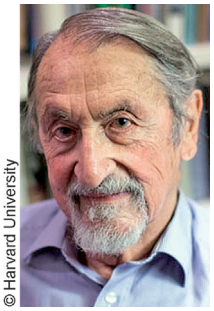
Nobel Prizes 2013



M. Karplus

M. Levitt

A. Warshel

Chemistry

The Nobel Prize in Chemistry 2013 has been awarded to Martin Karplus (Université de Strasbourg and Harvard University), Michael Levitt (Stanford University), and Arieh Warshel (University of Southern California) "for the development of multiscale models for complex chemical systems". The methods developed by the laureates couple classical and quantum mechanical theory. At the Weizmann Institute of Science, Warshel and Levitt had developed a technique that could model large biological molecules. Karplus and his group at Harvard University were interested in designing computer programs that used quantum theory to simulate chemical reactions. When Warshel moved to Karplus' laboratory as a postdoctoral researcher, they worked together produce a program that could calculate the spectra of planar molecules by using both classical and quantum chemical approaches. This work was the foundation in the use of hybrid methods to model complex systems, and was further developed by Levitt and Warshel to model an enzymatic reaction. The use of quantum mechanics/molecular (QM/MM) mechanics methods in biomolecular reactions was reviewed in *Angewandte Chemie* just a few years ago.[1]

Martin Karplus studied at Harvard University and worked with Linus Pauling at the California Institute of Technology for his PhD, which was awarded in 1953. After postdoctoral work with Charles Coulson at University of Oxford (1953–1955), he held faculty positions at the University of Illinois, Harvard University, and Columbia University. He is currently professeur conventionné at the Université de Strasbourg and Theodore Richards Professor of Chemistry Emeritus at Harvard University. Karplus is interested in the electronic structure, geometry, and dynamics of molecules of chemical and biological interest.[2]

Michael Levitt studied at King's College London and received his PhD from the MRC Laboratory of Molecular Biology (LMB) and the University of Cambridge in 1971. After a postdoctoral research fellowship with Shneior Lifson at the Weizmann Institute of Science (1972–1974), and working as a staff scientist at the LMB (1974–1979), he joined the faculty at the Weizmann Institute of Science in 1980. He was made Professor of Structural Biology at Stanford University in 1987. Levitt's research is focused on the use of physical, computational, and biological methods for the prediction of protein structures.

Arieh Warshel studied at the Technion–Israel Institute of Technology and the Weizmann Institute of Science, and received his PhD from the latter institution in 1969 for work supervised by Shneior Lifson. After postdoctoral work with Martin Karplus at Harvard University, he subsequently returned to the Weizmann Institute and also worked at the LMB (1972–1976). He joined the faculty at the University of Southern California in 1976, and is currently Distinguished Professor of Chemistry and Biochemistry. Warshel is interested in biophysical chemistry, including computer simulations of biological molecules.[3]

Physics

The Nobel Prize for Physics 2013 was awarded to Peter W. Higgs (University of Edinburgh) and François Englert (Université Libre de Bruxelles) for their work on the theory of how particles acquire mass. This theory, which is central to the Standard Model of particle physics, was proposed independently by the laureates (Englert in collaboration with his late colleague Robert Brout) in 1964, and was confirmed in 2012 by the discovery of the Higgs boson.

Medicine or Physiology

The Nobel Prize in Medicine or Physiology 2013 has been awarded to James E. Rothman (Yale University), Randy W. Schekman (University of California, Berkeley), and Thomas C. Südhof (Stanford University) "for their discoveries of machinery regulating vesicle traffic". Rothman was recognized for his work in elucidating how vesicles dock and fuse with their targets, Schekman identified the genetic basis of cellular transport systems, and Südhof's work on nerve cells in the brain explained how vesicles can release their cargo when triggered.

[1] H. M. Senn, W. Thiel, *Angew. Chem.* **2009**, *121*, 1220; *Angew. Chem. Int. Ed.* **2009**, *48*, 1198.

[2] a) C. M. Dobson, A. Šali, M. Karplus, *Angew. Chem.* **1998**, *110*, 908; *Angew. Chem. Int. Ed.* **1998**, *37*, 868; b) H. Guo, Q. Cui, W. N. Lipscomb, M. Karplus, *Angew. Chem.* **2003**, *115*, 1546; *Angew. Chem. Int. Ed.* **2003**, *42*, 1508.

[3] a) M. P. Frushicheva, A. Warshel, *ChemBioChem* **2012**, *13*, 215; b) S. C. L. Kamerlin, J. Florián, A. Warshel, *ChemPhysChem* **2008**, *9*, 1767.

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