energy and ambition of Roger Revelle, who took its budget from $1.5 million to $12 million during his tenure as director from 1950 to 1964. 28 Revelle, one of the founding fathers of UC San Diego, envisioned it as a public version of the California Institute of Technology (Caltech), focusing primarily on graduate education in scientific and technical fields, capitalizing on the established excellence of SIO. The Regents ultimately decided otherwise and designated UC San Diego as a general campus in 1960, but even so its inaugural class consisted of fifteen graduate students in physics. Revelle's
vision had a lasting influence on UCSD's image of itself. He believed there was a certain order in building a great university: first assemble a group of outstanding academics, then bring in graduate students, and only later add undergraduates. Distinguished universities, he told a Princeton University audience in 1958, had to be constructed "from the top down and not from the bottom up—and from the inside out, not the outside in." UC San Diego fit that pattern, and from the beginning the campus pursued a strategy of recruiting distinguished senior faculty to staff its academic departments. So many of its founding faculty were lured from the University of Chicago that in the early days UCSD was jokingly referred to as the University of Chicago at San Diego. By 1980 the campus was a powerhouse in mathematics, chemistry, physics, and biology, as well as oceanography. And it was located on one of the most beautiful stretches of the California coast. Atkinson's daughter, Lynn, had spent a summer at SIO as a research assistant, and her parents were deeply impressed by La Jolla and San Diego when they visited her.

Atkinson had many sources of information about the campus, and not only because UCSD was a leading recipient of NSF funds. SIO Director Bill Nierenberg was on the National Science Board, the governing body for NSF; UCSD's chancellor at the time, Bill McElroy, was a former NSF director; and Bill McGill, who had been the third chancellor of UC San Diego and then president of Columbia University, was an old and close friend. The 1,200-acre campus, originally a Marine base, sat on a scenic bluff overlooking the Pacific and had the international prestige and academic traditions of the University of California behind it. Although the system was struggling through a major budgetary downturn, there was every reason to think UC's and UCSD's long-term prospects were bright. Atkinson's experience as a faculty member at UCLA gave him a sense of what the University of California and public higher education were about. Several members of the search committee later described him as having impeccable academic credentials, an engaging enthusiasm, and developed ideas about what was needed at San Diego. He arrived in Los Angeles carefully prepared.

The interview with the search committee was at noon. That evening, Saxon called and offered Atkinson the job. After a long phone conversation with Rita, he called Saxon back and said yes.

"As you know from our discussions," Saxon wrote him after the Regents had approved his appointment, "the campus has had some tough problems and the fallout from them will present you with correspondingly tough challenges, but I am confident of your ability to handle the situation. I know that you and I have a common view of the high quality of the campus and of the brilliant future before it." The first of the problems was the campus rift over the outgoing chancellor, Bill McElroy. McElroy was a distinguished biologist whose pioneering work in the bioluminescence of fireflies was a dazzling example of everything Atkinson had argued for at NSF about the long-term payoffs of basic research; his exploration
of how fireflies emit light led to important advances in genetic research.\textsuperscript{31} After eight years as chancellor, McElroy had been forced to resign in the wake of a no-confidence vote by the San Diego faculty. The campus was torn by an ongoing power struggle between the administrative and academic vice chancellors, compounded by the faculty’s unhappiness with organizational changes McElroy had made that, in the faculty’s view, were instituted without sufficient consultation with the campus faculty senate. Many people felt the root of the problem lay in McElroy’s failure to exert leadership in his relations with the faculty. This situation left the academic vice chancellor, not the chancellor, as the campus’s chief academic spokesperson.

McElroy, who was having troubles in his personal life, tried to forestall the no-confidence vote by privately telling the campus’s academic leaders that he would quietly resign. But they insisted on taking the formal and public vote anyway. It was a symptom of just how deep and persistent tensions were; even secretaries in the opposing camps were not talking to each other. The faculty eventually went to Saxon, who was pained and puzzled by the whole affair. He respected McElroy and tried to rescue his chancellorship, but the faculty’s mutinous mood and the bitterness of the situation were clear. He had a private talk with McElroy, who resigned soon afterward.

