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MATERIALS AND MOLECULAR RESEARCH DIVISION. INVESTIGATORS

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Lawrence Berkeley National Laboratory

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AND
MOLECULAR
RESEARCH
DIVISION
INVESTIGATORS

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April 1982

Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

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MATERIALS AND MOLECULAR
RESEARCH DIVISION
INVESTIGATORS

Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

Prepared for the U.S. Department of Energy under Contract DE-AC03-76SF00098

INTRODUCTION

The Materials and Molecular Research Division (MMRD) of the Lawrence Berkeley Laboratory is an interdisciplinary basic research center in which is pursued a broad spectrum of investigations in metallurgy, ceramics, solid-state physics, chemistry, atomic physics, nuclear science, and chemical, mechanical, nuclear, and ceramic engineering. An important component of MMRD is the National Center for Electron Microscopy, which is operated as a user facility for the community of U.S. scientists and engineers.

MMRD is not only a major research center, but also an important educational resource. In addition to full-time LBL personnel, the MMRD staff include some 56 members of the University of California Berkeley faculty and more than 360 graduate students from six academic departments of the University. About 160 postdoctoral students and scholars from around the world participate in MMRD research.

Brief descriptions of MMRD investigators and their current scientific interests are provided on the pages that follow. Research programs at MMRD are primarily supported by the United States Department of Energy. Additional funding is provided by industrial organizations and other government agencies.

For further information contact any
of the following:

Alan W. Searcy, Division Head and
Associate Director, LBL.

Rolf Muller, Assistant Division
Head for Research

Conway Peterson, Assistant Division
Head for Administration,

or

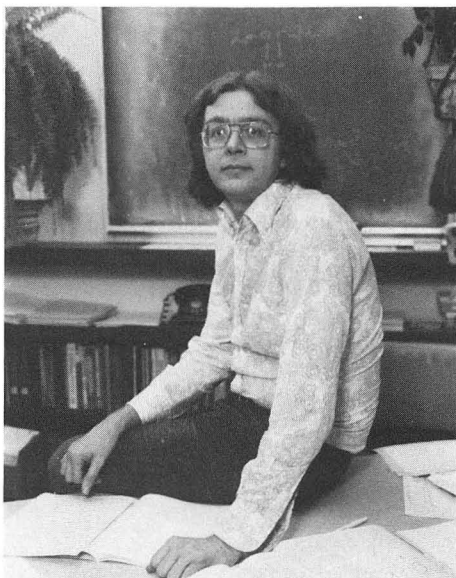
Gareth Thomas, Scientific Director
National Center for Electron
Microscopy

Materials and Molecular Research
Division,

Lawrence Berkeley Laboratory
Berkeley, California, 94720
(415) 486-6062

RICHARD A. ANDERSEN
Chemistry

SYNTHETIC INORGANIC AND ORGANOMETALLIC CHEMISTRY



EDUCATION

BA, University of South Dakota
PhD, University of Wyoming

SOCIETIES

Royal Society, London
American Chemical Society

PROFESSIONAL ACTIVITIES

Assistant Professor of Chemistry

SCOPE OF RESEARCH

Research in synthesis of lanthanide and actinide inorganic and organometallic compounds to understand structure-bonding and reactivity patterns.

Preparation of compounds with actinide to carbon bonds and exploring the extent to which these compounds can act as stoichiometric or catalytic reagents.

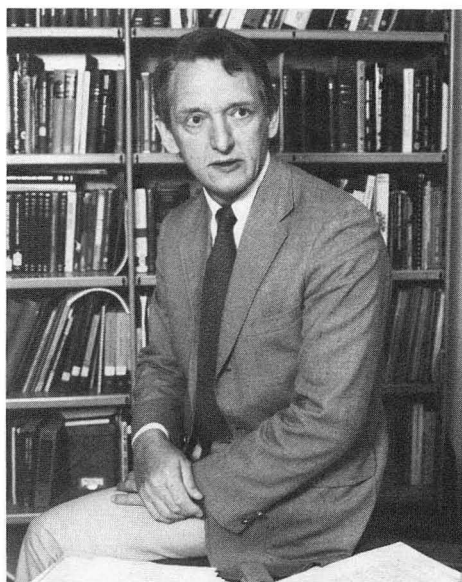
Preparation of actinide-hydride compounds and their reaction with organic molecules with emphasis upon their mechanisms.

Search for new materials that contain transition metal to actinide or lanthanide metals within the same molecular species; clusters and their potential towards further reaction chemistry.

Synthesis of lanthanide and actinide molecules with bonds to non-classical ligands, i.e., phosphorus and sulfur.

Structural (solution and solid state) and bonding trends in inorganic and organometallic molecules.

DELOCALIZED-ELECTRON SOLIDS AND HIGH ENERGY OXIDIZERS



high-oxidation-state species to further understanding of chemical bonding and mechanism of formation of simple chemical species.

Intercalation of graphite and other layer materials to provide insight into the factors that control intercalation; the extent to which graphite and its relatives can be oxidized or reduced reversibly; the impact of such oxidation or reduction upon the normally high electrical conductivity of such materials and the application of them as electrodes in cells and batteries.

EDUCATION

BSc and PhD, King's College,
University of Durham, England

SOCIETIES

Royal Society, London
American Chemical Society
American Crystallographic Association

AWARDS AND HONORS

Research Corporation Award, 1965
Dannie-Heineman Prize of the
Göttingen Academy, 1971
Inorganic Chemistry Award, ACS, 1971
Robert A. Welch Award, 1976
Honorary doctorates: Bordeaux,
Newcastle, Waterloo, Colby
National Academy of Sciences
American Academy of Arts and Sciences

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Chairman, Fluorine Division, 1973,
Inorganic Chemistry Division, 1977,
Solid-State Subdivision, 1982, of
the American Chemical Society
Member, Advisory Panels, National
Bureau of Standards and National
Academy of Sciences, 1968-1980

SCOPE OF RESEARCH

Research in synthesis and structural
characterization of new materials
with emphasis on new or unusual

Synthesis and physical and chemical
characterization of new two-
dimensional materials (e.g., in-
plane hybrids of boron nitride and
graphite) in an effort to tailor-
make band gaps.

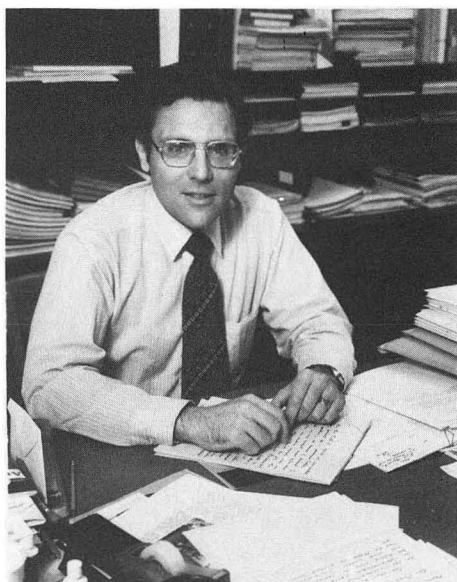
Search for new solid fluoride-ion and
proton conductors for use in
electrochemical cells with
powerfully oxidizing graphite-salt
electrodes; involving correlation of
ion-mobility studies with structural
studies to guide in the selection
and synthesis of possible ion
conductors.

Application of highly oxidizing two-
dimensional metals (such as certain
graphite salts) as cathodes in the
electrochemical synthesis of novel
chemical species.

Exploration of highly oxidizing cations
(e.g., KrF^+ , C_6F_6^+) in salts in
the electron-oxidation of delocalized-
electron species (molecular and
polymeric) in the synthesis of
metallic materials.

ALEXIS T. BELL
Chemical Engineering

HETEROGENEOUS CATALYSIS



Assistant Dean, College of Chemistry,
UCB, 1979-81

Associate Editor, Catalysis Reviews--
Science and Engineering, 1980--

California Catalysis Society,
President, 1980-81

Dielectrics and Insulation Division,
Electrochemistry Society: Treasurer,
1979-80; Secretary, 1978-79

SCOPE OF RESEARCH

Heterogeneously catalyzed reactions
with emphasis on experimental
elucidation of reaction mechanisms
involved in carbon monoxide
hydrogenation and interpretation of
reaction kinetics: mechanistic
models.

Characterization of the structure and
reaction dynamics of adsorbed
species through the use of in situ
infrared spectroscopy.

Effects of metal-support interactions
on catalyst activity and
selectivity: studied by application
of XPS and vibrational
spectroscopies.

Mass transfer effect of the catalytic
synthesis of hydrocarbon from carbon
monoxide and hydrogen in slurry
reactors: theoretical and
experimental studies.

Metal halide catalyzed liquefaction
of coal: mechanistic studies.

EDUCATION

SB and ScD, Massachusetts Institute of
Technology

SOCIETIES

American Chemical Society
American Institute of Chemical
Engineers
Electrochemical Society

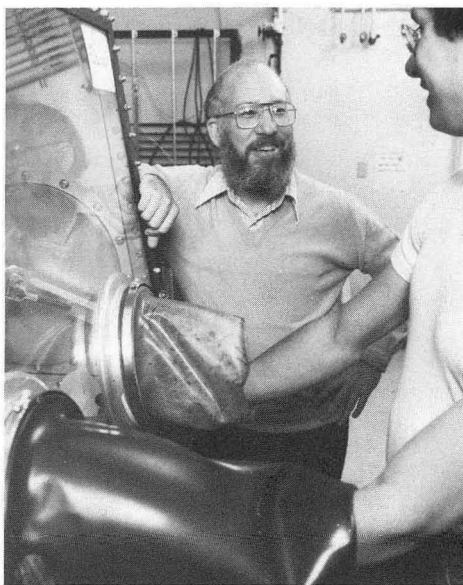
AWARDS AND HONORS

American Society of Engineering
Education, Curtis W. McGraw Research
Award

PROFESSIONAL ACTIVITIES

Professor of Chemical Engineering
Chairman, Department of Chemical
Engineering, University of
California Berkeley (UCB), 1981

METAL-INDUCED TRANSFORMATIONS OF ORGANIC COMPOUNDS



EDUCATION

BA, Carleton College
PhD, University of Wisconsin

SOCIETIES

American Chemical Society
The Chemical Society, Great Britain

AWARDS AND HONORS

Phi Beta Kappa, 1963
National Institutes of Health
Predoctoral Fellow, 1964-66
Sigma Xi, 1966
North Atlantic Treaty Organization
Postdoctoral Fellow, 1966-67
Fellow of the Alfred P. Sloan
Foundation, 1969
Camille and Henry Dreyfus Foundation
Teacher-Scholar Award, 1970
Miller Foundation Professorship,
University of California, Berkeley,
1982-83.

PROFESSIONAL ACTIVITIES

Professor of Chemistry

SCOPE OF RESEARCH

Carbon-carbon bond forming reductive elimination reactions and carbon and hydrogen group transfer reactions occurring between cyclopentadienyl-cobalt(I) complexes and unsaturated molecules such as olefins, CO, and acetylenes.

Reactions of mononuclear and cluster alkyls with hydrogen gas to produce alkanes and metal hydrides.

Carbon-hydrogen bond forming reactions occurring on interaction of organo-transition metal alkyls and acyls with metal hydrides.

Synthesis and reactions of dinuclear dialkyl complexes, with special emphasis on metallacyclic systems containing two metal atoms in the ring.

Development of carbon-nitrogen bond forming reactions using nitric oxide contained in organotransition metal nitrosyl complexes, via migratory insertion of complexed NO into metal carbon-bonds, and addition of metal nitrosyls to olefins.

Laser pyrolysis of tetralin and other hydrocarbons used as hydrogen donors in coal liquefaction; studies of free radicals and diradical intermediates.

Metal-mediated transfer of hydrogen between saturated and unsaturated hydrocarbons.

STRUCTURE AND ELECTRICAL PROPERTIES OF COMPOSITE MATERIALS



Chairman, Department of Materials
Science and Mineral Engineering,
University of California Berkeley,
1981

SCOPE OF RESEARCH

Carbon materials, especially hard
carbons rather than easily
graphitized carbons, glassy carbon
prototype.

Correlation of microstructure and
electrical properties as a function
of heat treatment temperatures and
times to determine kinetics
governing evolution of electronic
structure and microstructure.

Description of microstructure obtained
by wide-angle x-ray diffraction
(crystallite or lathe size and
crystallographic plane spacings);
small-angle x-ray scattering (radius
of gyration and surface area of
inhomogeneities such as voids); x-ray
radial distribution analysis (rela-
tive position of carbon atoms and
thus nature of bonds between them).

Microstructural data collected for
heat treated pyrolytic graphite as a
standard; processes of coarsening
(vacancy diffusion) and graphitiza-
tion anticipated to be similar to
processes in glassy carbon.

Electrical conduction, magneto-
resistance, and Hall effect obtained
with 6-point specimen probe,
alternating electric current at
constant cryogenic temperature, and
constant magnetic field.

Scope to expand to coals and less
refined carbons, and to intercalated
components and other high technology
graphite compounds.

EDUCATION

BS, MS, PhD, Illinois Institute of
Technology

SOCIETIES

American Physical Society
American Crystallographic Association
American Society for Metals
American Ceramic Society
American Association for the
Advancement of Science
Sigma Xi, Sigma Pi Sigma, Tau Beta Pi
American Institute of Mining and
Metallurgical Engineers
American Carbon Society
American Association of University
Professors

AWARDS AND HONORS

Percy Lavon Julian Memorial Lecture
Award, 1979

PROFESSIONAL ACTIVITIES

Professor of Materials Science

HIGH TEMPERATURE THERMODYNAMICS



EDUCATION

BS, California Institute of Technology
PhD, University of California Berkeley

SOCIETIES

American Chemical Society
American Optical Society
American Physical Society
Coblentz Society
Combustion Institute
Electrochemical Society
International Plansee Society
for Powder Metallurgy
Royal Society of Chemistry
The Metallurgical Society of AIME

AWARDS AND HONORS

Leo Hendrick Baekeland Award, 1953
National Academy of Sciences
E. O. Lawrence Award, AEC, 1961
Electrochemical Society Lecturer, 1970
Palladium Medalist, Electrochemical
Society, 1971
Distinguished Alumni Award, Cal Tech,
1974

W. D. Harkins Lecturer, University of
Chicago, 1974
Oak Ridge National Laboratory
Lecturer, 1979
American Academy of Arts and Sciences

PROFESSIONAL ACTIVITIES

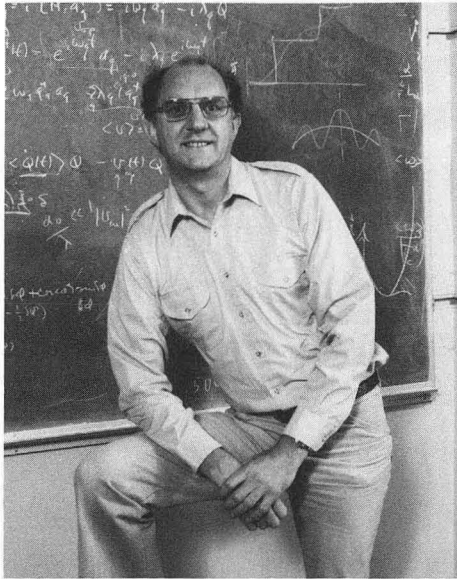
Professor of Chemistry
Associate Editor, Journal of Chemical
Physics, 1959-63
Head, Inorganic Materials Research
Division, LBL 1961-75
USAF Science Advisory Board on Basic
Research, US Army Research (Durham),
1964, and six advisory boards for
other federal agencies.
Member, US Delegation for US-Japan
Science Program, 1965 and 1973
Associate Director, LBL 1967-75
Committee on High-Temperature Science
and Technology, NRC-NAS 1975-, and
five other NRC-NAS committees
Division Editor, Journal of the
Electrochemical Society, 1976-
International Council on Alloy Phase
Diagrams, 1978-, and six other
international committees
Basic Energy Sciences Laboratory Panel
of DOE 1978-

SCOPE OF RESEARCH

Characterization of the high-
temperature chemical behavior of
materials, particularly refractory
ceramic materials, metals, and gases.
High-temperature thermodynamic
properties determined through use of
solid electrochemical cells,
solid-gas equilibria, and by x-ray
and metallographic characterization
of phase boundaries.
Data used to test and improve chemical
models capable of predicting
thermodynamic and elastic properties
of high-temperature materials.

