



## *IN MEMORIAM*

Howard K. Schachman

Professor of the Graduate School, Molecular and Cell Biology  
UC Berkeley  
1918 – 2016

Howard Kapnek Schachman, Professor of the Graduate School in the Department of Molecular and Cell Biology at the University of California, Berkeley, died on August 5, 2016, at the age of 97. He was born in Philadelphia, Pennsylvania, on December 5, 1918, and educated at Princeton University and the Massachusetts Institute of Technology.

Howard's career at the University of California spanned over 60 years — a period that has seen many changes in the world including his field of biochemistry. The discipline, known today as molecular biology, did not exist when Howard arrived at Berkeley in 1948. Biologists had not yet accepted that DNA is the genetic material, although O. T. Avery, C. M. McLeod, and M. McCarthy demonstrated in 1944 that it was DNA, not protein, that is responsible for bacterial transformation.

Howard's productive career at Berkeley extended for nearly seven decades. He was primarily a scientist, but unlike most, he contributed importantly to what might be termed the sociology of science. The latter embraces his political activities, especially on the Berkeley campus, and his later efforts concerning issues of national and international scientific misconduct, the importance of basic research, and the broad category of bioethics. He helped to save the scientific enterprise from wholesale accusations of fraud when a congressional lawyer proposed that scientific misconduct be defined as any serious deviation from the standard approach. Schachman pointed out with good effect that the very best science almost necessarily embodied such a deviation. He also delineated the distinction between normal error and willful fraud. The following quote on this subject delivered with his gracious sense of humor is telling of both his humor and incisiveness. "Some scientists are ambitious, opportunistic, self-serving, and arrogant. But that doesn't make them crooks. The challenge is to separate the crooks from the jerks."

## **Scientific contributions**

Schachman's doctoral research prepared him as one of the foremost experts in the use of the analytical ultracentrifuge. When Howard first arrived in Berkeley his major area of research was on tobacco mosaic virus (TMV). Although the presence of nucleic acid in TMV had been detected in the 1930s, it was not until the experiments of Fraenkel-Conrat and of Gierer and Schramm in 1956 that demonstrated that it was the RNA in the virus particle that carried the genetic information. At this stage of Howard's research he was not thinking about genetics — that does come much later — but was devoting his attention to establishing the structure and uniformity of virus particles, particularly of TMV but also of papilloma virus. Could they be considered as molecules or as some advocated as organisms? In 2000, in an essay for the *Annual Reviews of Biochemistry*, he described his “love affair with the ultracentrifuge.” That “love affair” was not monogamous and he often brought the use of the ultracentrifuge to collaborations with colleagues at Berkeley and in many other universities and research units. His contributions to the use of the ultracentrifuge in biological research also led him away from virology. Howard (and the ultracentrifuge) played an essential role in discovering the existence of ribosomes, a crucial step in deciphering how proteins are synthesized. In the 1960s, he began a long-term collaboration with his junior colleague, John Gerhart, who introduced him to the enzyme aspartate transcarbamylase (ATCase). ATCase became the primary focus of the remainder of his scientific career. His research on this subject converted him from being essentially a physical biochemist to one who embraced the areas of molecular biology and genetics.

In his *Annual Review of Biochemistry* 2000 essay, Howard wrote, “But it was the development of the photoelectric absorption optical system and the incorporation of the Rayleigh interferometer onto the ultracentrifuge that had the greatest impact on our further research. These tools, when applied to our initial research on *E. coli* aspartate transcarbamoylase (ATCase), led to the discovery of distinct subunits for catalysis and regulation and the global conformational change in the enzyme associated with its role in regulation.” These studies were important contributions to the understanding of structural and conformational changes in proteins and to defining the folding and assembly pathways of multi subunit enzymes.

## **Political activities at the University of California, Berkeley**

The first of these involved his joining the *ca.* 200 Berkeley faculty members who opposed the required signing of The UC Regents' mandated loyalty oath, which was aimed at purging Communists and their sympathizers from the faculty. Howard painfully watched the 200 dwindle to a few stout souls as some left the University voluntarily, and others were fired. Faced with having to support a young family, and with few other job prospects he ultimately signed.

Howard became increasingly active during the Free Speech Movement of the 1960s, and was a major faculty supporter of students protesting university policies that limited political activism on campus.

## **Service at the University of California, Berkeley**

Over the years, Howard performed his fair share of committee service. His activities included membership on the following committees for the stated years: Assembly Representation (1969-1973 and 1974-76); Committees (1966-68); Privilege & Tenure (1964-67); and Undergraduate Scholarships (1955-56). Importantly he served a double term as chair of the nascent Department of Molecular Biology from 1969 to 1976.

## **Political activities in the national arena and role as ombudsman**

In the 1980s, Howard was first president of the American Society of Biological Chemistry (now the American Society of Biochemistry and Molecular Biology), and succeeded to the presidency of the umbrella organization, The Federation of American Societies for Experimental Biology. These positions, together with his service on several national committees led to his increasingly active engagement in following and attempting to influence science policy. He was appointed by Harold Varmus, who was the director of the National Institutes of Health, as an ombudsman in the Basic Sciences from 1994 to 2002; an experience that he found gave him a deeper understanding for the conduct of biomedical research. He felt that he served as a valuable bridge between academic basic research and the National Institutes of Health as the source of funding for this research.

Howard became more and more concerned about the involvement and interaction between the academic and commercial communities. His views were cogently presented in his essay for the *Journal of Biological Chemistry* celebrating its centenary in 2005. His title is "From 'Publish or Perish' to 'Patent and Prosper'". He wrote, "It will be interesting to witness whether these relatively new practices jeopardize the openness of universities and how they can be accommodated with the much older, traditional roles in creating and dispensing knowledge." We don't yet know the answer.

## **Family**

Howard met Ethel Lazarus while they were both undergraduates in the Boston area. They married in 1945, and had two sons, Marc and David. Ethel had worked for the Emergency Committee of Atomic Scientists, and in that capacity often acted as a courier to Albert Einstein. On occasion she and Howard provided transportation in their car for him. Although not a scientist, Ethel was well versed in social sciences, politics, music, and art. Except for actual experimental data, Howard explored the consequences of all of his important activities with her in advance, and frequently acknowledged how often her insights led him to change his intended course of action. They traveled widely together and enjoyed the friendship of many internationally prominent figures including Ephraim Katzir, who was their houseguest on the evening that it was learned that he had been named the next president of Israel. Ethel died in 2012. They enjoyed 67 years of productive happiness and fulfillment together.

## **Oral Histories at the Bancroft Library of the University of California, Berkeley**

*University of California Professor of Molecular Biology: Discussions of His Research Over His Scientific Career From the 1940s Until 2010.* 2010, 175 pp. (interviews conducted by Sondra Schlesinger).

*UC Berkeley Professor of Molecular Biology: On the Loyalty Oath Controversy, The Free Speech Movement, and Freedom in Scientific Research.* 2007, 182 pp. (interviews conducted by Ann Lage).

### **Obituaries**

Obituary published in *ASBMB Today*, December 2016:

<http://www.asbmb.org/asbmbtoday/201612/Retrospective/Schachman/>  
(author, J. F. Kirsch)

Obituary published in *Cell*, September 2016:

[http://www.cell.com/cell/fulltext/S0092-8674\(16\)31156-4](http://www.cell.com/cell/fulltext/S0092-8674(16)31156-4)  
(author, Marc W. Kirschner)

Sondra Schlesinger  
Jack F. Kirsch  
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