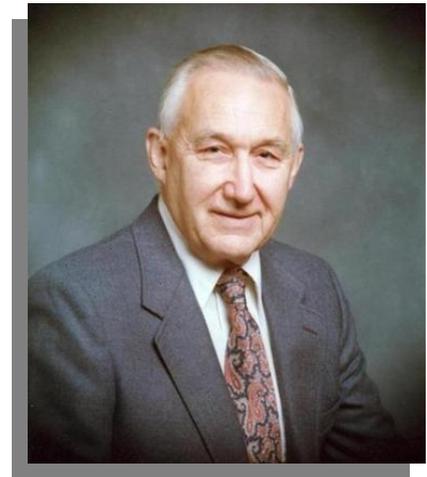


P.B. Dews (1922 – 2012)

Peter Dews died on November 2, 2012, after several years of declining health. He is widely recognized as the single individual most responsible for the emergence of behavioral pharmacology as an experimental science concerned with the rigorous assessment of the behavioral effects of drugs. From the time of his first experiments on scheduled-controlled behavior, Dews understood that the sequential scheduling procedures he was using in elucidating the pharmacology of central nervous system (CNS) drugs had general significance for all behavioral phenomena, including many aspects of biomedical sciences. It was through a series of fortunate circumstances and wise decisions on the part of Dews that this Englishman with no formal training in anything to do with behavior became a powerful advocate for an awareness of behavior as a part of biology, and of the need for biological scientists to have an understanding of behavior in physical as opposed to subjective terms.



Peter Dews was born in the north of England, in Yorkshire, and lived there until his mid-twenties. He had very good schooling in the fundamentals of mathematics, physical sciences, and the English language before going to the University of Leeds to study medicine. This early experience, coupled with his original, independent temperament, is reflected in his educational philosophy that one good introductory course is sufficient to prepare a student to begin independent, individual study – very different from the way the same material is taught repeatedly in high school, college and graduate school in the United States. Dews treated postdoctoral fellows as he would like to be treated – to be provided with adequate resources and then left alone to use them.

In medical school, Dews liked physiology and pharmacology the best of all subjects. After finishing his internship in 1945 and not wanting to be a junior person in the Department of Physiology at Leeds, he became a Demonstrator and then Lecturer in the newly established sub-department of Pharmacology under W.A. Bain. Bain had in his possession a large quantity of a potent extract from marijuana (itself a story of serendipity), and Dews began studying the actions of "red oil" on the behavior of laboratory animals with no success at all. However, from that time Dews had an interest in the behavioral effects of drugs. (For more details see Dews, 1997.)

When J.H. Burn came to Leeds to fill in for an unavailable external examiner, he met Dews and invited him to spend the summer of 1946 at Oxford. While there, Dews and J.D.P. Graham studied the diverse pharmacological effects of the antihistamine pyrilamine, a report of which appeared in the first volume of the *British Journal of Pharmacology*. Two years later, Burn suggested Dews as a possible alternative to replace the original candidate for a fellowship position at Burroughs Wellcome in Tuckahoe, New York.

Dews came to the United States in 1948 and spent two years as a research fellow at Burroughs Wellcome. He did collaborative research on the histamine liberator 48-80, and conducted an independent study on the effects of various psychomotor stimulants and convulsants on what he termed "voluntary activity" in mice. During this time, he realized that he was interested in the CNS effects of drugs on behavior, but was still unsure about how to proceed. While at Leeds, he had sought advice from other pharmacologists on ways to study behavior in experimental animals, but nothing

that was suggested (Pavlovian conditioning, learning in mazes) seemed suitable to Dews for determining quantitative dose functions. In the 1940s, there was literally no interest among pharmacologists in the United Kingdom in the behavioral effects of drugs, and even Dews himself, when studying the varied pharmacology of antihistamines, never considered investigating the "drowsy" effects reported in man.

Before coming to New York, Dews took a vacation in Switzerland and stopped in Paris at the laboratory of Daniel Bovet to visit with Bernard Halpern, another antihistamine researcher. Their friendship was renewed a year later when Halpern came to New York en route to attend the fall meeting of the American Physiological Society in Minneapolis, and to give a lecture at the Mayo Clinic. When Halpern suggested that Dews accompany him to Minnesota, Dews hastily changed his vacation plans and did so. At the Mayo Clinic, Charles Code, Halpern's host, had a research interest in histamine and antihistamines, and during their first casual conversation, Code asked Dews if he would like to work at the Mayo Clinic, saying that he knew of Dews's antihistamine paper.

In 1949, Peter married Grace Miller, also employed at Burroughs Wellcome, and after fulfilling his commitment there, moved in 1950 to the Mayo Clinic. He worked on the effects of cortisone, ACTH, and adrenalectomy on anaphylaxis in the Section on Physiology with Code, which formed the basis of his Ph.D. in Physiology from the University of Minnesota. The person at the Mayo Clinic who most influenced Dews was the biostatistician, Joseph Berkson, with whom he worked in 1952 as a Research Associate in the Division of Biometry and Medical Statistics. His interest in statistical analysis and estimating error took form then and continued throughout his career, particularly when he later turned his attention to risk assessment in behavioral toxicology.

