

The Chemistry Is Right

Arnold O. Beckman and Caltech have been working together for more than 50 years. Some highlights from those years – and from Beckman’s other careers

Arnold Beckman has worn just about all the hats there are at Caltech—student, alumnus, faculty, trustee, and donor. Now, having served as chairman of the board of trustees since 1964, he has been named a life trustee and chairman emeritus. And don’t bet he’s going to stop there either.

There wasn’t any Caltech when Arnold O. (for Orville) Beckman was born on April 10, 1900, in the small town of Cullom, Illinois, where his father was the blacksmith. By the time he was nine years old, there were already indications that Arnold might become a chemist. Rum-maging in the family attic, he came upon a copy of *Steele’s Fourteen Weeks in Chemistry* that had belonged to his aunt, and got so interested in performing the experiments in the book that, for his tenth birthday, his father built him an eight-by-ten-foot shed that served as a laboratory, and his older brother supplied him with chemicals from Chicago.

When Arnold got to high school, he was ready to take the senior-year chemistry course as a sophomore, and in his junior and senior years he took regular university courses in the subject.

Not that chemistry was his only interest. All through high school, for one thing, Arnold had a steady job playing piano at the local movie house—which meant six evenings a week plus matinees on Saturdays. In his spare time he played with a dance band.

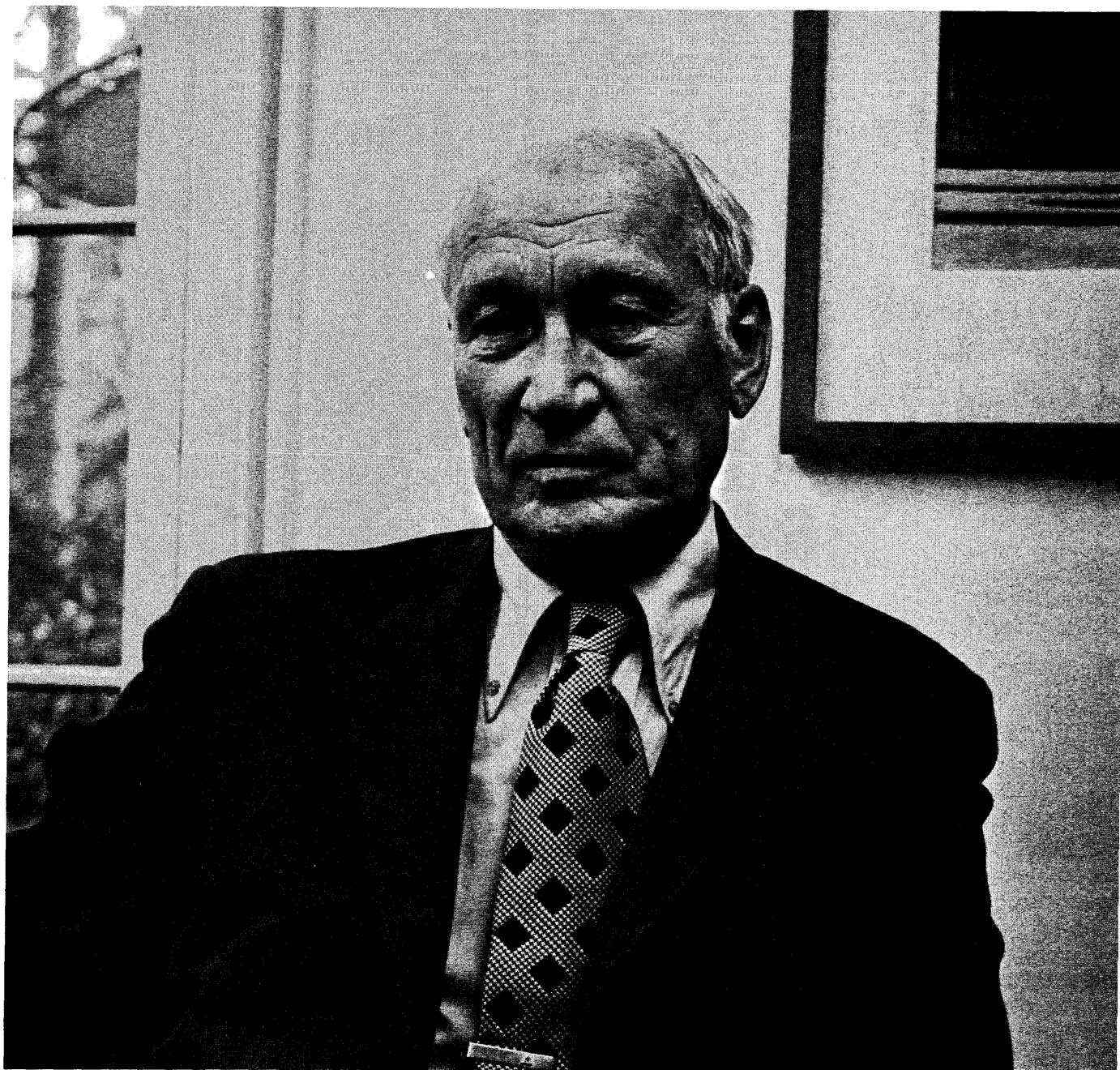
Arnold was top man in his high school class, and in 1918

he was allowed to leave school three months before graduation to take a war job as a chemist at the Keystone Steel and Wire Company in Pekin, Illinois. After a few months there he enlisted in the Marines, went through boot camp at Parris Island, and then was sent to the Brooklyn Navy Yard.

