

Janice L. Bishop, Ph.D.

THE SETI INSTITUTE

*Carl Sagan Center
for the Study of Life in the Universe*

189 Bernardo Ave., Mountain View, CA 94043

NASA AMES RESEARCH CENTER

Space Science & Astrobiology Division

Mail Stop 239-4, Moffett Field, CA 94035

EDUCATION:

Ph.D. in Chemistry Brown University, 1994
“*Spectroscopic analyses of chemically altered montmorillonites and applications to the soils on Mars*”
(advisor: John O. Edwards, co-advisor: Carlé M. Pieters, Geological Sciences)
M.S. in Applied Earth Science, Remote Sensing Program Stanford University, 1988
(advisors: Ronald J. P. Lyon and George A. Parks)
B.S. in Chemistry Stanford University, 1988

PROFESSIONAL POSITIONS:

Senior Research Scientist, The SETI Institute (contractor at NASA-Ames) 2010 - present
Research Scientist, The SETI Institute (contractor at NASA-Ames) March 1999 - 2009
Research Associate, NRC Fellow at NASA-Ames March 1997 - February 1999
Postdoctoral Research Associate, DLR-Berlin September 1994 - February 1997

CURRENT RESEARCH ACTIVITIES:

Mars surface composition and processes:

CRISM Science Team: Analysis of VNIR hyperspectral images to characterize surface minerals; focus on identifying phyllosilicates, sulfates and other OH/H₂O-bearing minerals in order to gain understanding of aqueous processes and geochemical environment on Mars.

MER/Pancam Data: Characterization of iron oxide and sulfate minerals.

Development of hyperspectral analysis tools: Working with graduate students to design and implement Gaussian modeling techniques, clustering algorithms, and simulated images for improved hyperspectral image analysis.

Mars Analog studies: Analysis of visible to thermal IR laboratory data of analog materials (and minerals found in them) for comparison with spacecraft data of the Martian surface; Emphasis on volcanic alteration products (e.g. Hawaii and Iceland), Martian meteorites, hydrothermal regions, acidic aqueous sites, and sediments from cold desert environments.

Laboratory alteration experiments: Investigation of the effects of chemical alteration and/or Martian environment on minerals and Mars analog materials.

Spectroscopy of Asteroids and Meteorites: Analysis of asteroid spectra (2008 TC₃, C-, F- and S-type) together with lab spectra of Almahata Sitta meteorites, other ureilites, and related lab mixtures in order to develop an association between ureilites and their parent bodies.

Relationships between organisms and minerals:

Minerals as solar UV shield for photosynthetic organisms: Performing lab and field experiments to explore the ability of iron oxide-bearing species to facilitate growth of photosynthetic organisms by providing solar UV protection.

Phyllosilicates and the origin of life: Investigating interactions of phyllosilicate minerals with organic molecules, cations, and anions. Performing lab experiments to test remote detection of organics and salts bound to phyllosilicates.

PLANETARY MISSION PARTICIPATION:

Mars Landing Site Characterization: Prepared presentations and reports on potential sites at Juventae Chasma and Mawrth Vallis; attended multiple landing site workshops for Mars Science Lab (MSL), MER and other missions, 2002-present.

Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) on Mars Reconnaissance Orbiter (MRO): Co-Investigator working on spectral identification tasks related to hydrated minerals and surface alteration, 2001 to present.

Marsokhod rover tests at Silver Lake, CA: participated as remote scientist during rover field activities; assisted in spectral analyses of data collected from mission, 1999.

Center for Mars Exploration (CMEX): participate in projects and meetings on Mars Landing Site development and furthering information technology capability for Martian Missions, 1998-2004.

Pathfinder Mineralogy Science Operations Working Group (SOWG): performed spectral analyses of Martian rocks and soils based on lab spectra of analogues, 1997-1999.

Community Activities:

Professional Community Service Activities:

Editor, *Icarus*, November, 2003 – December, 2004; Consulting Editor, January, 2005 – present;
Guest Editor for special issue, *Clay Minerals*, 2007-2008.

Review Panel Member: multiple NASA programs, 1999 - present.

External Reviewer: multiple NASA programs; scientific articles for *Science*, *Nature*, *Clays and Clay Minerals*, *Planetary and Space Science*, *Geology*, *JGR*, *MAPS*, *GRL* & others.

Mars Human Precursor Science Steering Group Member, July - September, 2004.

