Molecular scientist to be honored by Chemical Society

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MOLECULAR SCIENTIST TO BE HONORED BY CHEMICAL SOCIETY

Jay S. Siegel is a molecular "architect" whose fascination with the shape and structure of organic molecules has in itself helped reshape established ideas in his chosen field of chemistry. Siegel, professor of chemistry at the University of California, San Diego (UCSD) will be honored Aug. 24 by the American Chemical Society for his research contributions to molecular design, chemical synthesis and structural analysis.

He will be among 10 scientists to be presented the prestigious Arthur C. Cope Scholar Award at the Society's national meeting in Boston. The award includes $5,000 and an unrestricted research grant of $40,000. The American Chemical Society is the world's largest scientific society.

A recognized authority in molecular design, Siegel, with his research group at UCSD, in 1995 became the first to successfully alter, or distort, the shape of the benzene molecule the most common of the aromatic (hexagon-shaped) molecules. This milestone, which had been attempted unsuccessfully for 60 years, was accomplished by localizing the pi electrons, thereby altering the chemical bond in the molecule's hexagonal form and classic snowflake-like symmetry.

"The work established a new paradigm for perturbing the structure and hence modifying the reactivity of aromatic systems," Chemical & Engineering News magazine reported this year.

Siegel's research has current and future application possibilities in such fields as drug design, electronics, computer technology and telecommunications.

Using structure, form and control as his watchwords, Siegel approaches his work with the eye of an architect or sculptor. "There is an artistic, or aesthetic, side to this science as well," he explains with obvious excitement. "Designing and reshaping molecules allows us to test materials' limits in ways which bring out novel chemical properties, so I begin each project fascinated by a new unusual structural shape or form, whether it be something highly symmetrical or completely grotesque."

The element of control is also important, says Siegel, and is what initially attracted him to chemistry. "It's amazing what you can control on the molecular level. You have all these atoms bouncing all over the place, and although you have no direct manual control over them, with the right chemical technology you can coax them to adopt very specific molecular shapes, arrangements and attachments," he says.

One such "work in progress" involves a set of trefoil knot-shaped molecules that Siegel and his team are designing to explore the metal-binding capabilities of molecules (The trefoil knot is similar in shape to the three-sided overhand knot). Replicating the intricate shape of the trefoil at the molecular level using metals as templating agents, a daunting task, could shed light on how collections of metals cluster together, and potentially lead to a better understanding of how electrons are transmitted between metals.

However the aesthetic challenge of the project surfaces when Siegel asks with a smile, "How many molecules in nature do we know of that are shaped like knots? Other than DNA and maybe proteins, it's zero."

Siegel received his B.S. degree in chemistry from California State University, Northridge in 1980, and his M.A. and Ph.D. degrees in chemistry from Princeton University in 1982 and 1985, respectively. He is the recipient of numerous honors in science and is a fellow with the American Association for the Advancement of Science. The author or co-author of 70 published articles in chemistry, Siegel joined the UCSD faculty in 1986.

The American Chemical Society, founded in 1876, is a nonprofit organization of more than 155,000 chemists and chemical engineers. Chartered by a 1937 act of the U.S. Congress, it is recognized as a world leader in fostering science education and research, and in promoting public understanding of science.

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