

## Herbert A. Hauptman (1917–2011)



Image courtesy of Michael Mandolfo.

Herbert Aaron Hauptman, an American mathematician and crystallographer, died on 23 October 2011 at the age of 94. He was a co-winner of the Nobel Prize in Chemistry in 1985 for developing mathematical methods for deducing the molecular structures of chemical compounds.

Herb was born in New York City, the oldest of three sons of Israel Hauptman – a printer – and Leah (Rosenfeld) Hauptman, who was a sales clerk in the ladies' hat department of a prominent New York City department store. He credited his parents for playing an integral role in his development as a scientist; they gave him the choice to study whatever he wanted. In his Nobel autobiography, he said, 'My interest in most areas of science and mathematics began at an early age, as soon as I had learned to read, and continues to this day.' He also frequently said that the beauty of the Platonic solids was an early inspiration.

He attended Townsend Harris High School, where his interest in science and mathematics was nurtured, and then went on to the City College of New York where he graduated in 1937, earning the Belden Medal as the top student in mathematics. He also earned a master's degree in mathematics at Columbia University in 1939.

On a blind double date in the fall of 1940, Herb found that he preferred his friend's date. Displaying the same drive that later led to his professional success, he quickly acted on his emotions and, within a matter of weeks, married his young bride, Edith Citrynell, an educator.

Shortly after he and Edith were married, Herb joined the legions of young American men who were sent to serve in World War II. A Navy ensign, he was stationed in the Southwest Pacific where he was trained as a weather forecaster. He was made a permanent 'officer of the day' and was responsible for responding to a variety of crises. While he only had one day of firefighter training, he also served as a Fire Marshall in the Philippines – an assignment that twice nearly cost him his life. His time in the war was marred with close calls and the constant presence of death and destruction. During his war years, he spent his rare moments of spare time studying calculus (he brought the book with him to the South Pacific) and solving mathematical problems. His wartime experience was a constant memory throughout his life and led him, in future years, to

protest actively against American involvement in other military actions, including the Vietnam War.

In 1947, he began working at the Naval Research Laboratory (NRL) in Washington, DC where he remained until 1970. During his career there, he also earned his doctorate in mathematics from the University of Maryland in 1955.

During his time at the NRL, he became fascinated with the problem of how to directly determine molecular structures through the methodology of X-ray crystallography, a problem that had daunted other scientists for decades. Along with Jerome Karle, he co-published a solution in 1953 in a book entitled *Solution of the Phase Problem I: The Centrosymmetric Crystal*. However, for many years other scientists were skeptical of this work and it was largely ignored. It was finally accepted in the 1970s and received the recognition it deserved with the award, in 1985, of a Nobel Prize which he shared with Karle. During the last half-century, their techniques, known as 'direct methods', have been used to determine the three-dimensional structures of thousands of molecules, many of which have had medical significance.

In 1970, Herb joined the crystallographic group of a small, non-profit biomedical research institute, the Medical Foundation of Buffalo (MFB). In 1972, he became the MFB's Research Director and later its President. In 1994, the MFB was renamed the Hauptman–Woodward Medical Research Institute (HWI) to honor him as well as Helen Woodward-Rivas, the philanthropist who provided the seed funds for the Institute.

Not content to retire and relax after winning the Nobel Prize, he collaborated with his Buffalo colleagues in the 1990s and early 2000s to develop improvements to direct methods that permitted them to be applied successfully to much larger molecules.

During his years in Buffalo, he also served as Professor in the Department of Structural Biology, the Department of

Biophysical Sciences, and as Distinguished Professor in the Department of Computer Science at the University at Buffalo. In addition, throughout his career he was a mentor to aspiring crystallographers around the world, teaching at many International Union of Crystallography (IUCr) computing schools and Erice conferences, as well as at specialized meetings dedicated to direct methods.

A member of the American Crystallographic Association (ACA) and the US National Academy of Sciences, Herb received many honorary degrees from colleges and universities throughout the world as well as numerous other awards. Recent awards included an honorary degree from the State University of New York at the 2009 commencement of the University at Buffalo, the Niagara Lutheran Humanitarian award for 2009 and membership in the inaugural class of ACA Fellows.

He continued to work daily at the HWI into his nineties on his own new research projects as well as serving as a mentor and teacher to younger staff members.

Herb loved to hike in the Blue Ridge Mountains of Virginia, listen to classical music, and design and make stained glass stellations of the Platonic solids. A permanent collection of his beautiful artwork resides at the Institute that bears his name.

He is survived by his wife, Edith, their daughters Barbara Hauptman and Carol Fullerton, PhD, his brother Robert, and many nieces and nephews.

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