In 1952, Otto Kraye, at that time seeking someone interested in the CNS to fill a position in his Department of Pharmacology at Harvard, came to Rochester to give a Mayo Foundation Lecture. Earl Wood, who had previously been in Kraye's department, knew that Dews had written a paper on voluntary activity in mice, and suggested Kraye meet him. When they met, Dews (now seven years past his medical degree and on leave from a permanent position in Pharmacology at Leeds) accepted Kraye's offer of an Instructorship.

From the 1930s, B.F. Skinner had been interested in the effects of drugs on behavior, saying the brain could be "unlocked with a molecule better than with a scalpel." After Skinner returned to Harvard from Indiana in 1948, he periodically telephoned Kraye asking if any of his staff members were interested in drugs affecting behavior. Immediately after Dews arrived, Kraye suggested that he go over to Cambridge to see Skinner. Dews met Skinner in his office and then Skinner's associate, Charlie Ferster, showed Dews around the research laboratory. There were more than a dozen set-ups where the pecks of pigeons inside enclosed picnic boxes were being recorded cumulatively in time on paper tracings. Dews had never heard of B.F. Skinner and he didn't know what he and Ferster were studying, but Dews instantly recognized the paper tracings as the equivalent of slope kymograph recordings, and that the procedures that produced them could be what he had been looking for: a way to measure the effects of graded doses of a drug on a quantitative aspect of behavior in continuous time. As Ferster walked around showing the experiments that were going on in the different chambers, he understood that Dews appreciated what he was seeing even without specific knowledge of what the experiments were about. He invited Dews to come back and make injections in the middle of sessions to see what would happen. When such treatments resulted in an interesting change in the pattern of the cumulative response record it constituted an experiment for Ferster. Ferster thought it was wonderful to have

Dews coming over and altering schedule performances with injections of pentobarbital, antihistamines, LSD, and the marijuana derivative synhexyl. Single observations on all these drugs are reported in figures in "Schedules of Reinforcement" (1957). It took Dews a little longer to establish to his satisfaction that this was a worthwhile approach for studying the effects of drugs. He did this by chronically treating pigeons with sodium bromide and seeing that their altered performances were related to the bromide blood level.

Ferster gave Dews all the components for several set-ups and helped him put them into operation in the Department of Pharmacology to study the effects of drugs on schedule-controlled performances in the pigeon. Pigeons were not a species used in pharmacological research, but Kraye gave this venture and its subsequent expansion his full support. Kraye championed the extension of pharmacology to other fields as strongly as Skinner championed the wider application of behavioral techniques. Kraye tried to make the professional situation for every member of his department as good as could be, which Dews fully appreciated. In every way, Kraye encouraged this rather unusual type of behavioral research as part of pharmacology, even to reading and commenting on drafts of manuscripts, a helpful but humbling experience for authors. Dews was also outstanding in giving editorial help, and it was a pleasure to get his good advice about manuscripts. If he thought a sentence wasn't quite right, he rewrote it and always made it better. Here and there he would scratch out one word and substitute another that had just the right nuance. He had a very good sense for using words. For example, in 1947, in characterizing the antagonistic properties of drugs such as atropine and antihistamines, Dews employed the term "agonist," a very early, if not the first, use of this word in a pharmacological context to designate the substance against which a specific antagonist is effective.

In his initial experiment, Dews followed Ferster's advice and studied pecking in pigeons where a brief presentation of food followed a peck under two different scheduling conditions. The drug he chose to study was pentobarbital, and its effects on the rate and pattern of pecking were dose-dependently related to the two schedules. (Later he commented that with some other drugs the results would not have been so clear and may have discouraged his continuing this type of research.)

This first experiment influenced Dews profoundly. He realized that he had, at last, quantitative assay procedures for studying the effects of drugs on behavior in a pharmacologically rigorous way. Perhaps equally importantly, he appreciated the positive advantages of Skinner's general approach of studying behavior in an isolated, controlled space without extraneous influences, and describing it in objective physical terms. In subsequent experiments, he used scheduling procedures to study how behavioral effects of drugs were related to the established psychological concepts of motivation and discrimination by varying the degree of food deprivation and the complexity of stimuli. He also continued studies on different scheduling conditions. Neither traditional psychological explanations of behavior nor the pharmacological classification of drugs as stimulants or depressants appeared to be useful in interpreting the details of his results. Generalizing from the combined specific findings in these experiments, Dews concluded that the behavioral effects of drugs depended predominantly on the behavior engendered by the controlling scheduling conditions and could be changed by changing the scheduling conditions. Later, a relation between ongoing behavior and magnitude of drug effect was shown quantitatively for many drugs.