Conference/Workshop Organization:

Co-organizer: “Workshop on Martian Phyllosilicates: Recorders of Aqueous Processes?”, CNES, Paris, October, 2008; http://www.ias.u-psud.fr/Mars_Phyllosilicates/

Scientific Organizing Committee: “The New Martian Chemistry Workshop”, Tufts University, Boston, July, 2009; <http://www.lpi.usra.edu/meetings/marschem2009/>

Scientific Organizing Committee: “Workshop on the Microstructure of the Martian Surface”, Copenhagen, August, 2009; <http://www.nbi.ku.dk/forskningsgrupper/mars/english/soil-workshop/>

Invited Lectures:

“The Surface of Mars: Mineralogy as an Indicator of Water and Environmental Conditions”, The SETI Institute REU Program, June, 2010.

“Could the Large Phyllosilicate Outcrop at Mawrth Vallis on Mars be Sedimentary in Origin?”, Sedimentology Group, School of Earth Sciences, Stanford University, April, 2010.

“Aqueous Processes on Mars: What We Have Learned from Spectroscopy”, Whole Earth Seminar, Earth and Planetary Sciences Department, UCSC, October, 2009.

“The Surface of Mars: Mineralogy as an Indicator of Water and Environmental Conditions”, SETI Institute Colloquium, July, 2009.

“The Surface of Mars: Mineralogy as an indicator of Water and Environmental Conditions”, Livermore Public Library, sponsored by AAUW, March, 2009.

“Looking at Mars through a CRISM: What we know and how we are learning more”, Summer Science Program, New Mexico Tech., July, 2005.

Outstanding Women Scientists Series Lecture: “*The Surface of Mars: What We Know and How We’re Learning More*”, Indiana University, October, 2004.

Earth Sciences Division, NASA-Ames Research Center, Moffett Field, CA, January, 1999.

Space Sciences Division, NASA-Ames Research Center, Moffett Field, CA, March, 1998.

Planetary Physics Group, DLR-Berlin, (given in German), February, 1997.

Los Alamos National Laboratory, Los Alamos, NM, November, 1996.
Department of Physics, University of Medicine, Luebeck, Germany, (given in German) June, 1996;
Exobiology Branch, NASA-Ames Research Center, Moffett Field, CA, March, 1996
Dept. of Inorganic Chemistry, Academy of Science, Bratislava, Slovak Republic, January, 1996.

Popular Articles:

SETI Voices: "Seeing Red" posted August 27, 2003, <http://www.seti.org/about-us/voices/bishop-082703.php>.
Space.com: "Seeing the Invisible colors of Mars" posted January 29, 2004, <http://www.seti.org/news/features/seeing-invisible-colors-of-mars.php>.
SETI Thursday on Space.com: "Looking for Water on Mars" posted March 20, 2008, <http://www.space.com/searchforlife/080320-seti-mars-water.html>.

Educational Outreach Activities:

Summer Science Program, Inc. (SSPI), an educational program in math and astronomy for accelerated high school students (www.summerscience.org): Guest lecturer, July, 2005; Member, Board of Trustees, September, 2002 – present; Science Advisor, *Universal Times* newsletter, October, 1999 – 2002; Graduation Address, *Summer Science Program*, Thacher School, Ojai, CA, August, 1999.
Assistant, *Science on Saturday Lecture Series* for grade school children, sponsored by LLNL and Sigma Xi, Livermore, CA, Saturday mornings February - April, 1998.
Panelist, *Tri-Valley Expanding your Horizons Conference*; day-long program for junior high and high school girls to encourage them to pursue careers in science, sponsored by LLNL, at Los Positos College, Livermore, CA, March, 1985.

Membership in Professional Organizations:

American Geophysical Union	1998 – present
Geological Society of America	1997 – present
Mineralogical Society of America	1997 – present
European Geophysical Society	1995, 2005, 2008
Clay Minerals Society	1991 – present
Meteoritical Society	1991 – present
Planetary Society	1991 – present
American Chemical Society	1990 - 1994
Sigma Xi, The Scientific Research Society	1990 – 2006

Skills and Expertise:

Planetary Remote Sensing: spectroscopic analysis of the mineralogy and surface processes on Mars and the Earth using remotely acquired and laboratory spectral data.

Astrobiology: spectral identification of minerals (e.g. clays, iron oxides, silicates, sulfates and carbonates) and organic materials in geologic samples (meteorites, Antarctic sediments, hydrothermal rocks) in preparation for characterization of these on Mars and other planetary surfaces and identification of potentially habitable sites.

