RODNEY C. EWING

Rod Ewing is the Frank Stanton Professor in Nuclear Security and a Co-director of the Center for International Security and Cooperation in the Freeman Spogli Institute for International Studies and a Professor in the Department of Geological Sciences in the School of Earth, Energy and Environmental Sciences at Stanford University. He is also the Edward H. Kraus Distinguished University Professor *Emeritus* at the University of Michigan, where he had faculty appointments in the Departments of Earth & Environmental Sciences, Nuclear Engineering & Radiological Sciences and Materials Science & Engineering. He is a Regents' Professor *Emeritus* at the University of New Mexico, where he was a member of the faculty from 1974 to 1997. Ewing received a B.S. degree in geology from Texas Christian University (1968, summa cum laude) and M.S. (l972) and Ph.D. (l974, with distinction) degrees from Stanford University where he held an NSF Fellowship. His graduate studies focused on an esoteric group of minerals, metamict Nb-Ta-Ti oxides, which are unusual because they have become amorphous due to radiation damage caused by the presence of radioactive elements. Over the past thirty years, the early study of these unusual minerals has blossomed into a broadly based research program on radiation effects in complex ceramic materials. This has led to the development of techniques to predict the long-term behavior of materials, such as those used in radioactive waste disposal. He is the author or co-author of over 750 research publications and the editor or co-editor of 18 monographs, proceedings volumes or special issues of journals. He has published widely in mineralogy, geochemistry, materials science, nuclear materials, physics and chemistry in over 100 different ISI journals. He has been granted a patent for the development of a highly durable material for the immobilization of excess weapons plutonium. He is a Founding Editor of the magazine, *Elements*, which is now supported by 17 earth science societies. He is a Principal Editor for *Nano LIFE*, an interdisciplinary journal focused on collaboration between physical and medical scientists. In 2014, he was named a Founding Executive Editor of *Geochemical Perspective Letters* and appointed to the Editorial Board of *Applied Physics Reviews*.

Ewing has received the Hawley Medal of the Mineralogical Association of Canada in 1997 and 2002, a Guggenheim Fellowship in 2002, the Dana Medal of the Mineralogical Society of America in 2006, the Lomonosov Gold Medal of the Russian Academy of Sciences in 2006, a Honorary Doctorate from the Université Pierre et Marie Curie in 2007, the Roebling Medal of the Mineralogical Society of America in 2015, Ian Campbell Medal of the American Geoscience Institutue, 2015, the Medal of Excellence in Mineralogical Sciences from the International Mineralogical Association in 2015, and is a foreign Fellow of the Royal Society of Canada. He is also a fellow of the Geological Society of America, Mineralogical Society of America, Mineralogical Society of Great Britain and Ireland, American Geophysical Union, Geochemical Society, American Ceramic Society, the American Association for the Advancement of Science and the Materials Research Society. He was elected a member of the National Academy of Engineering in 2017.

He has been president of the Mineralogical Society of America (2002) and the International Union of Materials Research Societies (1997-1998). Ewing has served on the Board of Directors of the Geochemical Society, the Board of Governors of the Gemological Institute of America and the Science and Security Board of the *Bulletin of the Atomic Scientists*. He has been a guest scientist at the Hahn-Meitner-Institut in Berlin, Queensland University in Australia, Technion University in Haifa, Centre D'Etudes Nucléaires de Fontenay-Aux-Roses of the Commissariat A L'Énergie Atomique in France, Charles University in Prague, Japan Atomic Energy Research Institute - Tokai, the Institut für Nukleare Entsorgungstechnik of the Kernforschungszentrum Karlsruhe, Aarhus University in Denmark, the Mineralogical Institute of Tokyo University and the Khlopin Radium Institute in St. Petersburg, Russia.

He has been a member of program committees for the symposium on the *Scientific Basis for Nuclear Waste Management* held in ten different countries over the past 35 years. He is co-editor of and a contributing author of *Radioactive Waste Forms for the Future* (North-Holland Physics, Amsterdam, 1988) and *Uncertainty Underground – Yucca Mountain and the Nation's High-Level Nuclear Waste* (MIT Press, 2006). Professor Ewing has served on eleven National Research Council committees for the National Academy of Sciences that have reviewed issues related to nuclear waste and nuclear weapons. In 2012, he was appointed by President Obama to serve as the Chair of the Nuclear Waste Technical Review Board, which is responsible for ongoing and integrated technical review of DOE activities related to transporting, packaging, storing and disposing of spent nuclear fuel and high-level radioactive waste; he stepped down from the Board in 2017.

RODNEY C. EWING

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Freeman Spogli Institute for International Studies
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EDUCATION

B.S., 1968, Texas Christian University
Major: Geology Minor: Combined Sciences
Cumulative grade point: 3.9/4.0, *Summa Cum Laude*, University Honors, Departmental Honors

M.S., 1972, Stanford University

Ph.D., 1974, with distinction, Stanford University
Mineralogy of Metamict, Rare Earth, AB_2O_6-type, Nb-Ta-Ti Oxides

MILITARY SERVICE

Branch of Service: Army, Military Intelligence
Dates of active duty: January 1, 1969 - September 30, 1970
Duties: interpreter (Vietnamese)
Decorations: Bronze Star; Gallantry Cross (RSVN)

FELLOW

Mineralogical Society of America (1983)
Geological Society of America (1985)
American Association for the Advancement of Science (2004)
American Geophysical Union (2007)
Materials Research Society (Inaugural Class of Fellows, 2008)
American Ceramic Society (2008)
Geochemical Society and the European Association for Geochemistry (2009)
Royal Society of Canada - Earth, Ocean and Atmospheric Sciences Division (Foreign Fellow, 2009)
Mineralogical Society of Great Britain and Ireland (Honorary Fellow, 2013)
National Academy of Engineering (2017)

PROFESSIONAL SOCIETIES:

Mineralogical Society of America (President, 2002)
Mineralogical Association of Canada
Friends of Mineralogy
Geochemical Society (Board of Directors, 2012 – 2015)
Geological Society of America
New Mexico Geological Society (President, 1981)
American Geophysical Union
National Association of Geology Teachers
American Association for the Advancement of Science
Materials Research Society (Councilor, 1982-1985; Secretary 1985-1986; Councilor 1987-1989)
International Union of Materials Research Societies (Secretary, 1990-1994); Vice-president, 1995-1996; President, 1997-1998)
European Materials Research Society
American Ceramic Society
American Nuclear Society
Electron Microscopy Society of America
History of the Earth Sciences Society
Sigma Xi

SCHOLARSHIPS, AWARDS and HONORS

Josephine Barnes Scholarship, TCU, 1964-1966
Texaco Scholarship, TCU, 1966-1968
Bordon's Award (Outstanding Freshman), TCU, 1964
Sigma Phi Eta, TCU, 1964
Who's Who in American Colleges and Universities, 1967-1968
Gayle Scott Award (Geology), TCU, 1968
Sigma Xi Award, TCU, 1968
Senior Scholar (Geology), TCU, 1968
National Science Foundation Fellowship, Stanford University, 1970-1973
American Federation of Mineralogical Societies Scholarship, 1971-1973
GSA Penrose Bequest Research Grant, 1972-1973
Nominated for the Esquire Register, 1984, 1985 (to honor men and women < 40 yrs)
Who's Who in the West
Who's Who in Technology Today
Personalities of America
American Men and Women of Science
Who's Who in Science and Engineering (2nd Ed., 94-95; 3rd Ed., 95-96; 5th Ed., 2000-2001)
Who's Who in America (49th Edition, 94-95)
Who's Who in the World (12th Edition, 95-96)
Regents' Professor, University of New Mexico, 1993 to 1997
"Winner" in DOE/BES 1995 Materials Sciences Research Competition in the category Metallurgy and Ceramics for research on "Crystalline Ceramics as Hosts for Disposal of Excess Weapons Plutonium" (with W.J. Weber of Battelle PNL, Richland, WA).
Hawley Medal of the Mineralogical Association of Canada, 1997
“Winner” in DOE/Office of Science, Basic Energy Sciences competition to select major breakthrough research for the year 2000 (presented to Congress): Discovery of the radiation resistance of Gd-zirconate pyrochlore (with W.J. Weber of Battelle PNL, Richland, WA).
Yamada Foundation Fellowship, University of Tokyo, 1997
Outstanding Achievement Award for 2000-2001, Department of Nuclear Engineering and Radiological Sciences.
Best Paper Award, Materials Research Society (Symposium JJ) “Radiation Effects in Crystalline Oxide Host Phases for the Immobilization of Actinides” with W.J. Weber, 2002
Outstanding Service Award, International Union of Materials Research Societies, 2001
Best Paper Award, Materials Research Society (Symposium JJ) “Radiation Effects in Zircon” with C. Palenik, 2002
Guggenheim Fellowship, 2002
Hawley Medal of the Mineralogical Association of Canada, 2002
William Kerr Collegiate Professor of Nuclear Engineering Radiological Sciences, 2002 – 2004
Donald R. Peacor Collegiate Professor of Geological Sciences, 2004 - 2009
Mineralogical Society of America Distinguished Lecturer, 2004 - 2005
Zussman Lecture, University of Manchester, U.K., June, 23, 2005
Dana Medal of the Mineralogical Society of America, 2006
Michel T. Halbouty Distinguished Lecturer, Geological Society of America, 2006
Umbgrove Lecture, Universiteit Utrecht, Utrecht, The Netherlands, May 8, 2006.
Assoc. of Earth Science Editors Award for Outstanding Editorial or Publishing Contributions, 2006
Lomonosov Great Gold Medal of the Russian Academy of Sciences, 2006
Hamilton Visiting Scholar, Southern Methodist University, Texas, 2007

Honorary Doctor of Université Pierre et Marie Curie, 2007
Royal Society of Canada, Foreign Fellow, 2009
Edward H. Kraus Distinguished University Professor, University of Michigan, 2009
Best Professor Award (2010) – first recipient of an award made by undergraduates in the Department of Geological Sciences, University of Michigan
Hallimond Lecture of the Mineralogical Society of Great Britain and Ireland, September 28, 2010
Best Professor Award (2012) an award made by undergraduates in the Department of Earth & Environmental Sciences Department, University of Michigan
Ida Beam Distinguished Visiting Professorship, University of Iowa, 2013
Roebling Medal of the Mineralogical Society of America, 2015
Medal of Excellence in Mineralogical Sciences of the International Mineralogical Association, 2015
Ian Campbell Medal for Superlative Service to the Geosciences, American Geosciences Institute, 2015
Texas Christian University Distinguished Alumni Award, 2016
Grandey Distinguished Lecture, Colorado School of Mines, 2017
National Academy of Engineering, 2017

NAMED PROFESSORSHIPS:

- Regents Professor, University of New Mexico, 1993 – present (*emeritus*)
- William Kerr III Collegiate Professor, Nuclear Engineering & Radiological Sciences, University of Michigan, 2002 – 2004
- Donald R. Peacor Collegiate Professor, Earth & Environmental Sciences, University of Michigan, 2004 – 2009
- Edward H. Kraus University Professor, University of Michigan, 2009 – present (*emeritus*)
- Frank Stanton Professor of Nuclear Security, Stanford University, 2014 - present

PROFESSIONAL EXPERIENCE:

Summer 1966	Texas Instruments, Inc.	Geophysicist (JG)
Summer 1967	Smithsonian Institution	Research Assistant, NSF
Summer 1968	Pan American Petroleum	Geologist
Summer 1971	U.S. Geological Survey (Alaska)	Geologist
Autumn 1972	Stanford University	Teaching assistant
Summer 1973	Stanford University	Research assistant (NSF)
Spring 1974	Stanford University	Mineralogy Curator

