

## **Margaret S. Race, Ph.D.**

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### **Education**

Ph.D., 1979 Zoology (Ecology), University of California at Berkeley  
M.S., 1974 Energy Management and Policy, University of Pennsylvania  
B.A., 1971 Biology, University of Pennsylvania

### **Professional Experience**

#### **SETI Institute, Carl Sagan Ctr. For the Study of Life in the Universe, Mountain View, CA**

1991- present. Principal Investigator. Research and outreach activities on Planetary Protection (PP), Societal Issues and Risk Communication related to astrobiology & solar system exploration

#### *St. Mary's College of CA, Moraga CA*

2006-present. School of Science, Research Associate and member of Science Advisory Board  
Educational and program planning in Astrobiology Science & Technology; Science & Society

#### *Stanford University, Center for International Security and Cooperation (CISAC), Stanford CA.*

2003-05 Consulting Professor/ Res. Affiliate: Risk Communication, Mass Media and Bio-terrorism  
*University of California at Berkeley, Berkeley, CA.*

1993-95 Assistant Dean, Special Projects, College of Natural Resources

1991-93 Acting Director, UC Botanical Garden

1988-91 Assistant Dean for Planning, College of Natural Resources

1987- present Research Affiliate & Graduate Advisor, Energy and Resources Graduate Group (ERG)

#### **University of California, Office of the President, Oakland, CA**

1988 Director of Planning, UC Natural Reserve System

1984-88 Principal Science Policy Analyst, Division of Agriculture and Natural Resources

#### *Stanford University, Stanford, CA.*

1980-84 Assistant Professor, Human Biology Program

1982-84 Resident Fellow, Office of Residential Education

### **Other Relevant Employment**

1979-80 Postdoctoral Fellow, Marine Policy & Ocean Management, WHOI, Woods Hole, MA.

1978 AAAS Mass Media Science Fellow, KQED-TV News Room, San Francisco, CA

1973-74 Consulting Ecologist (nuclear & fossil fuel power plants), UE&C, Inc., Philadelphia, PA.

1972-73 Research Fellowship, National Center for Energy Management and Power, Univ. of PA

1971-72 Public Information Specialist (Mass Media, Public Communication), U.S. EPA, Phila. PA

### **Relevant Projects and Research:**

Extensive research, consulting, program planning and workshop organizing on planetary protection, environmental impact analyses, risk communication, educational outreach, and policy issues associated with solar system exploration, the search for extraterrestrial life, and Astrobiology. Selected relevant work includes:

National Research Council (NRC) Studies and Task Group Committee Member:

Polar Research Board: Principles of Environmental Stewardship for the Exploration of Subglacial Environments, 2006-07

Space Studies Board: Preventing the Forward Contamination of Mars (PREVCOM) 2003-05

National Science Education Standards Project: Science and Technology Addendum, 1999-2000  
Space Studies Board: Task Group on Sample Return from Small Solar System Bodies, 1997-98  
Space Studies Board: Task Group on Issues in Mars Sample Return & Back Contamination, 1996-97

Transportation Research Board: Study on Transportation and a Sustainable Environment, 1994-97

Research Collaboration, Ethics & ET Exploration. Grant funded by Ctr. for Theology and Natural Sciences (CTNS)

NSF Research Mentor in Summer Undergraduate Internship Program, SETI Institute, 2007

Space Science, Environmental Ethics & Policy Conference, NASA Ames, Speaker/chapter author; April 07

Planetary Defense Conference, (Washington DC, 3/07), Steering Committee, 2007

Invited Participant, NASA Workshop on Science Associated with Lunar Exploration, Tempe AZ Feb 2007

Selected Participant, CTNS/STARS Conf.: Evolution, ET & Significance of Life in the Universe, Cancun, 1/07

Invited Participant, Workshop on Governance of Synthetic Genomics Research (Washington DC, 12/06)

Invited Participant, Workshop on Oversight of Biodefense Research (Baltimore MD, 8/06)

NASA Workshop on Proposed Mars Environmental Geographic Information System (GIS), 2005.