In April 1980, at Atkinson’s request, Saxon appointed a committee to review the administrative organization of the campus, focusing on the senior management positions reporting directly to the chancellor. It was intended as a first step toward rectifying some of the imbalances in power and responsibility that had precipitated the turmoil between the chancellor and the faculty. The committee, chaired by physics professor and campus faculty senate chair Bill Frazer, gave him several useful options to consider, but Atkinson did not stop with a revised organization chart. By the end of his first year, there were new faces in virtually every senior administrative post. He wanted to start from scratch.

McElroy’s fate was a cautionary tale, and Atkinson’s first priority was building trust with the faculty. A few weeks into his tenure, during a round of visits to campus departments, he got into a debate with a member of the English faculty over the nature of a liberal education. The professor reminded him that the faculty had already gotten rid of one chancellor, and they could get rid of another.

The San Diego faculty was a self-confident body with a strong sense of its prerogatives and institutional identity. There is a story, dating to the early 1960s, about a visit to the young campus by President Clark Kerr. When he encouraged the UCSD faculty to strive for the academic standards set by Berkeley, he was told they had no desire to sink that low. Saxon, worried that Atkinson might not fully appreciate just how much power the faculty wielded, dispatched the chair of the systemwide Academic Senate, Berkeley engineering professor Karl Pister, to give him a quick tutorial in the way shared governance worked at the University of
Atkinson listened. His first message to the UCSD senate was about the remarkable quality of the faculty and his hope that it would be at least as good by the time he finished his tenure as it was when he arrived. Unlike McElroy, who attended campus faculty senate meetings only occasionally, Atkinson showed up regularly and prepared meticulously. He invited the chair of the senate to become a member of his administrative cabinet and established a faculty liaison position in his office to ensure that faculty viewpoints were well represented. While he had his share of differences with the campus senate leadership over the years, Atkinson always took the faculty seriously. It was not only a matter of self-interest but of institution building, capitalizing on UCSD's strong faculty-centered culture as an incentive to attract more outstanding scholars and scientists.

He found a campus organizational structure, administrative and academic, that was adequate in some areas, embryonic in others. The campus was strong in many of the physical and biological sciences, with approximately 45 percent of its faculty and more than 50 percent of its student body concentrated in science and engineering. It was far less developed in the humanities, the social sciences, and the arts. The campus had no academic deans and no endowed chairs; he instituted both. He recruited a series of senior faculty members to serve as academic vice chancellor. To deal with faculty criticisms that too much power had been concentrated in the administrative vice chancellor, he split the post into two positions, one responsible for business and planning and the other for budget. For the key position of director—later vice chancellor—for planning and budget, he recruited V. Wayne Kennedy, who had been associate dean of the medical school. Atkinson took control of the budget, in his view an indispensable step for any CEO, and appointed a budget committee headed by Kennedy to make recommendations about resource allocations to colleges and departments. One of Kennedy's responsibilities was to make sure that everyone understood how and why funds were distributed. Another was to put together an enrollment plan. The administrative and business infrastructure they created lasted substantially unchanged for more than two decades.

There was much more to do, and he wasted no time getting started. Although located on a stunning site, the campus had little sense of place. Physical planning had been haphazard and funding scarce in the tough budget years of the late 1970s. Capital planning, almost nonexistent when Atkinson arrived, got under way. The campus established a design review board, and Atkinson personally oversaw every building that went up on campus. When it appeared some campus neighbors might object to plans for stadium-scale floodlights in an athletic field, he had them installed without notice. On occasion he named some of the campus streets without bothering to seek the customary approval from the president or the Board of Regents, neither of whom apparently noticed the oversight. The Price Center, designed as a gathering place for students, was built early in Atkinson's
tenure. Students protested his decision to add private vendors to the on-campus food service, but memories of its controversial beginnings eventually faded. Any project that involved tree removal was fraught with peril. There was intense faculty resistance to a plan to eliminate some trees from an area outside the Geisel Library known as Library Walk. Students quickly took up the cause, attaching dramatic white crosses to the doomed trees and chaining themselves to the trunks. Along with a faculty member who joined them during a public demonstration, they had to be forcibly removed. Atkinson remembered the incident as one of the most unpleasant experiences of his chancellorship.