JOHN CLARKE
Solid State Physics

SUPERCONDUCTIVITY, SUPERCONDUCTING DEVICES, MAGNETOTELLURICS



EDUCATION

BA, MA, PhD, University of Cambridge

SOCIETIES

American Physical Society
American Association for the
Advancement of Science

AWARDS AND HONORS

Alfred P. Sloan Foundation Fellowship
1971-72
Miller Institute of Research
Professor, University of California
Berkeley, 1975-76
Charles Vernon Boys Prize for Physics
1977 (award of the British Institute
of Physics)
John Simon Guggenheim Fellowship
1978-79
Best paper in Geophysics Award 1979

PROFESSIONAL ACTIVITIES

Professor of Physics
Vice Chairman, Department of Physics,
University of California Berkeley,
1974-75, 1976-78

SCOPE OF RESEARCH

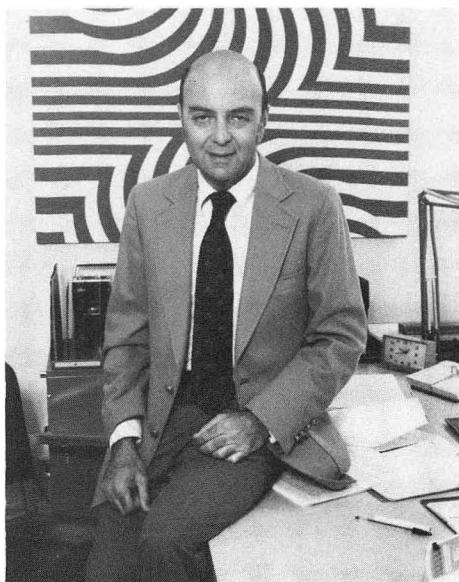
Research on nonequilibrium properties
of superconductors: measurement of
charge imbalance relaxation rate
leading to detailed information on
electron-phonon and electron
spin-flip relaxation rates; study of
the enhancement of superconductivity
by photons and phonons;
investigation of thermoelectric
effects in superconductors.

Research on Superconducting Quantum
Interference Devices (SQUIDS):
investigation of quantum noise
effects in Josephson junctions and
SQUIDS; development of quantum-noise
limited SQUID amplifiers; applica-
tions of SQUIDS to measurement of
tiny voltages, magnetic fields, and
magnetic field gradients.

Research on flicker (1/f) noise in
thin metal films and SQUIDS.

Application of SQUIDS to geophysics:
magnetotelluric measurements of the
surface electrical resistance of the
earth using remote reference
technique; investigation of the
resistance of the earth in the
vicinity of geothermal sources at
depths down to 10 km; development of
new techniques to measure naturally
occurring magnetic gradient
fluctuations at the earth's surface.

THEORETICAL SOLID STATE PHYSICS



EDUCATION

AB, University of California Berkeley
MS and PhD, University of Chicago

SOCIETIES

American Physical Society (Fellow)

AWARDS AND HONORS

Alfred P. Sloan Fellow, 1965-67
Professor, Miller Institute for Basic
Research in Science, University of
California Berkeley, 1969, 1976
Guggenheim Fellow, 1978
Oliver E. Buckley Prize for Solid
State Physics, 1979
National Academy of Sciences

PROFESSIONAL ACTIVITIES

Professor of Physics
Executive Council of the Division of
Solid State Physics of APS, 1975-79;
Chairman, 1977

U.S. Representative to the Semi-
conductor Commission of IUPAP,
1975-81

Chairman, Executive Committee, Miller
Institute for Basic Research in
Science, University of California
Berkeley, 1977-81

Oliver E. Buckley Prize Committee,
1980-81; Chairman, 1981

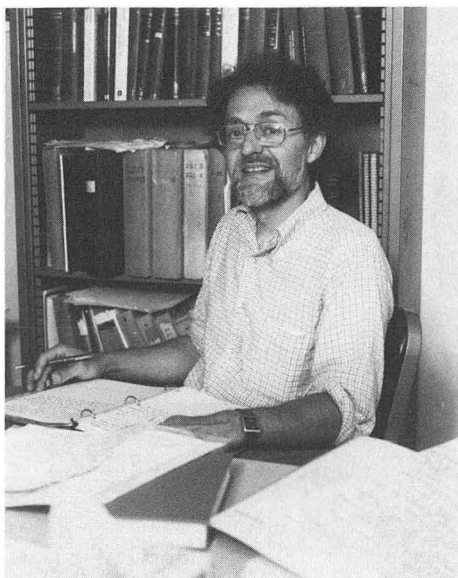
SCOPE OF RESEARCH

Theory of the electronic and
structural properties of solids:
optical, photoemissive,
superconducting, vibrational, phase
transitions, and surfaces.
Development of theoretical
techniques in condensed matter
physics with emphasis on
pseudopotential theory.

EUGENE D. COMMINS

Atomic Physics

WEAK INTERACTIONS, ATOMIC PHYSICS



Chairman, Physics Department,
University of California Berkeley,
1972-74

Associate Editor, Reviews of Modern
Physics

National Research Council Panel on
Atomic Physics, National Academy of
Sciences

SCOPE OF RESEARCH

Experimental physics, mainly at the
borderline between elementary part-
icle physics and atomic/nuclear
physics.

Work has included radio-frequency
spectroscopy of hydrogen-like atoms
(Lamb shift, hyperfine structure);
spins and magnetic moments of radio-
active nuclei; beta decay asymmetries
of polarized nuclei, tests of time-
reversal invariance, observations of
parity violation in atoms due to
neutral weak currents; tests of local
hidden variable theories and Bell's
inequality by observation of correla-
tions of photon polarizations;
optical spectroscopy by laser
methods. Present research devoted
to refinement of measurements of
parity violation in atoms due to
neutral weak currents.

Author of "Weak Interactions,"
McGraw-Hill, 1973; presently writing
a new version, incorporating gauge
theories and other modern
developments, to be published by
Cambridge University Press.

EDUCATION

BA, Swarthmore College
PhD, Columbia University

SOCIETIES

American Physical Society
American Association for the
Advancement of Science

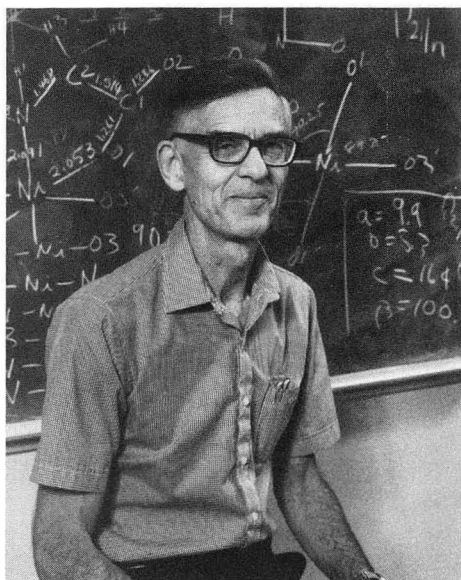
AWARDS AND HONORS

RCA Fellowship, 1955-56
Union Carbide & Carbon Fellowship,
1956-57
Alfred P. Sloan Fellowship, 1962-66
Guggenheim Fellowship, 1967-68

PROFESSIONAL ACTIVITIES

Professor of Physics

KINETICS AND EQUILIBRIA OF INORGANIC REACTIONS



EDUCATION

BS and PhD, University of California
Berkeley

SOCIETIES

American Chemical Society
Sigma Xi
Phi Beta Kappa

AWARDS AND HONORS

Guggenheim Fellowships, 1948, 1958

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Chairman, Department of Chemistry,
University of California Berkeley,
1958-60
Dean, College of Chemistry 1960-65
Vice Chancellor, Academic Affairs
1965-67
The Vice Chancellor, 1969-71
Chairman, Berkeley Division of
Academic Senate, 1974-76
Vice Chairman, Academic Council and
Statewide Assembly, 1981

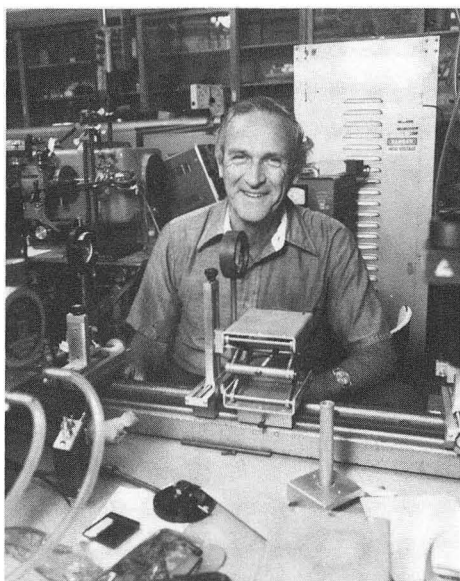
Co-Chairman, Committee on Chemical
Sciences, National Research Council,
1977-80

SCOPE OF RESEARCH

Rates of replacement of ligands in the
first coordination sphere of metal
ions in aqueous solution studied by
nuclear magnetic resonance.
Computer modeling of exchange reactions
from the first coordination sphere
of metal ions to understand better
the mechanistic course of such
reactions in a condensed phase.
Mechanisms of complex inorganic
reactions, including photochemical
and chain reactions.
Identification, characterization, and
stability of inorganic species, such
as S(IV) in solution, hydrolyzed
Cr(III) polymers, and ruthenium in a
variety of oxidation states.

JOHN G. CONWAY
Nuclear Chemistry

OPTICAL SPECTROSCOPY OF THE ACTINIDE AND RARE EARTH ELEMENTS



EDUCATION

BS, University of Pittsburgh

SOCIETIES

Optical Society of America (Fellow)
American Physical Society
Society for Applied Spectroscopy
American Association for the
Advancement of Science

AWARDS AND HONORS

Louis A. Strait Award, Northern
California Section of the Society
for Applied Spectroscopy, 1978
William F. Meggers Award, Optical
Society of America, 1980
Visiting Scientist, Institut de
Physique Nucleaire and Laboratoire
Aime Cotton, Orsay, France, 1973-74;
1979-80

PROFESSIONAL ACTIVITIES

Staff Senior Scientist
Committee on Line Spectra of the
Elements, National Academy of
Sciences, National Research Council
Board of Directors, Optical Society of
America

Chairman, Atomic Spectroscopy

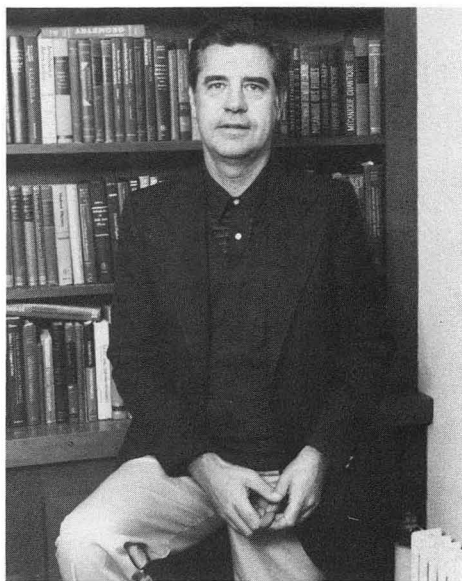
Technical Council, Optical Society
of America

General Chairman, Pacific Conference
on Chemistry and Spectroscopy and
Annual Meeting of the Optical
Society of America, sponsored by the
Optical Society of America, American
Chemical Society, and Society for
Applied Spectroscopy, 1964, 1966,
and 1972

SCOPE OF RESEARCH

Observations of the spectra of the
atoms and atomic ions of the
elements thorium, uranium,
neptunium, plutonium, americium,
curium, berkelium, californium, and
einsteinium; derivation of
electronic configurations of atoms.
Absorption and fluorescence of ions in
solids; spectra of ions into
well-known positions in single
crystals and energy levels of
electronic configurations to atomic
and crystal parameters.

LOCAL ATOMIC CONFIGURATIONS IN SOLID SOLUTIONS



EDUCATION

BS and MS, University of Louvain,
Belgium
PhD, Northwestern University

SOCIETIES

American Crystallographic Association
American Physical Society
American Institute of Metallurgical
Engineers
Societe Royale Belge des Ingenieurs et
Industriels

AWARDS AND HONORS

Argentine Atomic Energy Commission,
Visiting Lectureship, 1971
Institut National Polytechnique de
Grenoble, Visiting Professorship,
1979

Lecturer, Enrico Fermi School of
Physics, 1981

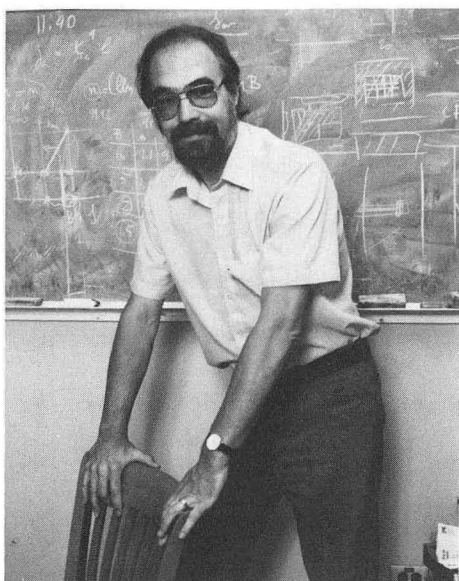
PROFESSIONAL ACTIVITIES

Professor of Metallurgy
Member, TMS/AIME Chemistry and Physics
of Metals Committee

SCOPE OF RESEARCH

Thermodynamics of solids, computation
of phase diagrams by statistical
mechanical methods.
Crystallography and thermodynamics of
order-disorder reactions; study of
local atomic arrangements.
X-ray diffraction and electron
microscopy studies of precipitation
in binary and ternary alloys.

CHEMICAL AND ELECTROCHEMICAL PROPERTIES OF CERAMICS



EDUCATION

BS, Higher Technical Institute,
Antwerp, Belgium
MAS, University of Delaware, Newark
PhD, University of California Berkeley

SOCIETIES

American Ceramic Society
National Institute of Ceramic Engineers
Ceramic Educational Council

PROFESSIONAL ACTIVITIES

Staff Senior Scientist
Associate Professor in Residence,
Materials Science
Chairman, Gordon Research Conference,
Solid State Studies in Ceramics, 1981
Editor, DOE Bulletin "Ceramics:
Science of Processing"
Technical Program Manager, Berkeley
Electrochemical Research Center

SCOPE OF RESEARCH

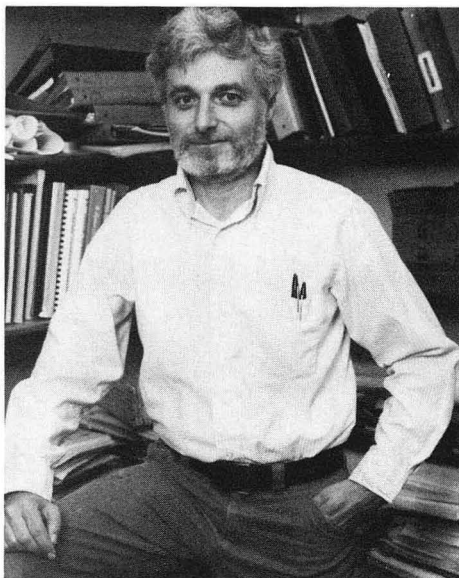
Research on gas/solid reactions that focuses on reduction of mixed oxides, such as CoFe_2O_4 and NiFe_2O_4 , by hydrogen and CO/CO_2 ; reaction kinetic measurements and microscopic observation used to examine reaction interface processes.

Transient liquid phases and enhanced grain boundary transport processes relating to ceramic fabrication.

Electrochemical behavior of solid electrolytes, including Na-beta" alumina and Nasicon, investigated with purpose of clarifying and improving electrolyte resistance to chemical and electrochemical degradation.

NORMAN M. EDELSTEIN
Chemistry

ACTINIDE CHEMISTRY



EDUCATION

BS, University of Illinois
PhD, University of California Berkeley

SOCIETIES

American Chemical Society
American Physical Society
American Association for the
Advancement of Science

AWARDS AND HONORS

NATO Senior Fellow, Oxford, 1972

PROFESSIONAL ACTIVITIES

Staff Senior Scientist
Group Leader, Actinide Chemistry

SCOPE OF RESEARCH

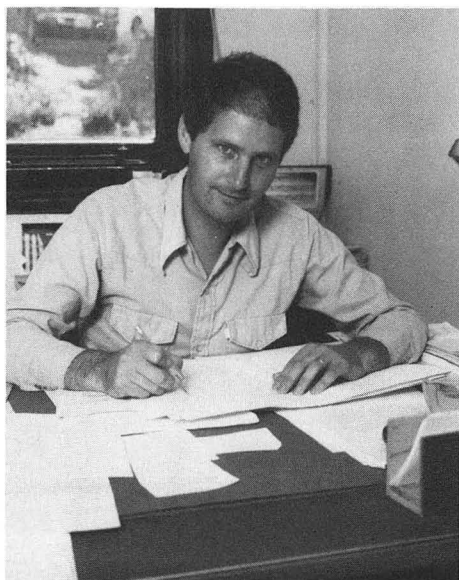
Electronic and magnetic properties of
f-transition element compounds,
including characterization by
magnetic and optical techniques.

Synthesis and structure of inorganic
and organometallic f-element
compounds.

Characterization of f-element species
in acidic, neutral, and basic
aqueous solutions, and the
development of techniques for this
purpose.

Electronic and magnetic properties of
d-transition element compounds.

MECHANICAL RELIABILITY OF CERAMICS



EDUCATION

BSc and PhD, Imperial College,
University of London

SOCIETIES

American Ceramic Society (Fellow)
American Institute of Metallurgical
Engineers

AWARDS AND HONORS

Matthey Prize, University of London
1967
Ross Coffin Purdy Award, 1974
Richard M. Fulrath Award, University
of California Berkeley, 1979
Robert Sosman Memorial Lecturer, 1981

PROFESSIONAL ACTIVITIES

Professor of Materials Science
Editor, Basic Science Division,
American Ceramic Society, 1974-76
Associate Editor, Materials Science and
Engineering, 1978-
Chairman, Gordon Conference on
Ceramics, 1978

Steering Committee, Materials Research
Council, 1976-

National Materials Advisory Board
Committees, National Academy of
Science, National Research Council
Program Chairman, Basic Sciences
Division, American Ceramic Society,
1973-74

SCOPE OF RESEARCH

Sources and mechanisms of mechanical
failure in ceramics over a broad
spectrum of microstructures to
establish a framework for assuring
structural reliability.

