

## MILLIKAN: Spokesman for Science in the Twenties

by DANIEL J. KEVLES

One week in 1927 Robert A. Millikan, distinguished physicist and head of the California Institute of Technology, beamed across the country from the cover of *Time*. The story inside gave executive Millikan the face of “a witty and successful banker.” It quoted scientist Millikan’s reassuring report: “I have never known a thinking man who did not believe in God.” In the twenties, when much of the nation held bankers and the Deity in nearly equal reverence, America’s second Nobel Prize physicist qualified quite ably as a public pundit of science.

It had been a long and eventful road from Maquoketa, Iowa, to the cover of *Time*. Millikan was a minister’s son who got into science by accident. In high school he learned almost nothing about nature’s laws. When at Oberlin his Greek pro-

fessor asked him to teach a physics course in the college’s preparatory department, Millikan modestly protested his ignorance. The professor replied: “Anyone who can do well in my Greek can teach physics.” Somewhat pinched for funds, Millikan took the job.

Once Millikan started learning physics, he decided to make a career of it. He went on to do graduate work at Columbia, spent a summer at Chicago under Albert A. Michelson, later to become America’s first Nobel Prize physicist. Awarded the PhD, he left for advanced study in Europe (his Columbia professor made the trip possible with an obliging loan of \$300 at 7 percent). While in Germany Millikan heard of the discovery of x-rays and radioactivity. When a cable arrived with an offer from the

University of Chicago, he hocked his luggage and returned to the States, eager to make his mark in the new physics.

In Chicago, Millikan added a sharp spur to his ambition by falling in love with Greta Blanchard. Well-established Mr. Blanchard, successful manufacturer and elder in his church, considered his daughter's suitor "somewhat hazardous," as Millikan remarked, "because I was not a man of property and had little prospect of ever being such." By paternal insistence, Greta could not marry Robert until he was earning at least \$1,500 a year.

Millikan threw his enormous energy into getting ahead. (He needed no more than six hours sleep and often managed a round of golf before morning class.) While frustrated in his research, he did publish a widely acclaimed textbook and develop the teaching side of the department. In 1902 father Blanchard blessed the marriage.

By 1906 Millikan wanted to do still better. He now had two children and a mortgage. Moreover, Mr. Blanchard's daughter, to whom he was wholly devoted, enjoyed the perquisites of gentility. While his pedagogical accomplishments had just won him an associate professorship, at Chicago the major rewards went for scholarship. Millikan was acutely aware of the controversies reverberating through his science. Eager to join the attack against the atom, he started concentrating on research. By 1910 he had emerged from the laboratory with a precise measure of the electronic charge. Triumphant, he won accolades from the world of science—and from the university a full professorship.

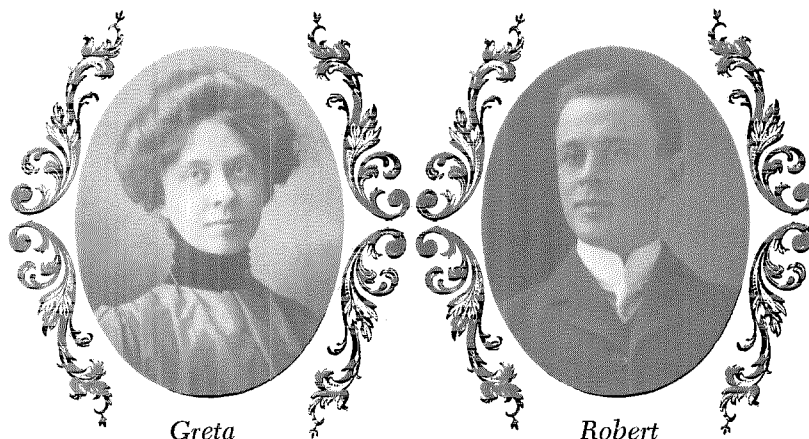
The Millikans prospered. Robert began learning how to administer science. He also started consulting on the development of the vacuum tube at AT&T, which had just established one of the country's first industrial research laboratories. American industry was beginning to recognize that investments in science could yield both dividends in technical progress and the protection of crucial patents. As a result, a mutually advantageous con-

nection was developing between academic science and business. Millikan, the able Chicago physicist and administrator, was an early link in the chain.