It was important to get the administrative and physical infrastructure in place so that he could turn his attention to his central task: moving the San Diego campus from its spectacular early start to the next level of quality. The first step was a campaign to have UC San Diego elected a member of the Association of American Universities. The membership of the AAU included the most distinguished research universities in the United States and Canada. Berkeley had been a founding member of the AAU in 1915, and UCLA had been admitted in 1972. UCLA's election was precedent breaking at the time because it made UC the only university system in the AAU with more than one campus as a member, and the odds that a third UC campus would be selected were unpromising. But persistence paid off. In 1982 UC San Diego succeeded in its bid for election.33

Atkinson's AAU campaign was obviously directed at boosting the campus's national reputation, but it also carried a message for the campus itself: UCSD's future did not lie in following the Caltech or MIT model, despite the dreams of some of the campus's early builders. It was a public research university, different from Berkeley and UCLA but with the same broad range of intellectual disciplines and the same commitment to educate undergraduates. Election to the AAU was public testimony to its readiness to compete in the same academic league as the two older campuses. For Atkinson, the important issue was focusing the campus's energies and aspirations in this direction.

The San Diego community presented a different kind of problem. UCSD's unusual top-down academic origins encouraged the idea among the faculty that its most important connections were national and international, not local; early on, the needs of the city of San Diego had not been a major consideration. UC San Diego had been a center of strident, sometimes violent student demonstrations during the Vietnam era of the 1960s and early 1970s. Some of the iconic figures of the era—student-revolutionary Angela Davis, for example, and faculty member Herbert Marcuse, the German-born neo-Marxist theorist and favorite philosopher of the New Left—were active at UCSD and impossible to ignore. The mainstream reaction in San Diego was predictable. McElroy's predecessor, Bill McGill, vividly describes living through the nightmare year of 1968 and dealing with radical students, angry Regents, and outraged San Diegans in his Year of the Monkey.
Among other things, he had to cope with the angry editors of the *San Diego Union*, who pummeled the campus regularly and once published an editorial titled "This Is an Order" demanding that Marcuse—"professor of Left Wing philosophy"—be instantly dismissed.\textsuperscript{34}

Unhappy memories of the days of student flag burning and political protest lived on in that conservative navy town. McElroy, a friendly and outgoing Texan, had tried to bridge the gap by inviting the community in and appointing a board of overseers to stimulate fund-raising. But the distance between the campus and greater San Diego remained more than geographic.

An example was a visit Atkinson received from the chair of a San Diego committee working on the city's official celebration of the 1987 bicentennial of the US Constitution. At the end of the meeting, during which UCSD's plans for the celebration were discussed, the chair asked to speak with Atkinson privately. His forthrightness, she told him, encouraged her to bring up a subject she had been warned not to mention: would he be willing to make an exception to UCSD policy, dating back to the Vietnam era, and allow the American flag to be flown on campus during the bicentennial events? Atkinson took her to the window, pointed to the American flag flying outside his office, and explained that no such policy had ever existed. Later he had flags—US, state of California, UC, and UCSD—installed at major entrances to the campus.

It would be difficult to overstate the challenges of bringing together the liberal campus and the conservative town, but Atkinson began to build methodically on the progress McElroy had made. San Diego was in transition from an economy based on tourism, retirees, the US Navy, and banking. Atkinson's constant message in dozens of talks at places like the Rotary Club and chamber of commerce was that UCSD was the city's key asset in making the leap to the newer, high-technology economy that was being born before their eyes.

