



Harry Gray is the Arnold O. Beckman Professor of Chemistry and the Founding Director of the Beckman Institute at the California Institute of Technology. After

graduate work at Northwestern University and postdoctoral research at the University of Copenhagen, he joined the chemistry faculty at Columbia University, where in the early 1960s he developed ligand field theory to interpret the electronic structures and substitution reactions of metal complexes. After moving to Caltech in 1966, he began work in biological inorganic chemistry and solar photochemistry, including the development of inorganic systems for energy storage. Working with Ru-modified proteins in the early 1980s, he demonstrated that electrons can tunnel rapidly over long molecular distances through folded polypeptide structures; and, in the years following, he and J. R. Winkler developed laser flash-quench methods that opened the way for experimental investigations that have led to a deeper understanding of the mechanisms of electron flow through proteins that function in respiration and photosynthesis.

Gray has published over 750 research papers and 17 books. He has received the National Medal of Science from President Ronald Reagan (1986), the Pauling Medal (1986), the Linderström-Lang Prize (1992), the Gibbs Medal (1992), the Harvey Prize (2000), the National Academy of Sciences Award in Chemical Sciences (2003), the Benjamin Franklin Medal in Chemistry (2004), the Wolf Prize in Chemistry (2004), the City of Florence Prize in Molecular Sciences (2006), the Welch Award in Chemistry (2009), six national awards from the American Chemical Society, including the Priestley Medal (1991), and 16 honorary doctorates, including ones from Pennsylvania, Chicago, Columbia, Florence, Copenhagen, and Edinburgh. He is a member of the National Academy of Sciences, the American Academy of Arts and Sciences, the American Philosophical Society, a foreign member of the Royal Danish Academy of Sciences and Letters, the Royal Swedish Academy of Sciences, the Royal Society of Great Britain, and the Accademia Nazionale dei Lincei. He has been a member of the Board of Directors of the Arnold and Mabel Beckman Foundation since 1994.

3M Lecturers

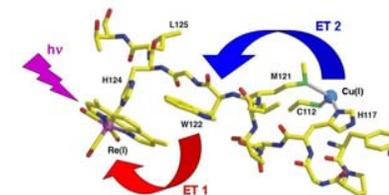
1962	Sir Derek H. R. Barton, Imperial College
1963	Sir Ronald Nyholm, University College
1964	F. C. Tompkins, Imperial College
1965	S. Winstein, U.C.L.A.
1966	F. A. Cotton, M.I.T.
1967	J. O. Hirschfelder, Wisconsin
1968	A. Eschenmoser, E.T.H, Switzerland
1969	H. Taube, Stanford
1970	S. A. Rice, Chicago
1971	F. H. Westheimer, Harvard
1972	R. G. Pearson, Northwestern
1973	W. A. Klemperer, Harvard
1974	G. Stork, Columbia
1975	R. J. P. Williams, Oxford
1976	J. A. Morrison, McMaster
1977	D. Arigoni, E.T.H., Switzerland
1978	J. Chatt, Sussex
1979	J. A. Pople, Carnegie-Mellon
1980	W. P. Jencks, Brandeis
1981	J. Halpern, Chicago
1982	Sir John Meurig Thomas, Cambridge
1983	R. Breslow, Columbia
1984	M. L. H. Green, Oxford
1985	D. R. Hershbach, Harvard
1986	J. M. Lehn, Strasbourg
1987	M. H. Chisholm, Indiana
1988	R. A. Marcus, Cal. Tech.
1989	D. J. Cram, U.C.L.A.
1990	D. Seyferth, M.I.T.
1991	D. A. Shirley, Berkeley
1992	K. U. Ingold, NRC
1993	H. Schmidbauer, Munich
1994	A. J. Bard, U. Texas, Austin
1996	R. Huisgen, Munich
1998	J. M. J. Fréchet, Berkeley
1999	R. W. Field, M.I.T.
2000	I. Dance, New South Wales
2001	K. C. Nicolaou, San Diego
2002	R. R. Birge, Connecticut/Syracuse
2003	D. Fenske, Karlsruhe
2004	A. Padwa, Emory
2005	N. Dovichi, Washington State
2006	K. N. Raymond, Berkeley
2007	K. Tamao, RIKEN and Kyoto University
2008	P. Corkum, NRC, Ottawa
2009	D. Astruc, Univ. Bordeaux
2010	Harry B. Gray, Cal. Tech.



