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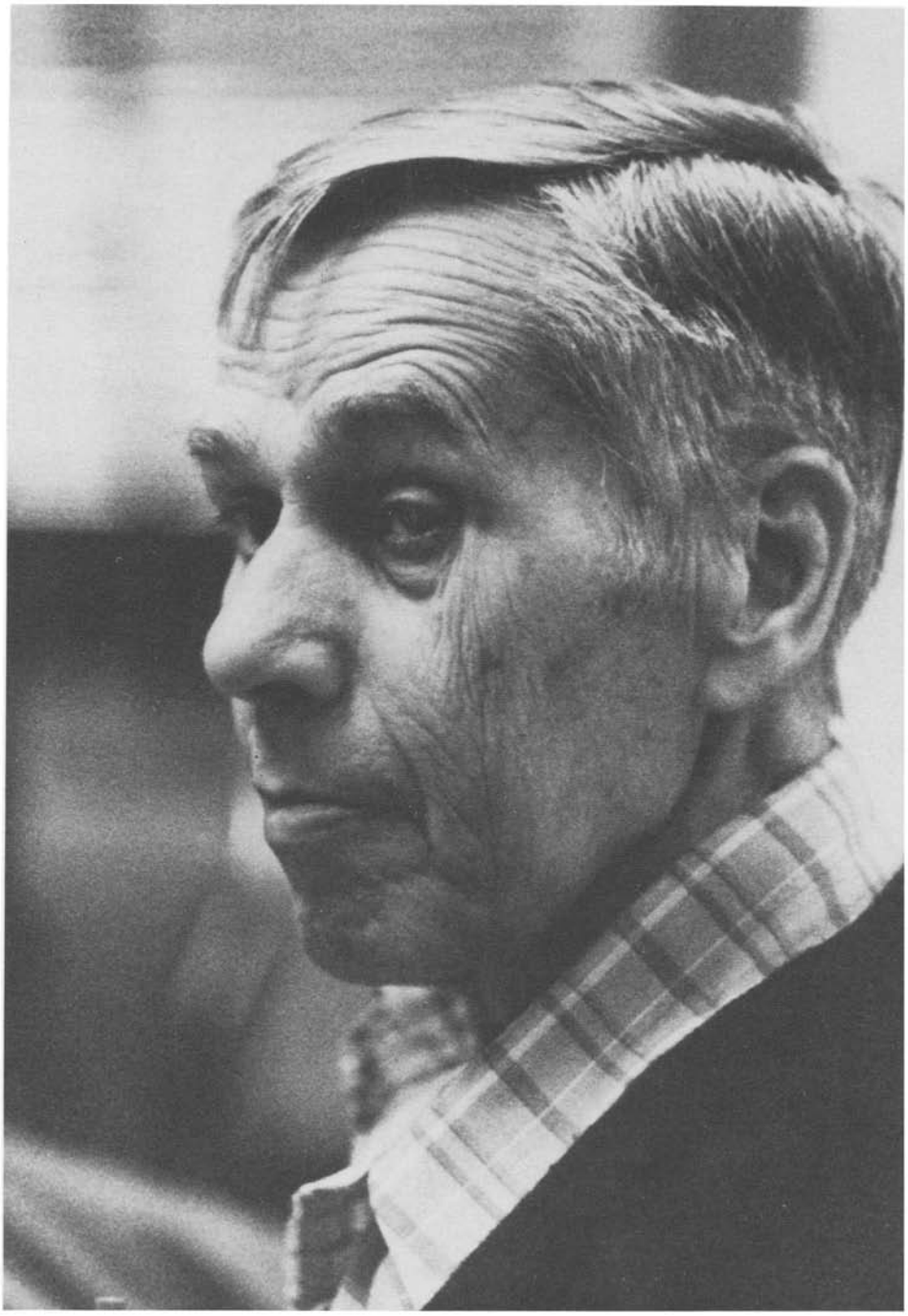
Obituary

Dr Don Charles DeVault, visiting Professor of Biophysics, Department of Physiology and Biophysics, University of Illinois, passed away suddenly last November 26, 1990, due to cardiopulmonary failure. Don discovered quantum mechanical tunnelling processes in biology for which he was honored on the occasion of his retirement in two special issues of *Photosynthesis Research* during 1989. Both his research and his personal interest in social issues were intense, and he made important contributions in both areas.