Studies of toughening mechanisms in
ceramics, associated with
microstructural changes at crack
tips, with the ultimate objective of
determining fundamental information
about crack-microstructure
interactions.

RATE PHENOMENA IN PROCESS METALLURGY



EDUCATION

BS, University of London
PhD, State University of New York
at Buffalo

SOCIETIES

American Institute of Mining,
Metallurgical, and Petroleum
Engineers
Electrochemical Society
Iron and Steel Institute of Japan

AWARDS AND HONORS

Extractive Metallurgy-Science Award of
AIME, 1973

PROFESSIONAL ACTIVITIES

Professor of Metallurgy
Chairman, Publications Committee
Metallurgical Transactions B, 1981-82
Chairman, Extractive Metallurgy Awards
Committee, AIME, 1980-81

SCOPE OF RESEARCH

Mathematical and physical modeling of
electrolytic cells (Hall cells) in
production of aluminum with
objective of reducing energy
consumption therein.

Investigation of behavior of fluidized
bed cathodes in electrodeposition of
metals from aqueous solution.
Application of this research in
production of copper, nickel,
cobalt, and other metals.

Use of the in situ technique at the
electron microscope to examine
relationship between microstructure
and solid reactivity in gas-solid
reactions; and microstructural
aspects of reactions of carbonaceous
material relevant to coal
liquefaction.

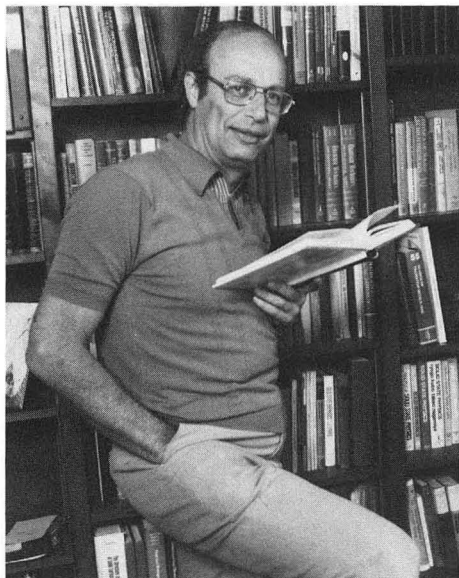
Monte Carlo simulation of diffusion of
gases in porous solids with
objective of providing means for
predicting diffusion rates from
first principles. Application
results in many energy technologies,
e.g., SO₂-sorption in coal
combustion, nuclear fuel enrichment.

Measurement (using Laser Doppler
velocimetry) and simulation of
velocities and mass transfer rates
in electrolytic cells for refining
of copper and other metals.

LEOPOLDO M. FALICOV

Solid State Physics

SOLID STATE THEORY AND THEORETICAL STUDIES OF ELECTRONIC PROPERTIES OF SOLID SURFACES



Professeur d'Echange, Université
de Paris, 1977

Miller Research Professor, University
of California Berkeley, 1979-80

PROFESSIONAL ACTIVITIES

Professor of Physics

Chairman, Department of Physics,

University of California Berkeley, 1981

Associate Editor, Physical Review
Letters, 1979-80

Associate Editor, Physical Review B,
1981-84

Chairman, Division of Condensed Matter
Physics, American Physical Society,
1980-84

EDUCATION

Licenciado en Química, University of
Buenos Aires, Argentina.

Licenciado en Física, Instituto
"J.A. Balseiro," University of Cuyo,
Argentina

Doctor en Física, Instituto "J.A.
Balseiro," University of Cuyo,
Argentina

PhD and ScD, University of
Cambridge, England

SOCIETIES

American Physical Society (Fellow)

Cambridge Philosophical Society
(Fellow)

British Institute of Physics (Fellow)

AWARDS AND HONORS

Alfred P. Sloan Foundation Fellow-
ship, 1964-68

Fitzwilliam College, Cambridge,
England Visiting Fellowship, 1966

Fulbright Fellowship, Columbia, 1969

OAS Fellowship, Argentina, 1970

NORDITA Visiting Professorship,
Copenhagen, Denmark, 1971-72

Fulbright Fellowship, Spain, 1972

Guggenheim Fellowship, 1976-77

Clare Hall, Cambridge, England,
Visiting Fellowship, 1976-77

SCOPE OF RESEARCH

Research on the electronic properties
of solids with special emphasis on
the Fermi surfaces of metals and
transport properties in high
magnetic fields.

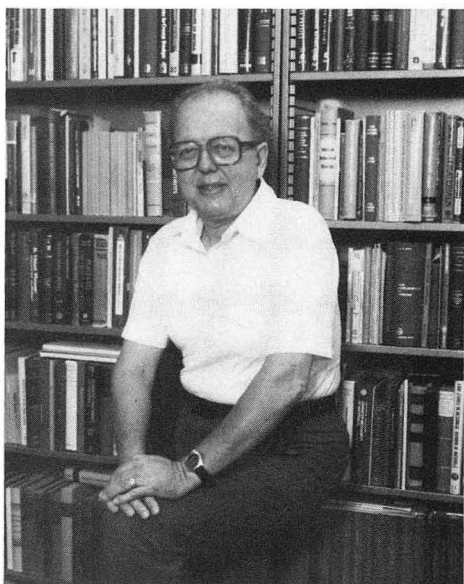
Electronic and optical properties
of semiconductors, in particular
the structure of complex impurities
and resonant Raman scattering.

Electronic, structural, magnetic and
chemical properties of solid sur-
faces, with applications to
catalytic reactions and analysis
of photoemission effects.

Electronic and structure properties
of disordered systems, with emphasis
on properties of alloys; study of
surface properties of alloys, includ-
ing segregation, chemical reactivity
and order-disorder transformations.

Superconductivity in metals and its
relationship to other order states:
ferromagnetism, antiferromagnetism,
and charge-density waves.

ABRASIVE, EROSIVE AND SLIDING WEAR OF MATERIALS



EDUCATION

BS, University of Glasgow
MS, ME and ScD, Massachusetts Institute
of Technology

SOCIETIES

American Society of Mechanical Engi-
neers
Institute of Mechanical Engineers
(London)
American Society for Testing and
Materials
Society for Experimental Stress Analysis

AWARDS

Guggenheim Fellowship, 1967
D.Sc. University of Glasgow, Scotland,
1974
National Academy of Engineering

PROFESSIONAL ACTIVITIES

Professor of Mechanical Engineering

Chairman, Department of Mechanical Engi-
neering, University of California
Berkeley, 1981

Technical Editor, American Society of
Mechanical Engineers, Journal of
Engineering Materials and Technology,
1975-78

SCOPE OF RESEARCH

Determination of the basic mechanisms of
abrasive, erosive and sliding wear.

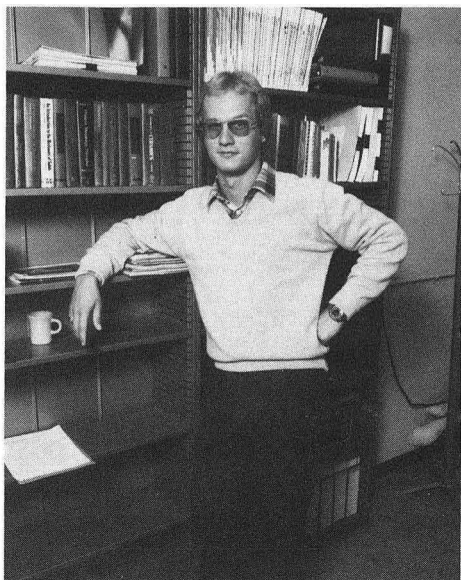
Identification of similarities and
differences in different types of wear
to allow development of simpler
screening tests.

Examination of material properties and
microstructural features needed for
optimum wear resistance.

Development of quantitative methods for
wear prediction for both single phase
and heterogeneous materials.

ANDREAS M. GLAESER
Ceramic Engineering

CERAMIC INTERFACES



EDUCATION

SB and ScD, Massachusetts Institute of
Technology

SOCIETIES

American Ceramic Society

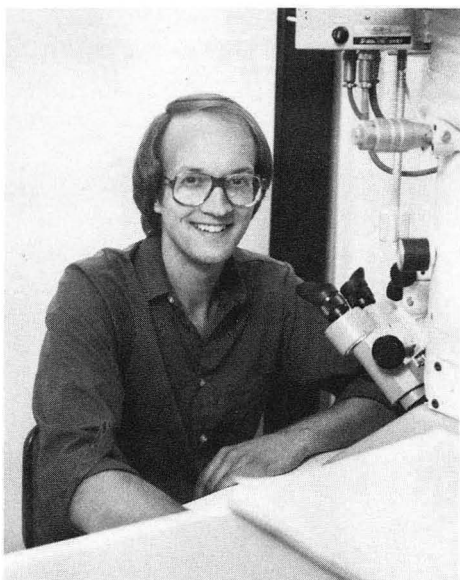
PROFESSIONAL ACTIVITIES

Assistant Professor of Ceramic
Engineering

SCOPE OF RESEARCH

Studies of grain boundary migration
behavior in ceramic oxides (especially
 Al_2O_3) in order to determine the
effect of temperature, driving force,
and solute content on the migration
rates; application of results to
description of microstructural
evolution during processing and/or
high temperature applications.

STRUCTURE AND PROPERTIES OF TRANSFORMATION INTERFACES



PROFESSIONAL ACTIVITIES

Staff Scientist
Manager, Atomic Resolution Microscope,
LBL

SCOPE OF RESEARCH

Establishment of the relationship between the atomic structure of crystalline interfaces and their roles in solid state transformations; modeling of atomistic processes involved in interfacial control of reactions.

Imaging of atoms in thin specimens by transmission electron microscopy; optimization of experimental parameters controlling contrast transfer during electron-optical imaging; computer simulation and optical processing for enhanced image contrast; application to intercrystalline and crystalline-amorphous boundaries.

Utilization of high spatial resolution chemical analysis by nanoprobe scanning transmission electron microscopy methods to relate compositional variations and microstructure on an atomic scale; studies of grain boundary and interfacial segregation and the influence of interfacial structure on these events.

Applications in the fields of phase transformations (mechanisms), electronic materials (MOS devices, amorphous semiconductors), catalysis (structure of reaction surfaces) and mechanical properties (grain boundary deformation and fracture).

Organization and operation of a user-oriented resource for transmission electron microscopy (NEMC).

EDUCATION

BS, University of Pittsburgh
MS and PhD, University of California
Berkeley

SOCIETIES

American Institute of Mining
Metallurgical and Petroleum Engineers
The Metallurgical Society
American Society for Metals
Electron Microscopy Society of America

AWARDS

Hertz Memorial Foundation Fellowship,
1973
Electron Microscopy Society of America
Presidential Scholarship, 1974
The John E. Dorn Memorial Award, UC
Berkeley, 1978
The R.L. Hardy Gold Medal TMS-AIME,
1979

CHARLES B. HARRIS

Chemistry

ENERGY TRANSFER AND STRUCTURAL STUDIES OF MOLECULES ON SURFACES



EDUCATION

BS, University of Michigan
PhD, Massachusetts Institute of
Technology

SOCIETIES

American Physical Society (Fellow)
American Chemical Society

AWARDS AND HONORS

Atomic Energy Commission Fellow, 1966-67
Award in Applied Spectroscopy, American
Optical Society, 1967
Alfred P. Sloan Fellow, 1970-74
Humboldt (Senior US Scientist) Award,
1980

PROFESSIONAL ACTIVITIES

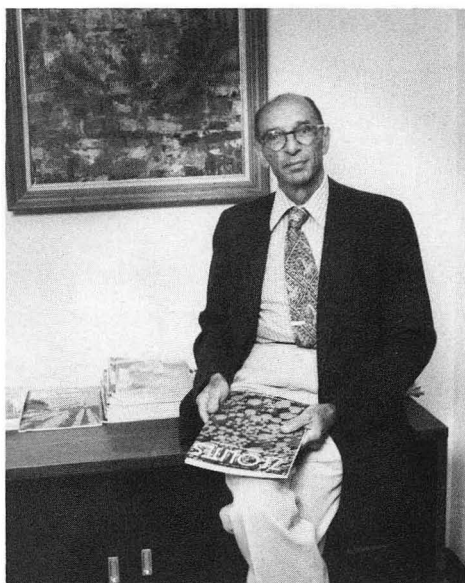
Professor of Chemistry

SCOPE OF RESEARCH

Energy transfer processes in condensed
phase and on metal surfaces on the
 10^{-12} second timescale using pico-
second lasers and non-linear optics.

Application of spectroscopic ellipso-
metry, emission spectroscopy and laser
Raman scattering for studying the
electronic and molecular structure of
molecules adsorbed on metal surfaces.

COAL GASIFICATION AND LIQUEFACTION



Catalysis Club of Philadelphia Award,
1976
Distinguished Lecturer, AIChE, 1970-71
Honorary Membership: Consejo Superior
d'Investigaciones Scientificas,
Spain, 1964

PROFESSIONAL ACTIVITIES

Staff Senior Scientist
President, International Congress on
Catalysis, 1960
Petroleum Research Fund Advisory Board,
1972-74
Sigma Xi Board of Directors, 1964-68
Editor, "Catalysis Reviews," 1968-
Councilor, American Chemical Society,
several terms

EDUCATION

BS, University of Berlin
PhD University of Basel, Switzerland

SOCIETIES

American Chemical Society
American Association for the Advance-
ment of Science
American Institute of Chemical Engineers
American Institute of Chemists
Catalysis Society
Royal Society of Arts
German Chemical Society

AWARDS AND HONORS

National Academy of Engineering
American Chemical Society Award in
Industrial and Engineering Chemistry,
1971
E.J. Houdry Award of Catalysis Society,
1975

SCOPE OF RESEARCH

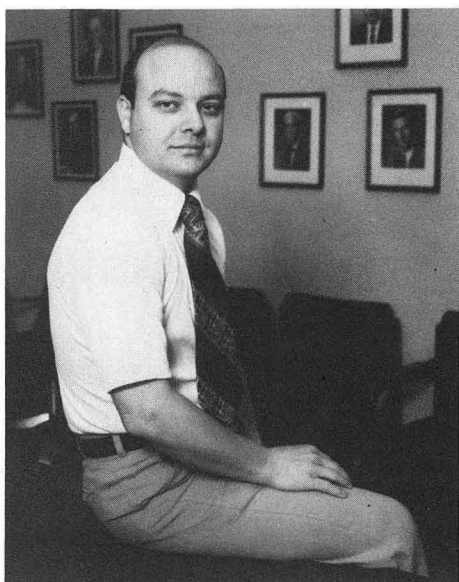
Research on petroleum catalysis, dual
functional catalysis, catalytic
cracking, reforming.

Research on clays and synthetic
catalysts, physical and chemical
properties of silica-alumina and of
zeolites.

Process research on zeolite catalysis
and on synthesis of ammonia, steam
reforming, olefin production, aromatic
production, oxychlorination of
ethylene, conversion of methanol to
gasoline, etc., leading to 16
commercial processes.

Fundamental research on coal dissolution
and properties of coal liquids,
upgrading of coal liquids; Fischer-
Tropsch synthesis.

PLASMA ENHANCED DEPOSITION OF THIN FILMS



EDUCATION

BS, Albright College
MS and PhD, Lehigh University

SOCIETIES

American Chemical Society
American Institute of Chemical Engineers
Electrochemical Society
Sigma Xi
Tau Beta Pi

PROFESSIONAL ACTIVITIES

Associate Professor of Chemical
Engineering
Divisional Editor, Journal of the
Electrochemical Society

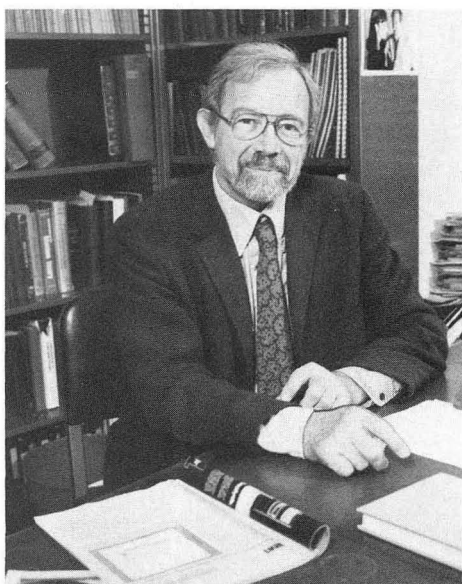
SCOPE OF RESEARCH

Plasma-enhanced deposition of inorganic thin film materials for use in photovoltaic and photoelectrochemical cell fabrication; optimization of deposition parameters to maximize cell efficiencies.

