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U.S. News & World Report, August 30, 1999
Caltech comes out
For the first time, a science and engineering powerhouse leads the U.S. News academic rankings

By Ben Wilavsky

When 19-year-old Nicholas Knouf of Badger, Iowa, was deciding where to go to college last year, the aspiring research scientist faced an enviable set of choices. With perfect high school grades and a combined SAT score of 1500, he was accepted everywhere he applied, from small, top-notch liberal arts schools like Minnesota’s Carleton College to big, research universities such as Stanford. But in the end Knouf didn’t have to choose between the intimacy of a small school and the excitement of studying at a scientific powerhouse. He enrolled at the California Institute of Technology, where he spent the summer after his freshman year in the lab of neuroscientist Christof Koch researching how the brain interprets visual images.

At Caltech, would-be engineers and scientists can have it all: plentiful opportunities to learn at the feet of award-winning professors thanks to an extremely low, 3-to-1 student/faculty ratio and the sense of community that one finds at small schools. Caltech’s 900-strong undergraduate student body is smaller than the 1,047-member freshman class at archival Massachusetts Institute of Technology. The college’s esprit de corps is strengthened by its elite enrollment. Freshmen enter with outstanding SAT scores: The mean scores for this fall’s class were 770 in math and 730 in verbal. One hundred percent of Caltech’s freshmen last year were in the top 10 percent of their high school class, a higher proportion than that of any other school in the U.S. News survey. With few students and many pricey scientific facilities, Caltech’s average per-student spending is a whopping $192,000. These attributes and others were given added emphasis this year by a change in U.S. News’s ranking methodology (Page 84), and that helped move Caltech into the No. 1 spot for national universities.

But for all its academic firepower, Caltech is not for everyone. Party animals and philosophy lovers who can’t stomach quantum mechanics are unlikely to find personal or academic happiness on the beautiful, intense Pasadena campus, which has been home to some of this century’s most eminent scientists, from chemist Linus Pauling to physicist Charles Richter and Richard Feynman. But “if you know you’re really interested in science,” says geneticist and Caltech grad Leroy Hood, who taught there before being lured away to the University of Washington by the chance to establish a new molecular biotechnology department, “I can’t imagine a better place to go than Caltech.”

Caltech has long had a reputation for nurturing gifted students. Unlike many major universities, which have only lately begun providing undergrads with more research opportunities (Page 66), at Caltech...

Accessible.

Prof. Kip Thorne
(background)
discusses research results
with senior
Marc Favata.

Photography by
David Butow – SABA FOR USN&W
research jobs are often just an E-mail away, especially in the summer. "You can approach almost any professor and they'll be willing to take you on," marvels junior biology major Deanna Carrick, who is working in the lab of developmental biologist Eric Davidson. Senior physics major Marc Favata of Bergen County, N.J., took a class on relativity last year with theoretical physicist Kip Thorne, author of *Black Holes and Time Warps: Einstein's Outrageous Legacy.* Now, he's meeting regularly with Thorne to discuss a mathematical formula Favata's analyzing that involves the gravitational interactions between neighboring neutron stars. "Caltech teaches people the thrill of discovery better than any other university I've been at in my life, and that includes Harvard, Oxford, and Berkeley," says UC Berkeley political scientist Bruce Cain, a Harvard Ph.D. and former Rhodes scholar who taught at Caltech from 1976 to 1989.

This discovery takes place at myriad high-quality labs and off-campus research facilities, including the Palomar Observatory north of San Diego and the giant twin telescopes at the W. M. Keck Observatory on Mauna Kea in Hawaii, operated jointly with the University of California. The university also runs NASA's Jet Propulsion Laboratory.

Caltech's small-town atmosphere gives faculty members frequent opportunities to talk with colleagues in other disciplines, whether at chance encounters at the gym or across the lunch table at the Athenaum, the elegant faculty club. This means that undergrads and the school's 984 grad students are exposed to research and teaching that cross traditional boundaries. Outsiders such as David Nelson, chairman of Harvard University's physics department, remark on the "extraordinary synergy" whereby geoscientists keep up with new developments in biology and physicists work on planetary science.