“I’ve always been lucky,” Beckman says. “There I was—about to be shipped out. But the quota was filled just before they got to my name. I think the squad got sent to some place like Vladivostok. I stayed in Brooklyn.

“I was still in Brooklyn on Thanksgiving Day. We had just put away a great big turkey dinner when an invitation came in for a group of us to have dinner at the Greenpoint YMCA. So we were ordered to get out there and eat a second meal. Well, it was another stroke of luck that one of the volunteers who waited on our table was a girl named Mabel Meinzer. She’s been my wife for almost 50 years now.

“The war ended before I was ever shipped out. I was lucky there too because, when we heard the war was over, there was an announcement that anyone who wanted to go back to school as a civilian should sign up on a particular list. So I signed up. That was in the morning. After lunch they announced that they wouldn’t take any more names on that list, but the men who had signed in the morning would be mustered out—and everybody else would stay at the Navy Yard, or be sent somewhere for guard duty for another year or more.”



It was too late in the year to enter college, so Beckman decided to work his way out to the West Coast. He was heading for Yellowstone Park when he stopped off in the town of Ashton, Idaho, and his trip came to a halt.

The manager of the Ashton movie house needed a new piano player, so Beckman agreed to do a trial show for him. Before he had even worked his way through the *Poet and Peasant Overture*, Arnold not only had a steady job, but room and board at the manager's house. He settled down to an idyllic existence in Ashton, working at the movie house every night (playing through the entire

summer, incidentally, without a single sheet of music), and spending every weekend camping and fishing for trout with the projectionist and his brother.

Beckman entered the University of Illinois in the fall of 1919. There he got to know Richard Tolman, who came to Caltech in 1921, and helped to shape the Institute of today. When the time came for him to go to graduate school, Beckman decided to come to Caltech too. In a Model T, he and a classmate spent six weeks crossing the country, and he entered Caltech as a graduate student in chemistry in 1923.

A year later, Beckman was almost out of money, so he took a boat back through the Panama Canal to New York and got a job in the Western Electric engineering division (which later became the Bell Telephone Laboratories). Of course, Mabel Meinzer was another reason for his going to New York. They were married in June 1925.

In 1926 the Beckmans, in another Model T, moved to Pasadena so Arnold could finish his graduate work at Caltech.

Graduate students got simple quarters in those days—"a couple of 60-watt bulbs and a counter," as Beckman remembers it. Still, there was occasional excitement in his lab in the basement of Gates—like the day Arnold had to stop working because test tubes kept crashing outside his window. Climbing the stairs to investigate, Beckman discovered an undergraduate student tossing loaded test tubes, at regular intervals, out the window of the frosh lab. The student had a simple explanation for his behavior. He was trying to make nitroglycerin. But he was hard of hearing. So he was dropping his trial results out the window, figuring that when he really got nitroglycerin, he would really hear it. Fortunately, says Beckman, the man wasn't much of a chemist.

As a graduate student, Beckman was a regular visitor to the Corona del Mar beach house of A. A. Noyes, chairman of Caltech's chemistry division. Noyes often invited graduate students there—usually to help him with revisions of his chemistry textbooks. The journey from Pasadena was made in Noyes's Cadillac touring car, known as Brown Betty. On one trip, Beckman made himself indispensable when Brown Betty refused to climb a hill outside Santa Ana. Noyes, who was helpless in the face of mechanical failure, watched Beckman wield the only tools available—a five-pound hammer and an extra-long screwdriver—to adjust the distributor points and save the day. Beckman thus became one of the few students who was allowed to drive Brown Betty, and, on occasion, he still entertains the deflating thought that perhaps that was how he managed to get his doctor's degree at Caltech.

He got that degree in 1928, and stayed on at Caltech as an instructor in chemistry. He was an assistant professor in 1934 when Robert A. Millikan encouraged him to take a

consulting job with the National Postage Meter Company, which was having ink problems. Beckman was able to solve them so successfully that they set up a National Inking Appliance Company to make devices for inking metered mail.