Investigation of the ability of plasma-enhanced deposition to synthesize thin films with unique electrical, chemical, optical, magnetic and structural properties.

Relationship of plasma parameters to the kinetics of film deposition; formulation of kinetic models for plasma-enhanced deposition.

EXCITED QUANTUM FLUIDS IN SOLIDS



EDUCATION

BS, Louisiana State University
PhD, Stanford University

SOCIETIES

American Physical Society
International Solar Energy Society

AWARDS AND HONORS

Research Corporation Award, 1953
Fulbright Professor, 1958
Senior NSF Fellow, 1959
Miller Institute Professor, 1961
Senior NSF Fellow, 1965

PROFESSIONAL ACTIVITIES

Professor of Physics
Vice-Chairman, Physics Department,
University of California Berkeley,
1967-69

SCOPE OF RESEARCH

Research in condensed matter physics in

several areas: Quantum effects produced when light strikes semiconductors, particularly the condensation of excitons into a degenerate electron-hole metallic liquid in crystals at low temperatures; study of the properties of this novel liquid: phase diagram, surface tension, binding energy, compressibility.

Kinetics of a system of electron-hole drops, excitons, multiexciton molecules, and free carriers in excited crystals; study of unusual explosive effects at high excitation due to forces of a hot phonon wind; study of decay mechanisms; electron-hole liquids in uniform and non-uniform stress, where large drops are formed.

Optical hysteresis accompanying the nucleation of electron-hole drops; measurement of diffusion of drops and excitons; measurement of crystal surface effects.

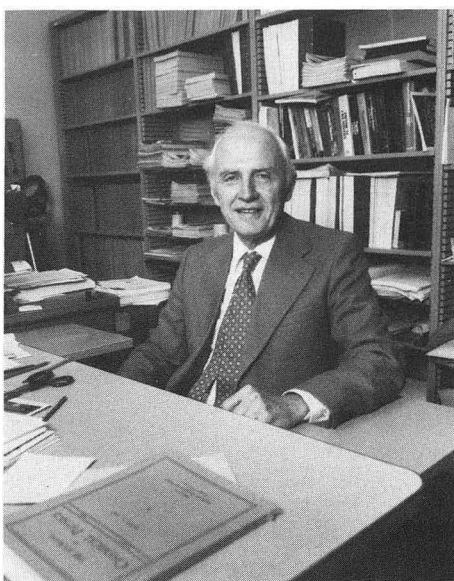
Microwave Alfvén wave resonance of a spherical volume of electron-hole liquid; dimensional resonances of a plasma sphere; cyclotron resonance of free carriers; magneto-oscillatory resistance of crystals due to carrier scattering on metallic droplets; magneto-oscillatory luminescence due to ultrasound absorptions.

Microwave spin resonance of impurities in semiconductors, trapped excitons, and dangling bonds due to dislocations.

High sensitivity optical detection of magnetic and cyclotron resonance of spin systems and free carriers in semiconductors.

HAROLD S. JOHNSTON
Chemistry

PHOTOCHEMISTRY



EDUCATION

AB, Emory University
PhD, California Institute of Technology

Gold Medal Award of California Section
of American Chemical Society
National Academy of Sciences
American Academy of Arts and Sciences

SOCIETIES

American Chemical Society
American Physical Society (Fellow)
American Geophysical Union

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Dean, College of Chemistry, 1966-70

AWARDS AND HONORS

Guggenheim Fellow, Brussels, 1961
NATO Visiting Professorship
Pollution Control Award of the American
Chemical Society, 1974

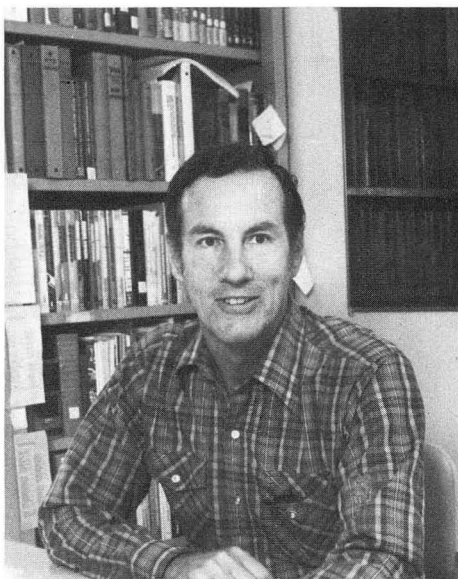
SCOPE OF RESEARCH

Gas-phase chemical kinetics and photo-
chemistry, involving oxides of
nitrogen, ozone, fluorine, chlorine
oxides, HO and HOO free radicals, etc.

WILLIAM L. JOLLY

Chemistry

X-RAY PHOTOELECTRON SPECTROSCOPY OF INORGANIC AND ORGANOMETALLIC COMPOUNDS



EDUCATION

BS and MS, University of Illinois
Urbana

PhD, University of California
Berkeley

SOCIETIES

American Chemical Society
American Association for the Advancement of Science
Royal Society of Chemistry
Sigma Xi
Alpha Chi Sigma

AWARDS AND HONORS

Guggenheim Fellow, 1960

PROFESSIONAL ACTIVITIES

Professor of Chemistry

Secretary, Section C (Chemistry)
of AAAS

Member of Inorganic Syntheses, Inc.

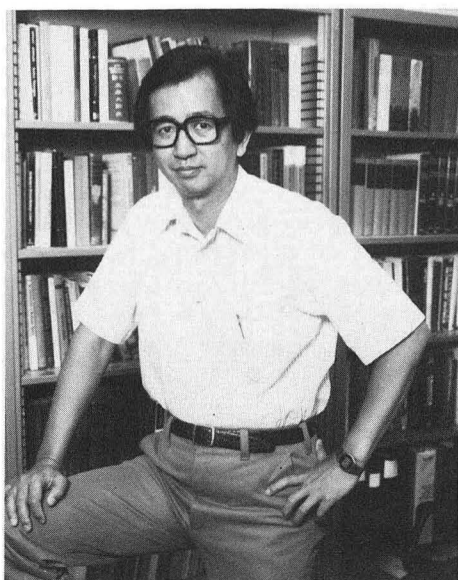
SCOPE OF RESEARCH

Use of x-ray photoelectron spectroscopy to measure atomic core electron binding energies, which are correlated with the effective charges of atoms.

Study of the bonding and electron distribution in molecules from core binding energy measurements.

Study of the interaction of various organic ligands and simple molecules with transition metals toward a better understanding of the behavior of various catalytic systems.

MOLECULAR BEAM REACTION DYNAMICS



National Academy of Sciences
National Academy of Arts and Sciences
Academia Sinica, Taipei, Taiwan

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Chairman, 1978 Conference on the
Dynamics of Molecular Collisions,
Asilomar, California, 1978
Member, US Pure and Applied Chemistry
Delegation to the People's Republic
of China, May-June 1978
Member, NAS-NRC Committee on Atomic
and Molecular Science, 1980

EDUCATION

BS Taiwan University
MS, Tsinghua University, Taiwan
PhD, University of California
Berkeley

SOCIETIES

American Chemical Society
American Physical Society (Fellow)

AWARDS AND HONORS

Alfred P. Sloan Fellowship, 1969
Camille and Henry Dreyfus Foundation
Teacher Scholar Grant, 1971
Guggenheim Fellowship, 1976
Miller Professorship, 1981
Honorary professorships: Fudan University,
Shanghai; Institute of Chemistry,
Chinese Academy of Sciences, Beijing
Philip Lecturer, Haverford College,
1979
Culver Lecturer, Iowa State
University, 1979
Falk-Plaut Lecturer, Columbia
University, 1980
Lester P. Kuhn Lecturer, Johns Hopkins
University, 1980
Harkins Lecturer, University of
Chicago, 1981

SCOPE OF RESEARCH

Dynamics of elementary chemical
reactions by the crossed molecular
beams method. Investigation of
dynamic resonance phenomena in
state-to-state chemistry, endoergic
reactions at high collision energies,
and reactions of selectively excited
atoms and molecules.

Elucidation of the reaction mechanism of
chemical reactions involved in
combustions. Especially, the
reactions of oxygen atoms with
unsaturated hydrocarbons.

Intramolecular energy transfer in
chemically activated and laser
excited polyatomic molecules.

Energetics and IR absorption spectro-
scopy of molecular clusters, ionic
clusters, and polyatomic radicals by
the molecular beams method.

Dynamics and mechanism of photo-
dissociation processes by molecular
beam photofragmentation translational
spectroscopy. Selective dissociation
of polyatomic molecules by IR multi-
photon process and UV photons.

WILLIAM A. LESTER, JR.
Chemistry

MOLECULAR INTERACTIONS



EDUCATION

BS and MS, University of Chicago
PhD, The Catholic University of
America

SOCIETIES

American Chemical Society
American Physical Society
National Organization for the
Professional Advancement of Black
Chemists and Chemical Engineers
Sigma Xi
National Institute of Science
American Association for the
Advancement of Science

AWARDS AND HONORS

Percy L. Julian Award, 1979

Distinguished Speaker Series:

University of Utah, 1979; University
of New Orleans, 1981

PROFESSIONAL ACTIVITIES

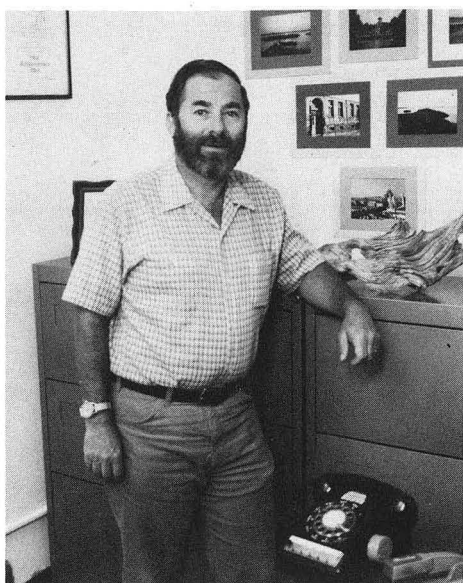
Professor of Chemistry
Director, National Resource for
Computation in Chemistry (NRCC), and
Associate Director, NRCC Division,
Lawrence Berkeley Laboratory, 1978-81
Specialist Editor, Computer Physics
Communications, 1981
Chemistry Division Advisory Panel,
National Science Foundation 1980-81
United States National Committee,
International Union of Pure and
Applied Chemistry, 1976-79
Chairman, Division of Physical
Chemistry, American Chemical Society,
1979
Chairman, Gordon Conference on Atomic
and Molecular Interactions, 1978

SCOPE OF RESEARCH

Research on the fundamental inter-
actions that govern collisions of
ground- and excited-state atoms,
molecules, and ions. Computation of
potential energy surfaces, cross
sections, and rates of energy transfer
and reactive collisions. Studies of
polyatomic photodissociation with
emphasis on prediction of product
energy distributions.

ALAN V. LEVY
Metallurgy

EROSION-CORROSION-WEAR IN COAL CONVERSION, OIL SHALE RETORT AND COMBUSTION ENVIRONMENTS



EDUCATION

BS and MS, University of California
Berkeley

SOCIETIES

National Association of Corrosion
Engineers
American Society for Metals
Electrochemical Society
Sigma Xi

AWARDS AND HONORS

Associate Fellow, American Institute of
Aeronautics and Astronautics

PROFESSIONAL ACTIVITIES

Staff Scientist
Editor, Proceedings, NACE Conference on
Corrosion-Erosion of Coal Conversion
System Materials, 1979

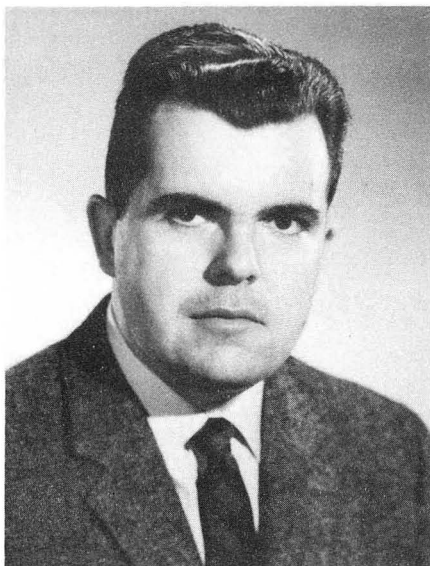
Member Materials Advisory Board,
National Academy of Sciences 1963-67
Member NASA Materials Research Advisory
Committee 1963-69
Member Public Service Committee, ASM
1971-73
Member Finance Committee, National
Materials Advisory Board, National
Academy of Engineering, 1969-71
Metals Handbook Committee of ASM,
1960-63
Served on seven Materials Advisory
Board panels advising Department of
Defense on materials fabrication
technology, 1957-65
Structures and Materials Committee of
American Rocket Society.

SCOPE OF RESEARCH

Erosion behavior of materials in gas-
solid particle and liquid-solid
particle two-phase flows in coal
conversion and combustion systems.
Combined erosion-corrosion behavior of
metals at elevated temperatures in
two-phase flows of energy conversion
systems.
Fluid mechanics of two-phase flows in
energy conversion systems.
Corrosion of materials in oil shale
retorting environments.
Development and characterization of
protective coatings for energy con-
version and transportation systems.
Modification of corrosive scales to
enhance adherence.
Deactivation of hydrosulfurization
catalysts.
Two-body and three-body abrasive wear of
materials in energy conversion
systems.

BRUCE H. MAHAN
Chemistry

CHEMICAL DYNAMICS STUDIES



EDUCATION

AB, AM and PhD, Harvard University

Fellow of the American Association for
the Advancement of Science, January
1981.

SOCIETIES

American Chemical Society
American Physical Society
American Association for the Advance-
ment of Science (Fellow)
American Physical Society (Fellow)

PROFESSIONAL ACTIVITIES

Professor of Chemistry, Emeritus
Professor of Chemistry, University of
California Berkeley, 1966-80
Chairman, Department of Chemistry,
University of California Berkeley,
1968-71

AWARDS AND HONORS

Distinguished Teacher Award, University
of California Berkeley, 1961
Alfred P. Sloan Foundation Fellow,
1963-67
California Section Award, University of
California Berkeley, 1968
Visiting Fellowship, Joint Institute for
Laboratory Astrophysics, Boulder,
Colorado, 1972
Research Professorship, Joint Institute
of Basic Research in Science,
University of California Berkeley,
1973-74
Associate Editor, Accounts of Chemical
Research, 1975-77
National Academy of Science, April 1976

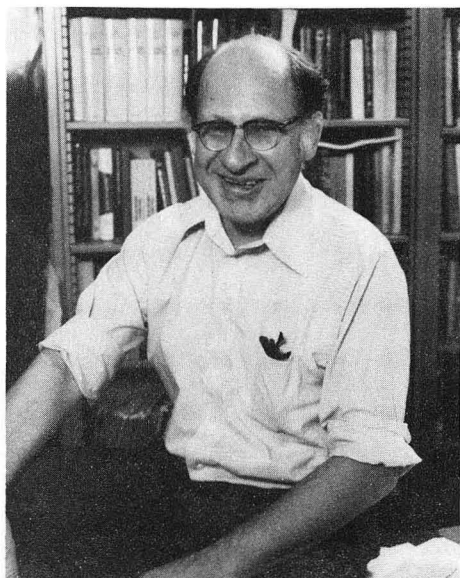
SCOPE OF RESEARCH

Dynamics of ion-molecule reactive and
nonreactive collisions studied by
crossed-beams methods.
Spectroscopy of molecular ions derived
from laser-induced fluorescence of
mass-selectively trapped ions.
Derivation of fundamental models for
various molecular collision processes
involving simple ions, molecules, and
radicals.

RICHARD MARRUS

Atomic Physics

ATOMIC PHYSICS



EDUCATION

BS, New York University
MA and PhD, University of California
Berkeley

SOCIETIES

American Physical Society (Fellow)

AWARDS AND HONORS

National Science Foundation Senior
Fellowship
John S. Guggenheim Award
Alexander Von Humboldt Award

PROFESSIONAL ACTIVITIES

Professor of Physics

SCOPE OF RESEARCH

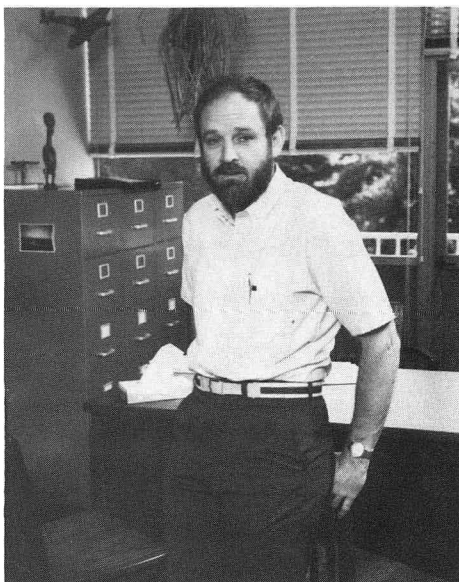
Collision processes and spectroscopy of highly ionized atoms.

Electron Capture Processes: Electron capture by highly ionized atoms in collisions and gaseous and solid targets from a few eV to several hundred MeV (measurements relevant to the physics of fusion devices and to possible x-ray laser applications).

