



Bernard David Davis



Bernard D. Davis long a prominent figure at Harvard Medical School, in microbiology, and in national science policy, died on January 14, 1994 at the age of 78. Born in Franklin, Massachusetts to immigrant parents, proprietors of a dry goods store, he and three siblings were each valedictorian at the local high school and went on to Harvard College or Radcliffe. After majoring in biochemistry, he proceeded to Harvard Medical School, where he simultaneously worked with the biochemist, E.J. Cohn, graduating with the very rare M.D., summa cum laude, in 1940. Following a medical internship at Johns Hopkins, Bernard entered the Public Health Service in Bethesda, Maryland in 1942, initially for study of tolerance to high altitude. But his background in protein chemistry led to an assignment for work on serological tests

for syphilis and hence transfer to the laboratories of Elvin Kabat at Columbia then, briefly, with Jules Freund at the Public Health Research Institute of New York City. After several years in immunochemistry, in 1945 he was offered his own USPHS laboratory for work related to tuberculosis, for which he prepared by spending two years in the laboratory of René Dubos at the Rockefeller Institute.

His published papers to age 30, many of them solely authored, dealt with electrophoresis of proteins, physiology, immunochemistry, and fatty acid binding to serum albumin. In a memoir of 1992 (*Ann. Rev. Microbiol.*, vol. 44) Davis admitted to a lack of special taste for protein chemistry as it was and then conducted, to opportunities not seized (e.g., to appreciate myeloma proteins), and frankly, with regard to Kabat, being “uncomfortable working with a master of the field who was always one jump ahead of me.” In 1946 while at Rockefeller he contracted a mild case of tuberculosis. A year of rest and reading led to a sea change in scientific fortunes ultimately to a decade of his best-known work, much of it done in the “tuberculosis” laboratory housed at Cornell University Medical College (1947-1954). He (and independently Joshua Lederberg) devised the penicillin enrichment method for obtaining nutritional

mutants of *Escherichia coli* and established himself as a major figure in the years when *E. coli* and its viruses came to dominate studies in cellular and biochemistry genetics. His most important contribution was a series of papers which worked out the biosynthesis of the aromatic amino acids, the last studies in collaboration with David Sprinson at Columbia. There was also work on the pantothenate, parahydroxybenzoate, the proline, lysine, methionine, and histidine pathways, and somewhat later mutant studies on the tricarboxylic acid cycle.

Davis's work particularly that with Werner Maas, foreshadowed later important discoveries in genetics, including types of suppression, chemical nature of mutation, cross feeding, and metabolic antagonisms. A well-known experiment on bacterial mating also dates from that period. However, genetics did not become his major focus, possibly a matter of regret, for the logic of genetics might have suited Davis' gifts better than biochemical approaches. Subsequent work on streptomycin led to the genetics of protein synthesis itself. The use of an *E. coli* strain poorly suited to genetics was bad luck, but Davis himself complained, perhaps with tongue in cheek, that the real misfortune was to have met Lederberg early, to find that many of his own ideas had been anticipated! Instead, his wide-ranging curiosity embraced physiology. Davis deduced that bacteria must have specific membrane transport systems, and explained why metabolic intermediates were charged (*On the Importance of Being Ionized*, 1958). Further he anticipated mechanisms of drug resistance in an influential chapter on chemotherapeutic agents in Dubos' textbook (1st ed. 1948). The latter interest led to his appointment (1954) as head of Pharmacology at New York University College of Medicine.

After 1957, when he had taken the chairmanship of Bacteriology and Immunology at Harvard Medical School, the focus of his research was on antibiotics and protein synthesis in vitro. His key findings included the dominance of susceptibility to streptomycin, (due to misreading of the genetic code), details of the ribosome cycle, protein secretion by vesicles, and finally, in 1987 a unified mechanism of streptomycin killing. The later phases of this work were shared with his long-time colleague, P.C. Tai, and overlapped with Davis' increasing role as a science policy advocate.

Davis had come to a Department headed before him by J. Howard Mueller, the discoverer of biotin and methionine. Among others in the Department were Boris Magasanik and H. Edwin Umbarger examining biochemical genetics in bacteria. Albert Coons had devised fluorescent labeling and shown that antibodies came from plasma cells. John Enders, 1954 Nobel laureate of polio virus fame, was a professor, but located at Children's Hospital. From New York University, Davis brought only Luigi Gorini and, in line with the Mueller style (absent the 5 a.m. start) established and maintained for the next 27 years a relatively small research group, usually having only two or three postdoctoral fellows, some of them with a medical background. The Department remained partial to *E. coli* and what was later to become molecular biology. Immunology was not favored in spite of Coons and Davis' own background, nor was medical bacteriology. However, with his medical training and a frank love for teaching with its theatrical aspects, Davis took charge of, and set a high standard for the departmental second year course given for the medical students. This semester-long treatment of basic and medical bacteriology,

virology, and immunology was participated in by the whole faculty and a considerable number of colleagues from the Harvard hospitals. He attended all lectures, taking notes to correct his colleague. A generation of medical students were introduced to the molecular basis of infectious diseases through his own lectures which were fluid, stimulating, amusing, and sometimes spellbinding, as in his normal warning to the physicians-to-be against drug house detail men. Harvard Medical School still had monthly faculty meetings, widely attended and sometimes led by President Pusey, where Davis was one of the luminaries counted on to contribute to challenge and entertain.