Laboratory: spectroscopic measurement and analysis including visible and infrared reflectance, emittance, Raman, and transmittance spectroscopy of minerals and Mars analog materials; mixture experiments designed to evaluate quantification of individual minerals in mixtures based on spectral features; and alteration experiments designed to test the spectral properties of minerals and analog materials under Mars-like environmental conditions.

Field Work: sample collection and *in situ* analysis of clay-, sulfate- and carbonate-bearing rocks, rock alteration and coating formation.

Languages: nearly fluent in German: speaking, reading, writing, lecturing; French (limited).

Honors and Awards:

Professional Awards:

Featured Scientist, Astronomy Magazine, March issue “A Day in the Life of an Astronomer”	2010
Best Paper Award, IEEE Whispers conference Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (co-author), Grenoble, France.	2009
Kavli Fellow (invited to 18 th Kavli Frontiers of Science Symposium, Irvine, CA)	2008
NRC Fellow, NASA-Ames Research Center, Moffett Field, CA	1997-1999
Alexander von Humboldt Fellow, Berlin, Germany	1994-1996

Student/Young Scientist Abstract/Travel Awards:

DPS, 27th Annual Meeting	1995
Meteoritic Society, 57th Annual Meeting	1994
San Juan Capistrano Research Institute Conference on Infrared Spectroscopy	1991
Meteoritic Society, 54th Annual Meeting	1991

Scholarship Awards:

Amelia Earhart Fellowship Award, Zonta International Foundation	1993-1994
NASA Graduate Student Researchers Program Fellowship	1990-1994
Research Fellowship, School of Earth Science, Stanford University	1987-1988
Stanford University Undergraduate Research Grant	1986-1987
Fannie and John Hertz Foundation Fellowship	1983-1987
Nahas Foundation Scholarship	1983-1987
General Electric Co. Scholarship for Women in Science	1983-1987
Livermore Boosters Olympian Award: Outstanding Athletics and Academics	1983-1987
Elks Association (Calif.) Most Valuable Student Award: Scholarship & Leadership	1983
Bank of America Achievement Award in Science and Mathematics	1983
Josten's Foundation Award	1983
Valedictorian, Livermore High School	1983

Successful Research Proposals as Principal Investigator:

- “CRISM and HiRISE Investigation of Aqueous Materials at the Juventae Plateau in order to Identify and Characterize a New Landing Site with High Potential for Habitability and Preservation of Biosignatures.” RFP Critical Data Products Program at JPL, 2010-2011.
- “Revealing the Clays on Mars: A Spectral Unmixing Study of Phyllosilicates, Zeolites, Hydrated Silica and Glass “ Mars Fundamental Research Program, 2008-2011.
- “Searching for Aqueous Activity on Mars through Analyses of VNIR Spectral Images” Mars Data Analysis Program, 2006-2010.
- “Formation of Magnetic Minerals on Mars by Alteration of Nanophase Ferric Oxides/ Oxyhydroxides” Mars Fundamental Research Program, 2006-2010.
- “Iron oxide: An early sunscreen for photosynthetic microbes?” Director’s Discretionary Fund research grant, NASA-Ames Research Center, 2002-2004.
- “Organic Reductant as Key to Maghemite Formation on Mars?” Director’s Discretionary Fund research grant, NASA-Ames Research Center, 1999-2001.
- “A Study of Soil Formation and Rock Alteration Models Through Analysis of Spectroscopic, Magnetic and Chemical Data from Mars Pathfinder and S, Fe-bearing Analog Materials“ Mars Data Analysis Program, 1999-2003.

“Spectral Identification of Organics and Carbonates in the Martian Surface Rocks“ National Research Council Research Associateship at NASA-Ames Research Center, sponsor: Rocco Mancinelli, 1997-1998.

“Visible and Infrared Spectroscopic Analyses of Mars Soil Analogs“ Alexander von Humboldt Research Fellowship at the DLR-Berlin, Germany, sponsor: Gerhard Neukum, 1994-1996.

“Spectroscopic Analysis of Iron-rich Montmorillonite as a Mars Soil Analog Material“ NASA Graduate Student Researchers Program, sponsor: Sherwood Chang, 1990-1994.

Successful Research Proposals as Co-Investigator:

“Geologic Investigation of Interior Layered Deposits in Hebes Chasma and Noctis Labyrinthus” (PI Cathy Weitz, PSI) Mars Data Analysis Program, 2010-2013.