University of New Mexico

1974-1978	Assistant Professor
1978-1984	Associate Professor
1979-1984	Chair, Dept. of Geology
1984-1993	Professor
1993-1997	Regents' Professor
1996-1997	Adjunct Professor of Chemical & Nuclear Engineering
1997-present	*Emeritus* Regents' Professor

University of Michigan

1997-2013	Professor of Nuclear Engineering & Radiological Sciences
1997-2013	Professor of Earth & Environmental Sciences
1998-2013	Professor of Materials Science & Engineering
2002-2004	William Kerr Collegiate Professor of Nuclear Eng. & Radiological Sciences
2004-2009	Donald R. Peacor Collegiate Professor of Geological Sciences
2005-2007	Chair, Dept. of Geological Sciences
2006-2013	Faculty Associate, Program in the Environment
2009-2013	Edward H. Kraus Distinguished University Professor
2014 - present	*Emeritus* Edward H. Kraus Distinguished University Professor
2014 - present	*Emeritus* Professor in Earth & Environmental Sciences, Materials Science & Engineering and Nuclear Engineering & Radiological Sciences

Stanford University

2010-2011	Visiting Professor in Center for International Security and Cooperation
2011-2013	Affiliate to Center for International Security and Cooperation
2014 – present	Professor, Geological Sciences
2014 – present	Senior Fellow, Center for International Security and Cooperation (CISAC)
2014 – present	Frank Stanton Professor in Nuclear Security, CISAC
2017 – present	Co-Director (Science) CISAC

APPOINTMENTS AS VISITING RESEARCH SCIENTIST or VISITING FACULTY

Northwest College and University Association for Science, visiting scientist, Battelle Pacific Northwest Laboratories, June, 1977.

Hahn-Meitner-Institut, Berlin, Germany, visiting research scientist, 1979-1988.

University of Queensland, Australia, visiting professor, March, 1982.

Oak Ridge Associated Universities, visiting scientist to Solid State Division, Oak Ridge National Laboratory, 1981-1994.

Technion University, Haifa, Department of Nuclear Engineering, visiting research faculty, January, 1985.

Centre D'Études Nucléaires de Fontenay-Aux-Roses, Commissariat A L'Énergie Atomique, visiting research scientist, July, 1989.

National Academy of Sciences Faculty Exchange Program to Charles University, Prague, Czechoslovakia, October, 1989.

Japan Atomic Energy Research Institute, Department of Environmental Safety Research, visiting research scientist, April, 1990.

Kernforschungszentrum Karlsruhe, Institut für Nukleare Entsorgungstechnik, visiting research scientist, June-July, 1990.

Aarhus University, Department of Earth Sciences, visiting Professor, June-1993, June-1994; Adjunct Professor, 1995 to 2000.

Pacific Northwest Laboratories Affiliate Staff Scientist, 1995 - 1997

University of Tokyo, Mineralogical Institute, Visiting Faculty, Yamada Foundation Fellowship, March, 1997

Stanford University, Center for International Security and Cooperation, Visiting Professor, 2010-2011; Affiliate, 2011-2013.

EDITORIAL POSITIONS

New Mexico Geological Society Guide Book, *Vermejo Country*, co-editor (with B.S. Kues) 1976
Journal of Materials Research, member of the Advisory Review Board, 1994-2002
Journal of Materials Research, Advisory Review Board, 1994-2002
Scientific Basis for Nuclear Waste Management, proceedings of the Materials Research Society, co-editor, 1982, 1984, 1988, 1994
American Mineralogist, associate editor, 1979-1981, 1986, 1998-2000.
Elements, founding editor, 2000
Elements, Water on Mars, managing editor, 2005
*Element*s, Nuclear Power: Environmental Impact, guest editor, 2006
Elements, Fukushima Daiichi – More Than One Year Later, guest editor, 2012
Mineralogia Polonica, Editorial Board, 1999-2001
Journal of Nuclear Materials, Advisory Editorial Board, 1991-2006
Journal of Nuclear Materials, special issue on Nuclear Waste Forms, guest editor, 1992
IUMRS Facets, corresponding editor, 2001-2010
Nano Life, principal editor, 2011 - present
Applied Physics Reviews, Editorial Board, 2014 – present
Geochemical Perspectives Letters, Founding Executive Editor, 2014 - present

BOARDS and COMMITTEES of the NATIONAL RESEARCH COUNCIL

Waste Isolation Pilot Plant, 1984 - 1996.

Remediation of Buried and Tank Wastes, 1992 - 1995.

Glass as a Waste Form and Vitrification Technology: An International Workshop (chair) 1996.

Alternative High-Level Waste Treatments at the Idaho National Engineering and Environmental Laboratory, 1998-1999.

End Points for Spent Nuclear Fuel and High-Level Radioactive Waste in Russia and the United States, 2001.

Improving the Scientific Basis for Managing Nuclear Materials and Spent Nuclear Fuel through the Environmental Management Science Program, 2001-2002.

Board of Radioactive Waste Management of National Academy of Sciences, Engineering, and Medicine, 2001-2005.

Development of 'Risk-Based' Approaches for Disposition of Transuranic and High-Level Radioactive Waste, 2003-2004.

The Effects of Nuclear Earth-Penetrator Weapon and Other Weapons, 2004.

Nuclear and Radiation Studies Board of National Academy of Sciences, Engineering, and Medicine, 2005 - 2006.

Management of Certain Radioactive Waste Streams Stored in Tanks at Three Department of Energy Sites, 2005-2006.

Technical Assessment of Environmental Programs at the Los Alamos National Laboratory (vice-chair), 2006-2007.

Waste Forms Technology and Performance (vice-chair), 2009 - 2011.
Board on Earth Sciences and Resources of National Academy of Sciences, Engineering, and Medicine, 2017 – 2020.

