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George A. Olah Award In Hydrocarbon Or Petroleum Chemistry

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Mitch Jacoby

Courtesy of Peter Stair

Stair

Vanishingly thin surface films—often just a molecule or two thick—can dominate the properties of solids. The reactivity and selectivity of solid catalysts, for example, is critically dependent on the intricacies of the outermost layers, which are notoriously difficult to characterize and control.

Since the 1970s, that's exactly where Northwestern University chemistry professor **Peter C. Stair** has focused his research talents, which his colleagues respect immeasurably. "He is among the most skilled experimentalists working on the surface chemistry of hydrocarbons," says Bruce C. Gates of the University of California, Davis. Gates adds that Stair is "the rare individual who knows the field of catalysis well and combines his knowledge with physical chemistry to get to the heart of reactions on surfaces."

Hans-Joachim Freund, professor and director of the Fritz Haber Institute of the Max Planck Society in Berlin, points out that many of the sophisticated techniques used in Stair's laboratory were also invented there. One example is the use of azomethane to generate methyl radicals and deposit them on catalytic surfaces. That versatile technique enabled Stair's group to probe methyl groups' surface chemistry, which deepened understanding of C–C bond-forming reaction mechanisms.

Another key example is Stair's seminal advances in Raman spectroscopy, an analytical technique of limited scope in catalysis research prior to his innovations due to seemingly insurmountable fluorescence interference. By developing instrumentation, procedures, and a novel reactor system that permits catalysts to be probed in situ with UV Raman spectroscopy, Stair contributed a powerful analytical tool to catalytic science. Experts agree that virtually no other technique can probe the catalyst, reactants, and products in a single measurement and under reaction conditions.

In a series of pioneering studies with the UV Raman method, Stair identified reaction intermediates during zeolite-driven conversion of methanol to hydrocarbons as well as various types of carbonaceous (coke) deposits that accumulate on catalyst surfaces. He also used the technique to elucidate the structure and chemical nature of catalytically active sites and to deduce critical relationships between catalyst structure and performance in

hydrocarbon conversion reactions.

Stair, 60, completed his undergraduate education at Stanford University in 1972 and earned a Ph.D. at UC Berkeley in 1977, working with noted surface scientist Gabor A. Somorjai. He began his academic career that year at Northwestern, where he has mentored nearly 60 graduate students and postdoctoral researchers and has published more than 175 articles in scholarly books and journals.

In addition to holding a Northwestern faculty position, Stair is a senior scientist at Argonne National Laboratory and serves as director of two Northwestern research organizations: the Center for Catalysis & Surface Science and the Institute for Catalysis in Energy Processes.

Stair is the recipient of numerous awards and honors, including the Alexander von Humboldt Senior Scientist Award and the Alfred P. Sloan Fellowship. He has served on the editorial and advisory boards of *Langmuir*, *Catalysis Letters*, and other journals, and as a guest professor at Dalian Institute of Chemical Physics in China.

Stair will present the award address before the Division of Catalysis Science & Technology (Probationary).

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