

Plenty of Room at

2010-2011: Morgan Kousser
2009-2010: Dennis Dougherty
2008-2009: Shuki Bruck
2007-2008: Zhen-Gang Wang
2006-2007: Michael Brown

2005-2006: Richard Murray
2004-2005: Christopher Brennen
2003-2004: George Rossman
2002-2003: Niles Pierce
2001-2002: Joseph Kirschvink

$$\begin{array}{ll} s \rightarrow \infty & s' = f' \\ s' \rightarrow \infty & s = f \end{array}$$

$$\frac{m}{f'} = \frac{m-1}{R}$$

$$\frac{1}{f} = \frac{m-1}{R}$$

$$\frac{1}{s} + \frac{m}{s'} = \frac{1}{f}$$

$$\frac{f'}{m} = \frac{f}{1}$$

$$f = \frac{R}{m-1}$$

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}$$

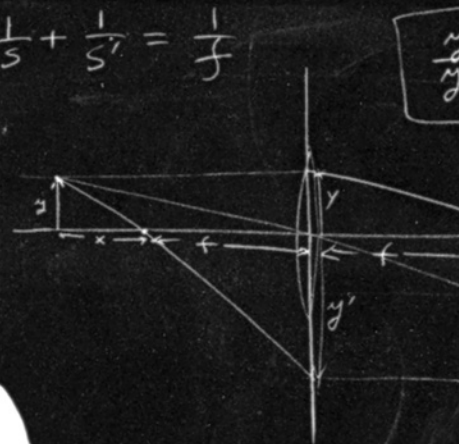


Photo courtesy of the Caltech Archives; additional art by Lance Hayashida; likeness of Richard Feynman reprinted with permission of Melanie Jackson Agency, LLC.

the Blackboard

by Kathy Svitil



2000-2001: David Stevenson
1999-2000: Donald Cohen
1998-1999: Emlyn Hughes
1997-1998: Barbara Imperiali
1996-1997: R. David Middlebrook



$f = \frac{f}{x} = \frac{x'}{f}$ } $xx' = f^2$
 $s = x + f$
 $s' = x' + f$

1995-1996: Yaser Abu-Mostafa
1994-1995: Erik Antonsson
1993-1994: Tom Tombrello

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34 — Lance Hayashida; 35, 36 — Bob Paz;
37 — Bill Youngblood

Science alone of all the subjects contains within itself the lesson of the danger of belief in the infallibility of the greatest teachers in the preceding generation.

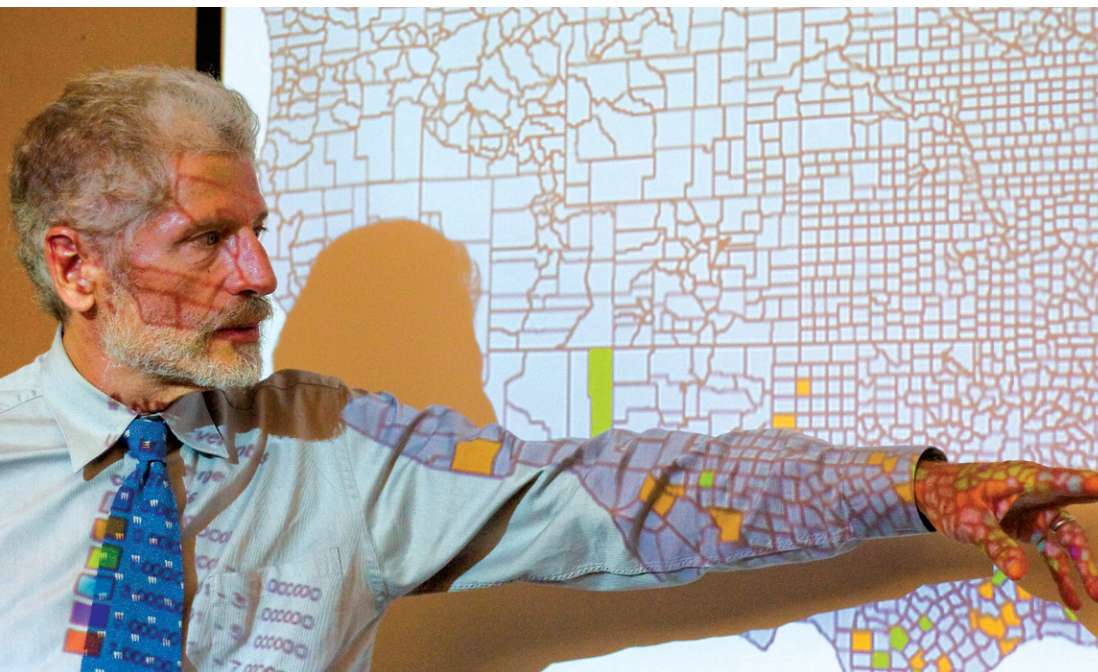
— Richard P. Feynman, in *The Pleasure of Finding Things Out: The Best Short Works of Richard Feynman*, edited by Jeffrey Robbins (1999)