When the First World War erupted, Millikan went to Washington as the Chief Executive Officer of the National Research Council. There he worked closely with George Ellery Hale and Arthur A. Noyes; both had a special interest in the Throop College of Technology, the small school in Pasadena from which Caltech would germinate. There also he got to know many of the dollar-a-year industrialists who had come to the capital to help run the defense effort. There Major Millikan of the U.S. Army learned how, as a friend put it, to "sell science" to a wide variety of people, military and civilian alike.

The war pointed up a highly effective sales argument. Airplanes, submarines, poison gas—all were revolutionizing the face of combat. At the same time, physics was detecting air fighters and U-boats, chemistry protecting against noxious attacks; in short, science was proving a defense against its own martial offspring. Moreover, the war was driving home the economic reasoning of firms like AT&T (if planes could carry bombs in war, they could transport passengers in peace). Salesman Millikan drew his conclusions. One way to drum for science was to stress its powerful utilitarian potential for both the nation's defense and its economy.

Millikan came out of the war eager to get back to atomic physics. In 1919 Ernest Rutherford, the British Nobel Laureate, made the mysteries of the atom all the more tantalizing by reporting an experiment in which nuclear mass had been transformed into energy. But to press the attack on the atom would take money. Millikan returned to Chicago insisting on far more funds for research. Despite his threat to accept an offer from Throop, the university, squeezed in the burst of postwar inflation, refused his demands. Millikan left for Pasadena, where he had been promised a munificence for physics. ("Just imagine," a German scientist



goggled, "Millikan is said to have a hundred thousand dollars a year for his researches!")

Millikan arrived as full-time head of the newly named California Institute of Technology in 1921. He brought scientific acumen and zeal to the post. Both these traits, fused with Hale's vision, Noyes's wisdom, and all that money, made Caltech virtually an overnight success. As chairman of the executive council—he preferred the title to president even though, it is said, he ran the Institute autocratically—Millikan found himself standing on an increasingly prestigious institutional platform. The award of the Nobel Prize in 1923 added to his public clout.

Salesman Millikan made effective use of it over the decade. Privately, he raised money for Caltech (so persuasively that executives at the Rockefeller Foundation would virtually lock the cash box when he came around). Publicly, he spoke for science in general. With the country in the clutches of isolationism, science for defense had become an untimely argument. But in the twenties, Americans were eager to hear about science for science, science for God, and science for industry.

Science had never enjoyed such wide publicity in the United States. Einstein paid his first visit to America in 1921 and charmed newspaper readers all over the country. Year after year, the merest utterance of the wild-haired, absentminded genius of relativity found its way onto the front pages. Einstein's idiosyncracies aside, his ideas fascinated the public. Arthur S. Eddington's book-length expositions of relativity sold well through the decade.

The flow of scientific news was unprecedented. Major newspapers all over the country hired science editors. Mass-circulation magazines carried stories on the most abstruse developments and glossed them with technological promise (harness the energy in a glass of water and you could power a steamship clear across the Atlantic). The American Association for the Advancement of Science happily contributed to the stream of news by inaugurating symposia for the press. Science Service, created in 1921, sent out authoritative copy.

Apart from the publicists, science gained enormous prestige from its identification with enormously prestigious business. The war had ratified industry's commitment to research. During the twenties, radio and rayon, along with all the other gadgets taking their place in the pantheon of American technology, supported the utilitarian argument

for science spectacularly. In the era of Warren Harding's normalcy, business was good for America, science good for business, and, completing the chain, science good for the nation's prosperity.

Friendly journalists added to the Chamber of Commerce image by letting the public know that not every scientist was offbeat like Einstein. Scientific conventioners, a reporter wrote, were "as clean-shaven, as youthful, and as jazzy as a foregathering of Rotarians." Today's scientist, he elaborated, "is fully as much a man of the world as his brother, the businessman." Hadn't his research