Spectroscopy of One- and Two-Electron Atoms: Precise measurements in hydrogenic and helium-like uranium at energy levels strongly affected by relativistic and quantum hydrodynamic effects.

WILLIAM H. MILLER
Chemistry

THEORY OF MOLECULAR COLLISION PROCESSES AND CHEMICAL REACTION DYNAMICS



EDUCATION

BS, Georgia Institute of Technology
PhD, Harvard University

SOCIETIES

American Physical Society
American Chemical Society
American Association for the
Advancement of Science

AWARDS AND HONORS

Sloan Fellowship, 1970
Camille and Henry Dreyfus Fellowship,
1973
Annual Prize of the International
Academy of Quantum Molecular Science,
1974
Guggenheim Fellowship, 1975
Fellow of Churchill College
(Cambridge), 1975
Miller Professor, University of
California, 1978
Humboldt Senior Scientist Award, 1981

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Associate Editor, Journal of
Chemical Physics, 1976-79

SCOPE OF RESEARCH

Research in new theoretical methods and models for describing molecular collision phenomena and other aspects of chemical dynamics; especially, the development of semiclassical theory that utilizes classical mechanics in a way that incorporates the most important aspects of quantum mechanics.

Dynamics of chemical reactions; tunneling and other quantum effects in reactions; mode- and state-specific aspects of chemical reactions.

Theoretical studies of electronically non-adiabatic collision processes; electronic to vibrational/rotational energy transfer; collisional ionization; the effect of high power lasers on molecular collision processes.

Scattering of atoms and molecules from solid surfaces.

C. BRADLEY MOORE

Chemistry

PHOTOPHYSICS, DYNAMICS AND CHEMICAL REACTIONS OF EXCITED MOLECULES



EDUCATION

BA, Harvard University
PhD, University of California
Berkeley

SOCIETIES

American Physical Society (Fellow)
American Association for the
Advancement of Science (Fellow)
American Chemical Society

AWARDS AND HONORS

Harvard National Scholarships, 1958-60
National Science Foundation Predoctoral
Fellow, 1960-63
Alfred P. Sloan Foundation Fellow,
1968-72
John Simon Guggenheim Memorial Fellow,
1969-70
Miller Research Professor, 1972-73

Coblentz Award, 1973
California Section Award, American
Chemical Society, 1977
Visiting Fellow of the Joint Institute
for Laboratory Astrophysics of the
University of Colorado and the
National Bureau of Standards, 1981-82

PROFESSIONAL ACTIVITIES

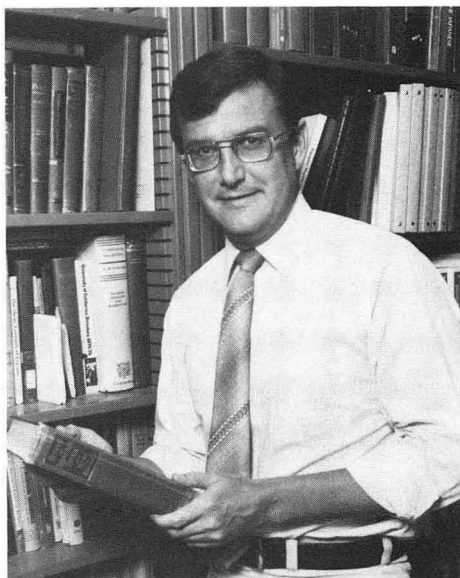
Professor of Chemistry
Vice-Chairman, Department of Chemistry,
1971-75
American Chemical Society, Vice-Chairman
Division of Physical Chemistry

SCOPE OF RESEARCH

Photophysics of selective excitation of
molecules, the dynamics of energy
transfer and specificity loss, and
the chemical reactions of
specifically excited states.

J. W. MORRIS, JR.
Metallurgy

THEORY OF ALLOY DESIGN



EDUCATION

SB and ScD, Massachusetts Institute of Technology

SOCIETIES

The Metallurgical Society, AIME
American Society for Metals
American Physical Society
American Society for Engineering Education
Iron and Steel Institute of Japan

AWARDS AND HONORS

Robert Lansing Hardy Gold Medal, AIME, 1972
Bradley Stoughton Award, ASM, 1974
Miller Research Professor, University of California Berkeley, 1977-78
Department of Energy Materials Research Award, Implication for Energy, 1981

PROFESSIONAL ACTIVITIES

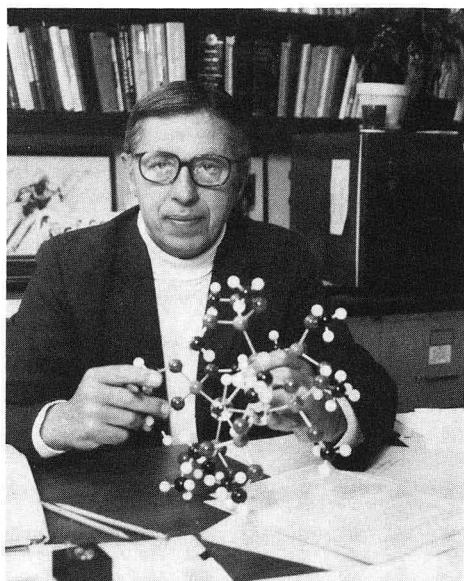
Professor of Metallurgy
Chairman, Fourth International Cryogenic Materials Conference, 1981
Chairman, Chemistry and Physics of

Metals Committee, TMA/AIME, 1976-78
Chairman, Publications Committee, TMS/AIME, 1977-78

SCOPE OF RESEARCH

Theoretical research on thermodynamics and phase transformation with emphasis on elastic contributions.
Fundamental research on the microstructural determination of strength and toughness in structural alloys.
Development of new structural steels with emphasis on structural alloys for use at cryogenic temperature.
Welding of structural steels and the development of improved filler metals and welding procedures.
Development of Al5 superconducting wire for high-field superconducting magnets.
Materials failure and failure analysis.

CHEMISTRY OF METALS



EDUCATION

BS, Northwestern University
AM and PhD, Harvard University

SOCIETIES

American Chemical Society
American Physical Society
Chemical Society of London

AWARDS AND HONORS

ACS Award in Inorganic Chemistry,
1965, 1979
National Academy of Sciences
American Academy of Arts and Sciences
Honary Fellow of the Royal
Society of Chemistry

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Gmelin Institut, Max Planck Gesell-
schaft, 1977-81

Advisory Panel, Chemistry Division of
the National Science Foundation,
1975-79

SCOPE OF RESEARCH

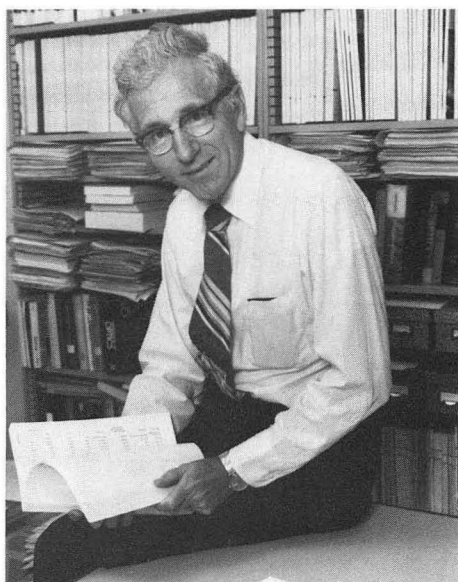
Study of the coordination chemistry of
metal surfaces as a function of
surface crystallography and surface
composition.

Theory, structure and chemistry of
molecular metal clusters.

Coordination and catalytic chemistry of
mononuclear transition metal co-
ordination and organometallic com-
plexes, mechanistic studies of
reactions and synthesis of new
classes of metal complexes.

Mechanism of hydrocarbon, and hydro-
carbon derivative, C-H bond breaking
processes centered on metal atoms in
molecular complexes and on metal
surfaces.

ELECTROCHEMICAL SURFACE LAYERS



EDUCATION

MS and PhD, Swiss Federal Institute of
Technology, Zurich

SOCIETIES

Electrochemical Society
Optical Society of America
International Society of Electro-
chemistry
American Chemical Society
Swiss Chemical Society
American Association for the
Advancement of Science

AWARDS AND HONORS

Plenary Lecturer, International
Society of Electrochemistry, 1976
Invited Speaker, International
Conference on Ellipsometry, 1968, 1975

PROFESSIONAL ACTIVITIES

Staff Senior Scientist
Assistant Division Head, MMRD, 1970-
Lecturer, Department of Chemical
Engineering, 1966-

Division Co-Chairman, 1973-77, and
Meeting Program Committee 1976-78,
International Society of Electro-
chemistry

Honors and Awards Committee, Electro-
chemical Society, 1977-81
Secretary, National Battery Advisory
Committee, ad hoc, Planning
Subcommittee 1977-

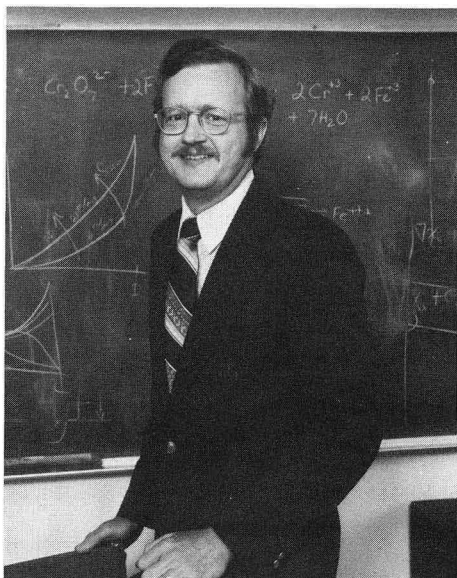
SCOPE OF RESEARCH

Investigation of the formation of thin
films and boundary layers at electro-
chemical interfaces, development and
use of optical techniques for the
observation of surfaces in liquid
media.

Solid and liquid films at electrodes,
mechanism of formation, nucleation and
growth, control of film properties,
effect on electrochemical reactions
in metal deposition and dissolution,
batteries and fuel cells.

Electrochemical processes at high
current densities, acceleration of
electrochemical mass transport,
increase of space-time yield,
material and energy efficiency.

ELECTROCHEMICAL SYSTEMS



EDUCATION

BS, Northwestern University
MS and PhD, University of California
Berkeley

SOCIETIES

American Institute of Chemical Engineers
Electrochemical Society
Tau Beta Pi

AWARDS AND HONORS

Young Author's Prize for 1966,
Electrochemical Society
Young Author's Prize for 1969,
Electrochemical Society (with W.R.
Parrish)

PROFESSIONAL ACTIVITIES

Professor of Chemical Engineering

SCOPE OF RESEARCH

Electrochemical Removal of Heavy Metals from Aqueous Streams: Theoretical and experimental analysis of copper, mercury, and lead deposition onto porous electrodes. Theoretical and experimental analysis of zinc and lead electrosorption onto porous electrodes.

Corrosion of Iron: Characterization of passivation kinetics and the effect of coupled kinetic and transport phenomena on iron corrosion.

Liquid-Junction Photovoltaic Cells: Theoretical analysis of the coupled phenomena governing cell behavior. Emphasis on prediction of cell performance and optimization of cell design.

Battery Systems: Theoretical analysis of coupled phenomena governing battery systems. Emphasis on optimization of the lead-acid and the lithium iron sulfide batteries.

DONALD R. OLANDER
Nuclear Engineering

MATERIALS CHEMISTRY IN NUCLEAR FISSION AND FUSION REACTOR



EDUCATION

AB and BS, Columbia University
ScD, Massachusetts Institute of
Technology

Scientific Advisory Committee, Idaho
National Engineering Laboratory

AWARDS AND HONORS

Euratom Fellowship, 1965-66
FOM - Institute of Atomic and
Molecular Physics Fellowship, 1972-73
Award for Outstanding Contribution to
Nuclear Technology, from the American
Nuclear Society, 1976

SCOPE OF RESEARCH

Molecular beam studies of the chemical
kinetics of atomic hydrogen reaction
with refractory oxides and carbides
and of halogen reactions with metals.
Thermal gradient migration of metallic
inclusions in uranium dioxide and of
brine inclusions in salt.
High temperature transport properties of
uranium dioxide, including lattice
diffusion of oxygen and surface
diffusion of uranium.
Transient vaporization of uranium
dioxide and uranium carbide by laser
pulsing.
Stress corrosion cracking of zircaloy
by iodine and metal iodides.

PROFESSIONAL ACTIVITIES

Professor of Nuclear Engineering
Chairman, Department of Nuclear
Engineering, University of California
at Berkeley
Executive Committee, Materials Science
and Technology Division of the
American Nuclear Society, 1977-80
Editorial Board: Journal of Nuclear
Materials; Progress in Nuclear
Energy; Materials Technology of the
Nuclear Fuel Cycle

JOSEPH A. PASK

Ceramic Science and Engineering

CERAMIC, GLASS AND METAL INTERFACES; PHASE TRANSFORMATIONS IN CERAMIC SYSTEMS



EDUCATION

BS and PhD, University of Illinois
at Urbana
MS, University of Washington, Seattle

SOCIETIES

American Association for the
Advancement of Science (Fellow)
American Ceramic Society (Fellow)
American Society for Engineering
Education
British Ceramic Society
American Society for Metals
Mineralogical Society of America
(Fellow)

AWARDS AND HONORS

Honorary Life Member, American
Ceramic Society, 1976
Nuclear Academy of Engineering, 1975
Alumni Honor Award for Distinguished
Service in Engineering, University of
Illinois, 1982
The Berkeley Citation, University of
California, 1980
Outstanding Educator in Ceramic
Engineering Award, 1981
John Jeppson Medal Award, American
Ceramic Society, 1967
Ross Coffin Purdy Award, American
Ceramic Society, 1967

Gold Medal for Research and Develop-
ment, French Society for Promotion
of Research and Development, 1979
Dr. G. Wagener Memorial Lecture, Tokyo
Institute of Technology, Tokyo, 1963,
1978

PROFESSIONAL ACTIVITIES

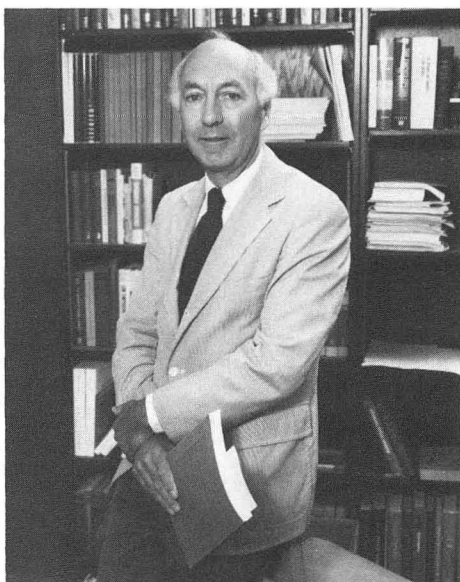
Professor of Ceramic Engineering
Associate Dean for Graduate Matters,
College of Engineering, 1969-80
Chairman, Department of Materials
Science and Mineral Engineering,
1957-61
Orton Lecture, American Ceramic Society,
1979
Member, National Materials Advisory
Board, National Research Council,
1964-68
Member, National Selection Committee
for National Inventors' Hall of Fame
Member, Advisory Committee, Ames
National Laboratory, 1976-78
Member, Advisory Panel, Metallurgy
Division, National Bureau of
Standards, 1958-64
Member, Mineral Resources Committee,
National Association of State
Universities and Land Grant Colleges,
1970-78

SCOPE OF RESEARCH

Thermodynamic and kinetic studies of
wetting and reactions at interfaces
of liquid ceramic (glass)/metal,
liquid metal/ceramic, and liquid
ceramic/ceramic systems; development
of an understanding of conditions for
wetting, spreading of a liquid on a
solid, and chemical bonding at inter-
faces between dissimilar phases.
(Specific: Bonding of dental porce-
lain to nonprecious alloys.)
Stable and Metastable phase transforma-
tions in the $\text{SiO}_2/\text{Al}_2\text{O}_3$ system;
study of effect on character develop-
ment and achievement of designed
microstructure. (Specific: Micro-
structure control to realize satis-
factory resistance to fluid corrosion
at high temperatures.)

NORMAN E. PHILLIPS
Chemistry

LOW TEMPERATURE PROPERTIES OF MATERIALS



EDUCATION

BA and MA, University of British
Columbia
PhD, University of Chicago

SOCIETIES

American Physical Society (Fellow)
American Association for the Advancement
of Science (Fellow)
American Chemical Society
Sigma Xi

AWARDS AND HONORS

Sloan Foundation Fellow, 1959-61
Guggenheim Fellow, 1961-62
NSF Senior Postdoctoral Fellow, 1968-69

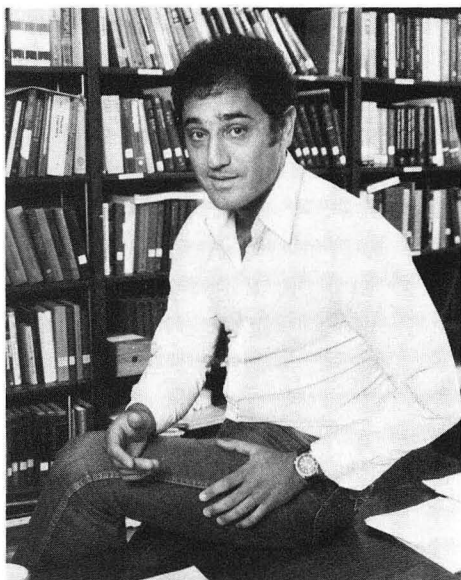
PROFESSIONAL ACTIVITIES

Professor of Chemistry
Dean, College of Chemistry,
University of California Berkeley,
1975-81

SCOPE OF RESEARCH

Measurement of low-temperature properties of condensed matter systems, particularly of low-temperature heat capacities, to obtain data that contribute to an understanding of the properties of materials, used for tests of theoretical models or to find values of important parameters. Tests of theoretical models include cooperative transitions, spin-fluctuation effects on the properties of Fermi systems, etc. Parameters include the density of electronic states, important for calculations of other properties such as the critical temperature for superconductivity. Thermometers under development include several types based on magnetic susceptibility measurements and having response times and heat capacities suitable for calorimetry.

