

Obituary



Jeffries Wyman
(1901–1995)

Jeffries Wyman died on November 4, 1995, at his home in Paris. He was 94. A native of West Newton, Massachusetts, Jeffries held degrees from Harvard University and the University of London. He taught at Harvard from 1928 to 1951, when he resigned to become the first scientific attaché in the United States Embassy in Paris. He was science director of the Middle East office of UNESCO from 1955 to 1958, after which he worked for the Department of Biochemistry of the University of Rome until he retired in 1983. He was a founder and past secretary general of the European Molecular Biology Organization.

Jeffries will be remembered for his theory of

linked functions and allosteric transitions that revolutionized the way we look at biological macromolecules. First conceived in 1948, the theory of linked functions brought the rigor and elegance of Gibbs' thermodynamic approach to the field of cooperative binding equilibria. Jeffries was the first to realize that the ability of macromolecules to transduce chemical and physical effects stems from thermodynamic principles like the Gibbs–Duhem equation and the Maxwell reciprocity relations. Linkage is the natural consequence of the first two laws of thermodynamics and macromolecules exploit it in nearly every aspect of their function. Jeffries also proposed a possible molecular mechanism for link-

age to manifest itself macroscopically. He speculated that a macromolecule can assume distinct “conformations”, each one recognizing specific ligands at distinct sites. Linked effects would then result from a shift in the distribution of conformations driven by changes in the chemical potential of a given ligand. This key idea, which is now background knowledge for any graduate student in biochemistry, was revolutionary in 1951 when first proposed. The paper with Allen describing the first molecular explanation of the Bohr effect of hemoglobin using the concept of linked equilibria and conformational changes was deemed “heretic” and declined publication by the *Journal of Biological Chemistry*. It was later published in the *Journal of Polymer Science*, now *Biopolymers*. In this paper, Jeffries had de facto invented allosteric theory, 12 years before “allosteric enzymes” were christened by Monod, Changeux and Jacob. When Jeffries joined forces with Monod and Changeux in 1965, a spectacular model for allosteric regulation was developed along the lines set forth in the seminal Wyman–Allen paper. The Monod–Wyman–Changeux model has enjoyed myriad applications in biology. It will remain forever a masterpiece of elegance and simplicity, a gold standard for thermodynamic theories applied to biological systems.

Jeffries had numerous interactions during his scientific career that spanned almost 70 years. His lifelong friendship and scientific interaction with John Edsall produced in 1958 the monumental and land-

mark book *Biophysical Chemistry*, which practically started the homonymous field. The experimental genius of Eraldo Antonini attracted Jeffries to Rome in the early 60s, where he remained until Antonini’s untimely death in 1983. This collaboration led to seminal discoveries on the functional properties of hemoglobin and, along with the beautiful structural work of Perutz, brought the Renaissance to the field. Equally noteworthy was his interaction with the late Stanley Gill in Boulder, Colorado, which culminated in the landmark book *Binding and Linkage* published in 1990. Jeffries also had productive interactions with some of the finest minds in non-linear dynamics, like James Murray in Oxford and Paul Phillipson in Boulder, and with outstanding physicists and mathematicians, like Giorgio Careri and Gaetano Fichera in Rome. *Biophysical Chemistry* has marked the contribution of Jeffries Wyman to the area by publishing, in 1990, a Special Issue of the Journal dedicated to him (Vol. 37), edited by Enrico Di Cera.

Jeffries was a man of genius, endowed with many talents and unusual qualities. He had the wisdom of the philosopher and the curiosity of the scientist guiding his steps throughout his life. He leaves a great intellectual heritage and an immense void among us all.

Enrico Di Cera
(Editor)