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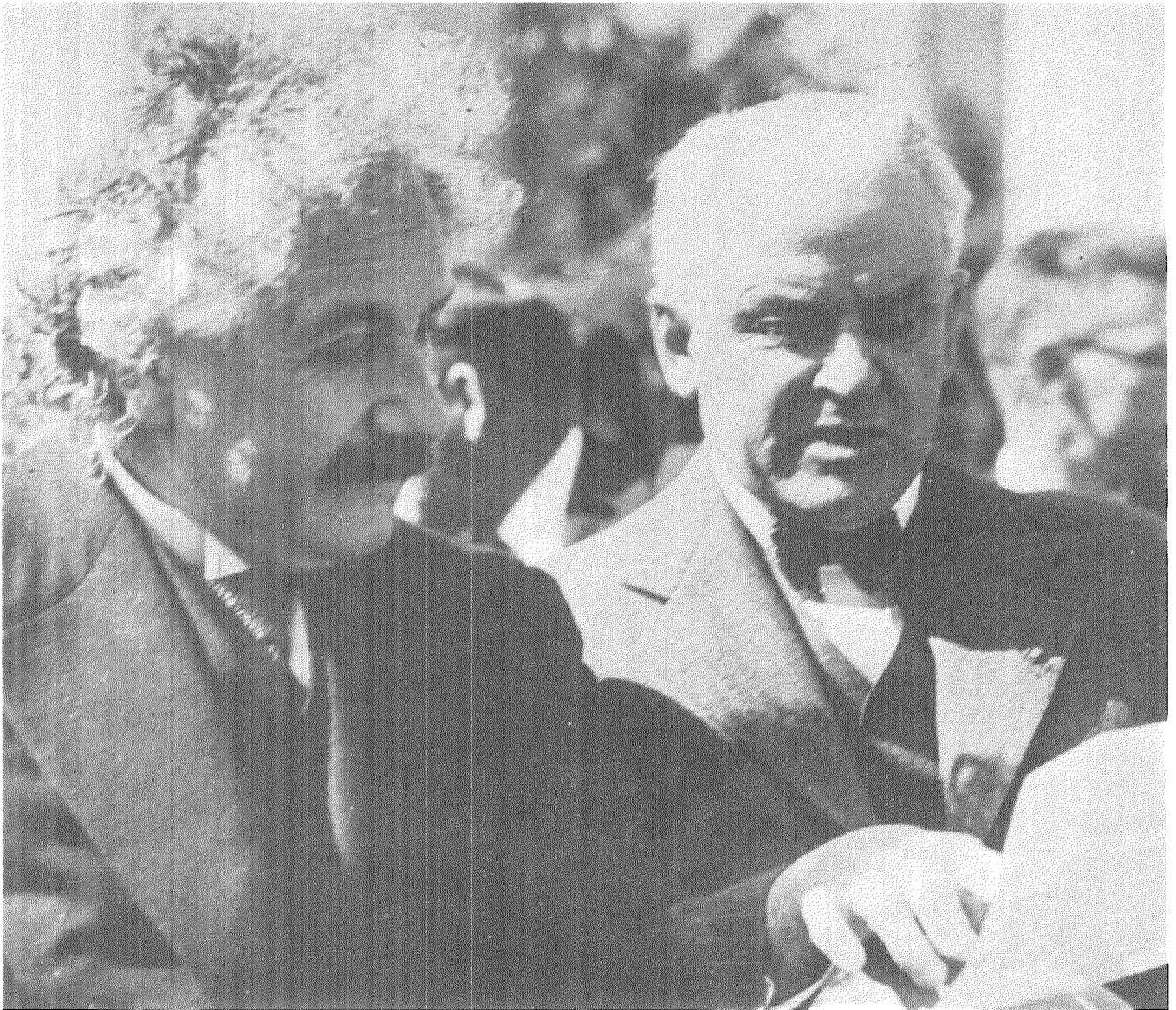
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given America the automobile, the radio, even the saxophone? In this reporter's opinion, scientists had in fact made the jazz age possible.

In the twenties, the scientist as giver of good things spoke with high authority. The new advertising industry, already a litmus paper of American tastes, understood the potential. There was the squib for Palmolive soap: "The blend of palm and olive oils has produced the mildest cleanser science can produce;" and the pitch for Pebecco toothpaste which quoted the well-considered opinion of an "Eminent scientist: 'Use a dentifrice that polishes without scratching and one which mildly stimulates the salivary glands.'" The *Nation* remarked, "A sentence which begins with 'Science says' will generally be found to settle any argument in a social gathering or sell any article from tooth-paste to refrigerators."

Many Americans were particularly eager to hear what science had to say about God and religion. The decade swirled with defensive religiosity. In the post-Civil War years Thomas Huxley had hurled Darwinism against the certitudes of the Bible. Now science was once again assaulting religious and moral pieties. At the carnival in Dayton, Tennessee, Clarence Darrow, counsel for young John Scopes, ridiculed William Jennings Bryan's fundamentalist conviction that the Lord had literally created the universe in six days of labor. Behavioral psychol-



*Next to Albert Einstein, Robert Millikan was the most famous scientist of the twenties.*

ogists worried millions who were scarcely fundamentalist with the assertion that you could not find a soul in a test tube. College students, taking Freud as their text, scoffed at traditional standards of virtue. The Reverend Harry Emerson Fosdick could say: "When a prominent scientist comes out strongly for religion, all the churches thank Heaven and take courage as though it were the highest possible compliment to God to have Eddington believe in Him."