The quality of teaching at UCSD was high, but the one-year student retention rate was the worst in the UC system—77 percent—when he arrived in 1980. The range of majors was narrow. Psychology, for example, was heavily experimental, and students complained that after four years they graduated knowing more about rats and pigeons than about people. Atkinson, though an experimental psychologist himself, sympathized with the students and pushed for broadening the department's curriculum. He worked with the faculty to institute popular new majors, including cognitive science, ethnic studies, and communications.

Undergraduate student life centered on four—later six—colleges modeled on the Oxford and Cambridge example, each with its own general education requirements, housing, and dining halls. As was the case at UC Santa Cruz, which also aspired to the Oxbridge ideal, the English college system did not adapt readily to the California academic climate, with its history of organization into disciplinary departments. The colleges were the site of pitched battles over curriculum and
control during the student revolution of the 1960s. As chancellor in the 1980s, Atkinson was pluralist in the national debate over curricula; he did not agree with his old classmate Allan Bloom that the classical, University of Chicago-style core curriculum was the right model for everyone. He considered the course of study offered in each of the UCSD colleges rigorous and conducive to what mattered most—intellectual growth. His preference, he said, was “the Aristotelian approach that stresses knowledge of many areas and deep experience in at least one . . . .

What is ultimately going to matter to students when their college years are over is not the particular books they read or the specific curriculum they followed but the cognitive skills they acquired.”

Atkinson warned departments that growth in student numbers alone, without a parallel growth in academic strength, would not be rewarded. Not that enrollments were unimportant to him; they were a central issue, in fact, because of their link to the budget—the more students, the more money from the state; the more money from the state, the greater the opportunities to attract outstanding faculty. In 1979, a year before Atkinson came to UCSD, the Office of the President had issued a report warning that UC campuses should brace for anything from small to large declines in student enrollment during the 1980s, the post-baby boom decade. For UCSD, which had the same budget woes as the older campuses but not their thousands of alumni donors and large base of money from the state, every possible funding avenue had to be explored. This set up a tug-of-war between the faculty, who tended to see enrollment as workload, and the administration, which saw it as precious income in a world of scarcity. Atkinson fought for higher numbers than those proposed by the faculty every year, and he usually won. He was helped by UCSD’s academic quality and by rising tuition at places like the University of Southern California, Stanford, and other private institutions, which made UC campuses financially attractive to bright students.

The austere budgets of the early 1980s improved by mid-decade, but funding circumstances still required Atkinson and his administrative colleagues to be consistently inventive and innovative in ways small and large. They were constantly on the hunt for opportunities for community or business partners who could help them expand the campus’s academic reach and excellence. Atkinson focused his energy and persuasiveness on recruiting faculty and raising funds; he proved highly successful at both.

His growing reputation in San Diego and beyond led the Regents to consider him for president on three occasions, first as a successor to David Saxon in 1983, then again in 1992 and 1995. The Regents chose other candidates in the first two searches. Several colleagues thought that the experience of being passed over in 1992 left him depressed and discouraged; he had been a highly successful chancellor, and much as he loved San Diego, he was ready for something more. Around this time he was offered the presidency of the New York Public Library and briefly
considered it. But he and Rita ultimately decided that their roots were too deep in La Jolla and in the University of California for such a move.

In the mid-1990s two-thirds of the university presidents in the United States had served five years or less. Atkinson had headed San Diego for fifteen. It had been long enough to realize his most important aims: guarding the distinction of the faculty and broadening the scope and excellence of UCSD's academic offerings. The National Research Council's 1995 report on academic program quality at American research universities ranked the scholarly and scientific caliber of UCSD's faculty tenth in the nation—higher than UCLA's and indeed higher than any public US university's except Berkeley. Two UCSD programs—neurosciences and oceanography, the university's founding discipline—were rated first in the country. Its strengths in the arts and humanities were competitive with the best public and private institutions.

