
USC Distinguished Professor Arieh Warshel Wins 2013 Nobel Prize in Chemistry



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USC Distinguished Professor Arieh Warshel

Distinguished Professor Warshel of the USC Dornsife College of Letters, Arts and Sciences received this year's Nobel Prize, along with Harvard's Martin Karplus and Stanford's Michael Levitt, with whom he collaborated earlier in his career. Professor Warshel joined USC's faculty as an assistant professor in 1976.

Beginning in the 1970s, long before computers were commonplace, Professor Warshel and his colleagues created numerical simulations of molecules, which enabled them to examine these particles even more minutely and rigorously. This dramatically deepened our understanding of complex chemical reactions, such as combustion and photosynthesis, and has significantly improved the design of new drugs.



Yael Warshel, Tamar Warshel, 2013 Nobel Prize winner in chemistry Arieh Warshel, USC President C. L. Max Nikias, USC Provost Elizabeth Garrett.

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Announcing the award in Stockholm, Staffan Normark, permanent secretary of the Royal Swedish Academy of Sciences, said, “This year’s prize is about taking the chemical experiment to cyberspace.”

At its simplest, the computational techniques the three pioneered—working out their first ideas on a vintage Harvard supercomputer called “the Golem,” after the creature of Jewish folklore—today allow chemists in fields from pharmaceuticals to photosynthesis to test sophisticated theoretical chemical reactions by simulating them on a computer first. That allows experimenters to work more quickly, cheaply, and efficiently.

—from *The Wall Street Journal*

The New York Times

“It’s like seeing a watch and wondering how it actually works,” Dr. Warshel said. “So in short, what we developed is a way, which required a computer, to take the structure of a protein and then to eventually understand how exactly it does what it does.”

They found that they could not understand the behavior of the enzyme without including the effects of the surrounding molecules — water, in particular. “This was really, in my view, the conceptual breakthrough,” Dr. Warshel said. “I realized that everything you want to do with computers could be done if you make it simple enough. We wrote in a way that did not require too much memory.”

—from *The New York Times*



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Distinguished Professor Arieh Warshel is congratulated by President Nikias.

Chemists used to create models of molecules using plastic balls and sticks. Today, the modelling is carried out in computers. In the 1970s, Martin Karplus, Michael Levitt and Arieh Warshel laid the foundation for the powerful programs that are used to understand and predict chemical processes. Computer models mirroring real life have become crucial for most advances made in chemistry today.

Chemical reactions occur at lightning speed. In a fraction of a millisecond, electrons jump from one atomic nucleus to the other. Classical chemistry has a hard time keeping up; it is virtually impossible to experimentally map every little step in a chemical process. Aided by the methods now awarded with the Nobel Prize in Chemistry, scientists let computers unveil chemical processes, such as a catalyst's purification of exhaust fumes or the photosynthesis in green leaves.

—*from Science Daily*

BUSINESS INSIDER

“Chemistry is an experimental science but today theoretical chemists are providing answers to complex questions,” the committee said. These theoreticians “are working together with experimentalists to understand [the world around us].”

Some of the applications include the creation of drugs and understanding photosynthesis—the way in which plants turn carbon dioxide, water, and light into sugar and oxygen. The actual inner workings of these processes is invisible to the naked eye and happen in a split second.

—*from Business Insider*



PHOTO BY MINNIE HO

On the morning of October 9, Professor Warshel received congratulatory calls from around the world. Israeli Prime Minister Benjamin Netanyahu asked Professor Warshel to describe the significance of his work, and Professor Warshel's one-minute explanation was so effective that the prime minister said he would now expect all his advisers to explain everything in the same speedy manner.



PHOTO BY GUS RUELAS

At USC's press conference, Professor Warshel charmed everyone with his humor. When asked how he persevered over the decades, and maintained his drive and focus, he shrugged and said, "I had nothing else to do."



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1 Distinguished Professor Warshel (left) took questions from the press. **2** When USC's Distinguished Professor George Olah (right) won the Nobel Prize in Chemistry in 1994, the Warshels' daughter, Yael, was a reporter for the *Daily Trojan*. It was she who photographed him for the story. Now, 19 years later, Professor Olah sat in the front row, warmly cheering her father, his venerable colleague, and USC's newest Nobel laureate.