Mars Journal (online), Editorial Board, 2005- present

NASA Workshop on Life Support, Habitation & Planetary Protection, Organizing Committee (2005)

NASA-European Space Agency (ESA), Workshop on Human Missions and Planetary Protection, 2005

NASA Astrobiology Communications Roadmap, Working Group, 2004-05

“One Earth- One Universe” Workshop on Native American Perspectives in Science, Invited Participant, 2005

NASA Mars Human Precursor Science Strategy Group (MHP SSG) 2004

European Space Agency (ESA) Ethical Working Group member, 2004-06

AAAS Dialogue on Science, Ethics and Religion (DoSER) Advisory Committee & workshop series participant: “Exploring the Origin, Extent & Future of Life: Philosophical, Theological & Ethical Perspectives” 2002-05

“Living with Risk” Project, Center for Global Security Research (CGSR) and International Institute for Strategic Studies (IISS), 2003-04

NASA Course on Planetary Protection Policies and Practices (Organizing Committee and Lecturer) 2003-06

TOPOFF2 National Seminar on Terrorism, US Dept. of Homeland Security, Invited Expert. 2002-03

COSPAR/IAU Planetary Protection Workshop, 2002. (Subgroup Chair: PP & Human Missions)

NASA Risk Communication Workshops, 2001-02 (Planetary Protection, Space Nuclear Power, Biocontainment)

NASA Workshop Series: Developing a Protocol for Mars Sample Handling & Testing (Organizing Committee; Subgroup Chair, and Series Editor), 1999-2002

University of Washington, Astrobiology Conference Invited Speaker and Chapter Author: Societal Implications of Astrobiology, 2001-02, (Published Cambridge University Press, 2007)

NASA Workshop: Planetary Protection Issues in Human Exploration of Mars (Invited sub-group chair) 2001.

Near Earth Asteroid (NEA) Sample Return Workshop, LPI, Houston TX. Invited Speaker/Participant, 2000

Collaborative Research on Risk Perception & Risk Communication w/ Decision Research, Inc. 1994-2000

Committee on Space Research (COSPAR) Scientific Editor; Scientific Organizer; 1999- present

NASA/Lunar & Planetary Institute, Liftoff '99—Summer Educators' Workshop, 1999

Invited Presentations to National Research Council (NRC) Committees:

- SSB-COMPLEX: Quarantine & Certification of Mars Samples: Perceived Risks of Sample Return, 1999
- SSB-COMPLEX: Near Earth Asteroid Impact Warnings: Risk Communication & Perceptions, 1998
- SSB Task Group on Planetary Protection: Societal Issues and Back Contamination Concerns, 1991

Amer. Biological Safety Assn(ABSA) 1998 Annual Conf., Session on Extraterrestrial Biocontainment Issues

NASA Ames Astrobiology Roadmap Workshop, Invited Participant, 1998

NASA-Mars Sample Handling Research Panel (MSHARP Workgroup) 1997-98

AAAS Workshop. (Organizer): Mars Sample Return: Scientific, Technical and Societal Challenges, 1998

NASA Workshop: Development of Protocols for Mars Sample Return, 1997 (editor/ Biohazards chair)

JPL-NASA Workshop on Contamination Control for Lake Vostok (Antarctica) and Europa, July 1997

CTNS Science & Religion Workshops: Ethical & Theological Implications of Extraterrestrial Life, 1997-99

NASA Mars Exploration Long Term Strategy Work Group, Planetary Protection & Communications, 1996-97

University of CA, System-wide and Berkeley campus: Research, policy analysis, program development and communication on a wide range of natural resource issues, 1984-95

## Teaching

*University of California at Berkeley* (1984-present)

University level teaching (courses and guest lecturing) in Integrative Biology, Zoology, Biology, Conservation and Resource Studies, Environmental Sciences, Energy and Resources Graduate Group, Public Policy, Engineering, Geography, and Center for the Study of Higher Education

*College of Notre Dame, Belmont CA*, (Spring Semester, 1993)

Visiting Scholar/ Sr. Cunningham Endowed Chair, Division of Natural Sciences & Mathematics  
Course: Science and Technology- A Global View of Environmental Sciences

*Stanford University, Human Biology Program* (1980-84)

Teaching in Biology, Environmental Policy & Decision Making. Academic Advisor for undergraduate majors, honors theses and research projects on environmental and natural resource management topics

*Coyote Point Environmental Museum, San Mateo, CA* (1982-88)

Docent Training Programs, Program Planning Committee, and Program Review Committee

*University of California at Berkeley, Departments of Biology and Zoology* (1974-79)

Graduate Teaching Assistant and Associate for 15 academic quarters. Lecture and Lab courses in lower and upper division biology and ecology with class sizes ranging from 15 to 600 students.