SERVICE to the NATIONAL RESEARCH COUNCIL

Served as a Reviewer for the National Research Council for the report entitled: "Progress, Challenges, and Opportunities for Converting U.S. and Russian Research Reactors from Highly Enriched to Low Enriched Uranium Fuel" (2011).

Served as a Report/Review Monitor for the National Research Council for the report entitled: "Uranium Mining in Virginia" (2011).

NATIONAL & INTERNATIONAL ADVISORY COMMITTEES & BOARDS

Alternative Waste Form Peer Review Panel for Department of Energy (Professor L. L Hench, chair), 1979-1981.

Scientific Needs of the Technology of Nuclear Waste Containment for the Office of Basic Energy Sciences of the Department of Energy (Professor D. Turnbull, chair), 1982.

Board of Directors of the Caswell Silver Foundation (secretary-treasurer), 1980-1984.

Board of Directors of Energy, Exploration, Education, Inc. (secretary), 1979-1984.

Second-Generation Waste Form Selection and Evaluation Group for the Department of Energy through Battelle, PNL, 1986.

Review panel for WIPP Materials Interface Interactions Test (MIIT), April, 1986.

Steering Committee member for the "Nuclear Waste Form Borosilicate Glass Compendium" prepared by Argonne National Laboratories for the U.S. Department of Energy, 1992.

National Advisory Council on Environmental Policy and Technology for the Environmental Protection Agency (subcommittee on WIPP), 1993-1995 (1st term); 1996-1999 (2nd term).

Technical Advisory Group for DOE on "Buried Waste Integrated Demonstration" at the Idaho National Engineering Laboratory (Professor D. Pye, chair), 1994 to 1995.

Tank Waste Remediation (Hanford, Washington), Waste Processing Architecture Group, Battelle Pacific Northwest Laboratories (Dr. R. Wymer, chair), 1994 to 1995.

Co-Chair, Panel on "Radiation Effects in Glasses Used for Immobilization of High-Level Waste and Plutonium Disposition", Council of Materials Science, Office of Basic Energy Sciences, Department of Energy, 1996.

Co-Chair, Panel on "Radiation Effects in Crystalline Ceramics for the Immobilization of High-Level Waste and Plutonium", Council of Materials Science, Office of Basic Energy Sciences, Department of Energy, 1997.

E.O. Lawrence Award of the Department of Energy, selection committee, 1997, 2001.

Consel Scientifique for the Direction des Sciences de la Matière, Commissariat à L'Energie Atomique, 1998-2000.

Review panel of the Total System Performance Assessment of the Yucca Mountain Repository for TRW (C.W. Whipple, chair), 1996-1999.

Consel Scientifique for the Direction des Sciences de la Matiere, Commissariat à L'Energie Atomique, 1998-2000.

International Scientific Advisory Board (member; A.J. Leadbetter, chair) of the Research Program on the Long-Term Behavior of Nuclear Waste Glasses for the Nuclear Energy Division of the Commissariat à L'Energie Atomique, 2002-2005.

Advisory Council of ITC, School for Underground Waste Storage and Disposal, (2010 to present) a consortium of 59 members from 16 countries, 2010 to present.

Visiting Committee (chair) for Commissariat à L'Energie Atomique (2010 - 2011) appointed by the High Commissioner for Atomic Energy, France.

Review Panel for the Heavy Element Chemistry and Separations & Analysis. (panel lead, 2011) *Report of the Committee of Visitors of the Division of Chemical Sciences, Geosciences and Biosciences Division to the Basic Energy Sciences Advisory Committee*, April, 6-8, 2011, 67 pages.

Environmental Management Advisory Board (member) for the Department of Energy (2010-2011) appointed by the Secretary of Energy, USA.

Scientific Advisory Committee for *Center for Energy Frontier Research in Extreme Environments (EFree)* (member, 2010-present) at the Geophysical Laboratory, Carnegie Institution, Washington, D.C., April 14, 2011, 5 pages.

Gemological Institute of America, Board of Governors, 2006 - 2015.

Advisory Board for United Kingdom Spent Nuclear Fuel Research Consortium (member, 2011 - present).

Board of Directors, Geochemical Society (2012 – 2015)

Science and Security Board of the *Bulletin of the Atomic Scientists* (2012 – 2018)

Nuclear Waste Technical Review Board (Chair) (2011-2017) appointed by President Obama to the Board on July 28, 2011 and designated as Chair on September 26, 2012.

Advisory Committee (member) to the Nuclear Science and Engineering Program, Colorado School of Mines (2017 – present).

EUROPEAN COMMISSION & EUROPEAN AGENCIES

Expert Evaluator for the European Commission for the Euratom Reseach and Training Programme on Nuclear Energy (2002-2006). Involved panel review of programs on Nuclear Fission and Radiation Protection with the Sixth Framework Programme. June 1-4, 2003.

Expert reviewer for the Engineering and Physical Sciences Research Council, United Kingdom, 2005. 2008.

PATENTS

U.S.Patent 5,545,797 for: METHOD OF IMMOBILIZING WEAPONS PLUTONIUM TO PROVIDE A DURABLE, DISPOSABLE WASTE PRODUCT.
Inventors: Rodney C. Ewing, Werner Lutze, William J. Weber.