MAGNETIC RESONANCE



PROFESSIONAL ACTIVITIES Professor of Chemistry

SCOPE OF RESEARCH

Novel aspects of nuclear magnetic resonance, optical nuclear double resonance and the coupling of nuclear spin to other degrees of freedom are studied theoretically and experimentally. Research areas include:

Multiple Quantum Transitions--An approach in which "forbidden" n -quantum coherences in NMR are excited with sequences of pulses, has been developed including the selective absorption of only groups of n photons and applications to motional correlations.

NMR in Solids--Nuclear spins are polarized by pumping at resonance frequencies of other coupled degrees of freedom such as other spins and bond vibrations; this is used together with multiple pulse sequences and magic angle spinning to study molecular structure, conformation and dynamics in solids.

Laser Magnetic Double Resonance--Structure and relaxation of molecules in excited states is studied by following the nuclear spin polarization that results from pulsed laser irradiation of doped organic crystals. Includes study of optical-spin coherence, spin diffusion and hydrogen transfer in the excited state.

Liquid Crystals--Molecular features that give rise to macroscopic properties of liquid crystals are studied.

Magnetic Effects in Chemistry--The effects of nuclear spin in photochemical reactions are investigated through the nuclear magnetic isotope effect and time resolved CIDNP. Further topics include the effect of nuclear spins on molecular rotation and vibration in solids through the strong forces induced by nuclear permutational symmetry.

EDUCATION

BSc, Hebrew University of Jerusalem
PhD, Massachusetts Institute of Technology

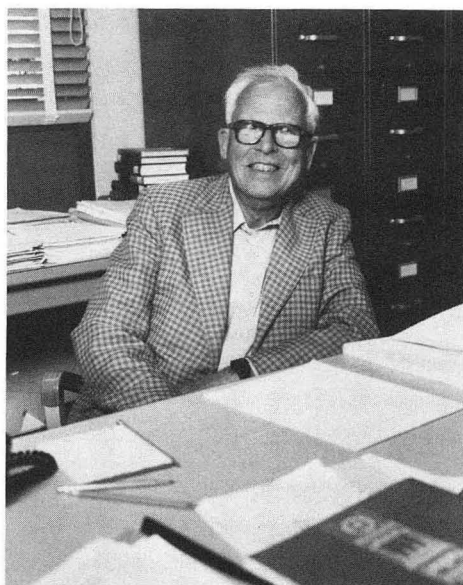
SOCIETIES

American Chemical Society
The Chemical Society (London)
Royal Society (London)
International Society of
Magnetic Resonance
Institute of Physics, London
(Fellow)
American Physical Society (Fellow)

AWARDS AND HONORS

Alfred P. Sloan Fellow, 1974-78
Camille and Henry Dreyfus Teacher-Scholar, 1976-80
Richard Merton Guest Professor of the German Science Foundation, 1977
Distinguished Visiting Lecturer, University of Texas, Austin, 1978
Robert W. Vaughan Memorial Lectureship, California Institute of Technology, 1981
American Chemical Society Nobel Laureate Signature Award, 1981
Guy Allen Lecturer in Physical Chemistry, Yale University, 1981

ELECTROLYTE SOLUTIONS, QUANTUM CHEMISTRY



EDUCATION

BS, California Institute of Technology
PhD, University of California Berkeley

SOCIETIES

American Philosophical Society
American Chemical Society (Counselor)
Faraday Society
American Physical Society (Fellow)
American Nuclear Society (Fellow)
American Institute of Chemists (Fellow)

AWARDS AND HONORS

American Chemical Society Award in Pure Chemistry, 1943
Precision Scientific Co. Award in Petroleum Chemistry, 1949
U.S. Jr. Chamber of Commerce Award as one of the Ten Outstanding Young Men in the Nation, 1950
Alumnus of the Year Award, University of California Berkeley, 1951
DSc (Hon.), Wesleyan University
LLD (Hon.), University of California Berkeley
LLD (Hon.), Mills College
Guggenheim Fellowship, 1951
Clayton Prize, Institution of Mechanical Engineers, London, 1958

Priestley Memorial Award, Dickinson College, 1963
Gilbert Newton Lewis Medal, California ACS, 1965
Alumni Distinguished Service Award, California Institute of Technology, 1966
Priestley Medal, American Chemical Society, 1969
National Medal of Science, 1975
Gold Medal of the American Institute of Chemists, 1976
Willard Gibbs Medal, Chicago Section, American Chemical Society, 1978
Centenary Lecturer, Chemical Society, Great Britain, 1978
National Academy of Sciences, Counselor 1964-67, 1973-76
American Academy of Arts and Sciences (Fellow)

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Technical Director, Maryland Research Laboratory, 1943-44
Director of Research, Atomic Energy Commission, 1949-51
President and Professor of Chemistry, Rice University, 1961-68
President and Professor of Chemistry, Stanford University, 1968-71
Pitzer College, Trustee, 1966
Owens-Illinois, Board of Directors, 1967

SCOPE OF RESEARCH

Quantum chemistry involving heavy atoms. Chemical properties determined by valence electrons.
Extension of statistical-mechanical equations for electrolytes. Electrolyte solutions at high temperatures and pressures being studied by calorimetric measurements and calculations. Experimental measurements of water (or other solvent) vapor pressure characterizing thermodynamic properties. Formulation of statistical mechanics including fused salts and concentrated solutions.

MOLECULAR THERMODYNAMICS OF FLUID-PHASE EQUILIBRIA



EDUCATION

BChE, Cornell University
MS, University of Rochester
PhD, Princeton University

SOCIETIES

American Chemical Society
American Institute of Chemical Engineers
Bunsengesellschaft für Physikalische Chemie

AWARDS AND HONORS

Guggenheim Fellowship, 1962, 1973
Colburn Award, 1962; Walker Award, 1967, AIChE
Murphree Award, 1979, ACS
National Academy of Sciences, 1973
National Academy of Engineering, 1979
Alexander von Humboldt Senior Scientist Award, 1976
Research Professor, Miller Institute for Basic Science, 1965, 1978
G.N. Lewis Lecturer, University of California Berkeley, 1978
Faculty Research Lecturer, University of California Berkeley, 1981

PROFESSIONAL ACTIVITIES

Professor of Chemical Engineering
Advisory Panel, National Bureau of Standards, 1972-75
Advisory Council, Princeton University, 1970-76

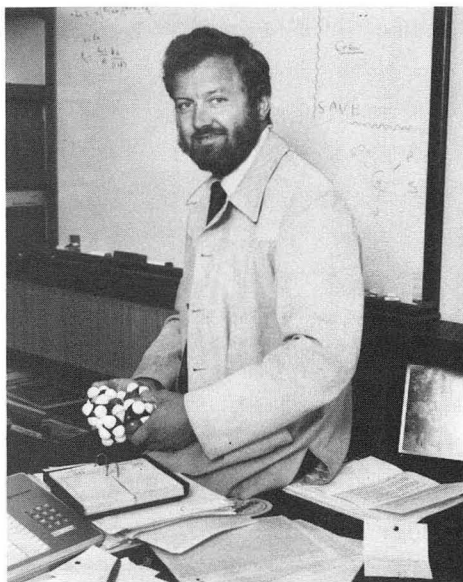
SCOPE OF RESEARCH

Phase equilibria of fluid mixtures at high pressures with particular attention to systems containing natural gases and water (or brine).
Characterization and physical properties of heavy fossil-fuel liquids as derived from petroleum residues and from coal processing.
Mutual solubilities of water and heavy liquids derived from processing fossil fuels.
Vapor-liquid equilibria for multi-component volatile weak electrolytes.
Fundamental studies on the equation of state for fluids and fluid mixtures.
Thermodynamic properties of polymer solutions.
Phase equilibria for extraction using supercritical solvents.
Adsorption of organic solutes from aqueous solution.
Activity coefficients of volatile solutes in ordinary solvents at very high dilution.

KENNETH N. RAYMOND

Actinide and Coordination Chemistry

SPECIFIC SEQUESTERING AGENTS FOR ACTINIDES, COORDINATION CHEMISTRY



EDUCATION

BA, Reed College

PhD, Northwestern University

Vice-Chairman, Department of
Chemistry, University of California
Berkeley

SOCIETIES

Sigma Xi Society

American Chemical Society

American Association for the
Advancement of Science

American Crystallographic
Association

SCOPE OF RESEARCH

Synthesis of metal-ion-specific
sequestering agents; rational design
and preparation of such compounds,
their physical and chemical char-
acterization and optimization based
on such characterization.

General coordination chemistry of
actinide and lanthanide metal ions;
structure and bonding of such metal
complexes.

Coordination chemistry and biochemistry
of iron transport and mobilization;
structure and function of the
siderophores (microbial iron transport
agents) and human iron transport
proteins.

AWARDS AND HONORS

Alfred P. Sloan Research Fellow, 1971-73

Miller Research Professor, University
of California Berkeley, 1977-78

Guggenheim Fellow, 1980-81

PROFESSIONAL ACTIVITIES

Professor of Chemistry

INFRARED SPECTROSCOPY



EDUCATION

AB, Harvard University
PhD, University of California
Berkeley

SOCIETIES

American Physical Society (Fellow)

AWARDS AND HONORS

Miller Institute Professor, University
of California Berkeley, 1969-70
Guggenheim Fellowship, 1973-74
California Scientist of the Year, 1981
Humboldt Senior Scientist Award, 1982

PROFESSIONAL ACTIVITIES

Professor of Physics
Materials Research Council, ARPA
Free Electron Laser Subcommittee of the
Solid State Science Committee, NAS
Management Operations Working Group
for Airborne Astronomy, NASA

SCOPE OF RESEARCH

Development of infrared and millimeter
wave detectors: developed low back-
ground Ge:Ga photoconductive detector;

invented and developed stressed Ge:Ga
detector; invented and developed
composite bolometer with metal film
absorber; developed Josephson-effect
direct detector, heterodyne mixer,
and parametric amplifier; invented
and developed superconducting quasi-
particle direct detector and
heterodyne mixer.

Development of new techniques for
infrared measurements of the vibra-
tional spectra of molecules chemi-
sorbed on metal surfaces: direct
absorption spectroscopy and emission
spectroscopy.

Measurement of infrared properties of
materials including charge density
waves in one-dimensional compounds,
electrons on the surface of liquid
helium, infrared magnetic resonances
in biological systems, and spin wave
resonances in ordered magnetic
insulators.

Measurement of spectrum of cosmic
microwave background at infrared wave-
lengths. Measurement of infrared
emission from dust in our galaxy.

ROBERT O. RITCHIE
Metallurgy

ENVIRONMENTALLY INFLUENCED CRACK GROWTH IN ENGINEERING MATERIALS



EDUCATION

BA, MA and PhD, University of Cambridge

SOCIETIES

American Society for Metals
American Society of Mechanical Engineers
American Society for Testing and Materials
The Metallurgical Society of AIME
The Japan Institute of Metals
The Institution of Metallurgists
The Metals Society, United Kingdom

AWARDS AND HONORS

Goldsmith's Fellowship (Cambridge), 1972
Miller Research Fellowship, University of California Berkeley, 1974
ASME Best Paper Award, 1977
Marcus A. Grossmann Award (ASM), 1978
MIT Class of 1922 Professorship, 1980

PROFESSIONAL ACTIVITIES

Associate Professor of Metallurgy
Chairman, ASTM E24.04.06 Task Group on Short Cracks

Co-Chairman, Engineering Foundation on Conference of Fatigue Crack Initiation, 1980

Associate Editor, Journal of Fatigue of Engineering Materials and Structures
Advisory Panel on Structures, Federal Aviation Authority

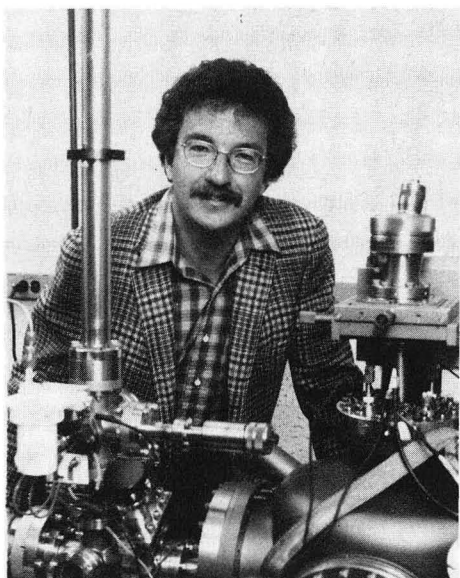
SCOPE OF RESEARCH

Study of mechanics and mechanisms of subcritical crack propagation by fatigue and environmentally influenced flaw growth, with particular emphasis on behavior at ultra-low, near-threshold growth rates.

Examination of the separate roles of microstructure and environmental species and crack-growth resistance; interpretation of results to form basis for alloy design of higher-toughness alloys.

PHILIP N. ROSS
Electrochemistry

ELECTRODE SURFACE CHEMISTRY



EDUCATION

BS, Yale University
MS, University of Delaware
PhD, Yale University

SOCIETIES

American Chemical Society
American Vacuum Society
Electrochemical Society

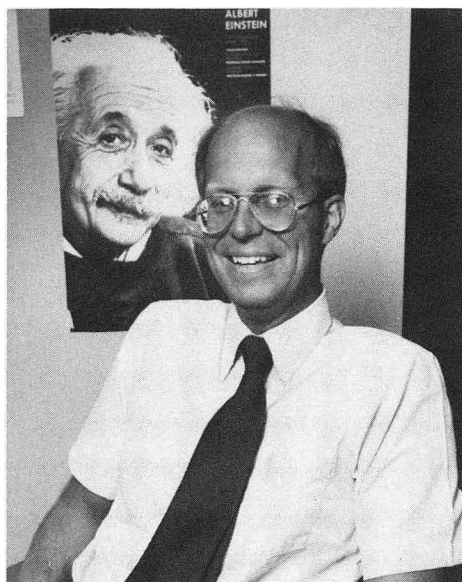
PROFESSIONAL ACTIVITIES

Staff Scientist
Electrochemical Society, Honors and
Awards Committee and Executive
Committee of the Energy Technology
Group.
Technical Program Manager, Berkeley
Electrochemical Research Center

SCOPE OF RESEARCH

Basic research on adsorption of the
solid-liquid interface; in particular
adsorption of hydrogen on transition
metals in aqueous solution.
Studies on structure of anodically
formed layers on metal surfaces by
low energy electron diffraction.
Photoemission studies of oxygen chemi-
sorption on metal surfaces; effect of
pre-adsorbed or omega-adsorbed water
on oxygen adsorption process.
Studies on the electrocatalytic
properties of Pt and Pd intermetallic
compounds.
Studies on breakdown processes in
bifunctional air electrodes.
Synthesis and study of new electrolytes
for hydrogen-air fuel cells.

POTENTIAL ENERGY SURFACES FOR CHEMICAL REACTIONS



EDUCATION

SB, Massachusetts Institute of
Technology
PhD, Stanford University

Wilfred T. Doherty Professor and
Director, Institute of Theoretical
Chemistry, University of Texas,
Austin, 1979-80.

SOCIETIES

Phi Lambda Upsilon
Sigma Xi
American Physical Society (Fellow)
American Chemical Society
American Scientific Affiliation

SCOPE OF RESEARCH

Research in theoretical chemistry,
especially a priori quantum mechanical
study of the electronic structure of
molecular systems.
Development of new theoretical methods
for description of electron correla-
tion in molecules.
Theoretical predictions of potential
energy hypersurfaces, molecular
structures, chemisorption on metal
surfaces, model organometallic com-
plexes, and electronic spectroscopy.

