

Remarks by Benjamin M. Rosen
At the Caltech Board of Trustees Annual Meeting

In accepting the Robert A. Millikan Medal

October 26, 2018

I am extremely grateful to receive this award, the Robert A. Millikan Medal. I shall treasure it as much I do my seven-decade association with Caltech.

I matriculated at Caltech in 1950, just five years after Robert Millikan stepped down from leading the Institute for 24 years.

This year, we're celebrating the 150th anniversary of Millikan's birth. He was born in a small town in Illinois, attended Oberlin, then went on to earn Columbia University's first PhD in physics.

He was initially recruited to Caltech from the University of Chicago (that seems to be a tradition here) by Arthur Amos Noyes and George Ellery Hale. Initially, he was in charge of the physics curriculum. Then, in 1921, Millikan became the leader of Caltech as chairman of the executive council (for some reason, he preferred that title to "president").

In 1923, he was awarded the Nobel Prize "for his work on the elementary charge of electricity and on the photoelectric effect." He later changed directions and undertook a major study of radiation from outer space. Millikan proved that this radiation was of extraterrestrial origin, and hence he named it "cosmic rays."

Under Millikan's leadership, Caltech metamorphosed from what was just an idea in the 1920s to its current position in the Pantheon of the world's leading science and technology universities.

Millikan died in 1953. His legacy is replete with scientific and leadership accomplishments, but what I've discovered recently is that he made another contribution, one that I believe is as consequential for Caltech as were his better-known ones.

Here it is:

Millikan felt strongly that Caltech students would be much better equipped to face the world had they more than just a technical education. As a result, starting in the 1930s, he incorporated humanities into in the curriculum. In his words:

"Their preparation for the job of living, after they have got a job, is taken care of by requiring every student to spend about one-fourth of his time for four years in the division of the humanities."

How has that worked out? A recent experience has provided me with evidence, albeit anecdotal, that the Caltech person today has progressed a long way from the erstwhile stereotype of “nerd.”

Here’s the anecdote. It’s a small sample, granted, but not unimpressive. Over the last four years, Donna and I created and ran a non-profit ideas festival in northwestern Connecticut. For three days each summer, we gathered 75 experts in myriad fields – global affairs, science, technology, politics, the arts, economics, environment, health care, social issues and education -- to discuss the important topics of the day before some pretty demanding audiences.

Naturally, Caltech was represented with multiple speakers each year. What turned out to be surprising were the topics that some of them chose to speak about. Take the 2018 event held last August. Three of the speakers, as expected, spoke on technical topics:

- Caltech astronomer Konstantin Batygin took the audience with him on the search for Planet 9.
- Cosmologist Sean Carroll, in less than an hour, explained life, meaning and the universe!
- Materials Scientist and concert pianist Julia Greer, who would have played Rachmaninoff had we let her, instead described the incredible potential of nanomaterials.

But then came the unexpected.

- Harold McGee, undergrad class of ’73 with a degree in *literature*, spoke on food and cooking, a field in which he is an acknowledged guru.
- Robert Lang, ’82 EE and ’86 PhD in applied physics, spoke on the art and science of origami, an ancient art form in which he is today recognized as one of the world’s leading origamists.
- And Jessica Mathews, a Caltech PhD in biochemistry, spoke on diplomacy, having served for over a decade as president of the Carnegie Endowment for International Peace.

So here we have three Caltech faculty members opining on the solar system, the universe and the nano-world, while three Caltech alums are speaking on cooking, art and the state of the world. Science and the humanities. Just as Millikan had hoped for.

Here’s one more piece of evidence. Caltech faculty member Hillary Mushkin is a research professor of art and design. In the current issue of Caltech Magazine, she describes herself as an artist working with nonartists, one who continually asks the question:

"What is the role of the artist in society? One role is to be a conceptual thinker, to be a provocative thinker, to be somebody who does not necessarily think with utility in mind but who thinks outside of that and can push the margins of how we expect things to function. I encourage scientists and engineers to think similarly. Creative thinking is often risky and impractical at first. It may, in the end, solve a problem, but it's not because you started off that way."

Prof. Hilary Mushkin -- another example of Caltech demonstrating Millikan's synergy between the arts and sciences.

Here's my final example of Millikan's special contribution. For this talk, I located a copy of my freshman physics textbook, *Mechanics, Molecular Physics, Heat & Sound*, by Millikan, Roller and Watson. (I ignored that it was published by the MIT Press.)

For the first time in 68 years, I opened it up. Imagine my surprise. The first thing I saw -- the frontispiece -- was a full-page illustration of Albrecht Durer's engraving *Melancholia I*, one of the world's most famous, and most studied, prints. Why did Millikan highlight this 1514 art masterpiece so prominently -- right in the beginning -- of his book on physics?

Millikan points out in his accompanying essay that *Melancholia* is a work of art that displays not only the usual subject matter of 16th century art -- humans with wings, lots of animals, and landscapes and sunrises -- but also shows a litter of mechanical tools, scientific instruments and mathematical symbols, even a magic square (which includes the year, 1514, that the artwork was created). With the help of Durer, Millikan is underscoring in his textbook what he did with the school's curriculum -- combining science and the humanities.

In the early 1960s, C.P. Snow wrote in his book, *The Two Cultures*, of the breakdown between the sciences and the humanities as a major hindrance to solving the world's problems. Though we're far from solving these problems, I am encouraged -- thanks in large part to Robert Millikan -- that at Caltech we're making progress.

Thank you.