The UNIVERSITY of WESTERN ONTARIO

The 3M University Lecturer
in Chemistry
2010

Harry B. Gray
Arnold O. Beckman
Professor of Chemistry
California Institute of Technology



May 2 - 4, 2011

<http://www.cce.caltech.edu/faculty/gray/>

Contact

Mike Kerr 519-661-2111 ext. 86354

makerr@uwo.ca

Sandy McCaw 519-661-2111 ext. 86350

smccaw@uwo.ca

Our website: <http://www.uwo.ca/chem/>

Prof. Harry B. Gray will present 3 lectures:

Monday, May 2nd, 2011
4 p.m.
3M Building
Room 3250

REFRESHMENTS WILL BE SERVED
PRIOR TO THE LECTURE

Lecture 1

The 21st Century Solar Army

The sun is a boundless source of clean energy, but it goes down every night. We and many others are trying to design solar-driven molecular machines that could be used on a global scale to store solar energy by splitting water into its elemental components, hydrogen and oxygen. Hydrogen is a clean fuel that could be used directly or combined with carbon dioxide to produce methanol, a liquid fuel. We are working on rugged light absorbers and catalysts made from Earth abundant materials that have the potential to split water as efficiently as natural photosynthesis. We have recruited hundreds of students to join a Solar Army whose mission is the discovery of brand new metal-oxide catalysts for solar water splitters.

Tuesday, May 3rd, 2011
4 p.m.
3M Building
Room 3250

REFRESHMENTS WILL BE SERVED
PRIOR TO THE LECTURE

Lecture 2

Electron Flow Through Proteins

Electron transfers in photosynthesis and respiration commonly occur between metal-containing cofactors that are separated by large molecular distances. Understanding the underlying physics and chemistry of these biological electron transfer processes is the goal of much of the work in my laboratory. Employing laser flash-quench triggering methods, we have shown that 20-angstrom, coupling-limited Fe(II) to Ru(III) and Cu(I) to Ru(III) electron tunneling in Ru-modified cytochromes and blue copper proteins can occur on the microsecond timescale both in solutions and crystals. Redox equivalents can be transferred even longer distances by multistep tunneling, often called hopping, through intervening amino acid side chains. In recent work, we have found that 20-angstrom hole hopping through intervening aromatic residues is several hundred-fold faster than single-step electron tunneling in a Re-modified blue copper protein, *Pseudomonas aeruginosa* azurin. The lessons we have learned about the control of electron tunneling and hopping through biological molecules are now guiding the design and construction of sensitizer-modified redox metalloenzymes and other molecular machines for the production of fuels and pharmaceuticals from sunlight and water.

Wednesday, May 4th, 2011
11 a.m.
3M Building
Room 3250

REFRESHMENTS WILL BE SERVED
PRIOR TO THE LECTURE

Lecture 3

The Oxo Wall

The dianionic oxo ligand occupies a very special place in coordination chemistry, owing to its ability to donate pi electrons to stabilize high oxidation states of metals. The ligand field theory of multiple bonding in metal-oxos, which was formulated in 1961, predicts that there must be an "oxo wall" between Fe-Ru-Os and Co-Rh-Ir in the periodic table. I will discuss this early work as well as new developments in the field. In particular, I will make connections between the electronic structures and reactivities of biologically important metal-oxos, including Fe-oxos in the catalytic cycle of cytochrome P450 and Mn-oxos in the oxygen evolving complex of photosynthesis.