Caltech is known to the world for its research, but to the student, there's nothing so inspiring as a great *teacher*—one who excites and challenges; one who enlivens the mundane and elucidates the impenetrable with unexpected creativity, patient guidance, and boundless enthusiasm.

Students and faculty nominate Caltech's best for the annual Richard P. Feynman Prize for Excellence in Teaching, established in 1993 and named after the legendary physics professor, Nobel Prize winner, and gifted educator—who recognized that teaching can be as enlightening to the

instructor as to the students. “I *don't* believe I can really do without teaching,” wrote Feynman in his book *Surely You're Joking, Mr. Feynman!* “When I don't have any ideas and I'm not getting anywhere I can say to myself, ‘At least I'm living; at least I'm *doing* something; I am making some contribution’ . . . The students keep life going, and I would *never* accept any position in which somebody has invented a happy situation for me where I don't have to teach. Never.”

The 18 Feynman Prize winners would likely agree.



Morgan Kousser

MORGAN KOUSSER

A professor of history and social science, Kousser was lauded by Elizabeth Mak (BS '11) for “his ability to make the complex and convoluted subject of constitutional law clear and comprehensible to students more inclined to equations than court opinions.”

DENNIS DOUGHERTY

Hoag Professor of Chemistry

His energetic lectures possessed superb organization and exceptional clarity . . . They flowed elegantly without flaw, as he guided the class, always finding exactly the right words for his explanations that always seemed to go a step farther, deeper and beyond the normal lecture.

—Andrey Poletayev (BS '11)

SHUKI BRUCK

Bruck, the Moore Professor of Computation and Neural Systems and Electrical Engineering, was nominated by his IST 4 (Information and Logic) students for the inaugural term of the class, which covers the evolution of information systems. "Shuki's lectures do an excellent job in engaging the attention of a class-full of students," wrote teaching assistant Yuval Cassuto (PhD '08). "With a teaching style that includes impeccably prepared lectures, detailed and informative slides, and more than a bit of entertainment, Shuki skillfully sets a very inviting stage for the students to grasp the deep concepts of the class."



Zhen-Gang Wang

ZHEN-GANG WANG

Wang, a professor of chemical engineering, was selected for "his mastery of thermodynamics and polymer physics, clarity of presentation, and ability to empower students through the knowledge and experience they gain from his teaching." Students have described his lectures—conducted without notes—as "amazing" and "incredibly clear," and Wang as having an "uncanny ability to cut to the heart of a question and provide an answer based on fundamentals."

MICHAEL BROWN

Brown—the Rosenberg Professor and professor of planetary astronomy—was singled out for Ge 1 (Earth and Environment), and for Ge/Ay 133. The latter, a graduate course on the formation and evolution of planetary systems, always appeared to be "subtly directed by the students," wrote Colette Salyk (PhD '09). "The questions, when not immediately answerable, gave the class a feeling that they were involved in helping to solve a mystery." Although seemingly spontaneous, Brown's lectures "must have been well thought-out and, perhaps, rehearsed," she noted. "I liked to imagine him like Feynman, parading around an empty classroom."

RICHARD MURRAY (BS '85)

Everhart Professor of Control and Dynamical Systems and Bioengineering

Most Feynman Prize winners knew the enigmatic bongo player only as a colleague, but Richard Murray first met him as a freshman on the opening day of frosh camp. As Murray recalled, Feynman "sat down next to me and started talking about some shells he had found while he was swimming. That willingness to talk to a student typified his approach to teaching." More than two decades after that encounter, Murray received the Feynman Prize for the same willingness to engage his students and his "enthusiasm, responsiveness, and innovation."

CHRISTOPHER BRENNEN

Hayman Professor of Mechanical Engineering, Emeritus

The use of the word "classroom" as a metaphor for "teaching" is a bit of a misnomer, as Prof. Brennen's teaching often takes place in unusual places. My first lessons from Prof. Brennen took place in the middle of nowhere in the Mojave Desert, where we hiked for several miles up the crest of a sand dune and slid down on our behinds to



Chris Brennen

cause the dunes to boom. Prof. Brennen's enthusiasm, even in hundred-degree-plus temperatures, was an inspiration.