**Ph.D. bound.** A higher proportion of graduates go on to earn science and engineering doctorates than at other schools: 42 percent at Caltech versus 22 percent at the next-closest institution, MIT, according to a recent analysis by Nobel laureate Thomas Cech, the incoming head of the Howard Hughes Medical Institute in Chevy Chase, Md. By contrast, only 12 percent of Princeton grad and 8 percent of Stanford grad science and engineering Ph.D.'s.

The university's size inspires a sense of community and common purpose. Most students report that although they work tremendously hard, they're not competing against one another. Says 21-year-old Daniel Abrams, a senior applied physics major from Houston: "It's not you ver-

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**PRICEY EQUIPMENT.** Sophomore Brian Wang at work in Caltech's Shock Wave Lab, one of the

sus your friend. It's you and your friend trying to do the problem together." Campus life is governed by an honor code that states simply: "No member of the Caltech community shall take unfair advantage of any other member of the Caltech community." That translates into a remarkable degree of freedom and responsibility for students: Exams are unsupervised and are often taken in dorm rooms, and many students carry master keys that give them 24-hour-a-day access to most campus buildings.

The private, $25,476-a-year school makes no bones about seeking only students who have what one brochure calls "a demonstrated passion for math and science." Every undergrad, regardless of major, must take five terms of math, five terms of physics, two terms of chemistry, a term of biology, and more. The academic diet is not all science: Undergrads must also complete 12 classes in the humanities and social sciences, which comes to a little over 20 percent of their total

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**BBQ BREAK.** Many undergrads stay on campus
coursework. But while it’s possible in principle to get a non-tech degree—and there are strong programs in economics and political science—almost nobody does. Over the past 10 years, only 1 percent of students have chosen a primary major in the humanities and social sciences.

And those whose interests tilt away from the sciences often decide not to stay. That’s largely how the university accounts for its relatively low graduation rate. Just 85 percent of entering freshmen graduate within six years, compared with MIT’s 92 percent and Harvard’s 97 percent. Caltech president and Nobel laureate biologist David Baltimore says he’s not bothered by the high proportion of students who leave. At Harvard, students can pursue intellectual interests in almost any area, he says. “That isn’t true at Caltech.”

**Night life.** Some Techers talk about their love-hate relationship with a college where the educational experience is often compared to drinking from a firehose. An old campus saw describes Caltech life as follows: “Grades, social life, sleep; Pick two.” Nocturnal hours are so much a part of campus culture that most professors don’t bother trying to schedule morning classes until 10 a.m. or later. Last year, one computer science lab section met from midnight to 2 a.m. “You concentrate so much on work that you can forget about the rest of the world,” says Knouf.

The highly demanding workload leaves less time for socializing than at many colleges. The Princeton Review calls Caltech one of the nation’s worst party schools. Still, the campus does have its own distinctive social scene centered on seven residential houses. For one recent soiree, Techers at Blacker House flooded their courtyard with water, and attendees had to step onto rafts to reach the party entrance.

Caltech also fields varsity teams in baseball, basketball, and water polo, among other sports, but the teams are so hard up for players that they take all comers. With no football team, fraternities, or sororities, the closest thing to a homecoming is the annual engineering design contest at which throngs of students listen to the Glee Club sing the national anthem and watch competing teams construct devices to perform tasks such as shooting Ping-Pong balls into a goal.

The most popular annual event is “Ditch Day,” when seniors leave campus after creating multistep puzzles for underclassmen to unravel that require a combination of intellectual ingenuity, mechanical talent, and sometimes sheer strength. Student pranks occasionally draw the attention of the outside world—as when undergrads changed the scoreboard during the 1984 Rose Bowl between UCLA and Illinois to read “Caltech 38, MIT 9.”

Techers don’t take kindly to being caricatured as pocket-protector-wearing dweebs. Still, there’s no question that a good number of Caltech’s students are “introverted” and socially awkward, says astrophysics Prof. Peter Goldreich. “Many faculty members complain students don’t look them in the eye when they come to dinner.” At the same time, the campus seems refreshingly free of the brutal social pecking orders that characterize some colleges. “These are sweet kids,” says political science Prof. Rod Kiewiet. “There’s no meanness or maliciousness to them.”

A lopsided male/female ratio doesn’t help the social life. Last year, just over 28 percent of undergraduates were women. Baltimore says he’s working to improve the gender balance. This fall’s class will be 35 percent female, more than three times the percentage 20 years ago. At the faculty level, women make up fewer than 9 percent of all tenured professors. Caltech now has a faculty committee looking at how female professors are treated, from hiring and tenure decisions to the allocation of lab space.