PUBLICATIONS (* indicates student authors)

Cumulative Web of Science: 625 papers with a total of 17,877 citations; **h = 66**
Cumulative Goggle Scholar data: 28,016 citations; **h = 80**

Journals

1. Rodney C. Ewing and A. J. Ehlmann (1973) Yttrialite and uraninite, additional minerals from the Rode Ranch Pegmatite, Central Mineral Region Texas. The American Mineralogist, 58, 545-547.
2. Rodney C. Ewing (1973) Vickers hardness and reflectance determinations for metamict AB_2O_6-type rare earth Nb-Ti-Ta oxides. The American Mineralogist, 58, 942-944.
3. Rodney C. Ewing (1974) Spherulitic recrystallization of metamict polycrase. Science (cover), 184, 561-562.
4. Rodney C. Ewing and J. L. Krumhansl (1974) Natural gamma-ray spectra of euxenite, polycrase and aeschynite. The Canadian Mineralogist, 12, 357-359.
5. Rodney C. Ewing and A. J. Ehlmann (1975) Annealing study of metamict, ortho-rhombic, rare earth, AB_2O_6-type, Nb-Ta-Ti oxides. The Canadian Mineralogist, 13, 1-7.
6. Rodney C. Ewing (1975) Alteration of metamict, rare-earth, AB_2O_6-type, Nb-Ta-Ti oxides. Geochimica et Cosmochimica Acta, 39, 521-530.
7. Rodney C. Ewing (1975) The crystal chemistry of complex niobium and tantalum oxides IV. The metamict state: Discussion. The American Mineralogist, 60, 728-730.
8. Rodney C. Ewing (1976) A numerical approach toward the classification of complex orthorhombic, rare-earth AB_2O_6-type Nb-Ta-Ti oxides. The Canadian Mineralogist, 14, 111-119.
9. Rodney C. Ewing (1976) Metamict mineral alteration: An implication for radioactive waste disposal. Science, 192, 1336-1337.
10. Rodney C. Ewing (1976) Metamict columbite reexamined. Mineralogical Magazine, 40, 898-899.
11. R. H. Jahns and Rodney C. Ewing (1976) The Harding pegmatite, Taos County, New Mexico. Vermejo Park, Guidebook for the 27th Field Conference of the New Mexico Geological Society, 263-276.
12. R. H. Jahns and Rodney C. Ewing (1977) The Harding mine, Taos County, New Mexico. Mineralogical Record, 8, 115-126.
13. Rodney C. Ewing, K. B. Snetsinger and T. E. Bunch (1977) Euxenite from Ampangabe, Madagascar. The Canadian Mineralogist, 15, 92-96.
14. Rodney C. Ewing and S. Thompson III (1977) Thermal metamorphism of organic matter in drill cuttings from KCM No. l Forest Federal Well, Hidalgo County, New Mexico. In Geology, petroleum source rocks, and thermal metamorphism in KCM No. 1 Forest Federal Well, Hidalgo County, New Mexico. New Mexico Bureau of Mines and Mineral Resources Circular 152, 49-52.
15. M. Taylor and Rodney C. Ewing (1978) The crystal structures of the $ThSiO_4$ polymorphs: huttonite and thorite. Acta Crystallographica, B34, 1074-1079.
16. Rodney C. Ewing (1978) The elegant symmetry of crystals. Natural History, February, 63-71.
17. Wilson W. Crook, Rodney C. Ewing and A. J. Ehlmann (1978) Rowlandite from the Baringer Hill rare-earth pegmatite district, Llano and Burnet counties, Texas. The American Mineralogist, 63, 754-756.
18. W. L. Mansker*, K. Keil and Rodney C. Ewing (1979) Contributions to the mineral chemistry of Hawaiian rocks VII: Barian-titanian biotites in nephelinites from Oahu, Hawaii. The American Mineralogist, 64, 156-159.

19. D. G. Brookins, B. C. Chakoumakos*, C. W. Cook, Rodney C. Ewing, G. P. Landis and M. E. Register* (1979) The Harding Pegmatite: Summary of recent research. In New Mexico Geological Society Guidebook, 30th Field Conference, Santa Fe Country, R. V. Ingersoll and L. A. Woodward, Eds., 127-134.
20. R. F. Haaker and Rodney C. Ewing (1979) Differential thermal analysis of some irradiated materials: Discussion. The American Mineralogist, 64, 1131-1132.
21. F. Dowsett and Rodney C. Ewing (1980) High temperature alkali feldspars: A compositional gap. The Canadian Mineralogist, 18, 71-72.
22. Rodney C. Ewing and R. F. Haaker (1980) The metamict state: Implications for radiation damage in crystalline waste forms. Nuclear and Chemical Waste Management, 1, 51-57.
23. R. F. Haaker and Rodney C. Ewing (1981) A solution gelation method for preparing polycrystalline zircon. Journal of the American Ceramic Society, 63 (11), C-149.
24. T. J. Headley, Rodney C. Ewing and R. F. Haaker (1981) The structure of the metamict state. Nature, 293, 449-450.
25. Rodney C. Ewing and T. J. Headley (1983) Alpha-recoil damage in natural zirconolite ($CaZrTi_2O_7$) Journal of Nuclear Materials, 119, 102-109.
26. G. Malow, W. Lutze and Rodney C. Ewing (1984) Alteration effects and leach rates of basaltic glasses: Implications for the long-term stability of nuclear waste form borosilicate glasses. Journal of Non-Crystalline Solids, 67, 305-321.
27. R. B. Greegor, F. W. Lytle, Rodney C. Ewing and R. F. Haaker (1984) Ti-site geometry in metamict, annealed and synthetic complex Ti-Nb-Ta oxides by x-ray absorption spectroscopy. Nuclear Instruments and Methods in Physics Research, B1, 587-594.
28. W. Lutze, G. Malow, Rodney C. Ewing, M. J. Jercinovic* and K. Keil (1985) Alteration of basalt glasses: Implications for modelling the long-term stability of nuclear waste glasses. Nature, 314,252-255.
29. G. R. Lumpkin*, B. C. Chakoumakos, Rodney C. Ewing (1986) Mineralogy and radiation effects of microlite from the Harding Pegmatite, Taos County, New Mexico. American Mineralogist, 71, 569-588.
30. G. R. Lumpkin*, E. M. Foltyn and Rodney C. Ewing (1986) Thermal recrystallization of alpha-recoil damaged minerals of the pyrochlore structure type. Journal of Nuclear Materials, 129, 113-120.
31. G. R. Lumpkin*, R. C. Ewing, B. C. Chakoumakos, R. B. Greegor, F. W. Lytle, E. M. Foltyn, F. W. Clinard, Jr., L. A. Boatner and M. M. Abraham (1986) Alpha-recoil damage in zirconolite ($CaZrTi_2O_7$). Journal of Materials Research, 1, 564-576.
32. T. J. Headley and R. C. Ewing (1986) TEM study of the microstructure of metamict minerals. Microanalysis-1986 (San Francisco Press, San Francisco) 141-144.
33. G. R. Lumpkin* and R. C. Ewing (1986) High resolution transmission electron microscopy of microlite from the Harding pegmatite, Taos County, New Mexico. Microanalysis-1986 (San Francisco Press, San Francisco) 145-147.
34. Rachel Cowan* and Rodney C. Ewing (1986) Alteration products of basaltic glass, Hanauma Bay, Oahu, Hawaii. Microanalysis-1986 (San Francisco Press, San Francisco) 131-134.
35. T. J. Headley, R. C. Ewing and R. F. Haaker (1986) TEM study of the metamict state. In Physics of Minerals and Ore Microscopy, R. I. Kostov and B. K. Kamenov, Eds., (Bulgarian Academy of Science, Sofia) 281-289.
36. Rodney C. Ewing, Bryan C. Chakoumakos, Gregory R. Lumpkin* and Takashi Murakami (1987) The metamict state. Materials Research Society Bulletin, 12 (4), 58-66.
37. Bryan C. Chakoumakos, Takashi Murakami, Gregory R. Lumpkin*and Rodney C. Ewing (1987) Alpha-decay induced fracturing in zircon: The transition from the crystalline to the metamict state. Science (cover), 236, 1556-1559.