—Kathy Brantley (BS '03, MS '05)

GEORGE ROSSMAN (PhD '71)

McMillan Professor of Mineralogy

"George had a way of making everything in mineralogy fun and interesting," said one former student of Rossman's introductory mineralogy course (Ge 114). Rossman, the student noted, often brought unusual minerals to class, including a specimen that formed a dipole when squeezed in one direction. "He had one student tie an end with string and put it in liquid nitrogen, being sure not to bang it into the sides of the dewar. Of

course the cold squeezed the mineral and it created a dipole and was instantly attracted to the metal sides and just kept banging into one side or another." Another Ge 114 student said "George taught me much more than mineralogy. He taught me how to ask deep questions."

NILES PIERCE

Now a full professor of applied and computational mathematics and bioengineering, Pierce is the only assistant professor to have been awarded the Teaching Prize, for ACM 95/100—a combined graduate- and undergraduate-level applied mathematics course. His award citation noted that Pierce "teaches without oversimplifying and without intimidating, making the material accessible to this diverse group of students" and "possesses an uncanny ability to anticipate the frustrations and challenges of the students."

JOSEPH KIRSCHVINK (BS, MS '75)

Van Wingen Professor of Geobiology
Joe doesn't just think outside of the box; the box is irrelevant. Nothing hinders Joe's ambitions to do new and exciting science. Ideas that require unprecedented experimental setups don't phase him a bit; whatever is needed will get designed, built, tested, and utilized. Students learn from example that nearly anything is possible, and that you cannot let conventional barriers hinder the creative scientific process.

—John Holt (PhD '97)

DAVID STEVENSON

Van Osdol Professor of Planetary Science

Stevenson, who chaired the faculty committee responsible for implementing the revised core curriculum in the mid 1990s, turned Geology 1—the

general ed course on Earth and the environment—into a class unlike any other of its kind. "Dave's achievement in conceiving and implementing this course is truly unprecedented," wrote Ed Stolper—then chair of the Division of Geology and Planetary Sciences and now provost—in nominating Stevenson for the prize, "and the tangible benefit is quite remarkable." The three-quarters of the undergraduate population who are not Earth scientists leave the Institute with a deeper understanding of our planet and how we learn about it, he noted, "prepared to address . . . important issues that society will be grappling with (such as global warming) over their lifetimes."

bra or notation and reveal the essentials of the idea he is presenting, which leads to maximal understanding in his audience. He doesn't dress up simple ideas with fancy language, as many math professors love to do. Nor, however, does he oversimplify and present things as less complicated than they really are.

—Mike Fisher (BS '99)

EMLYN HUGHES

Then associate professor of physics, now a visiting associate in physics

"Over and above being a good lecturer," said Ken Libbrecht (BS '80), the executive officer for physics, mathematics and astronomy, in nominating Hughes for his core quantum mechanics class, "Profes-



Niles Pierce

DONALD COHEN

Powell Professor of Applied Mathematics, Emeritus

His eloquence in presentation is such that even when he is teaching a very difficult concept, he is able to lead the entire class through the muck of alge-

sor Hughes obviously applies a great deal of creativity to his teaching. He jumps around, throws things, has an evil twin brother, and spends time in nearly every lecture telling insightful stories about physics, and about life in general." Hughes's efforts to make

quantum mechanics accessible don't go unappreciated by students, who describe him as "charismatic," "entertaining," and "rad" in course evaluations. "Emlyn," one student concluded, "should be canonized."

BARBARA IMPERIALI

Then a professor of chemistry, Imperiali—who, during her Caltech tenure, was described by her students as "dynamic and intense" with "infectious" enthusiasm—was singled out for the Feynman Prize as a "lively lecturer" (of both introductory and upper-level chemistry courses) and an "inspirational mentor" to her research students.

R. DAVID MIDDLEBROOK

Dozens of former students—including working engineers, university professors, and company presidents—wrote glowing letters supporting the nomination of their mentor. For more than 40 years, the beloved electrical engineering professor, who passed away in 2010, "did not only teach analog circuit design," said one, "but a far more important concept: he taught us *how to think!* . . . he taught us how to concentrate immediately on the essentials of a problem and disregard the 'non-essentials' (only to add them in the final stages of the problem). But when you 'think' about it, isn't it the way we should tackle large research problems? Isn't this the way we should even handle family life matters? Basically, concentrate on the essentials and do not get fooled with the peripherals!!"