Atkinson's UCSD years had seen the establishment of a school of engineering, a graduate school in international relations and Pacific Rim studies, research centers in disciplines ranging from US-Mexican studies to molecular genetics to supercomputing. UCSD was home to the world's largest laboratory for testing structural
resistance to earthquakes, a place the state of California looked to for advice following the 1989 Loma Prieta temblor. One of the few programmatic goals he did not achieve was a law school; despite his intense and persistent lobbying, two UC presidents opposed the idea.

Enrollment had doubled and the campus's annual economic impact on the local San Diego economy, $300 million in 1980, had risen to more than a billion dollars a year by 1995. UCSD's contributions to building the city's high-technology sector were so far-reaching that Washington Post publisher, Katharine Graham, once described the economic rebirth of the San Diego region during the 1980s as "the Atkinson miracle."

Institutional transformations of this kind are never simply the work of a single leader. Yet it is clear that Atkinson's Terman-influenced view of research universities was naturally attuned to the aspiring and entrepreneurial character of the campus. He finished what McElroy had begun—expanding the campus's view of itself from a science-centered to a broad-based research university qualified to compete with any in the UC system and beyond. One of his longtime University colleagues described him as among the brightest and most focused of UC's nine chancellors, genuinely—not just rhetorically—willing to take risks and reward creativity.

Anyone observing the pattern of Atkinson's decisions and administrative practice at both NSF and San Diego would have noticed some consistent traits. He was often impulsive, quick to embrace new ideas, highly intellectual, but with a distinctly un-academic dislike of verbal dueling. From a distance, he was often seen as a low-key persuader and consensus builder. Those who knew him up close also saw the drive, the willingness to remove people he did not think up to the job, and the sense of institutional direction that was always at work even if it was not always obvious to the casual observer. His friend and predecessor Bill McGill summed it up: Atkinson's "managerial style is a restless flood of energy. He simply does not rest until he has constructed paths to all of his goals."

Fifteen years at San Diego had shown him that a chancellor should have many goals, because no matter how hard you worked there were some you were not going to accomplish. He had led San Diego to a new and higher level of academic quality. And it had at last led him to something he wanted and felt he had earned: he was the seventeenth president of the University of California.
Who Runs the University?

Multicampus systems, such as the University of California, which now dominate public institutions of higher education in the United States, all seem to be in constant stages of adjustment. They are inherently very difficult to govern.

—CLARK KERR, THE GOLD AND THE BLUE, VOL. 1

After... years of struggle, we recognize that the university is governed in a most intricate, artistic way, by complex interactions among its many parts... We no longer ask the ultimate question: Who runs the University?

—ROGER HEYNS, UC BERKELEY CHANCELLOR, "BERKELEY: TODAY AND TOMORROW," 1971

The institutional train wreck known as SP-1 handed the administration and the Academic Senate a political dilemma of daunting proportions. As a matter of long-standing tradition, the University of California was committed to high academic standards for entering students, a commitment that made UC an anomaly among public universities from early in its history. As a matter of politics, UC leaders understood that no public university could expect support from a legislature whose constituencies were sparsely represented on its campuses. Affirmative action had been an admittedly imperfect but increasingly successful tool for helping strike a balance between those two realities. Now that tool was gone.

Between 1980 and 1990 the number of African American, Native American, and Latino undergraduates on UC campuses more than doubled, from 9,000 to 21,000. But the fundamental problem persisted: underrepresented minorities qualified for UC at a much lower rate than whites and Asians. There seemed no alternative to racial and ethnic targeting in admissions; analyses had demonstrated that in UC's zero-sum admissions process, using the broader criterion of economic status would not work because it would result in qualifying larger numbers of white and Asian students. There was also the strange phenomenon called the achievement gap. When University analyses looked at SAT scores for all California