38. G. R. Lumpkin*, Y. Eyal and R. C. Ewing (1988) Preferential leaching and natural annealing of alpha-recoil tracks in metamict betafite and samarskite. Journal of Materials Research, 3 (2), 357-368.
39. R. C. Ewing, B. C. Chakoumakos, G. R. Lumpkin*, T. Murakami, R. B. Greegor and F. W. Lytle (1988) Metamict minerals: Natural analogues for radiation damage effects in ceramic nuclear waste forms. Nuclear Instruments and Methods in Physics Research, B32, nos. 1-4, and the Proceedings of the Fourth International Conference on Radiation Effects in Insulators, Lyon, France, July 6-10, 1987. Also printed in Nuclear Waste Materials: A Workshop On Radiation Damage Effects in Nuclear Waste Materials, edited by Hj. Matzke, 487-497.
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Review of the U.S. Department of Energy Activities to Preserve Records Created by the Yucca Mountain Repository Project, August, 2013, 69 pages.
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Evaluation of the Technical Issues Associated with the Development of a Separate Repository for U.S. Department of Energy-Managed High-Level Radioactive Waste and Spent Nuclear Fuel, June, 2015, 15 pages.
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INVITED LECTURES & COLLOQUIA (since 2010)

"Pyrochlore & Plutonium: The Elegant Response of a Simple Structure to Extreme Conditions," University of Illinois at Chicago, March 4, 2010.
"Nuclear Waste Management – Lessons Learned," invited keynote, Materials Research Society symposium on the Scientific Basis for Nuclear Waste Management XXXIV, San Francisco, CA, April 6, 2010.
"Pyrochlore & Plutonium: The Elegant Response of a Simple Structure to Extreme Conditions," invited seminar at University of Texas, El Paso, April 22, 2010.
"Actinide Materials Under Extreme Conditions," invited paper Advanced Photon Source Users Meeting, Argonne National Laboratory, May 5, 2010.
"Nuclear Waste Management – Lessons Learned," invited keynote, International Conference on Nuclear Power Plant: Technology and Safety," Hanoi, Vietnam, June 17, 2010.
"Nuclear Waste Forms for Actinides," presentation at EFRC Workshop Actinide Materials, Savannah River Site, South Carolina, July, 27, 2010.
"Nuclear Fuel Cycle: Mineralogy and Geochemistry in the Safe Management of Nuclear Waste" invited *Elements* lecture at the International Mineralogical Association Meeting, Budapest, Hungary, August 23, 2010.
"Nuclear Fuel Cycle: Mineralogy and Geochemistry in the Safe Management of Nuclear Wastes": invited Hallimond Lecture at the annual meeting of The Mineralogical Society, Cambridge, UK, September 28, 2010.
"Actinides at the 'Back-End' of Nuclear Fuel Cycles: Issues of Geological Disposal": invited Center of International Security & Cooperation, Stanford University, Stanford, CA, November 8, 2010.

