networks and kinetics of hydroprocessing reactions under near-industrial conditions. For example, the group conducted pioneering studies of hydrodesulfurization, hydrocracking, and aromatic hydrogenation reactions.

One area with which Gates's name is synonymous is supported metal cluster catalysis. Gates's group has published on the topic broadly. But as Texas A&M University professor emeritus Jack H. Lunsford puts it, a "quintessential example" of the group's work in cluster catalysis is described in a 2002 paper in *Nature*. In that study, Gates's group combined X-ray absorption spectroscopy, IR spectroscopy, and catalytic measurements of hydrogenation of ethene and propene to demonstrate that the hydrocarbons and catalyst-support material both function as ligands that modify bonding and catalytic properties of supported Ir_4 clusters. According to Lunsford, "The methodology and results establish a protocol for bridging the gap between homogeneous and heterogeneous catalysis."

In addition to the reputation built from a career's worth of laboratory work, Gates is also well known for writing authoritative textbooks, including "Chemistry of Catalytic Processes," which has been translated into several languages, and "Catalytic Chemistry."

Gates, 63, graduated from UC Berkeley in 1961 with a bachelor's degree in chemical engineering. In 1966, he received a Ph.D. degree in chemical engineering from the University of Washington, Seattle. Following a postdoctoral research fellowship at the University of Munich's Institute of Physical Chemistry, Gates returned to the U.S., where he served as a research engineer at Chevron Research in Richmond, Calif., near his hometown.

In 1969, Gates began his academic career as an assistant professor in chemical engineering at the University of Delaware. He was promoted to professor in 1977, the same year he was appointed associate director of Delaware's Center for Catalytic Science & Technology. From 1981 to 1988, Gates served as the center's director. In 1992, the California native returned to the West Coast as professor of chemical engineering and materials science at UC Davis.

The award address will be presented before the Division of Petroleum Chemistry.—MITCH JACOBY

ACS Award in the Chemistry of Materials

Sponsored by E. I. Du Pont de Nemours & Co.

No one has done more to advance basic research at the nanoscale toward practical applications than **Charles M. Lieber,** Mark Hyman Professor of Chemistry at Harvard University. According to numerous colleagues, in the past decade he has established himself as the world's leader in the fabrication and study of electronically functional nanostructures.

"Charles has gone farther, I believe, than anyone else in making the case for the bottom up—that is, chemical—approach to functional nanostructures," says Harvard chemistry professor George M. Whitesides. "Both the materials he is synthesizing and the strategies that he is demonstrating will have enormous impact on the future of materials science. It may also change device physics and perhaps, ultimately, electronics in a most profound way."


Lieber

Lieber, 44, began his work in nanoscience with studies of the materials that, in many ways, have sparked the current nanotechnology frenzy—carbon nanotubes. His research systematically examined carbon nanotubes from the point of view of someone interested in the electronic properties of matter. His work and that of a handful of others demonstrated that carbon nanotubes are very complicated entities, with small differences in structure having major implications on properties. Despite these difficulties, Lieber has fashioned nanotubes into a number of primitive electronic devices.

More recently, Lieber has expanded his horizons to traditional semiconductor materials. For example, he has been able to grow nanowires of single crystalline silicon and compound semiconductors, which are electronically much simpler than carbon nanotubes. "In a burst of papers published in the last two years," Whitesides notes, "Charles has demonstrated a host of important, archetypical devices, all fabricated by crossing nanowires of one or another material: diodes, transistors, light-emitting diodes. His work has already laid the foundation for a decade of work in this area by the field of nanodevices physics."

Lieber's early research career focused on the use of scanning tunneling and atomic force microscopies to characterize a wide range of materials. He turned to efforts to craft nanoscale devices because of the enormous potential they offer.

"With nanoscience—it's not a technology, yet—I truly believe that one has the opportunity to change many technologies as they exist today," Lieber says. "Moreover, nanoscience will lead to new technologies we haven't even envisioned." Lieber says that nanoscience represents a fundamental change in how one builds things, a bottom-up paradigm that uses chemistry to mold inorganic materials in much the way biology has always created organic structures.

"What we are doing, in essence, is defining the syntheses and properties of new nanoscale structures—wires and other building blocks," Lieber says. "It is becoming clear to me that one can build in functional diversity by varying structure and composition with molecular precision. Likewise, we are learning how to organize this matter in making proof-of-concept devices from sensors to circuits to photonic devices."

The materials Lieber is working with, he says, are "slightly bigger than molecules; they are inorganic analogs of proteins. Proteins are functional, but not in an electronic or photonic sense. The materials we are working with are of sufficient size to have robust electronic properties. And we are able to build in desired properties with the precision that chemists are used to."

Lieber received a B.A. in chemistry in 1981 from Franklin & Marshall College and a Ph.D. in chemistry in 1985 from Stanford University. After a postdoctoral fellowship at Caltech, he joined the chemistry department at Columbia University in 1987. He moved to Harvard as a professor of chemistry in 1991.

Lieber is a fellow of the International Union of Pure & Applied Chemistry, the American Association for the Advancement of Science, and the American Physical Society. He has received numerous awards, including the Feynman Prize in Nanotechnology in 2001 and the ACS Award in Pure Chemistry in 1992.

The award address will be presented before the Division of Physical Chemistry.—RUDY BAUM

ACS Award for Research at an Undergraduate Institution

Sponsored by Research Corp.

Chemistry undergraduates at the University of Texas, El Paso, are in for an adventure