Recollections of 1932-33

MILTON PLESSET, now professor of engineering science emeritus at Caltech, first came to the Institute in 1932-33 as a National Research Fellow. He brought with him a PhD from Yale, where he had done a part of his thesis on a solution to Paul Dirac's relativistic theory. This theory opened up the now-verified idea that every particle in nature has its antiparticle. Plesset spent most of his time that year working with Paul Epstein on another aspect of theoretical physics, but he also encountered Carl Anderson, who had just discovered and identified the positron, the antiparticle for the electron.

"I remember," said Plesset in a recent interview, "walking from my office in Bridge to the Athenaeum in the evenings and being impressed by the flashes of light from the windows of the lab on the top floor of Guggenheim, where Anderson was operating his cloud chamber and making photographs of cosmic rays, in which he found tracks of electrons (as expected) and also of positively charged particles. That was totally unexpected. He used the aeronautics building because it had the only source of power large enough for his magnet, and he had to work at night because that was the only time the power was available to him.

"Both Dirac's theory and Carl's growing belief that the positive particles showing tracks in his photos couldn't be protons but had to be anti-electrons or positrons, as he called them, were radical concepts for those days. They were hard for physicists to accept or account for. But I was entranced with the possibility that what Carl was claiming resolved some of the problems in Dirac's theory, and I persuaded Robert Oppenheimer that we should try to explain the production of the pairs — electron and anti-electron — theoretically. I don't know whether we were the first to use the word "pairs" for particles and antiparticles, but it's come to be the accepted term.

"Oppenheimer wasn't wildly enthusiastic about the Dirac theory, but I think he was kind of at loose ends right then. Work on the quantum theory of the atom was pretty well finished, and he may have been looking for what he was going to concentrate on next. He was one of the most erudite physicists I ever met, full of ideas and insights. When he came down to Caltech from Berkeley each spring, it was rather like a comet coming across the sky. It was very exciting for me to work with him, and our paper — "On the Production of the Positive Electron" — did come up with some reasonable quantitative explanations.

"It had a lot of significance for experimental work, particularly some that was being done at Caltech. Charles Lauritsen's group was working on the interaction of gamma rays and matter, and Robert Millikan was deeply involved with cosmic rays and their origin. If the calculations Oppenheimer and I had done meant anything — and if Dirac's theory could be extended to high energies — it would be difficult to continue to accept photons as a significant component of the primary radiation. About a year later it was proved in Copenhagen that the theory was valid for very high energies.

"Millikan was very concerned about all this. I remember one hot day in the spring of 1933 he nabbed me just as I had gotten into my fiancée's car to go out. He put his foot on the running board and kept us there in the hot sun for an hour while he pursued the question of whether Dirac — and Anderson — were right. You know, he really didn't care much for theoretical physics. He had a lot of respect for the old school of theoretical physicists — Sommerfeld and Ehrenfest, for example — but he was suspicious of those who were active in quantum mechanics, like Dirac and Oppenheimer. We all have our blind sides, and this was one of Millikan's.

"Someone once told me that Dirac originally came up with his theory while taking a train trip from Moscow to Vladivostok. He didn't have anything to do for eight days but think, and what he thought helped him get a Nobel Prize in 1933. Carl's discovery, which won the Nobel Prize in 1936, established Dirac's theory as one of the most stimulating in all of physics, and it opened up a whole new world of research." □