"Geological Storage and Disposal of Fissile Material": invited International Panel for Fissile Material, Princeton University, Princeton, NJ, November 18, 2010.
"Plutonium: Geologic vs. Nuclear Solutions": Distinguished Speaker Series, School of Earth Sciences, Stanford University, January 24, 2011.
"Plutonium: Geologic vs. Nuclear Solutions": Invited Lecture, Université Paul Sabatier – Toulouse III, February 14th, 2011.
"Actinides at the 'Back-End' of the Nuclear Fuel Cycle: Impact on Geological Disposal": Invited Plenary, Nuclear and Radiochemistry Symposium (NUCAR) 2011, Visakhapatnam, Andhra Pradesh, India, February 22nd, 2011.
"Response of Solids to Extreme Conditions: Coupling High-Pressure Cells with Large Accelerators": Invited Seminar, Bhabha Atomic Research Centre, Mumbai, India, February 28, 2011.
"Environmental Impact of the Nuclear Fuel Cycle: Standards & Regulations": Invited Seminar, Center for International Security & Cooperation, CISAC, Stanford University, March 10, 2011.
"Plutonium: Geologic vs. Nuclear Solutions": Distinguished University Professor Lecture, University of Michigan, April 4, 2011.
"Environmental Impact of the Nuclear Fuel Cycle: Standards & Regulations": Invited Seminar, Elliott School of International Affairs, The George Washington University, April 15, 2011.
"Plutonium: Geologic vs. Nuclear Solutions": Invited Seminar, The George Washington University, April 15, 2011.
"Standards & Regulations for the Geologic Disposal of Spent Nuclear Fuel and High-Level Waste": Invited presentation at workshop sponsored by the Center for International Security and Cooperation, Stanford University, June 6, 2011.
"Nuclear Fuel Cycles and Nuclear Waste Forms": Invited seminar at Institute of Modern Physics of the Chinese Academy of Sciences, Lanzhou, P.R. China, August, 12, 2011.
"Actinide Waste Forms": Invited lecture at *Materials Challenges for Advanced Nuclear Energy Systems*, McANES-2011 International Summer School, Beijing, P.R. Republic, August 22, 2011.
"Plutonium: Geologic vs. Nuclear Solutions": Invited lecture at *Materials Challenges for Advanced Nuclear Energy Systems*, McANES-2011 International Summer School, Beijing, P.R. Republic, August 25, 2011.
"Plutonium: Geologic vs. Nuclear Solutions": Invited lecture, Department of Geological Sciences, University of North Carolina, September 1, 2011.
"Fluorite Structure & Derivatives": Workshop on *Thermodynamics of Actinides Materials: Theory and Experiment*, Notre Dame University, September 25, 2011.
"Standards and Regulations in the United States: What Went Wrong?": Invited, XXXV International MRS Symposium on the Scientific Basis for Nuclear Waste Management, Buenos Aires, Argentina, October 3, 2011.
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"Plutonium: "Burn" or Bury – Nuclear vs. Geologic Solutions": The Provost's Lecture Series, Stony Brook University, April 26, 2012.
"Nuclear Waste Forms: The Road Not Taken": Plenary lecture at first European Mineralogical Conference, Frankfurt, Germany, September 4, 2012.
"Nuclear Waste Forms: The Road Not Taken": Invited talk at Materials Research Society Fall meeting, November 27th, 2012, Boston, MA.
"What is Risk?": Discussant of Paul Slovic presentation at Doomsday Clock Symposium, November 29th, 2012, Washington, D.C.
"Nuclear Waste Forms: Complex Materials and Radiation Effects": Invited seminar to the Center of Research Excellence in Complex Materials at Michigan State University, December 13, 2012.
"Actinide Waste Forms and the Immobilization of Plutontium": Invited talk at workshop sponsored by the International Panel of Fissile Materials at Princeton University, January 25th, 2013.
"Lessons from Yucca Mountain: Standards, Regulations and Performance Assessments": Michigan Section of the American Nuclear Society, Ann Arbor, February 21, 2013.
"Lessons from Yucca Mountain: Standards, Regulations and Performance Assessments": invited seminar for the Department of Chemical and Nuclear Engineering, University of New Mexico, Albuquerque, February 26, 2013.
"Response of Simple, Model Systems to Extreme Conditions": invited lecture, Mechanical Behavior and Radiation Effects Contractors Meeting, Basic Energy Sciences, Potomac, Maryland, March 26th, 2013.
"Transuranium Elements: Impact on Geologic Disposal": invited presentation at symposium in honor of Richard Haire's receiving the Glenn Seaborg Medal of the American Chemical Society, 245th American Chemical Society National Meeting, New Orleans, LA, April 10th, 2013.
"Lessons Learned at Yucca Mountain: Standards, Regulations and Performance Assessments": Ida Beam Public Lecture, University of Iowa, Iowa City, Iowa, May 2, 2013.
"Actinides in the Nuclear Fuel Cycle and Their Impact on Geologic Disposal": Ida Beam Public Lecture, University of Iowa, Iowa City, Iowa, May 3, 2013.
"History and Present Status of the U.S. Nuclear Waste program: Role of the Nuclear Waste Technical Review Board": Seminar sponsored by Nucleopolis and GANIL/SPIRAL2, Caen, France, June 17, 2013.
"Plutonium: Nuclear *vs.* Geologic Solutions": research seminar at Nukleare Entsorgung, Forschungzentrum Jülich, GmbH, Jülich, Germany, July 17, 2013.
"The Effect of Nuclear Radiation on the Structure of Zircon": invited for the symposium in honor of Heinrich Holland at the Goldschmidt Conference, Florence, Italy, August 27, 2013.
"Nuclear Materials under Extreme Condition": keynote in the symposium on nuclear materials at the Goldschmidt Conference, Florence, Italy, August 29, 2013.
"Projecting Risk into the Future: Geologic Repository Failure and the Sinking of the Titanic": invited paper at the MRS Scientific Basis for Nuclear Waste Management XXXVII, Barcelona, Spain, September 30, 2013.
"U.S. Nuclear Waste Technical Review Board and the U.S. Program for the Long-Term Management of High-Activity Radioactive Waste" invited presentation at the Advisory Bodies to Government meeting, London, England, October 22, 2013.