Extensive volunteer K-12 science enrichment, classroom teaching, program planning (*1986-Present*)

- Trustee, Lafayette Library and Learning Center, Lafayette CA 2007-2010
- Keynote Speaker, Expanding Your Horizons Conference (Science for Girls Gr. 6-8), Diablo Valley College, 3/07
- Astrobiology Summer Science Experience for Teachers (ASSET), Lecturer, 2005 & 2006 (SETI Inst. & SF State Univ.)
- National Youth Leadership Forum on Technology, Workshop Leader, San Jose, CA 2005 and 2006
- JPL Solar System Ambassador, Varied Education/Public Outreach programs to schools and the public, 2005-07
- Idaho Science Teachers Association. Invited Speaker, Boise ID, October 2006
- Expanding Your Horizons, and Sally Ride Science Workshops for Girls, Workshop Speaker, 2005. 2006
- Project ASTRO, SF Region Educators Workshop and classroom presentations, 2004-05
- NASA-National Park Service, Earth to Sky: Park Rangers and Interpreters' Workshop, Lecturer 2004

- Contra Costa Libraries, Public Presentations and Outreach, National Library Week, April 2004
- Chabot Space and Science Center, Oakland, CA. K-12 Teacher Training Workshops (1999-2000)
- Astronomy in A Box: Material Development, fund raising & distribution to district & regional teachers. 1998-2000
- Univ. of California at Berkeley, Graduate School of Education, Visiting Scholar (2000-01)
- Lawrence Hall of Science Fellow (Global Systems Science Curriculum Project) 1997-98
- NASA-Univ. of Hawaii, Educators' Workshop, Invited Participant and Sponsor of local teacher, 1998
- Lafayette, Oakland and Berkeley School Districts and other regional schools (1986-present)

#### Publications:

- Race, M.S., 2007. Planetary Protection, Astrobiology and Solar System Exploration, conference presentation and chapter for upcoming book: Space Science, Environmental Ethics and Policy (in preparation April 2007)
- NRC, 2007. Antarctic Subglacial Aquatic Environments: Stewardship and Management, National Academies of Science, Washington DC (available online: <http://www.nap.edu>, spring 2007)
- Hogan, J.A., J.W. Fisher, M.S. Race, J. Joshi, and J.D. Rummel, 2007. Results Summary of the Life Support & Habitation and Planetary Protection Workshop, Paper number 2006-01-2007, March 2007, 2006 Transaction Journal of Aerospace, SAE International., [www.sae.org](http://www.sae.org)
- Race, M.S., 2006. Risk Communication and Planning for High-Level Biocontainment Laboratories: A comparative study of successful and unsuccessful projects. Presented at American Biological Safety Assn (ABSA) annual meeting, Boston, MA, Oct. 2006
- Hogan, J.A., M.S. Race, J.W. Fisher, J.A. Joshi, and J.D. Rummel, 2006. Life Support and Habitation and Planetary Protection Workshop, Final Report. NASA/TM-2006-213485, NASA Ames Res. Ctr. Moffett Field, CA.
- Mix. L.J. et al. (eds./authors), 2006, The Astrobiology Primer: An Outline of General Knowledge, version 1. Astrobiology Oct 2006, Vol. 6, No. 5: 735-813
- NRC, 2006. Preventing the Forward Contamination of Mars, C.F. Chyba (chair), National Research Council, National Academy Press, Washington DC (available online: [www.nap.edu](http://www.nap.edu))
- Race, M.S. 2005. The Implications of Discovering Extraterrestrial Life: Different Searches, Different Issues. Chapter in a forthcoming book: Exploring the Origin, Extent and Future of Life, edited by AAAS program 'Dialogue on Science, Ethics and Religion: (DoSER); Cambridge University Press (in final editing, Fall 2005)
- Viso, M., M.S. Race, P. Stabekis, A. Debus, J. D. Rummel. A Draft protocol for the safe handling of martian samples returned to Earth (abstract) submitted to European Geophysical Union, April 2005.
- Criswell, M.E., M.S. Race, J.D. Rummel, and A. Baker (eds.), 2005. Planetary Protection Issues in the Human Exploration of Mars, Pingree Park Final Workshop Report, NASA / CP - 2005 - 213461, NASA Ames Research Center, Mountain View CA
- Hogan, J.A., J.W. Fisher, M.S. Race, J. Joshi, and J.D. Rummel, 2005. Results Summary of the Life Support & Habitation and Planetary Protection Workshop, Paper 06ICES-205, International Conference on Environmental Systems
- J.A. Hogan, J.W. Fisher, and M.S. Race, 2005 (abstract) Life Support & Habitation and Planetary Protection Workshop: presented at Habitation '06 Conference, Orlando Fla.