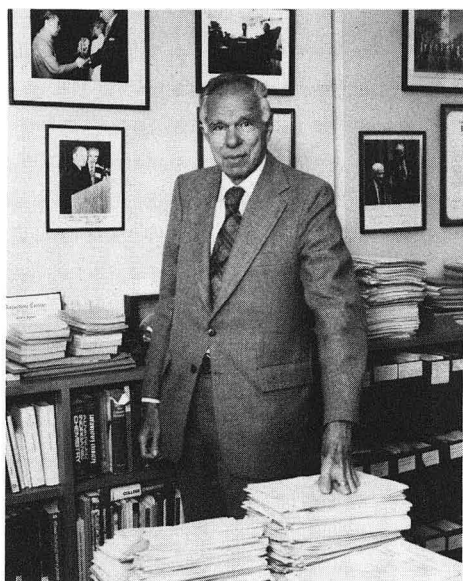
AWARDS AND HONORS

Sloan Fellowship, 1972
Guggenheim Fellowship, 1976
American Chemical Society Award in
Pure Chemistry, 1979

PROFESSIONAL ACTIVITIES

Professor of Chemistry

LANTHANIDE AND ACTINIDE CHEMISTRY



EDUCATION

AB, University of California
Los Angeles
PhD, University of California Berkeley

SOCIETIES

American Chemical Society
American Physical Society
American Association for the
Advancement of Science
International Organization for Chemical
Sciences in Development (Founding
Member and President, 1981)

AWARDS AND HONORS

Nobel Prize in Chemistry, 1951
National Academy of Sciences
Enrico Fermi Award, AEC, 1959
Arches of Science Award, Pacific
Science Center, 1968
Priestley Medal, ACS, 1979

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Associate Director, LBL, 1954-61, 1972-
Chancellor, University of California
Berkeley, 1958-1961
President, AAAS, 1972
President, American Chemical Society,
1976
Scientific Program Council, LBL, 1973-
Chairman, AEC, 1961-1971

SCOPE OF RESEARCH

Synthesis and characterization of
actinide and lanthanide compounds.
Attempts to synthesize and identify
superheavy elements.
Study of the mechanisms of heavy ion
nuclear reactions.

HIGH TEMPERATURE REACTIONS



EDUCATION

AB, Pomona College
PhD, University of California Berkeley

SOCIETIES

Phi Beta Kappa
American Chemical Society
American Ceramic Society (Fellow)
Keramos
Sigma Xi
American Association for the
Advancement of Science (Fellow)

AWARDS AND HONORS

Fulbright Lecturer in Physical Chemistry
Institute of Physics, San Carlos de
Bariloche, Argentina, 1960-61
Guggenheim Fellow, 1967-68
Miller Research Professor, University of
California Berkeley, 1970-71

PROFESSIONAL ACTIVITIES

Professor of Materials Sciences
Associate Division Head, Inorganic
Materials Research Division, 1961-64

Faculty Assistant to the Chancellor,
1963-64

Vice-Chancellor of the University of
California Berkeley, 1964-67

National Research Council Committee
on High Temperature Chemistry, 1961-70

Head, Materials and Molecular Research
Division and Associate Director,
Lawrence Berkeley Laboratory,
1980-

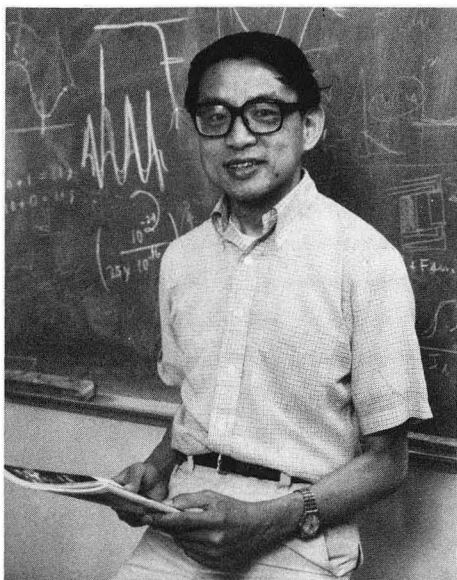
SCOPE OF RESEARCH

Thermodynamics and kinetics of high
temperature reactions with emphasis
on development of theoretical models
for interpreting and predicting reac-
tion equilibria and reaction rates.

Influence of temperature, pressure,
particle size, sample size, and
catalysts on surface areas, and
crystallization of solid products of
decomposition reactions.

Vapor transport through porous solids,
with emphasis on understanding and
predicting importance of surface dif-
fusion in vapor transport, sintering,
and heterogeneous catalysis.

SOLID STATE PHYSICS AND QUANTUM ELECTRONICS



EDUCATION

BS, National Taiwan University
MS, Stanford University
PhD, Harvard University

SOCIETIES

American Physical Society
Optical Society of America

AWARDS AND HONORS

Sloan Fellow, 1966-68
Guggenheim Foundation Fellowship,
1972-73
Vinton-Hayes Fellowship (Harvard),
1972
Miller Research Professor, University of
California Berkeley, 1975-76, 1981-82

PROFESSIONAL ACTIVITIES

Professor of Physics
Co-Chairman, Gordon Research Conference
on Nonlinear Optics, 1971, 1975

Chairman, Western Spectroscopy Conference, 1975.

SCOPE OF RESEARCH

Research in nonlinear optics; understanding physics of nonlinear optical phenomena; applications of nonlinear optical effects to material studies and optical devices.

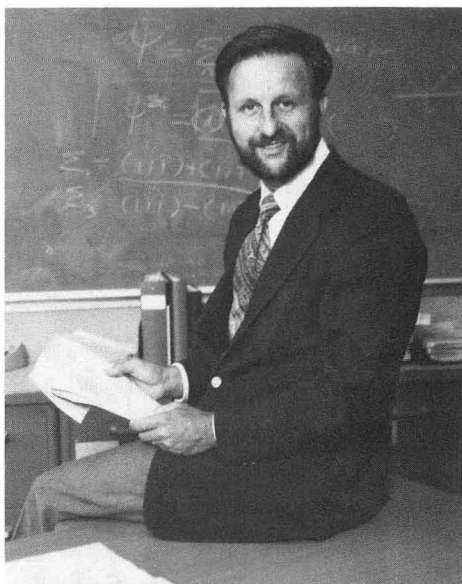
Studies of condensed matter physics: optical properties of metals, semiconductors, liquid crystals, and magnetic materials; Raman and Brillouin scattering, luminescence; phase transitions.

Surface physics: surface optical properties; interaction of surface electromagnetic waves; surface enhanced optical processes; detection of molecular monolayers by nonlinear optical methods.

Molecular physics: laser spectroscopy; multiphoton excitation and dissociation of molecules; optical detection of molecular dynamics.

DAVID A. SHIRLEY
Chemistry

PHOTOELECTRON SPECTROSCOPY



Doctor of Science, honoris causa,
University of Maine, 1978

PROFESSIONAL ACTIVITIES

Professor of Chemistry
Vice-Chairman, Department of Chemistry,
University of California Berkeley,
1968-71
Chairman, Department of Chemistry,
University of California Berkeley,
1971-75
Associate Director and Head of the
Materials and Molecular Research
Division, LBL, 1975-80
Director, LBL, 1980--

EDUCATION

BS, University of Maine
PhD, University of California Berkeley

SOCIETIES

American Chemical Society
American Physical Society (Fellow)
American Association for the
Advancement of Science

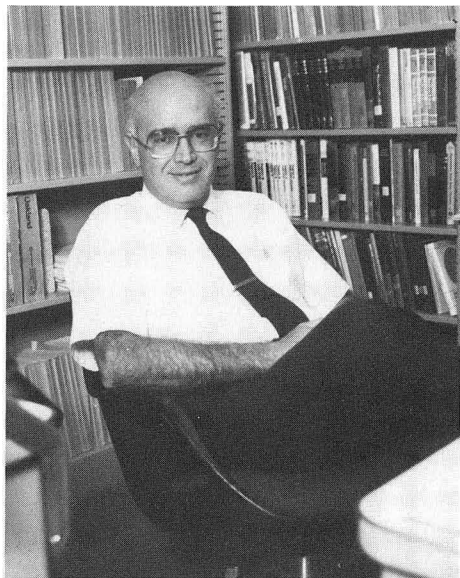
AWARDS AND HONORS

National Academy of Sciences
American Academy of Arts and Sciences
NSF Senior Postdoctoral Fellowship,
Clarendon Laboratory, Oxford
University, 1966-67
NSF Senior Postdoctoral Fellowship, I.
Physics Institute, Free University
Berlin, 1970
California Section Award, American
Chemical Society, 1970
US Atomic Energy Commission, Ernest
O. Lawrence Award, 1972

SCOPE OF RESEARCH

Research in electron spectroscopy.
Electronic structure of matter, as
determined by photoelectron spectro-
scopy and related techniques.
Electronic structure of gas-phase
species, including high-temperature
species, as determined by use of
pulsed synchrotron radiation and
time-of-flight photoelectron
spectroscopy. Photoelectron angular
distributions and correlation-state
studies.
Electronic structure of solids from
angle-resolved, variable-energy photo-
emission. Atomic and electronic
structure of surface-adsorbate
systems.
Exploration and development of new
experimental methods based on
synchrotron radiation in the energy
range 10-4000 eV, such as photo-
electron diffraction and surface
EXAFS.
Very high resolution photoelectron
spectroscopy using molecular beam
sources (with Y.T. Lee).

SURFACE SCIENCE AND HETEROGENEOUS CATALYSIS



EDUCATION

BS, University of Technical
Sciences, Budapest, Hungary
PhD, University of California Berkeley

SOCIETIES

American Chemical Society
American Physical Society (Fellow)

AWARDS AND HONORS

National Academy of Sciences
Colloid and Surface Chemistry (Award of
the American Chemical Society, 1981)
Emmett Award, American Catalysis
Society, 1977
Kokes Award, Johns Hopkins University,
1976
Baker Lecturer, Cornell University, 1977

PROFESSIONAL ACTIVITIES

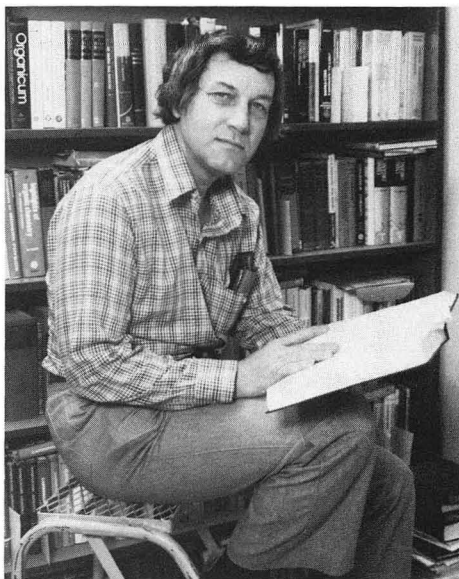
Professor of Chemistry

Chairman, Division of Colloid and
Surface Chemistry, Division of
American Chemical Society, 1976

SCOPE OF RESEARCH

Studies of the structure of clean metal,
insulator, and molecular crystal
surfaces, and the structure of
adsorbed molecules by LEED and
electron spectroscopy. Concentration
on diatomic and small hydrocarbon
molecules adsorbed on platinum,
rhodium, and strontium titanate
surfaces; studies of catalytic reac-
tions on single crystal surfaces.
Mechanisms of catalysis of hydrocarbon
reactions by platinum, the catalytic
hydrogenation of CO over rhodium and
iron and the photochemical reactions
of water vapor and CO₂ over oxide
surfaces; molecular beam scattering
studies of energy transfer at
surfaces.

ORGANOACTINIDE CHEMISTRY



EDUCATION

AB, Columbia College
MA and PhD, Columbia University

SOCIETIES

American Chemical Society
Royal Society of Chemistry
American Association for the
Advancement of Science (Fellow)
Sigma Xi

AWARDS AND HONORS

American Academy of Arts and
Sciences
National Academy of Sciences
National Science Foundation
Science Faculty Fellowship, 1959-60
California Section Award, ACS, 1964
Miller Institute Research Professor,
1964-65
ACS Award in Petroleum Chemistry, 1967
Guggenheim Fellowship, 1969

Alexander von Humboldt Award, 1976
Alexander von Humboldt Medal, 1979
Miller Institute Research Professor,
1979-80
ACS Norris Award in Physical Organic
Chemistry, 1982

PROFESSIONAL ACTIVITIES

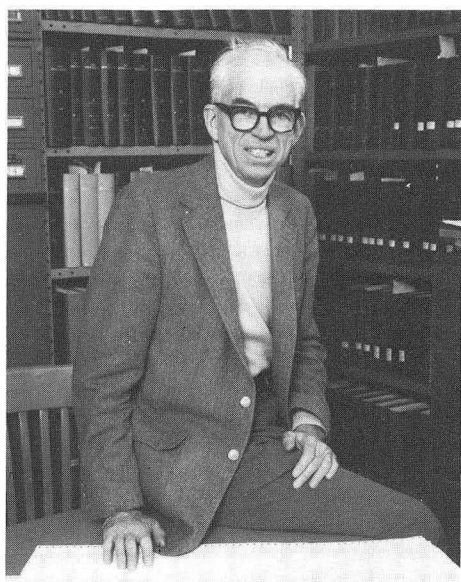
Professor of Chemistry
Chairman, Organic Division, ACS, 1973-74
Chemistry Advisory Panel, Air Force
Office of Scientific Research, 1971-75
Member of International Committees for
several IUPAC Conferences on Physical
Organic Chemistry
Commission on Physical Organic
Chemistry, IUPAC, 1973
Committee on Kinetics of Chemical
Reactions, National Research Council,
1979-81

SCOPE OF RESEARCH

Organoactinide Compounds: Preparation,
characterization, structure, physical
and chemical properties; development
of potential new catalysts and
reagents; studies of bonding and
reaction mechanisms.
Carbon Acidity: Determination of
quantitative measures of ionic and
ion pair, kinetic and equilibrium
carbon acidities; mechanism of proton
transfer reactions in polar and non-
polar media; structure and signif-
icance of carbon ion intermediates in
organic synthesis.
Molecular Orbital Theory in Organic
Chemistry: Quantum chemical computa-
tions and evaluation of electron
density functions applied to various
chemical concepts.

DAVID H. TEMPLETON
Chemistry

ANOMALOUS X-RAY SCATTERING, X-RAY DICHROISM, CRYSTAL STRUCTURE



EDUCATION

BS, Louisiana Polytechnic Institute
MA, University of Texas
PhD, University of California Berkeley

Committee on Chemical Crystallography,
National Academy of Sciences, National
Research Council, 1963-68, 1974-75

SOCIETIES

American Crystallographic Association
American Chemical Society
American Association for the
Advancement of Science (Fellow)

AWARDS AND HONORS

Guggenheim Fellowships, 1954, 1969
Fil. Dr. (h.c.) University of
Uppsala, Sweden 1977

PROFESSIONAL ACTIVITIES

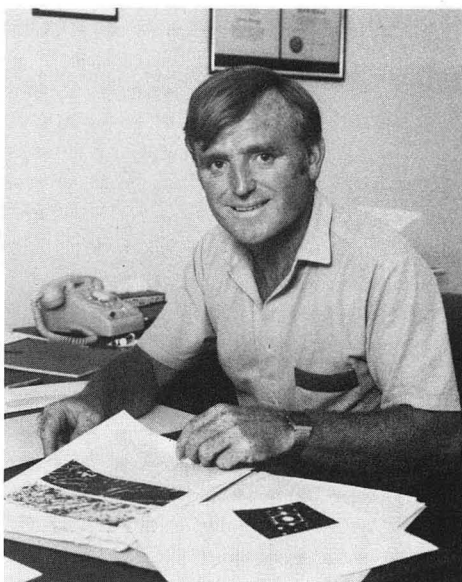
Professor of Chemistry
Dean of the College of Chemistry,
University of California Berkeley,
1970-75
Co-Editor, Acta Crystallographica
US National Committee for Crystal-
lography 1957-59, 1963-65, 1967-69,
1973-76

SCOPE OF RESEARCH

Studies of anomalous scattering and dichroism of x-rays to provide a foundation for applications of synchrotron radiation to problems of chemical structure. This anomalous scattering can help solve the structures of macromolecular crystals or separate the effects of different atoms in other diffraction problems. Dichroism permits the polarized nature of synchrotron radiation to be exploited to make absorption spectroscopy more powerful, and it may lead to new methods in crystal structure analysis.

Investigations of crystal structure of compounds of actinide and lanthanide elements to aid in their identification, to establish their molecular structures and bonding, and to provide a basis for studies of their physical and chemical properties.

STRUCTURE OF MATERIALS



EDUCATION

BSc, University of Wales, Cardiff
PhD and ScD, Cambridge University

SOCIETIES

Sigma Xi
American Society for Metals (Fellow)
American Institute of Metallurgical
Engineers (Fellow)
Royal Microscopical Society (Fellow)
American Ceramic Society
Electron Microscopy Society of America
Metals Society, United Kingdom

AWARDS AND HONORS

Miller Research Professor, 1964
American Society for Metals Bradley
Stoughton Teaching Award, 1965
Grossman Publication Award (ASM), 1966
Curtis-McGraw Research Award, 1966
Guggenheim Fellow, 1971-72
The Rosenhain Medal, Metals Society
(UK), 1977
Ernest O. Lawrence Award, 1978
EMSA Distinguished Award for
Physical Sciences, 1980
Humboldt Senior Science Award, 1981
National Academy of Engineering

PROFESSIONAL ACTIVITIES

Professor of Metallurgy
Scientific Director, National Center for
Electron Microscopy (NCEM), at LBL
Associate Dean, Graduate Division, UCB,
1968-69
Assistant to Chancellor, UCB, 1969-72
Acting Vice Chancellor, Academic
Affairs, UCB, 1972
Secretary General of IFSEM, 1974-
President, EMSA, 1975

SCOPE OF RESEARCH

Experimental program investigating
structure-property relations involving
characterization of materials using,
for example, high resolution and
analytical electron microscopy.