Don called Professor A.A. Noyes his 'father in science.' He worked in Noyes' laboratory at the California Institute of Technology during the height of the Depression. Noyes opened up his own office at night so that Don, not able to afford housing, would have a place to sleep while he completed his B.S. in Chemistry. Don's achievements as a Ph.D. student under W.F. Libby (Nobel prize winner for ^{14}C dating) in the early days of radioisotope research led to a friendship with Martin Kamen during the late 1930s at the University of California, Berkeley. The association resulted in a paper entitled 'Photosynthesis with Radio-Carbon' (Ruben et al. 1939). This early introduction to photosynthesis research would ultimately lead Don back 25 years later to studies of primary photochemical processes for which he is best remembered. During the interim period, he pursued his interests in electronics and social causes. He spent much of WWII as a conscientious objector in prison and in a Civilian Public Service Camp from which he actually published two articles on methods of teaching electronic structure of the atom (DeVault 1944a and b). After the war, he spent a short time at the University of Chicago, but most of his efforts focused on using Gandhian methods of nonviolence to fight racial discrimination long before this became a popular thing to do. Don and his CORE (Congress for Racial Equality) colleagues were successful at integrating Tuley Park in South Chicago on one occasion by refusing to retaliate despite beatings and in Don's case, a broken jaw. Subsequently, for ten years until 1958, he taught at the University (then College) of the Pacific and spent part of the time serving as Chairman of the Physics Department. Frustrated with administrative duties, Don headed East to develop a Xenon flash/detector device to guide the blind with a small Philadelphia company called Bionic Instruments, Inc. During this period, he championed Seneca Indian causes and protested germ warfare work by the army.

With the advent of lasers, Don joined Britton Chance at the Johnson Research Foundation, University of Pennsylvania, in 1963. He used his electronics expertise and background in kinetics to develop one of the first time-resolved laser spectrometers built to measure fast light-induced chemical reactions. Since many of the required electronic circuits were not available at the time, he designed the requisite amplifiers, lamp boost circuits, timing systems, and an A.C. coupling device himself from first principles. Chance's interest in the laser system arose out of his own work on light-driven cytochrome oxidation with John Olson, a graduate student at the time. Chance also discovered, with Mitsuo Nishimura, low temperature cytochrome oxidation in the photosynthetic bacterium, *Chromatium vinosum*, and observed, with Walter Bonner, low temperature cytochrome oxidation in green leaves. This environment set the stage for the laser studies. In a series of classic papers (Chance and DeVault 1964, DeVault and Chance 1966, DeVault et al. 1967), Don showed that the rate of cytochrome oxidation in *C. vinosum* decreased as the temperature was lowered to 120 K but thereafter remained constant with a half-time of 2.3 ms down to liquid helium temperature. This was the salient information (the lack of apparent activation energy at low temperature) that led to Don's interpretation of the result in terms of quantum mechanical tunnelling. Details of these times were discussed by Don himself (DeVault 1989) and Bill Parson (1989). Parson, by the way, with Don's guidance used the laser equipment to determine that P870 and not a cytochrome was oxidized in the primary photochemical step of photosynthesis. This answered a major question



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of the time. My four years with Don as his first Ph.D. student were also spent examining cytochrome oxidation kinetics with the laser system. Bill Hildreth, Toro Kihara, Les Dutton, Jim McCray, Bob Floyd, Sei Izawa, Wolfgang Junge, Andrew Rubin, Mayfair Kung and many others were in addition Don's collaborators, laser users, and colleagues at the time. During this period, Don also maintained a continuing interest in the Society for Social Responsibility in Science for which he wrote pamphlets on secrecy and war research in universities.

Don joined the Biophysics group at the University of Illinois in 1977 and carried on his fast electron transfer reaction studies. He wrote a monograph, 'Quantum Mechanical Tunnelling in Biological Systems' (DeVault 1980) which he later updated and published in book form (DeVault 1984). It is curious that his laboratory at Illinois was in the W.A. Noyes building named for A.A. Noyes' father. His colleagues and collaborators during this last part of his career included Tony Crofts, Govindjee, Bob Overfield, Colin Wraight, Akinori Sarai, Goran Neshich, Bill Arnold, Jozef Grabowksi and Geza Meszena.

Besides the work for which he is best known, Don and his co-workers (Floyd et al. 1971) demonstrated that cytochrome *b*-559 was the cytochrome oxidized in green leaves at low temperature and that it rereduced photo-oxidized P680. The term P680, which they used to describe the primary donor of photosystem II, is the name everyone still uses. He also developed the theory (DeVault et al. 1983, DeVault and Govindjee 1990) that accurately describes thermoluminescence data. Don was a believer in truth and outlined 8 steps to reach an approximation to truth in his book 'Science and Satyagraha' (DeVault 1987). The steps are observation, analysis, testing and correcting, open-mindedness, communication, absence of all deceptions, absence of secrecy, and absence of coercion. He applied Satyagraha (sanskrit for 'adherence to truth') in both his science and in his daily life.

Those who knew Don personally characterize him as generous, kind, humble, peaceful, patient, and truly principled. He had time for anyone who asked. He was an original thinker, unconcerned with recognition for himself. He was so unassuming in his brown lab jacket, that a visitor at the Johnson Research Foundation once asked me if he was the janitor. His many friends around the world will miss him, and to his wife Roberta and daughter Julie go our heartfelt sympathies.

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