The administration also is concerned about increasing racial diversity. Asian students made up 24 percent of last year’s student body. But Hispanics were just 5 percent, and African-American students made up a meager 1 percent. Caltech accepted six black undergrads this spring, but all opted for other schools, among them Harvard, MIT, and the University of Chicago.

For those who find their niche at Caltech, the institution breeds intense loyalty. “I feel like I fit in here,” says physics major Favata, “in a way I might not fit in at other places.” Goldreich is one of many professors who have visited accepted high school seniors in their homes in the hope of signing them up. He plans to leave money to Caltech, not to his own alma mater. “This place stands for one thing,” he says. “Excellence in science and engineering. And I believe in that.”

Reprints of “America’s Best Colleges” are $5.50 each, from U.S. News, Dept. 123, PO Box 5790, Livonia, MI 48151. Or call (800) 505-6134, Ext. 123.
Why Caltech matters
Supporting our research universities helps keep America strong

There's a great irony in this issue of U.S. News: The school ranked No. 1 in the country among national universities this year could also be No. 1 on the chopping block in Washington, D.C. It makes no sense, but it's true—and it's dangerous.

The California Institute of Technology, this year's winner, is smack in the bull's-eye of budget cutters, says its president, David Baltimore. When Congress and the president got together in 1997 on spending plans, they placed tough budget caps on a wide range of domestic programs. At first, the caps didn't affect much, but this year, if applied, they'll squeeze hard, and nowhere more so than in scientific research and technology.

"All major research universities would be hurt, but we think we are uniquely vulnerable because so much of our research depends upon government funding," Baltimore said in an interview last week. His university got a foretaste of what might come when a House subcommittee this year voted a nearly 10 percent cut in NASA funding. Officials at the Jet Propulsion Laboratory, whose research and faculty are intimately linked to Caltech, thought they would have to make draconian reductions in their programs or even close down. Fortunately, the local Republican congressman, James Rogan, managed to rescue JPL—at least for now.

"Potential disaster." Space exploration is not the only area facing uncertainty. So are research programs sponsored by the National Science Foundation; oceanic and atmospheric programs; renewable-energy technologies; agricultural research; environmental research, and more. Only defense seems spared for sure. How in heaven's name can a nation with a $1 trillion surplus threaten so much scientific research so vital to its future? "This is a potential disaster," says Baltimore, a Nobel Prize winner for his work in virology. "I have to believe it won't happen. But [members of Congress] have themselves in a box, and they have to find a way out."

Baltimore is counting not only on stout Republican allies like John Porter of Illinois but on a collective sense in Congress that science has been a prime generator of America's exuberant economic performance in recent years. Whether his faith is justified remains to be seen. The same congressmen who say they favor advances in medicine have allowed cuts in Medicare to put some teaching hospitals on life support. Two years ago, Congress and the White House rallied to the calls of Democratic Sen. Joe Lieberman of Connecticut and Republican Sen. Phil Gramm of Texas to increase science and technology funding by 7 percent a year for 10 years—a worthy goal. This year that support has been withering.

Washington needs to wake up. Just as the patrons of Renaissance Italy supported artists, statesmen today should support scientists and engineers. The electronic revolution now underway flowed out of basic university research financed largely by the federal government. Within the next 50 years, as Baltimore points out, a revolution in biotechnology could bring breathtaking advances in health, longevity, food supplies, and even energy supplies. But that, too, will depend on robust federal support.

Private corporations no longer engage much in long-term, basic research. They look to major universities—many of those in the top U.S. News rankings this week—for that effort. The universities in turn look to Washington for help because scientific research has become so expensive. Consider Caltech: The cost of educating in its state-of-the-art laboratories works out to an average of $192,000 per student per year! The student is charged $25,476, only one eighth of the total expense; most of the rest comes from Uncle Sam.

Is it worth it? If you wonder, take time out on a trip to Pasadena and visit the faculty club at Caltech. There on the wall are photographs of scientists who have taught at the university—Richard Feynman, Linus Pauling, Murray Gell-Mann, Max Delbrück, and others. They are among the 27 university faculty and alumni who have brought Nobel Prizes to America. Is any more proof needed?