In the spring of 1935 an old classmate from the University of Illinois, Glen Joseph, came to Beckman for advice. Joseph was working on some by-products of lemon juice for the Sunkist Fruit Growers, and was trying to measure the acidity of these materials, using a galvanometer and a glass electrode. Both were so delicate and fragile they kept breaking.

Beckman's solution to the problem was to get rid of the galvanometer in the measuring instrument Joseph was using and substitute an electronic amplifier. He sketched a circuit, and a radio ham put it together. The resulting instrument was a dud. So Beckman worked out the circuit himself and delivered the instrument to Joseph. It performed so well that, in three months, Joseph was back for another one.

This enthusiastic reaction encouraged Beckman to go into the business of manufacturing the instrument. It was not exactly a major operation. The firm bore the impressive name of National Technical Laboratories, but the staff consisted of two graduate students, working part-time. The plant was a nine-foot roped-off area in the garage behind the shop of Fred Henson, who had been the chemistry department's talented instrument maker. In time, the company moved into more prepossessing quarters—an empty store at 3330 E. Colorado Boulevard, recently vacated by a dry-cleaner, and owned by Ernest Swift, Caltech professor of chemistry.

In September 1935 Beckman took one of his instruments to an American Chemical Society meeting in San Francisco, to ask some of his former chemistry professors whether they thought there was a market for such a thing.

National Technical Laboratories had produced a total of six pH meters by that time, and Beckman was not at all sure how many more people would be willing to pay \$195 for an instrument that would do the same job as a five-cent piece of litmus paper.

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The experts gave Beckman their most optimistic estimates—that he might be able to sell about 600 pH meters in about ten years. The year was 1935, so that sounded like good news to Arnold. He and Mabel set out by train to call on chemical supply houses all over the country.

It soon became clear that the pH meter filled a wide commercial need. The 600 instruments were sold in a couple of years (and, to date, the Beckman organization has produced more than a quarter of a million pH meters). Beckman left Caltech in 1940 to devote all his effort to the development of scientific instruments.

To put it plainly, he has been spectacularly successful. In 1940 he produced his second instrument, the spectrophotometer, which makes a chemical analysis of a sample by light absorption, determining what substances are present and in what amounts.

The Beckman spectrophotometer was so much faster and more accurate than other instruments and methods that it became the workhorse of the chemical laboratory. For example, World War II had cut off the supply of fish liver oil from Scandinavia, which was used in making vitamin A and vitamin D. At that time the biological assay for vitamin content involved feeding the material to be analyzed to starved rats for a period of about three weeks, then chopping off the rats' tails and measuring the amount of bone growth that had taken place. The spectrophotometer was able to make the assay in a couple of minutes.

The ultraviolet spectrophotometer was followed by an infrared spectrophotometer, which proved invaluable during the war for the chemical analysis in the production of synthetic rubber and aviation gasoline.

Over the years the Beckman organization has produced new precision instruments until today the company makes a total of about 4,000 of them. A \$200,000,000 business, Beckman Instruments derives about 40 percent of its sales from medical research and clinical medicine, 38 percent from industry, 16 percent from scientific research, and 6 percent from defense.

But scientific instruments are no more Beckman's whole life today than chemistry was in his high school years. A

founder of the Instrument Society of America, in 1971 Beckman was named California Industrialist of the Year by the California Museum of Science and Industry for his "profound and lasting contributions to industry, education, and public service."

He is a member of the National Academy of Engineering, the American Chemical Society, and the Newcomen Society. He is an honorary member of the American Institute of Chemists, a fellow of the American Association for the Advancement of Science, and a Benjamin Franklin fellow of Great Britain's Royal Society of Arts. He is past president (1956) of the Los Angeles Chamber of Commerce, a former director of the National Association of Manufacturers and of the Security Pacific National Bank, the Southern California Symphony Association, and Mills College. He has played a leading role in the campaign against air pollution and has served on a number of state and national organizations in this effort.

The first alumnus to be elected to Caltech's board of trustees, Beckman has been a member of that board for 21 years. As chairman (1964-74), he was also chairman of the executive committee and ex officio member of five other elected committees, which of course involved endless meetings—all of which he attended regularly.

The Caltech campus today is graced by two Beckman buildings—the Auditorium, which has not only given the Institute great architectural distinction and provided a gathering place for the campus, but has proved to be a binding force for Caltech and the surrounding community; and the new Mabel and Arnold Beckman Laboratories of Behavioral Biology. Characteristically, Beckman thinks the buildings are "the best investment I ever made."

The Beckmans live in Corona del Mar, where Arnold finds time occasionally to sail his 41-foot sloop. They have two grown children—Arnold S. and Patty.

If it begins to appear that Arnold Beckman has all too many accomplishments, it might be noted that he has at least one talent that is just plain going to waste: He can still play a complete silent-movie score on the piano without a scrap of sheet music—from *Poet and Peasant*, through *Hearts and Flowers*, right on down to the Triumphant March from *Aida*. □