YASER ABU-MOSTAFA (PhD '83)

Professor of electrical engineering and computer science

Abu-Mostafa, the selection committee noted, "has consistently demonstrated that no-frills teaching is not a lost art. Year after year, using only chalk

and voice as media, he has tamed Caltech's challenging curriculum for a very grateful group of students. He takes a multi-faceted approach to every topic, often fooling his students into mastering even the most difficult material."

ERIK ANTONSSON

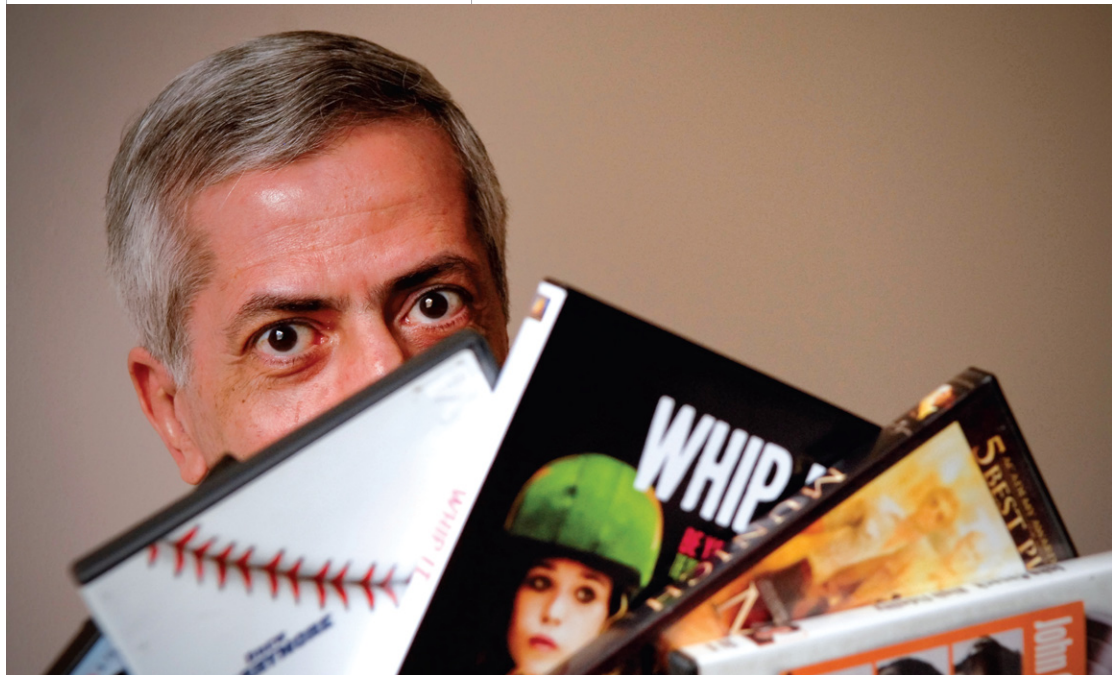
Then associate professor of mechanical engineering, now a visiting associate in mechanical and civil engineering, Antonsson created ME 72, Caltech's

in an unusual way and done what we all strive to do—except the result is better than most of us manage."

TOM TOMBRELLO

Kenan Professor and professor of physics

The Feynman Prize selection committee noted two innovative undergraduate courses created by Tombrello in presenting him the inaugural teaching award: Physics 11, a research tutorial



Yaser Abu-Mostafa

Engineering Design Laboratory, with a simple purpose: to help students learn about the "design of new *things*, and the solution of open-ended, ill-defined problems." The result was "wonderful," wrote Tom Tombrello in supporting Antonsson's nomination for the Feynman Prize. "The students work very, very hard; they do not complain; they have a good time; and they learn a tremendous amount. This is truly the essence of extraordinary teaching skill. Dick Feynman never took the ordinary or expected path in solving a problem, and that gave us wonderful new ways of looking at the world. Erik has taught

that allows freshmen to design and pursue their own research projects, and Physics 10, Frontiers in Physics, which teaches freshmen and sophomores about physical-science research on campus. "The format that Tom created, of having a guest professor describe his research in one lecture and then having the course instructor reiterate, expand, explain it, and answer any questions that pop up, in the next meeting, is truly stimulating for the students," noted then division chair Charles Peck, "and is yet another example of Tom's deep commitment to teaching." 