

**UND UNIVERSITY OF
NORTH DAKOTA
CHEMISTRY DEPARTMENT**



The 2006 Abbott
Chemistry
Lectures

University of North Dakota
Chemistry Department
Abbott Hall
Grand Forks, North Dakota
<http://www.und.edu/dept/chem/mainpage.html>

March 2 & 3, 2006

Dr. Malcolm Chisholm



Malcolm H. Chisholm was born in Bombay, India (1945) to Scottish parents and educated in England, Canford School and Queen Mary College, London. He received his Ph.D. in 1969 under the direction of Professor D. C. Bradley and did post-doctoral studies at the University of Western Ontario with Professor H. C. Clark. After academic appointments at Princeton University and Indiana University, he assumed his current position at The Ohio State University in 2000 where he is Distinguished Professor of Mathematical and Physical Sciences.

PREVIOUS

GEORGE A. ABBOTT LECTURERS

- 1963 Dr. Nelson Leonard, University of Illinois
- 1964 Dr. Robert West, University of Wisconsin
- 1965 Dr. Robert Parry, University of Michigan
- 1966 Dr. Ralph G. Pearson, Northwestern University
- 1967 Dr. Harold J. Bernstein, N.R.C. Ottawa, Canada
- 1968 Dr. Edward L. King, University of Colorado
- 1969 Dr. David N. Hume, Mass. Institute of Technology
- 1970 Dr. Ronald Breslow, Columbia University
- 1971 Dr. Arnold C. Wahl, Argonne Laboratory
- 1972 Dr. John L. Margrave, Rice University
- 1973 Dr. Cheves Walling, University of Utah
- 1974 Dr. Fred McLafferty, Cornell University
- 1975 Dr. Daryle H. Busch, Ohio State University
- 1976 Dr. Hans H. Jaffe, University of Cincinnati
- 1977 Dr. Roald Hoffmann, Cornell University
- 1978 Dr. H.C. Brown, Purdue University
- 1979 Dr. Leo A. Paquette, Ohio State University
- 1980 Dr. Robert E. Sievers, University of Colorado
- 1981 Dr. Dietmar Seyferth, Mass. Institute of Technology
- 1982 Dr. Koji Nakanishi, Columbia University
- 1983 Dr. Melvin Calvin, University of California-Berkeley
- 1984 Dr. Gabor A. Somorjai, University of California-Berkeley
- 1985 Dr. Harry B. Gray, California Institute of Technology
- 1986 Dr. Allen J. Bard, University of Texas at Austin
- 1987 Dr. William J. Bailey, University of Maryland
- 1988 Dr. Mark S. Wrighton, Mass. Institute of Technology
- 1989 Dr. Peter B. Dervan, California Institute of Technology
- 1990 Dr. Robert H. Grubbs, California Institute of Technology
- 1991 Dr. Andrew Streitwieser, Univ. of California-Berkeley
- 1992 Dr. Marye Anne Fox, University of Texas at Austin
- 1994 Dr. Kendall N. Houk, University of California, LA
- 1995 Dr. Edward Yeung, Iowa State University
- 1997 Dr. Henry F. Schaefer, III, University of Georgia
- 1999 Dr. Tobin J. Marks, Northwestern University
- 2000 Dr. Alexander Pines, University of California-Berkeley
- 2001 Dr. Paul A. Wender, Stanford University
- 2002 Dr. Samuel H. Gellman, University of Wisconsin
- 2003 Dr. Victor J. Hruby, University of Arizona
- 2004 Dr. William H. Miller, University of California-Berkeley
- 2005 Dr. Barry K. Carpenter, Cornell University