From the start, Dews regarded behavioral pharmacology as a discipline of pharmacology exemplified by rigorous assessment of the effects of drugs on objectively quantifiable behavior, and distinguished it from more clinically oriented psychopharmacology. When *the Journal of Pharmacology and*

Experimental Therapeutics established specific field editors to oversee publications in various fields of pharmacology, Dews became the field editor for behavioral studies and in that capacity further influenced the direction of research in behavioral pharmacology. The Division of Behavioral Pharmacology within the American Society for Pharmacology and Experimental Therapeutics has ensured the perpetuation of the Dews legacy by establishing an award in his name to be given biennially. The most recent recipient of that award, James E. Barrett, has written a scholarly review of the experimental work of Dews and his formative influence on the field of behavioral pharmacology (Barrett, 2006).

Dews joined the Department of Pharmacology at the Harvard Medical School in January 1953, was promoted from Instructor to Associate Professor, and in 1962 was appointed Stanley Cobb Professor of Psychiatry and Psychobiology, assuming wider responsibilities in the Department of Psychiatry. He continued to conduct collaborative experiments on behavioral pharmacology, physiology, and toxicology as before, but from the early 1960s, his major independent research was the quantitative study of schedule-controlled performances. He regarded Skinner's early work and Ferster and Skinner's scheduling procedures as the most significant influences on his career, and a recurring theme in his many reviews and essays was the recognition of how the ongoing behavior of life is controlled by its sequential interplay with environmental happenings.

Dews did not enjoy giving formal lectures, nor were they charismatic, yet his impromptu speaking was elegant and effective, with a delightful quality of improvisation. Lectures in pharmacology given to Harvard medical students by the same individuals were similar year to year, except those of Dews. For example, when lecturing on antiepileptic drugs, which patients take all their lives, Dews once gave a mini-lecture on the importance of physicians working with patients to establish an effective therapeutic dose with minimal side effects for chronically administered drugs. The next year his lecture changed to emphasize neurophysiological aspects of epilepsy. Fortunately, many of the off-the-cuff remarks Dews made at symposia and meetings were preserved in published commentaries, which have the flavor of insightful originality and the use of apt analogies that characterized his impromptu speaking. These writings contrast with the discussion sections of his experimental papers, which never went beyond carefully-worded, logical inferences of the results.

Dews's ability to quickly and wisely discern and clearly express the gist of complex situations made him highly effective on committees at Harvard and nationally. He served on Harvard committees continuously for some thirty-five years, and nationally on committees relating to mental health, drug dependence, social behavior, brain research, pharmacology, toxicology, space science, and evaluations of training and research programs. He said that he liked committee work and found it relaxing, taking him away from the rigor of laboratory experiments.

In contrast to his active participation in committees, Dews's habitual manner in conducting laboratory research was solitary. He preferred to do the actual work of some experiments himself, and visiting dignitaries were often surprised to find the Professor doing the work of a technician. He never ever spoke about any research that he was conducting independently until it was completed and he had studied the data sufficiently to make some logical conclusions about the results.

For many years, Dews directed a successful National Institute of Mental Health training program for Biological Training in the Behavioral Sciences. He supported collaborations on research in different fields only if the joint research conformed to the accepted standards of each separate field. He believed most research should be conducted with the internal cohesion of a limited context, but that

the results of such research took on a greater validity when they could be usefully applied to other areas of research. Understandably, he often cited the successful use of scheduling procedures from psychology in conducting pharmacological studies and the reciprocal influence from studies with drugs in showing the role of ongoing behavior itself as a psychological principle. He felt strongly that medical students should be taught a rational perspective on behavior and behavioral pharmacology. Starting in the late 1950s, one of the twelve student laboratories in pharmacology at Harvard was on the effects of drugs on behavior.

Dews was elected to the American Academy of Arts and Science and the Institute of Medicine, and was a member of a dozen professional societies (pharmacology, physiology, toxicology, neuroscience, and psychology). He served for fifteen years as the director of educational activities for the International Brain Research Organization. He enjoyed the fellowship of professional colleagues and attended many scientific meetings. Traveling for Dews was exploring where tourists never go, using public transportation, getting to know the local culture, and speaking the local language as much as possible. This robust adventurous spirit was also evident in the leisure activities Dews liked best: bicycling, swimming, hiking, and camping with his family.

Dews equaled the behaviorists Watson and Skinner in his disdain for mentalistic and subjective explanations of behavior. Like Skinner, he championed the wider understanding and appreciation of the concept of schedule-controlled behavior, in particular emphasizing in a non-polemic way its importance in other areas of science. After Skinner's death, Dews became the most eloquent advocate for the objective study of behavior as an experimental science and for understanding it in the context of physically defined concepts.

Peter Dews is survived by his wife Grace; daughter Pamela Rentschler; sons, Kenneth, Alan, and Michael; a sister, Jean Hilditch, in England; nine grandchildren, and a great-grandchild.

written by W.H. Morse

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