

ACCOUNTS *of* CHEMICAL RESEARCH®

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GUEST EDITORIAL

Molecular Architectures

The realization that simple molecular building blocks contain the information needed to assemble an astounding array of new chemical architectures has captured the imagination of chemists across the discipline. From porous metal-organic frameworks to molecular boxes, from engineered crystals to quantum dots, “shake and bake” has given way to design principles that arm the imaginative architect with blueprints for constructing novel materials across organic and inorganic chemistry. As the cover photo suggests, engineering, art, and architecture are coming together in a way that makes us aware of the endless frontier that is modern synthetic chemistry.

The Molecular Architectures special issue celebrates this accomplishment with 16 Accounts of how we arrived at the present state of the art. This is in no small part due to our ability to identify and manipulate the weaker forces of chemistry. Serendipitous self-assembly still plays a role, but chemists have become increasingly clever at using labile coordinate bonds and supramolecular chemistry to create grand order and complexity from random piles of small molecular components. Among these building components, one finds many simple and familiar molecules: porphyrins, fullerenes, multifunctional heterocycles, metal complexes (particularly cyano complexes), silsesquioxanes, oxyanions, catechols, chalcogenide clusters, multifunctional carboxylates, and multi-hydrogen-bonding molecules. New building materials are undoubtedly still lying around waiting to be exploited.

There are important underlying principles at work when small molecules assemble into large structures. In more than one of the present Accounts, authors reveal the guiding hand that physical principles and natural law plays in directing the development of macroscopic structure. The molecular architects and engineers of the future will increasingly find that they need to understand these principles to design new materials.

This has set the stage for the next era, making beautiful structures into functional constructs. I confess to a joy at simply stopping to marvel at the beauty of molecular architecture. Anyone who walks up to the new home of the Los Angeles Philharmonic illustrated on the front cover would do the same. However, eventually, we must go

inside the structure and make it useful. In a number of the present Accounts, you can find out how chemistry and physics can become quite different when confined to architecturally new space. It is music to our ears.

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