- Hogan, J.H., M.S. Race, and J.W. Fisher. Solid Waste Management Operations and Planetary protection Issues (abstract) for IAA 15<sup>th</sup> Humans in Space Symposium, Graz Austria May 2005 (Manuscript submitted for publication in Acta Astronautica)
- Race, M.S., Biohazards and Risk Assessment for Human Missions to Mars, (abstract) for IAA 15<sup>th</sup> Humans in Space Symposium, Graz Austria, May 2005, (manuscript submitted for publication in Acta Astronautica)
- Hogan, J.A., J.W. Fisher, J.A. Levri, K. Wignarajah, M.S. Race, and P. Stabekis. Influence of Planetary Protection Guidelines on Waste Management Operations, paper 05ICES266, International Conference on Environmental Systems, Rome Italy, July 2005 (Paper No. 2005-01-3097 in Journal of Aerospace, SAE 2005 Transactions, March 2006)
- Race M.S. C. Morrow, C. Oliver, E. CoBabe-Amman, and D. Scalice. Development of an Astrobiology Communication Roadmap, (poster) NAI Biennial Conference, Boulder CO, April 2005
- Race, M.S., 2005. Societal and Ethical Dimensions of Astrobiology and the Search for Extraterrestrial Life, in *Planets and Life: The Emerging Science of Astrobiology*, W.R. Sullivan and J. Baross (eds.), Cambridge Univ. Press, in press.
- Race, M.S., 2004. Planetary Protection Considerations for Future Human Missions to Mars, International Astronautical Conference, Vancouver Canada, October 2004, Paper IAC-04-IAA 3.7.2.06
- Race, M.S., 2004. Communicating About the Discovery of Extraterrestrial Life: Different Searches, Different Issues. International Astronaut. Conf., Vancouver Canada, October 2004, Paper IAC-04-IAA.1.1.2.02 ( article in press, Acta Astronautica, 2007)
- Race, M.S. 2004. Planetary Protection: Can't Leave Home Without It! The Planetary Report, XXIV(4), 6-11, Jul/Aug 2004
- Race, M.S., M.E. Criswell, and J.D. Rummel, 2003. Planetary Protection Issues in the Human Exploration of Mars. Paper Number 2003-01-2523 (invited). International Conference on Environmental Systems (ICES), Vancouver, B.C. July 2003.
- Race, M.S. and J.D. Rummel, 2003. Planning for Mars Sample Return: Design and Implementation Considerations for Handling and Testing Returned Samples. ICES Paper No. 2003-ICES-403 (invited), International Conferences on Environmental Systems (ICES), Vancouver, BC, July 2003.
- Race, M.S., 2003. Planetary Protection- An Integral Part of Mission Preparations. Space.com, [http://www.space.com/searchforlife/seti\\_race\\_protect\\_0230501.html](http://www.space.com/searchforlife/seti_race_protect_0230501.html)
- Race et al., 2003. Societal, Legal, Educational and Communications Issues in the Search for Extraterrestrial Life. Submitted to Advances in Space Research
- Race, M.S. and R.O. Randolph, 2002. The Need for Operating Guidelines and A Decision Making Framework Applicable to the Discovery of Non-Intelligent Extraterrestrial Life. Advances in Space Research, Vol. 30, No. 6, pp. 1583-91.
- Race, M.S., 2002. Responsible Exploration: Protecting Earth and the worlds we explore from cross contamination. Universe in the Classroom (online newsletter), No. 58, Summer 2002, Astronomical Society of the Pacific.  
[www.astrosociety.org/education/publications/tnl/58/planetprotect.html](http://www.astrosociety.org/education/publications/tnl/58/planetprotect.html)
- Rummel, J.D. and M.S. Race, 2002. A Sense of Place: Planetary Protection's Role in Astrobiological Exploration, Ad Astra, 14(1) Jan/Feb 2002, p 28-31
- Rummel, J.D., M.S. Race, D.L. DeVincenzi, P.J. Schad, P.D. Stabekis, M. Viso and S. E. Acevedo (eds.), 2002. A Draft Test Protocol for Detecting Possible Biohazards in Martian Samples Returned to Earth, NASA/CP-2002-211842, Washington, D.C.