Together with four co-authors (R. Dulbecco, H. Eisen, H. Ginsberg, and initially W.B. Wood) Davis expended great effort over 25 years to a new textbook for medical students: *Microbiology* (1st ed., 1967), well known as Davis et al. As chairman of the Department he likewise vetted the papers of even his not so junior colleagues, leading more than one of them to mutter, "Why don't I just give him the raw data?" Equally hard on himself as a writer, he once admitted that he could only hope for clarity but despaired of achieving the literary elegance of a Francis Crick. The Department was smaller than it is now, and most of the faculty ate together in a well-remembered lunch room. Those were good times in many ways and Davis was very much in and of the Department, as well as the focus of grievances, of conflicting ambitions and views of the Department's future direction. Harvard was important to him and he took his role seriously. It must have been galling to be seen ultimately as an authoritarian establishment figure for he championed the freedom to be a critic. Davis' own radical credentials were genuine.

Davis then moved across the quadrangle to head his own subdivision of the Department, the Laboratory of Bacterial Physiology. Eventually, with strained personal relationships repaired, his elder statesman role in the Department was particularly nurtured during the chairmanship (1984-1994) of the late Bernard Fields. His research flourished. Davis was always particularly acute at seminars, and he edited the textbook through three more editions. After 1968, however, he became increasingly engaged as a critic in the broader aspects of science and education. Recalling his entry to academia in 1954, as a chairman, this phase of his career was something of a reversion to the earlier independence. Functioning as a gadfly (his own description) he deplored as Luddites, scientists who warned about the potential dangers of recombinant DNA, and was sharp about geneticists he believed were guided by heart and not head in the nature vs. nurture controversy. He believed that the possibilities of genetic intervention in behavioral traits were remote. He opposed sequencing of the entire human genome. These and other issues were sometimes argued in person but largely in print in dozens of letters, reviews and op-ed columns in scientific and intellectual journals and in the public press.

Although many articles dealt with the subject, plans for a semipopular book on human diversity did not materialize, for he came to believe that his expertise was inappropriate. Instead, the final intended book was to be on the David Baltimore affair (the Nobel laureate virologist perhaps falsely accused of reporting questionable data attacked in Congress, shunned by colleagues and forced from the presidency of Rockefeller University). Convinced of the injustice of the episode he titled one of his columns, "*The*

Dingelling of Science". The book was almost ready at the time of Davis' death relating to prostatic cancer. But there was little interest from publishers who, he believed, found the line politically incorrect. Its prospects are still uncertain.

His critical writings were incisive, and of course opinionated. Although fairly thin-skinned himself, Davis was not beyond using a personal example if it served his argument, and many were stung at one time or another by his seeming tactlessness. Notoriety came with an article in the New England Journal of Medicine in 1976 which criticized the practice of affirmative action at Harvard Medical School. He was disappointed at receiving little open support from his colleagues, and his relationship with the then Dean of the School were somewhat strained.

Davis was a large figure in the life of colleagues and friends, and a touchstone of strong opinions. Bentley Glass, in a perceptive review of his collected essays, *Storm over Biology*, insisted that Davis' writings on so many controversial issues represented a sober majority opinion among scientists. His views were strongly held but, were influenced and attenuated by his colleagues and by his independent family, his wife Elizabeth Menzel, whom he married in 1955 and three children of quite different temperament. With friends and students he was charming and supportive. Music was an important part of his life (he was a good pianist and one son an accomplished cellist) and so was Woods Hole where he spent so many summers teaching and writing. He was elected to membership in the National Academy of Science, and later received the Hoechst-Roussel and Waksman awards. Although he mellowed, the feistiness hardly slackened. A non-observant Jew, he insisted on atheism. He was so offended by a memoir of the admissions wars that he requested a reprinting of the controversial NEJM article (HMAB, Spring 1991). Controversy outlived him. An obituary in New York Times brought such a chorus of "foul" from friends and critics as to cause the newspaper to print an unprecedented second obituary the next month, properly citing his accomplishments and honors as an investigator, teacher and critic. It is left for us to recall with affection his special combination of earnestness, ego, intellectual vigor, and integrity. But Bernie surely would have been correcting this memoir too.

Respectfully submitted,

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