“The State of Sulfur on Mars: Understanding the Inter-relationships Among the Crystal Structure, Chemistry, and Spectroscopy of Sulfates and Sulfides” (PI Melissa Lane, PSI) Mars Fundamental Research Program, 2010-2013.

“Analysis and Characterization of Phosphates Using Multiple Spectral Techniques” (PI Melissa Lane, PSI) Mars Fundamental Research Program, 2008-2011.

“Integrated Spectroscopy of Synthetic Pyroxenes: Tools to Characterize Igneous Processes on the Inner Planets” (PI Carlé Pieters, Brown) Mars Fundamental Research Program, 2007-2010.

“Further Analysis and Characterization of Sulfates and Sulfides Using Multiple Spectral Techniques” (PI Melissa Lane, PSI) Mars Fundamental Research Program, 2005-2009.

“BIOsphere of Mars: Ancient and Recent Studies” (PI Jill Banfield, U.C. Berkeley) NASA Astrobiology Institute, 2005-2009.

“Planetary Biology, Evolution and Intelligence” (PI Chris Chyba then Rocco Mancinelli, SETI Institute) NASA Astrobiology Institute, 2005-2009.

“Analysis and Characterization of Sulfates and Sulfides Using Multiple Spectral Techniques” (PI Melissa Lane, PSI) Mars Fundamental Research Program, 2004-2005.

“Taking Apart the Rocks of Mars” (PI Carlé Pieters, Brown) Mars Fundamental Research Program, 2004-2007.

“CRISM” (PI Scott Murchie, JHU-APL) MRO Program, 2002-present.

Teaching Experience:

Guest Lecturer, Human Biology (taught by Lynn Rothschild), Stanford University, 2010.

Informal lectures on mineral spectroscopy, remote sensing, Mars, soil formation, and aqueous chemistry to students working with me at the SETI Institute, 2003-present.

Substitute Lecturer, Remote Sensing (taught by Carlé M. Pieters), Brown University, 1999.

Informal lectures on mineral spectroscopy to students at DLR, Berlin, 1994-1996.

Teaching Certificate, Center for Advancement of College Teaching, Brown University, 1993; course designed to enhance teaching skills for graduate students.

Teaching Assistant, part-time, Volcanology, Brown University, 1992: responsibilities included grading and assisting students.

Teaching Assistant, Introductory Chemistry Laboratory Course, Brown University, 1989-1990; responsibilities included instructing students in the use of laboratory equipment and basic chemistry skills.

Teaching Assistant, Summer Science Program for accelerated high school students in astronomy and physics, Ojai, CA (sponsored then by the Thacher School, Pomona College and Stanford University) June - July, 1986 & 1987, responsibilities included instructing students in the use of telescopes, dark room and measuring engines.

Student Advising:

Advising Graduate Students:

Mario Parente, Electrical Engineering Department, Stanford University, M.S. 2005; Ph.D. 2010.

Nancy McKeown, Department of Earth and Planetary Sciences, University of California Santa Cruz, Ph.D. 2010.

Heather Makarewicz, Mathematics Department, University of Kansas, M.S. 2009; Computer Science and Engineering Department, University of Kansas, M.S. candidate.

Advising Undergraduate Students:

Lee Sapiro, Brown University, summer 2010.

Bill Freeman, Louisiana State University, summer 2010.

Lauren Hunkins, University of South Florida, summers 2009-2010.

Laura Bayley, Brown University, summer 2009.

Kaysea Perry, California Polytechnic State University, summer 2009.

Elena Amador, University of California Santa Cruz, summer 2008.

Alicia Muirhead, University of California Santa Cruz, summer 2008.

Trevor Clark, University of California Davis, summer 2007.

Nancy Garcia, Texas A & M University, summer 2007.

Andrew Honma, University of Hawaii, summer 2007.

Heather Makarewicz, Nazarene University, summer 2007.

Rebecca Sullivan, University of Texas El Paso, summer, 2004.

Student Advising while at Stanford University:

Residence Assistant at Haus Mitteleuropa, 1987-1988.

Selected for highly competitive position as student leader and liaison for student dormitory to residential management. Responsibilities included counseling, mentoring, and working with dormitory staff.

Academic Advisor, 1985-1987.

Selected to work jointly with faculty advisor to provide advise on a variety of academic issues including courses, major and career directions. Met once per week with group of six undergraduates.

Math Tutor, 1984-1985.

Selected from Freshman Honors Math course to provide tutoring in calculus and introductory math to students who needed extra assistance.