



*Peter V. Danckwerts*

## Peter Victor Danckwerts

1916–1984

By John Davidson

Professor Peter Victor Danckwerts, G.C., M.B.E., F.R.S., F.Eng., Shell Professor of Chemical Engineering at the University of Cambridge from 1959 to 1977, and fellow of Pembroke College, died on October 25, 1984, at the age of sixty-eight. The son of Vice Admiral V. H. Danckwerts, he was educated at Winchester and Balliol colleges, Oxford.

His war record was distinguished. As a sublieutenant in the Royal Navy Volunteer Reserve, he was awarded the George Cross in 1940 for disarming land mines that had fallen on London. The bold, imaginative approaches needed for this work—for example, lengths of string were used to extract fuses from the mines—were characteristic of his subsequent scientific endeavors. He was wounded during the invasion of Sicily and later joined the staff of Combined Operations Headquarters. In 1943 he was appointed Member of the Order of the British Empire.

Danckwerts's engineering education began after the war when he used a Commonwealth Fund (now Harkness Fund) fellowship to study chemical engineering at the Massachusetts Institute of Technology (MIT) for an M.S. This educational period at MIT (from 1946 to 1948) was a turning point in Danckwerts's career: He often spoke of the rigors of the course and the value of the MIT Practice School. While at MIT, he met T. R. C. Fox, who had just been appointed

Shell Professor of Chemical Engineering at Cambridge and was also learning the subject at that time. Fox recruited Danckwerts to become a member of Cambridge's original chemical engineering team, and it was there in the early 1950s that Danckwerts established an international reputation with a few remarkable papers.

The best known of these is his paper on continuous flow reactors, which gives basic theorems about the distribution of residence times. During the early 1950s, when Danckwerts was a junior faculty member at Cambridge, he began work on gas absorption into liquids, a topic that preoccupied him for many years and led to his 1970 book *GAS-Liquid Reactions*, a standard work on the subject.

Danckwerts's early scientific efforts were a model for what academic research should be in that minimal funds were needed and there was no necessity for the plans or proposals or grant applications that now constitute the administrative millstone we have come to associate with research. In his *Autobiographical Note*, which gives a far better impression of the man than these poor phrases, Danckwerts described his early research period as one of "academic indolence."

Yet like so many of his remarks, this is not to be taken literally: Like Englishmen before him but to a lesser extent now, he cultivated the notion of effortless achievement; only cads should be seen working. In the same style, Danckwerts professed an antipathy toward mathematics, even though his own discoveries—on residence times, gas absorption, and mixing—depended on the imaginative combination of simple mathematics and acute insight into physical and chemical realities.

His work anticipated what might be called the Bird, Stewart, and Lightfoot era of chemical engineering; he was one of the first and most outspoken critics of an education based on the assumption that all problems can be solved by striking out terms in generalized equations. Moreover, he believed that a highly mathematical education did not promote industrial innovation.

It was with industrial innovation in mind that Danckwerts left Cambridge in 1954 to work under Lord (then Sir Christopher) Hinton at the Atomic Energy Authority, but he soon returned to academic life. In 1956 he was appointed professor of chemical engineering science at Imperial College; in 1959 he returned to Cambridge as Shell Professor of Chemical Engineering. While there, he established a flourishing research school that included an active group continuing his earlier work on surface renewal at gas-liquid interfaces.

Danckwerts proved to be an effective department head at Cambridge, notwithstanding his distaste for administration: He regarded university committees as "politbureaus." Again, however, it is necessary to distinguish between off-the-cuff comments and his conduct of affairs. While affecting to despise elaborate calculations, Danckwerts ensured that the Cambridge department was the first in the United Kingdom to have its own computer—an IBM 1620. In the same way, he established a departmental electronics service. Although he did not care for the minutiae of teaching, he initiated design projects as a regular feature of the course, in line with the Institution of Chemical Engineers' requirements.

Danckwerts was active in this group and served as its president from 1965 to 1966. He formed, with a characteristically open-ended title, the Exploratory Committee, whose innovative function was to award industrial fellowships to enable faculty members to spend a year reporting on research topics that were likely to be useful to industry.

From 1958 to 1982 Danckwerts was executive editor of *Chemical Engineering Science* and during his tenure created one of the leading journals in the field. In this work, Danckwerts not only helped promote the welfare of chemical engineering, but in a modest way also contributed to the rise of one of our latter-day press barons, Robert Maxwell, who was one of the first to recognize the commercial opportunities in publishing scientific research.

In his day, Danckwerts was a great traveler. In addition to maintaining contact with the United States, he visited India,

Australia, and the Soviet Union. During the early 1960s, a Russian research student—now head of an institute—spent a year in Cambridge. Always an acute observer of humorous paradoxes, Danckwerts remarked that the visitor had said, after discussions about British government inertia, "In Russia we also have bureaucracies."

Danckwerts retained an affection for the United States and had a successful year in North Carolina in 1976, forming a link that endures—the Cambridge Chemical Engineering Department has permanently established the North Carolina State University Prize, which is given for the best student research project.

Danckwerts's election as a foreign associate of the U.S. National Academy of Engineering in 1978 greatly pleased him. It was fitting that his last honor, the year after retirement, should come from the country that had provided his formal education in the subject to which he had made such brilliant contributions.