- Race, M.S., D.L. DeVincenzi, J.D. Rummel and S.E. Acevedo (eds.), 2002. Mars Sample Handling Protocol Workshop Series, Workshop 4 Proceedings and Final Report. NASA/CP-2002-21184, Washington, D.C.
- Race, M.S., 2002. Protecting Ourselves Against Mars, SETI Institute News, v. 11(2), p.8.
- Race, M.S. and J.D. Rummel, 2002. "Planetary Protection" in Macmillan Space Sciences Reference, USA, vol. 4: Our Future in Space, 0-02-865550-8, p 125-128.
- Race, M. S., G.T.A. Kovacs, J.D. Rummel, and S. E. Acevedo (eds.), 2001. Mars Sample Handling Protocol Workshop Series. Interim Report of the Workshop Series: Workshop 2 Proceedings and Final Report, NASA/CP 2001-210923, Washington, D.C.
- Race, M. S., K. Nealson, Rummel, J.D. and S. E. Acevedo (eds.) 2001. Mars Sample Handling Protocol Workshop Series. Interim Report of the Workshop Series: Workshop 3 Proceedings and Final Report. in press, NASA/CP-2001- 211388, Washington, D.C.
- Race, M.S. and J.D. Rummel (eds.), 2000. Mars Sample Handling Protocol Workshop Series. Interim Report of the Workshop Series: Workshop 1 Proceedings and Final Report. NASA/CP-2000-209624, Washington, DC (Oct. 2000)
- Race, M.S., 2000. "Planning for Near Earth Asteroid Sample Return: Planetary Protection Controls and Non-Scientific Factors. In: Proc. of NEA Sample Return Workshop, LPI Contrib. No. 1073(Abstract #8038, page 35) Houston , TX.
- Race, M.S., 2000. No Threat? No Way: Hazardous Until Proven Otherwise, The Planetary Report. Nov/Dec 2000, p 5-7.
- Race, M.S. and D.G. MacGregor, 2000. Integrating Public Perspectives in Sample Return Planning. Adv. In Space Research, Adv. Space Res. v 26(12), 1901-09.
- Orgel, L., M. A'Hearn, J. Bada, J. Baross, C. Chapman, M. Drake, J. Kerridge, M. Race, M. Sogin, and S. Squyres, 2000. Sample Return from Small Bodies, Adv. In Space Res. v. 25(2), pp. 239-248.
- Race, M.S., J. Allton, C. Allen, and J. Richmond, 1999. Planning Considerations for Mars Sample Return Containment. J. American Biological Safety Assn. (JABSA) vol. 4(2), pp.53-59.
- DeVincenzi, D., J. Bagby, M. Race, and J. Rummel (eds.), 1999. Proceedings: Mars Sample Quarantine Protocol Workshop, NASA/CP-1999-208772, April 1999. NASA Ames Research Center, Moffett Field, CA
- Race, M. S., J.H. Allton, C.C. Allen, and J. Y. Richmond, 1999. Containment Design Concepts for Extraterrestrial Sample Materials, in: "An Anthology of Biosafety: I. Perspectives on Laboratory Design," J. Y. Richmond (ed.), American Biological Safety Association (ABSA), Mundelein, IL
- MSHARP, 1999, (Carr, M.H., J. Bada, S. Bogard, B. Clark, M. Drake, D. DeVincenzi, D. McCleese, K. Nealson, J. Papike, M. Race, and S. Stahl), Mars Sample Handling and Requirements Panel, Final Report, NASA/TM-1999 – 209145, Jet Propulsion Laboratory (JPL), Pasadena, CA
- Race, M. S. and J. D. Rummel. 1999, Bring 'em back alive-- or at least carefully. Ad Astra 11:37-40.
- De Vincenzi, D.L., Race, M.S., and H.P. Klein, 1998. Planetary Protection, Sample Return Missions and Mars Exploration: History, Status and Future Needs. J. Geophysical Research 103(E12) 28,577-28,585.
- MacGregor, D.G., P. Slovic, and M.S. Race, 1998. Lay and Expert Perceptions of Planetary Protection , Report No 98-2, Decision Research, Eugene OR.
- MacGregor, Donald G., and Margaret S. Race, 1998. Microbiologists' Perceptions of Planetary Protection, Report No. 98-3, Decision Research, Eugene OR.