George A. Abbott

1874-1973

Dr. George Alonzo Abbott, Professor Emeritus at the University of North Dakota, had a long and fruitful career of service to the State of North Dakota and the science of Chemistry. He was born July 7, 1874, in Alma, Illinois. Dr. Abbott received both the B.S. and M.A. pro merito from DePauw University. From 1896 until 1904 he taught chemistry in high schools in Evansville, Indiana; Duluth, Minnesota; and Indianapolis, Indiana. In 1903, through a contact with Professor Talbot, he received the Austen Research Fellowship at Massachusetts Institute of Technology. Under the guidance of A. A. Noyes, Professor of Physical Chemistry at M.I.T., he received the Ph.D. in 1908. In this first class of doctorates in chemistry were such notables as Edward Washburn, Charles Kraus and Richard Tolman. Dr. Abbott joined the chemistry staff of the North Dakota Agricultural College (North Dakota State University) in 1909. In 1910 he was appointed Professor and Chairman of the Department of Chemistry at the University of North Dakota. His devotion to teaching and the application of chemistry for the betterment of North Dakota was one of his outstanding contributions. His interests in quality water and in natural products such as lignite, for which North Dakota is recognized, gave him national recognition. For half a century he was the only toxicologist in a wide area of the upper midwest. He found time to do a weekly radio program "Science from the Sidelines" which was broadcast for over twenty years. Professor Abbott was a founder and charter member of the North Dakota Academy of Science. He was a member of the Red River Valley Section of the American Chemical Society, a Fellow of the American Institute of Chemists, member of Sigma Xi, and a charter member of the University of North Dakota Phi Beta Kappa chapter. Dr. Abbott retired from administration in 1948 and from teaching in 1952. He continued toxicological work until 1970.

The George A. Abbott Lectureship was established by gifts from the University of North Dakota Alumni.

His research interests include the chemistry of complexes with metal-metal multiple bonds, the use of alkoxide and related δ -donor ligands in organometallic chemistry, molecular routes to materials and the development of catalysts for the preparation of biodegradable and biocompatible polymers from readily renewable resources.

He is author or coauthor of over 500 publications and has received several awards for his research including the Awards for Inorganic Chemistry and Distinguished Service to Inorganic Chemistry of the American Chemical Society and the Centenary and Ludwig Mond Lectureships of the Royal Society of Chemistry. He is a Fellow of the Royal Society, London, American Academy of Arts & Sciences, the German Academy of Natural Sciences – Leopoldina, and the recipient of the Davy Medal of the Royal Society. He was elected to the membership in the National Academy of Sciences and a member of the Royal Society of Edinburgh. He has served as Associate Editor for the Americas for *Chemical Communications*, *Dalton Transactions*, the inorganic journal *Polyhedron* and has held several positions of office within the American Chemical Society including Chair of the Division of Inorganic Chemistry.

Thursday March 2, 7:00 PM

*“Routes to New Generation Polymers
Employing Single-site Metal
Alkoxide Catalysts.*

*Polyesters, Polyethers and Polycarbonates
from Renewable Resources.”*

The limited world supply of oil and the ever-increasing demand for its consumption will profoundly affect mankind in many ways. Currently, greater than 90% of all commodity chemicals are fossil-fuel based. We can anticipate a move away from a hydrocarbon-based chemical industry towards one based on renewable resources. In terms of plastics or synthetic polymers, we will see a move toward polyoxygenates. Polyesters can be prepared from the ring-opening polymerization of cyclic esters derived from biomass, and polyethers by the ring-opening polymerization of Natures's oxiranes. The current production of polycarbonate by the toxic and environmentally-hazardous use of phosgene and *bis*-phenol-A will surely be replaced by a process involving the regular alternating coupling of an oxirane and carbon dioxide. In all these endeavors, metal-oxygen bonds will play a key role.

In this talk, I will review current research endeavors aimed at the preparation of polyesters, polyethers and polycarbonates employing single-site metal

Friday March 3, 12:00 PM

*“Electronic Coupling Involving Carboxylate
Links and MM Quadruple Bonds,
Where M = Mo and W. M₂ ä to
Ligand ð-Conjugation”*

The preparation of covalently-linked MM quadruply-bonded complexes of molybdenum and tungsten has been achieved through the use of dicarboxylate ligands. These new compounds are dimers of “dimers” or cyclo-trimers and -tetramers of “dimers” or extended chains of “dimers” and they have interesting electronic structures that relate to M₂ ä-to-bridge ð-bonding. They are redox active and show solvato-, thermo- and electro-chromism. The degree of electronic coupling is manifest by the EPR spectra, UV-vis-near IR and Raman spectroscopies in the products of oxidation, the radical cations. The use of thienyl, bi- and ter- and penta-thienyl carboxylate and dicarboxylate ligands provides a new class of polythiophenes incorporating MM quadruple bonds in the polymer backbone or as side chain appendages.