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POLYKARP KUSCH

Precision without TNT

"If you wanted to study the Taj Mahal," says Polykarp Kusch in his deep, sometimes booming voice, "you can go about it in two ways: either blow up the place and proceed to a stone-by-stone analysis; or make a great many trips through the structure, carefully noting how it's put together. You've got the same choice in nuclear physics, except that if you decide to blow up an atom, you can always find another to replace it."

Professor Kusch, executive officer of Columbia's department of physics since 1949, and one of the nation's leading precisionists in the study of atomic properties (he has been able to measure the "frequency of resonance" of the moving atom or molecule to within a millionth of a part), has always preferred the non-TNT method. The subtler approach -- sending atomic and molecular beams through a magnetized vacuum to gauge the behavior of neutrons, protons, and electrons inside the atomic nucleus -- has been his stock in trade since 1937, when he got his first systematic training in the technique as research assistant to the University of Minnesota's Professor John T. Tate.

"From the start I felt more adapted to physics than to something like engineering," he says crisply. "To me engineering was a matter of cook books and heavy economic motivations."

Few people were feeling the same attraction, however, when he enrolled at Cleveland's Case School of Applied Science (now Case Institute of Technology).in 1927. When he took his degree there in 1931, only five classmates were listed with him as having majored in physics.

Born in Germany 40 years ago while his Lutheran missionary father and his mother were visiting there, Professor Kusch spent most of his boyhood traveling from one Midwestern town to another before his father's affiliation with a Cleveland book publisher brought an end to the migrations and gave him the chance to pursue his education in one city.

"this is the way to live"

With the depression thudding on rock bottom, he was fortunate to get a graduate assistantship at the University of Illinois. There, where "you could hear the corn growing," he took his Ph.D., met and married his wife, Edith, and decided, "I was destined to become a professor; this is the way to live."

Destiny beckoned strongly near the end of 1937, when Professor Tate recommended him for an instructorship in physics at Columbia. The move marked the beginning of his association with Professor I. I. Rabi, who was to win the Nobel Prize in 1944 for his molecular beam discoveries.

In 1941 -- ten months before Pearl Harbor -- the defense effort brought him an offer to join Westinghouse's Bloomfield, Pa., lab to work on the development of microwave vacuum tubes -- subsequently to become vital in radar. Though he regarded the work as basically humdrum, he learned much experimental technique. It proved invaluable in the wartime assignments that followed: researcher on a Columbia-housed government project designed to develop high-frequency oscillators, and an 18-month stint as development engineer on special vacuum tubes and microwave generators in the Bell Telephone Laboratories.

One morning in April, 1946, he received a call from Professor Rabi. What did he think about returning to Columbia as associate professor of Physics? "I thought it over all of 10 seconds, and said yes. I have never regretted it."

There hasn't been much cause for regret: in three short

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years, he was promoted to full professor, took over administration of the department, and has moved to the forefront in the atomic beam work being done at the University. He continues to run endless experiments of often incredible accuracy, sometimes working a 70 or 80 hour week.

views via flat trajectory

The integrity upon which he insists both in his work and his conclusions almost borders on the fanatical. When he gives his opinion; you can almost see it coming straight at you; there is no couching in delicate phrases or vagaries.

Associate Professor Henry M. Foley, who has worked with him on various projects, is continually impressed: "Often, when an experiment agrees with a hypothesis, he's not happy. He'll pretend it doesn't agree and re-do the entire experiment because of a couple of minor points. And through it all he makes an apparatus perform better than any person I know."

His uncompromising integrity carries over in generous measures into teaching, with which he is as vitally concerned as with the experiments and the paper work. Impatient with the kind of scientific teaching that results in accumulations of data without a thorough understanding of how facts are brought to light, he prefers turning his students loose on a limited body of facts, with the methods of science the really important lesson to be grasped. He feels that this this is especially important in undergraduate teaching, where, he says, "most students have a poor orientation in pure science, often because their backgrounds were anti-scientific."

The same reasoning was the basis for his disapproval, as a member of the College's Committee on Instruction, of a broad survey course in the sciences. "I don't think a survey course will solve the scientific problem at all," he asserts. "You would make too many dogmatic statements. I would much rather offer an analysis of a selected scientific problem. In this way, we take science out of the realm of aestheticism or revelation."

Sometimes the Kusch frankness may embarrass, but the general opinion among those who know him is stated simply by Professor Foley: "Kusch is somebody to rely on."

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