Millikan believed—in science, in God, in private enterprise, and in all with equal faith. Americans of the twenties could happily respond to his authoritative voice.

Religiously troubled people could find comfort

in the way that Millikan the physicist touted the intellectual adventure of research. He extolled the rich harvest of ideas emerging from the study of matter. But God's universe, he assured, defied complete understanding. Moreover, the revolution of relativity and quanta had stripped science of certainty and taught the physicist "a wholesome lesson of humility." In Millikan's somewhat labored extrapolation, no scientist who admitted the tortuous complexities of the atom could assail religious truths with the insistence of his 19th-century predecessors.

For Millikan the minister's son, science without religion could be a curse to mankind. In fact, he insisted: "*The most important thing in the world*

is the reality of moral and spiritual values." At the same time, religion benefited from the open-minded tolerance of the scientific spirit. Churches without it had fostered "dogmatism, bigotry, persecution, religious wars, and all the other disasters which in the past have been heaped upon mankind in the name of religion."

No contest of science and religion concerned Americans of the twenties more than the battles symbolized by the Scopes trial. On that issue Millikan was no adamant atheist like Thomas Huxley a half century before. A reconciler, he repeatedly testified to the "complete lack of antagonism between the fields of science and religion." Why, the dozen leading scientists of America, Millikan exclaimed, saw absolutely no conflict between the two. More important, most of them were willing to line up in support of a higher being, and Millikan had testimonials to prove it.

No less an apostle of business than of God, Millikan made science an ally of the economy of normalcy. The world's economic problems, he said more than once, could not be solved by government intervention. Caltech itself exemplified the effectiveness of relying on private enterprise instead of the state. The resolution of economic want lay in more abundant production by more abundant industry. "No efforts toward social readjustments or toward the redistribution of wealth," he asserted, "have one-thousandth as large a chance of contributing to human well-being as have the efforts of the physicist, the chemist, and the biologist toward the better understanding and the better control of nature." New science led to new technology, to new industry, to new and higher paying jobs. Not revolution, but research, Millikan insisted, was the best bet for American labor.

Millikan's expositions of science, his testimonials to God, his sonorous accolades to private enterprise—all contributed to win him a wide public in the twenties. Apart from Einstein, he was the most famous scientist of the decade. But fame also won Millikan his critics. Some scientists considered him a platitudinous bore; others, sneering at his emphasis on utility, a desecration of the temple of pure science. Most scoffed when on occasion his religious convictions interfered with his physics. Einstein, a confirmed agnostic, reportedly once said of Millikan's views on cosmic rays: "He's not dishonest, just ignorant."

His public critics were not quite so generous. To-

day, one remarked, a Millikan "sits in the seats of the mighty. He is the president of great universities, the chairman of semi-official governmental councils, the trusted adviser of states and even of corporations." With responsibilities like these, the Millikans owed a greater loyalty to civilization than to science. But Millikan himself, this critic asserted, had discarded the salutary iconoclasm of a Huxley for the custodianship of the status quo.

Not all the critics matched Millikan against Huxley. Many were humanists who, like Huxley's enemies a half century before, considered science dominant a threat to the balance and texture of civilized society.

The most penetrating of Millikan's humanist critics was Christian Gauss of Princeton. Gauss wholly admired the Nobel Prize winner for his triumphs in physics. Professor of modern languages and one-time president of the Dante League of America, he disagreed quite emphatically with the social pundit's "confidence in the future of our civilization under science." Gauss chastized Millikan for arguing that morality progressed with the progress of research. Science merely described nature; it could not—and did not—speak to timeless questions of values. Surely one would not want to discard the teachings of Christ and Confucius because they were "hopelessly unscientific." Surely while modern man knew more than Socrates, he was demonstrably neither wiser nor more decent. Industry wrote checks against the sciences, but the sciences did not in turn check the rapacious industrialist. And if science had beneficently enlarged peaceful man's mastery over nature, it had multiplied warlike man's power to kill and destroy.

Gauss articulated what a good many Americans outside the academy apparently felt in a more marrow-of-the-bones way. When in 1927 an English bishop proposed a ten-year moratorium on research to allow civilization time to cope with its creations, he provoked a widespread stir in the United States. As the *Chicago Evening Post* explained its sympathetic response: "Science has been leading us rather a giddy chase for the last two or three decades."