"Extreme Conditions: Combining energetic ion beams with high pressure cells": invited lecture in session in honor of Frank Hawthorne, Roebling Medalist, 125th Annual Meeting of the Geological Society of America, Denver, CO, October, 27, 2013.
"Reflections on Yucca Mountain: What were the key issues?": invited lecture in session on radioactive waste management, 125th Annual Meeting of the Geological Society of America, Denver, CO, October, 27, 2013.
"Response of Solids to Extreme Conditions: Coupling High-Pressure Cells with Large Ion Accelerators": Earth & Environmental Science Seminar Series, Wayne State University, Detroit, MI, December 4, 2013.
"Actinide Waste Forms": Plutonium Disposition Alternatives Workshop sponsored by the Union of Concerned Scientsists, Washington, D.C., January 31, 2014.
"The Simplicity and Complexity of the Fluorite Structure"" invited lecture at the Workshop on Reducing Uncertainty in Performance Prediction (REDUPP) sponsored by EURATOM-7 and the European Community, Stockholm, Sweden, February 18, 2014.
"Lessons Learned at Yucca Mountain: Standards, Regulations and Performance Assessments": invited seminar, Notre Dame University, April 14, 2014.
"Lessons Learned at Yucca Mountain: Standards, Regulations and Performance Assessments": invited presentation at China-United States technical exchange, Beijing, China, May 9, 2014.
"Projecting Risk into the Future: Geologic Repository Failure and the Sinking of the *Titanic*": Keynote at symposium on nuclear waste management at the annual meeting of the Geological Association of Canada and the Mineralogical Society of Canada, Fredricton, New Brunswick, Canada, May 22, 2014.
"The Nuclear Fuel Cycle *vs.* the Carbon Cycle: Pu *vs.* C": Energy Seminar, Precourt Energy Institute, Stanford University, June 2, 2014.
"The Nuclear Fuel Cycle *vs.* the Carbon Cycle: Pu *vs.* C": keynote lecture in *Elements* symposium at the Goldschmidt Conference, Sacramento, CA, June 10, 2014.
"Response of Actinide-Bearing Materials to Highly Ionizing Irradiation": invited presentation in session on Scientific Basis of the Nuclear Fuel Cycle at the IUMRS – ICA meeting, Fukuoka, Japan, August 28, 2014.
"Long-Term Performance of Nuclear Waste Forms: Current Status and Perspectives": keynote address, Materials Science & Technology 2014, Pittsburg, PA, October 14, 2014.
"Response of Actinide-Bearing Materials to Highly Ionizing Irradiation": invited presentation on the occasion of the 50th Anniversary of the Nuclear Division of the American Chemical Society, Denver, CO, March 25th, 2015.
"Projecting Risk into the Future:" seminar in the Nuclear Engineering Department at the University of Tennessee, Knoxville, TN, April 1, 2015
"The Future of Nuclear Energy:" panelist at symposium sponsored by the Yale Climate & Energy Institute, New Haven, CN, April 24, 2015.
"Response of Actinide-Materials to Highly-Ionizing Irradiation" invited seminar at Lawrence Livermore National Laboratory, Livermore, CA, May 27th, 2015.
"Projecting Risk into the Future: Geologic Repository Failure and the Sinking of the *Titanic*": Keynote at symposium on nuclear waste management at the 25th Goldschmidt Conference, Prague, CZ, August 18, 2015.
"Nuclear Wastes in the United States: Where will it go?" presentation for Energy@Stanford&SLAC, Stanford University, September 9, 2015.
"Reset of America's Nuclear Waste Management Strategy and Policy," invited plenary at 15th International Conference on the Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere, Santa Fe, NM, September 14th, 2015.
"Energy Tutorial: Nuclear Waste Management 101": invited tutorial at GCEP 11th annual research symposium, Stanford, CA, October 13, 2015.

"The Science-Policy Interface,": Roebling Medal Lecture at the annual meeting of the Geological Society of America, Baltimore, MY, November 3, 2015.
"Projecting Risk into the Future: Geologic Repository Failure and the Sinking of the *Titanic*": Baldwin Frontiers in Geology Distinguished Lecture, University of Miami, Ohio, March, 31, 2016.
"Projecting Risk into the Future: Geologic Repository Failure and the Sinking of the *Titanic*": Keynote speaker at DISTINCTIVE, Bristol, UK, April 19, 2016.
"Projecting Risk into the Future: Geologic Repository Failure and the Sinking of the *Titanic*": Presentation at Texas Christian University, Fort Worth, TX, April 22, 2016.
"Swift Heavy Ion Irradiation of Actinide Materials": invited presentation for the session on *Defect-induced Effects in Nanomaterials* at the spring meeting of the European Materials Research Society, Lille, France, May 3, 2016.
Commencement address for the Department of Earth & Planetary Sciences at the University of New Mexico, Albuquerque, NM, May 13, 2016.
"Projecting Risk into the Future: Failure of a Geologic Repository and the Sinking of the Titanic": Directors" Distinguished Lecture at Pacific Northwest National Laboratory, Richland, WA, June 1, 2016
"Radiation Effects in Minerals and Nuclear Materials": plenary presentation, New Minerals and Mineralogy in the 21st Century, Jachymov, Czech Republic, September 3, 2016.
"Radiation Effects in Minerals": plenary presentation, 2nd European Mineralogical Conference, Rimini, Italy, September 14, 2016.
"RESET of America's Nuclear Waste Management Strategy and Policy": plenary presentation, 2nd Conference on Key Topics in Geological Disposal, Cologne, Germany, September 28, 2016.
"Projecting Risk into the Future: Failure of a Geologic Repository and the Sinking of the Titanic": Grandey Distinguished Lecture, Colorado School of Mines, Golden, CO, February 1, 2017.
"Swift Heavy Ion Irradiation of Actinide Materials": invited presentation at session in honor of David Clark's receiving the Glen Seaborg Medal, 253rd meeting of the American Chemical Society, San Francisco, CA, April 3, 2017.
"Imaginaries: Projecting Risk into the Future": invited presentation at meeting sponsored by Science and Technology Studies on *New Nuclear Imaginaries*, Harvard University, Boston, MA, April 7, 2017.
"Long-term Performance of Nuclear Waste Forms: Current Status and Future Perspectives": invited presentation at the 12th Pacific Rim Conference on Ceramic and Glass Technology, Waikoloa Village, Hawai'i, May 22nd, 2017.

CONGRESSIONAL TESTIMONY

House Subcommittee on Energy and Water Development, Committee of Appropriations, April 11, 2013.