

Talk abstract:

“Design and realization of nanostructures that accomplish multiple useful functions”

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Discrete transition metal oxide cluster molecules with tunable sizes, reduction potentials, charges and shapes can be incorporated into more complex molecules, nanoarrays, metal-organic-frameworks (MOFs) and giant clusters by fairly systematic syntheses. These processes involve a combination of traditional synthesis of functional mono-cluster units and also self assembly of these units into the larger (supramolecular, nanosize) structures that exhibit additional sought capabilities (selective recognition, sorption, detection, etc.). Specific systems to be described are as follows:

- (1) Nanoarrays that sequester, detect and catalytically destroy toxic target molecules. The arrays are approximately $20 \times 20 \text{ nm}^2$ and constituted by triesterified $\{V_6O_{19}\}$ units.
- (2) Metal organic frameworks that catalyze air-only oxidations. These like the nanoarrays above are unique materials of potential value in air purification, chemical warfare agent decontamination, and other applications.
- (3) Giant clusters with up to 100 delocalized electrons and commensurate unusual magnetic properties of potential value MRI and quantum computing.
- (4) Multi-Ru and Mn clusters that catalyze the oxidation of H_2O to O_2 , the likely success-limiting factor in splitting H_2O to $H_2 + O_2$ using sunlight. (Water splitting is of global interest given both energy and environmental concerns of our current fossil-fuel-dependent economies and societies.)

Craig L. Hill

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EDUCATION

STANFORD UNIVERSITY, 1976-1977, NSF Postdoctoral Fellow (R. H. Holm, advisor)
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, June, 1975, Ph.D., Chemistry (G. M. Whitesides, advisor)
UNIVERSITY OF CALIFORNIA, SAN DIEGO, June, 1971, B.A. High Honors

CURRENT POSITION: The Goodrich C. White Professor, Emory University, Department of Chemistry (1996-present)

HONORS AND HONORARY SERVICE (since 1995 only)

Wilsmore Fellow, University of Melbourne, Australia, 2007; Stranks Memorial Lecturer, 2007; Fellow, American Association for the Advancement of Science (AAAS), 2006; Fellow, Distinguished Fellow, Victoria Institute of Chemical Sciences (VICS), Australia, 2006; Chair and organizer, NSF Inorganic Workshop, 2007-2009; co-organizer of NATO Workshop on Complexity, 2007; ACS Southern Chemist Award, 2002; Nominator for 1992-2007 Nobel Prizes in Chemistry; Professeur associé à l'Université de Strasbourg, 2002; Host, International Conference on Homogeneous Catalytic Oxidation, June, 2002; Professeur associé à l'Université de Lille, 2000; Professeur associé, University of Paris, 1997; USDA National Group Honor Award for Excellence in Research, 1996; Albert E. Levy Science Research Award (Sigma Xi), 1996; Senior Award, Alexander von Humboldt Foundation, 1994; Charles H. Stone Award of the ACS, 1992; National Science Foundation Graduate Fellowship Program, Chair, Chemistry Panel, 1994-1996; Editor for North America, *New Journal of Chemistry*, 1990-1997; a corporate advisory board, and international organizing committees for 3 conferences, 1995-present

SCIENTIFIC INTERESTS

- Design, preparation and investigation of large complex inorganic molecules and nanomaterials with specific structural, electronic and/or dynamic features of intellectual or practical significance.
- Self repairing catalytic materials.
- Multifunctional nanomaterials.
- Physical, chemical, and biological properties of polyoxometalates and charged nanoclusters.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Chemical Society, Royal Society of Chemistry, IUPAC, Sigma Xi, von Humboldt Foundation; Honorary (Fellow): VICS, AAAS

EDITORIAL BOARDS AND EDITING (partial list)

Editorial Advisory Board, *Reaction Kinetics and Catalysis Letters*; Editorial Board, *J. Molecular Catalysis, A: Chemical* (2001-present); International Advisory Board, Molecular Engineering – Supramolecular Science & Technology (2000-2001); Evaluation of the chemistry articles in *Nature* (1998-1999); Guest Editor of special edition of *Chemical Reviews* (1995-1998), Associate Editor for North America, *New Journal of Chemistry* (all fields) (1990-1997); Editorial Board, *Inorganic Chemistry* (1991-1993); Guest Editor, *J. Molecular Catalysis* (1995–1996 and 2005-2007);

RECENT/CURRENT RESEARCH SUPPORT: NSF, DOE, DoD (primarily ARO), NIH, industry

THESES AND POSTDOCS UNDER DIRECTION OF C. L. HILL: ~90

PUBLICATIONS: ~275 total **INVITED LECTURES:** 345; **PATENTS SINCE 1997:** ~31