In the context of the criticism, Millikan emerged not only as exponent but as staunch defender of science. With good sense, he attacked the bishop's proposal as "impossible and foolish." With something less than tolerance, he charged the dissidents with being misguided completely. Had the ma-

chine, instead of liberating civilization, enslaved it? In Millikan's opinion, the automobile had not smothered cities in exhaust fumes and congestion. It had created a "new race of men." "Contrast the clear-eyed, sober, skillful, intelligent-looking taxi driver of today with the red-nosed wreck of a human being who used to be the London cabby a quarter of a century ago . . ." For Millikan, a tee-totaler, the new London cabby proved irrefutably how "responsibility and power" born of the machine could alter human nature.

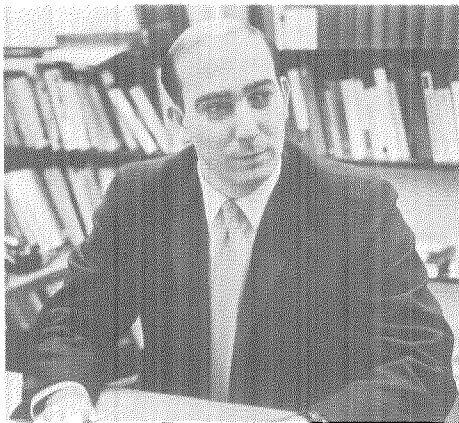
Millikan found scarcely a sin to be credited to science. "It is literature and art," he insisted, ". . . which have been the prey of those influences through which the chief menace to our civilization comes . . . Today literature is infested here and there with unbridled license, with emotional, destructive, over-sexed, neurotic influences. . ." The bishop need not worry about science, or even about the absurd possibility that mankind, armed with the energy of the atom, might blow itself to kingdom come. That energy, Millikan predicted, was destined to stay locked in the atom. Most scientists agreed, but Millikan's way of assurance was characteristically his own. "The Creator has put some fool-proof elements into his handiwork and . . . man is powerless to do it any titanic damage anyway."

In the long run, Millikan was of course wrong about that. In the short run, after 1929, to much of the public he appeared wrong about a lot of other things. An adamant opponent of the New Deal, he kept on touting the economic boon of science and private enterprise, kept on attacking plans to redis-

tribute wealth through government action, kept on preaching the importance of spiritual values to a people anxious about unemployment, economic collapse, and dictatorships abroad. Americans of the thirties still respected Millikan the scientist. They ignored, indeed some ridiculed, Millikan the social and economic pundit.

Amid the brutality of the Depression, Millikan's social vision of science was considered irrelevant at best. New Dealers preferred to use the scientific method as a weapon of reform. They wrestled with the economic role of science so as to save private enterprise by learning how to eliminate its inequities. They ignored the reconciliation of science and religion and concentrated on assuring Americans a chance to face God on a full stomach. The public rationale of science in one era does not necessarily fit the urgencies of the next. So scientists of the fifties are discovering today. So Millikan failed to recognize after 1929. By clinging tenaciously to the orthodoxies of the twenties, in the thirties he found himself publicly beside the point.

But in the twenties, Millikan, prickly toward state aid even for science, did enjoy a luminescent hour. Your industries, he told the New York State Chamber of Commerce in 1928, are the "offspring of pure science. If you believe in private initiative, you will keep pure science going strong in the universities . . . and applied science going strong in the private industrial laboratories." In the era of normalcy, Robert A. Millikan, widely respected physicist, sage of morals and religion, apostle of business, could speak for science very well indeed.



DANIEL J. KEVLES, associate professor of history at Caltech whose specialty is the development of science in the United States, is also a knowledgeable student of the career of Robert A. Millikan, Nobel Laureate in physics and head of the Institute from 1921 to 1946. In 1966 Dr. Kevles supervised the organization and cataloguing of Dr. Millikan's personal papers for the Caltech Archives. He has also explored this collection for his own book, a social and political history of physics in modern America, which will be published by Knopf. To gather information for his study, Kevles, who first majored in physics as an undergraduate at Princeton and then took his PhD in history there, recently spent a year in Washington, D.C., as an Old Dominion Fellow of Caltech, doing research in the National Archives and the Library of Congress. "Millikan: Spokesman for Science in the Twenties" has been adapted from a talk given at Caltech's 1968 Alumni Seminar.