Alloy Design of Medium Carbon Steels:
Combinations of high strength and
superior toughness, and improved
wear-resistant alloys.

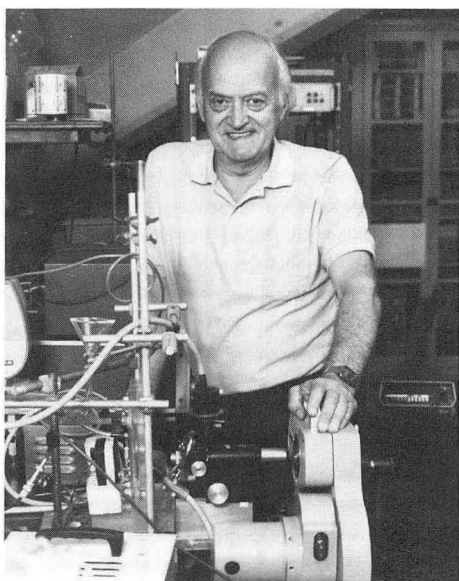
Alloy design of low carbon, Dual-Phase
Steels: Effects of composition and
heat treatment on the strength,
fracture, and corrosion resistance of
simple low carbon steels, through
controlled microstructure-property
relations. Applications to transpor-
tation, line-pipe, and high tensile
wires.

Refractory Ceramics: Effort divided
between developing new analytical
instrumentation for ceramics research
and applying new techniques to
significant ceramic problems, such as
grain boundaries.

Magnetic Materials: Magnetic properties
for high permeability applications
such as garnets for bubble devices,
hard magnets, especially rare-earth
Co-Sm-based soft magnets: ferrites.

Atomic Resolution Microscopy and
Spectroscopy: Direct imaging of atoms
in solids, and modern techniques for
compositional analysis in small
volumes.

ELECTROCHEMICAL PROCESSES



EDUCATION

Diploma of Chemical Engineering,
and PhD, University of Technical
Sciences, Budapest.

SOCIETIES

The Electrochemical Society (Honorary
Member), President, 1970-71
American Institute of Chemical Engineers
Bunsen Gesellschaft
American Society for Engineering
Education
American Chemical Society
Sigma Xi
Fellow of the AAAS, 1965
Registered Professional Engineer, Calif.
International Society for Electro-
chemistry, President, 1977-78

AWARDS AND HONORS

Miller Research Professor, University of
California, Berkeley
Acheson Award, The Electrochemical
Society, 1972
India-United States Exchange
Scientist, NSF, 1973
BASF, Renowned Scientist Lecture, 1975
Centennial Scholar, Case Western
Reserve University, 1980

PROFESSIONAL ACTIVITIES

Professor of Chemical Engineering
Chairman of the Department of Chemical
Engineering, 1967-72
Acting Dean, College of Chemistry, 1978
Divisional Editor, Journal of the
Electrochemical Society, 1954-
Advisory Editorial Board: Journal of
Applied Electrochemistry, London, 1971-
Chairman, Committee on Battery Materials
Technology, NAS/NRC, 1979-81

SCOPE OF RESEARCH

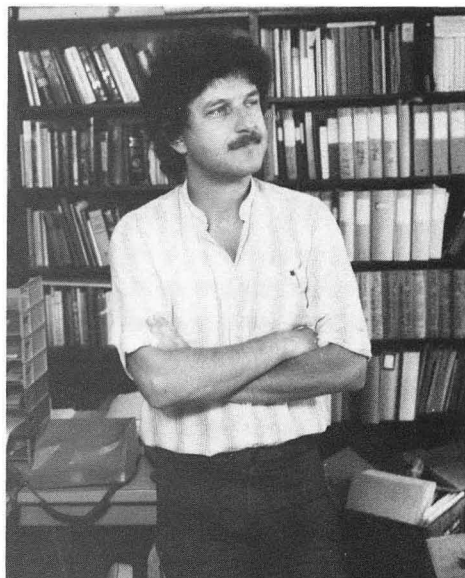
Mass Transport in Electrolysis: The
combined influences of cell geometry,
electrode potential, and hydrodynamic
conditions on limiting rates of
electrolysis and on current distribu-
tion are evaluated. Emphasis is
placed on high rate processes, such
as anodic shaping (ECM), and electro-
forming.

Gas-Electrolyte-Electrode Interfaces:
Supersaturation, nucleation, bubble
growth, coalescence, and detachment
from the electrode surface are
characterized on various metallic
substrates for hydrogen and oxygen
evolution in aqueous electrolytes.
The behavior of bubble streams in
free and forced convection, and their
influence on ohmic resistance are
elucidated.

**Surface Morphology of Metals Undergoing
Electrodeposition/Dissolution:** The
role of hydrodynamic flow, and of
electric field on the macrocrystalli-
zation of metals in electrodeposition,
and the contours obtained following
anodic dissolution, are evaluated by
various electrochemical and optical
techniques. Theoretical models are
developed for the simulation of
advancing and receding profiles.

Non-Aqueous Ionizing Media: These are
investigated for potential use at
ambient temperatures for electro-
synthesis and for galvanic cells. Of
primary interest are the transport
properties in aprotic solvents and
the thermodynamic and kinetic para-
meters of electrode couples that are
unstable in aqueous media.

TRANSITION METAL CATALYSTS AND ORGANOMETALLIC CHEMISTRY



EDUCATION

Vordiplom, University of Munich
PhD, University College, London

SOCIETIES

German Chemical Society
The Chemical Society (London)
American Chemical Society
Sigma Xi

AWARDS AND HONORS

Fellow and Overseas Fellow of the
Studienstiftung des Deutschen Volkes
Regents Summer Faculty Fellow
Alfred P. Sloan Foundation Fellow
Camille and Henry Dreyfus Teacher
Scholar
Visiting Professorship, University of
Paris at Orsay

PROFESSIONAL ACTIVITIES

Associate Professor of Chemistry

SCOPE OF RESEARCH

Research in the development of new catalytic systems in the conversion of coal to liquid fuels, the hydrogenation and hydrogenolysis of coal-derived organic molecules, Fischer-Tropsch synthesis, pyrolysis of sulfur-containing coal contaminants.

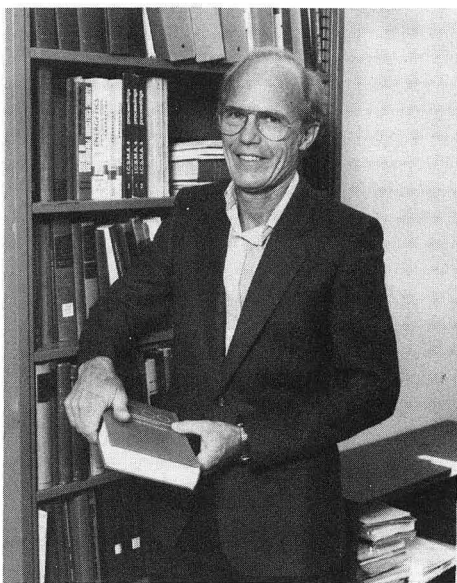
Studies in the application of transition metal catalysts and reagents to the chemo-, regio-, and stereo-specific construction of complex natural products (steroids, alkaloids, prostaglandins, antitumor agents).

Total synthesis of activated potentially mutagenic and carcinogenic polycyclic benzenoid and nonbenzenoid hydrocarbons.

Development of new synthetic methodology based on gas phase pyrolytic techniques and the discovery of novel rearrangements in the coordination sphere of transition metals.

JACK WASHBURN
Metallurgy

EFFECTS OF STRUCTURAL IMPERFECTIONS ON PROPERTIES OF SEMICONDUCTORS AND SEMICONDUCTOR INTERFACES



EDUCATION

BS, MS and PhD, University of California
Berkeley

Chairman, Department of Materials
Science and Mineral Engineering,
University of California Berkeley,
1966-70

SOCIETIES

American Society for Metals
Sigma Xi
Tau Beta Pi
American Institute of Mining and
Metallurgical Engineers
American Association of University
Professors
American Association for the Advance-
ment of Science

SCOPE OF RESEARCH

Study of the nature of structural
defects in semiconductor materials
and their effects on properties.
Clarification of important processing
steps such as crystal growth,
recrystallization, ion implantation,
oxidation, and diffusion annealing,
laser annealing that can result in
the formation of point, line, and
area defects, and the interaction of
dopant elements and impurities with
dislocation lines, stacking faults,
grain boundaries and precipitates of
critical importance to the electrical
behavior of solid-state devices.

High resolution electron microscopy, ion
back scattering techniques, electrical
measurements and secondary ion mass
spectroscopy are being used to better
understand these complex interactions
in silicon, gallium arsenide, and
copper sulfide.

AWARDS AND HONORS

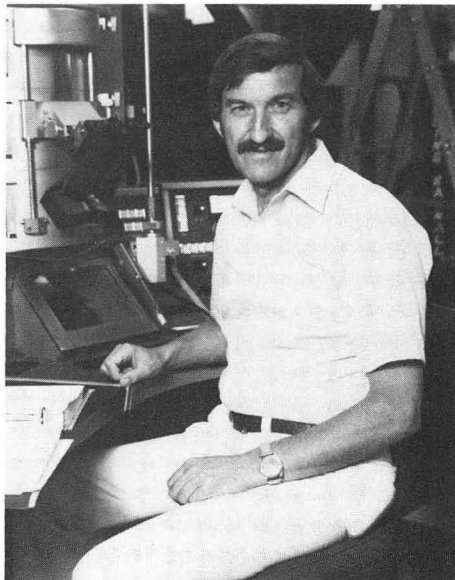
Mathewson Gold Medal for Research, AIME,
1956
Research Professor, Miller Institute for
Basic Research in Science, Berkeley
1962-63
National Science Foundation Fellow,
Cambridge University, 1959-60
University of Paris Faculty of
Science, 1965

PROFESSIONAL ACTIVITIES

Professor of Metallurgy

KENNETH H. WESTMACOTT
Metallurgy

SOLID STATE PHASE TRANSFORMATION MECHANISMS



EDUCATION

BS, Oxford Polytechnic (UK)
AIM, Associate Institution of
Metallurgists (UK)
PhD, University of Birmingham (UK)

SOCIETIES

American Institute of Metallurgical
Engineers
Electron Microscope Society of America

AWARDS AND HONORS

U.S. Naval Weapons Center Fellowship
1967, 1975

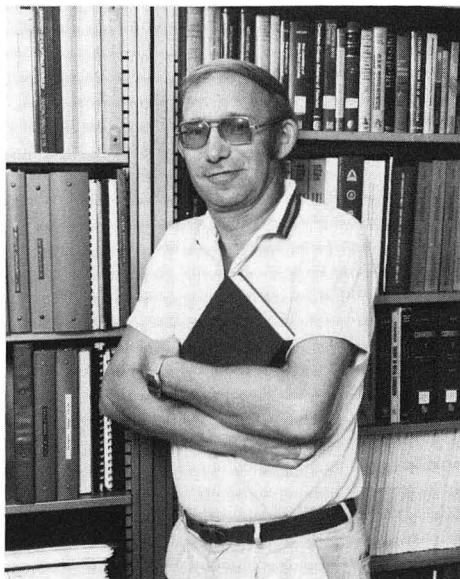
PROFESSIONAL ACTIVITIES

Staff Senior Scientist
Manager, High Voltage Electron
Microscope, National Center for
Electron Microscopy (NCEM), at LBL

SCOPE OF RESEARCH

Application of transmission electron
microscopy, particularly high voltage
microscopy, to the microstructural
characterization of materials.
Experimental and theoretical studies of
solid state phase transformations
with particular emphasis on the role
of crystal lattice defects, precipi-
tate nucleation and growth mechanisms,
the origin of orientation
relationships.
Dynamic in-situ studies of gas-solid
reactions and their effects on micro-
structure properties.
Organization and operation of a
user-oriented resource for transmis-
sion electron microscopy at the NCEM.

HIGH TEMPERATURE OXIDATION AND CORROSION OF MATERIALS



Steering panel for Combustion Zone
Durability Program of US Department
of Energy Fossil Fuel Utilization
Division

SCOPE OF RESEARCH

Research into the high temperature materials behavior in corrosive atmospheres in order to identify critical material and environment parameters which limit performance; corrosion rates as a function of gaseous and material compositions. Studies on interactions between liquid sulfate deposits and oxide covered metal surfaces; thermodynamics of oxide fluxing reactions; implications to hot corrosion of alloys and coatings in high temperature energy systems.

Defect chemistry and transport studies in oxides and oxide solutions; incorporation of sulfur into oxide lattice and its effects on the point defect concentration; interpretation of kinetics of growth of oxide solid solutions.

Studies of adhesion between oxide scales and substrate alloys and coatings; the nature of the alloy/scale interface; influence of alloy structure and composition.

Morphological development of scales on alloys and its relationship to the thermodynamics and transport properties of the phases involved. Prediction of alloy oxidation rates.

Application of solid state electrochemical devices to measure oxidant solubilities and diffusivities in alloys and studies of internal oxidation and sulfidation reactions.

Multicomponent diffusion theory and application to protective coating systems.

EDUCATION

BSc, MSc, PhD, and DSc, University of
Manchester (UK)

SOCIETIES

Electrochemical Society
National Association of Corrosion
Engineers
American Society for Metals
Metallurgical Society of AIME
Institution of Corrosion Science
and Technology

AWARDS AND HONORS

Max Planck Gesellschaft Fellow,
1967-68

PROFESSIONAL ACTIVITIES

Staff Senior Scientist
Professor in Residence, Materials
Science
Advisory Panel on "Corrosion in Energy
Systems," Council on Materials Science
of the Division of Materials Science,
US Department of Energy, 1979

JOHN S. WINN
Chemistry

MOLECULAR BEAM SPECTROSCOPY



EDUCATION

SB, Massachusetts Institute of Technology
PhD, University of California Berkeley

SOCIETIES

American Chemical Society
American Physical Society
Sigma Xi

AWARDS AND HONORS

Regent's Faculty Fellowship, 1976
Alfred P. Sloan Research Fellowship, 1978

PROFESSIONAL ACTIVITIES

Assistant Professor of Chemistry

SCOPE OF RESEARCH

Studies of gas-phase metal carbonyl dissociation mechanisms, dynamics, and efficiencies of various energy deposition processes leading to metal-ligand dissociation.

Fundamental information on molecular geometries derived from high resolution supersonic molecular beam electric resonance spectroscopy of molecular complexes and stable molecules.

Application of gas phase metal carbonyl dissociation mechanisms as a new technique for generating thin metal films.

PETER Y. YU
Solid State Physics

PICOSECOND SPECTROSCOPIES IN SOLIDS



EDUCATION

BS, University of Hong Kong
PhD, Brown University

SOCIETIES

American Physical Society
Sigma Xi
American Association for the
Advancement of Science

AWARDS AND HONORS

IBM Postdoctoral Fellowship, 1971
Directeur General de la Recherche
Scientifique et Technique Fellowship,
1977

PROFESSIONAL ACTIVITIES

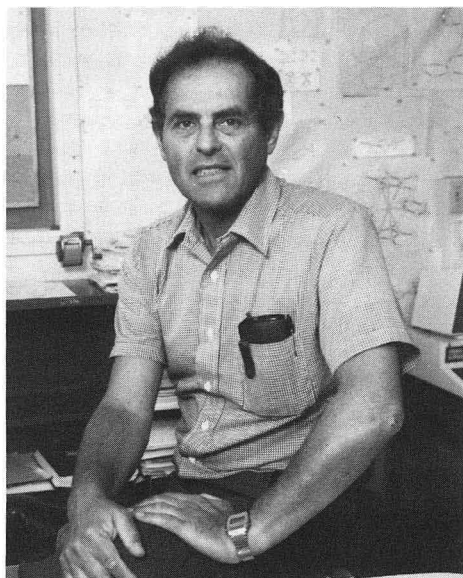
Professor of Physics

SCOPE OF RESEARCH

Application of resonant Raman and Brillouin scattering to study of exciton polaritons in semiconductors, electron-phonon interactions and electronic and vibrational properties of point defects in III-V and II-VI semiconductors such as GaP, CdS, and ZnSe which are in display devices. Study of relaxation of hot carriers and hot phonons in semiconductors by picosecond laser spectroscopies to understand how energy from intense laser beams is transferred to the lattice.

ALLAN ZALKIN
Crystallography

CRYSTAL STRUCTURE OF ACTINIDE COMPOUNDS



EDUCATION

BS, University of California
Los Angeles
PhD, University of California Berkeley

SOCIETIES

American Chemical Society
American Crystallographic
Association

PROFESSIONAL ACTIVITIES

Staff Senior Scientist

SCOPE OF RESEARCH

Crystallographic studies of inorganic
materials.
Structural and chemical studies of
actinide and rare-earth compounds.
Application and programming of
computers for crystallographic
problems.

This report was done with support from the Department of Energy. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the Department of Energy.

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