Seminario

Università degli Studi di Padova
Dipartimento di Scienze Chimiche

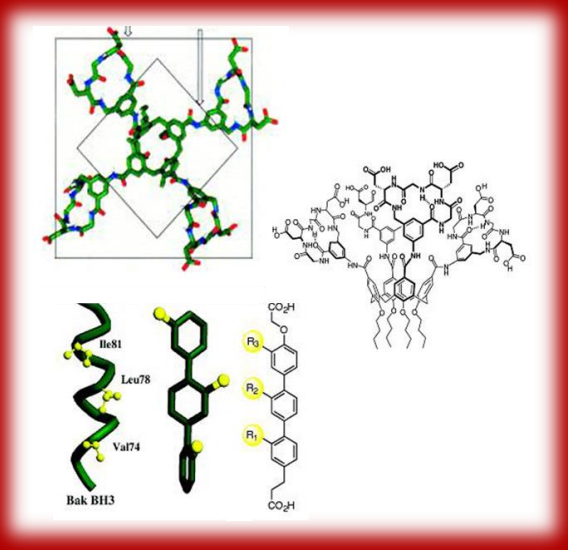
Ciclo di Seminari 'Frontiers in Chemistry'

Prof. Andrew D. Hamilton

President Emeritus
New York University
andrew.hamilton@nyu.edu

Adventures in Supramolecular Chemistry

Venerdì 8 settembre 2023, ore 11.00
Aula Nasini



Controlling intermolecular interactions through precisely positioned hydrogen bonding groups was one of the first goals of supramolecular chemistry. Our first studies on the antibiotic vancomycin led to new insights into the role of hydrogen bonding and π-stacking interactions in molecular recognition.
These studies formed the basis of another important research area, namely the design of artificial enzymes. This work showed that selectivity for high-energy intermediates or transition states on a reaction pathway can be built into synthetic receptors. Using this strategy large accelerations in a number of rections important in both organic and biological chemistry were achieved, including the Diels-Alder reaction, phosphate ester hydrolysis, and transacylation, as well as photoinduced energy transfer in multichromophore aggregates.
More recently the focus moved to the design of synthetic agents that bind and recognize the exterior surfaces of proteins. In particular, they have shown that hydrophobic interactions can be used to stabilize α-helices and by designing non-peptidic oligomers (foldamers) that fold into extended sheet or helical conformations. Small synthetic receptors that complement the functional groups on an α-helix surface can bind in a sequence and secondary structure selective fashion. This has led to a new concept in enzyme inhibitor design in which the exterior of the protein instead of the active site is targeted and a new family of potent antiproliferative agents that block the interaction of growth factors with their cell surface receptors in animal models of human cancer.
This fundamental investigation of protein surface recognition has now expanded into a major new program aimed at determining the structural requirements for disrupting protein-protein interactions. Various protein binding agents are revealing new arenas of biological chemistry centered on protein-protein disruption, sensing and remarkable room temperature and stoichiometric denaturation of proteins.

Prof. Michele Maggini
Direttore del Dipartimento di Scienze Chimiche

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