- National Research Council, 1998. (Orgel, L, M. A'Hearn, J. Bada, J. Baross, C. Chapman, M. Drake, J. Kerridge, M. Race, M. Sogin, and S. Squyres) Evaluating the Biological Potential in Samples Returned from Planetary Satellites and Small Solar System Bodies: Framework for Decision Making., National Academy Press, Washington, D.C.
- Race, M.S., 1998. Mars Sample Return and Planetary Protection in a Public Context. *Advances In Space Research* 22(3), 391-99.
- Race, M.S., 1998. Mars Sample Return and Biocontainment., *J. Amer. Biological Safety Assn.*, 3(1), 22-24.
- Randolph, R., M.S. Race, and C. McKay, 1997. Reconsidering the Ethical and Theological Implications of Extraterrestrial Life., *Center for Theology and Natural Sciences CTNS Bulletin* v. 17(3), 1-8.
- Space Studies Board, National Research Council, 1997. Mars Sample Return: Issues & Recommendations. Task Group on Issues in Sample Return (K.Nelson et al.). National Academy Press, Washington, D.C.
- Committee for a Study on Transportation and a Sustainable Environment). 1997. Toward a Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology. Transportation Research Board, (Ebert, J.D. et al.) (Special Report 251, National Academy Press, Washington D.C.
- MacGregor, D.L, P. Slovic, and M.S. Race. 1996. Lay and Expert Perceptions of Planetary Protection. *Decision Research Technical Report no. 96-9.* Decision Research, Eugene, OR.
- Race, M.S. and M. Fonseca, 1996. Fixing Compensatory Mitigation: What Will it Take? *Ecological Applications* 6(1), 94-101.
- Race, M.S. 1996. Planetary Protection, Legal Ambiguity and the Decision Making Process for Mars Sample Return. *Adv. Space Res.* 18(1/2), 345-350.
- Race, M.S. 1996. Mars Sample Return and Biohazards: A Source of Public Concern and Controversy. In *Case for Mars*, P. Boston (ed.), American Astronautical Society, University Press, San Diego.
- Race, M.S. 1995. Societal Issues as Mars Mission Impediments: Planetary Protection and Contamination Concerns. *Adv. In Space Res.* 15(3), 285-92.
- Race, M.S. 1994. Anticipating the Reaction: Public Concerns about Sample Return Missions. *Planetary Report*, xiv(4) , 20-22.
- Race, M.S., 1989. Regulation and Guidelines for Biological Control of Weeds: A Research Policy View. In *Proceedings of the International Vidalia Symposium*, Riverside, CA.
- Race, M.S. (chair) et al. 1988. Preserving and Enhancing California's Drinking Water: A Research Assessment. U.C. Water Quality Task Force, US Water Resource Center Report #70, Issn 0575-4968.
- Race, M.S. 1986. Wetlands Restoration and Mitigation Polices: Reply. *Environmental Management* 10(5): 571-72.
- Gary, N., H. Daly, S. Locke and M.S. Race. 1985. The Africanized Honeybee: Ahead of Schedule. *California Agriculture* 39(11-12): 4-7.
- Race, M.S. 1985. A Critique of Present Wetlands Mitigation Policies Based on an Analysis of Past Restoration Projects in San Francisco Bay, CA. *Environmental Management*, 9(1): 71-82.
- Race, M.S. and D.L. Christie. 1982. Coastal Zone Development: Mitigation, Marsh Creation and Decision Making. *J. Environmental Management* 6(4): 317-328.