

Curriculum Vitae

James W. Head, III

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Education

Washington and Lee University

B.S. 1964

Brown University

Ph.D. 1969

"An Integrated Model of Carbonate Depositional Basin Evolution: Late Cayugan (Upper Silurian) and Helderbergian (Lower Devonian) of the Central Appalachians."

Professional Positions and Appointments

Bellcomm, Inc., Washington, DC

1968-1972

Systems Analysis Branch of the National Aeronautics and Space Administration Headquarters. Studies relating to the Apollo Lunar Exploration Program, including:

1. Study and analysis of potential Apollo landing sites,
2. Study of selected landing sites and planning of geologic traverses,
3. Study of returned samples, the geology of visited sites, and returned photography,
4. Participation in lunar scientific experiments,
5. Scientific training of Apollo astronauts.

Lunar Science Institute, Houston, Texas

1973-1974

Interim Director of Institute involved in scientific studies of lunar samples and experimental data obtained during lunar investigations. LSI is sponsored by the Universities Space Research Association, of which Brown University is a member.

Director: Brown University Regional Planetary Data Center 1979-1984.

Office of the President-Elect Reagan's Transition Team,

Nov. 1980-January 1981.

California Institute of Technology, Pasadena, CA

Dec. 1990-June 1991

Visiting Associate in Planetary Science

Universidad Complutense, Madrid, Spain

August, 1997

Professor at Escorial Summer School, "The Solar System as a Scientific Frontier"

University of Washington Seattle, Seattle, WA

February, 2000

Jessie and John Danz Visiting Professor.

Brown University

January 1973-present

Louis & Elizabeth Scherck Distinguished Professor

April, 1995-Present

Honors

Washington and Lee University, Honorary degree, Doctor of Science, 1995

NASA Medal for Exceptional Scientific Achievement, for work with flight crew of Apollo 15 on the scientific objectives of the Hadley-Apennine landing site, 1971.

NASA Public Service Medal for contributions to the Magellan Mission to Venus, 1992.

Geological Society of America Special Commendation for geologic training of astronauts assigned to the United States lunar exploration program, 1973.

CASE (Council for Advancement & Support of Education) Professor of the Year for Rhode Island, 1990.

Honorary Member: Alpha Circle of Omicron Delta Kappa, Washington & Lee University, VA, January, 1990.

Geological Society of America G.K. Gilbert Award, presented annually for outstanding contributions to the solution of fundamental problems in planetary geology, 2002

Group Achievement Awards:

NASA Award to the Shuttle Imaging Radar-B Science Team, 1990.

NASA Award for Galileo Orbiter Instrument Design, Development, and Test, 1991.

NASA Award for the Magellan Science Group, 1992.

NASA Award for the Galileo Gaspra Encounter Team, 1993

Superior Performance Award: Galileo Solid State Imaging Team, 1995.

NASA Award for the Project Galileo Team, 1996.

NASA Group Achievement Award for the ARES Mission Concept Development Team, 2004.

Membership in Professional Organizations

American Academy of Arts and Sciences, Fellow, 2006.

Association for the Advancement of Science, Fellow, 1993.

American Astronomical Society

American Geophysical Union, Fellow, 1997

Space Exploration Initiative panel, 1992.

James B. Macelwane Medal Committee, 1994-1997.

EOS Editor Search and Publications Committees, 1998-2000.

President of the Planetary Sciences Section, 2000-2002

European Geophysical Union

Geological Society of America, Fellow, 1995

Vice-Chairman: Planetary Geology Division, 1986-1987.

Chairman: Planetary Geology Division, 1987-1988.

International Academy of Astronautics

Meteoritical Society, Fellow, 1994

Research Interests

Research in progress relates both to 1) understanding the fundamental physical aspects of geological processes operating on the planets and satellites and, 2) the application of this knowledge to deconvolving the complex signal of the history of the planet contained in the geological record. Also addressed is the comparison of processes and histories of each planet, including the Earth (for example, what were the important factors governing the first two billion years of planetary history?). Recently, specific emphasis has been placed on the following areas:

1) Volcanism and the Earth's seafloor as a planetary environment: Theoretical modeling of the ascent and eruption of magma in the high-pressure deep seafloor environment (equivalent to that of Venus) and understanding the transition to shallower submarine and subaerial volcanism; analysis of basic theory and comparison to images and topographic data obtained on oceanic cruises and deep submersible dives.

2) Interpretation of the tectonics of Venus and implications for Earth: Documentation of the geological history of Venus and its tectonic and volcanic processes, assessment of possible catastrophic and episodic volcanic and tectonic activity, and analysis of implications for the formation of continents on Earth and the processes that might have initiated plate tectonics on our own planet.

3) Crustal formation and evolution on one-plate planets: How do crusts form and evolve? Analysis of secondary and tertiary crust on Mars, Venus and the Earth's Moon and assessment of implications for Mercury and early Earth.

4) Volcanism and tectonics on outer planet satellites: Analysis of the characteristics and history of the Galilean satellites, Io, Europa, Ganymede, and Callisto with emphasis on volcanic and tectonic processes and comparative geological and thermal histories of these satellites. Application of this knowledge to other outer planet satellites.

5) Geological evolution of Mars: What are the major factors in the geological evolution of Mars, and how does Mars differ from the other terrestrial planetary bodies? What role does volcanism play in the resurfacing of the planet and in crustal formation and evolution? How does volcanism create shallow crustal situations (e.g., dike emplacement, heating, melting of ground ice) that might be conducive to the production of environments favorable to life? Where might these sites be located on Mars? How do volcanic processes interact with subsurface water, the cryosphere, and surface glacial and volatile-rich deposits?

6) The History of Water on Mars: What is the nature of the martian hydrological cycle and how has it changed with time? What is the evidence for the presence of large standing bodies of water in the history of Mars and what was the fate of any such water? What is the nature of the cryosphere and how has it changed with time? What is the history of the water table? How is the history of water linked to environments conducive to life?

7) Climate Change on Earth and Mars: What is the recent and ancient history of the polar caps? Is there evidence for glaciation? How do these compare with examination of terrestrial glacial environments in Iceland and to the Antarctic Dry Valleys? What is the evidence for migration and deposition of ice on Mars and how does the record of the Antarctic Dry Valleys inform us of this? What is the significance of tropical mountain glaciers on Mars and how do they relate to recent ice ages there?

Publications

25 chapters in books on planetary geology
Over 300 refereed articles in scientific journals

Mission Participation

NASA

Viking Guest Scientist: participated in the NASA Viking Mission to Mars, 1976.

NASA Project Galileo Imaging Team, Mission to Jupiter and its satellites. Lunar Encounter 1 leader; Ganymede leader, Europa even orbit leader, 1977-present.

Space Shuttle Astronaut Training Program, 1978-present.

Synthetic Aperture Radar Team, NASA Venus Magellan Mission, 1979-1993.

Magellan Mission Project Science Group, 1983-1993.

Shuttle Imaging Radar-C (SIR-C) Science Working Group, 1984.

Shuttle Imaging Radar-B (SIR-B) Science Team, 1984-1987.

Vice-Chairman: Venus Radar Mapper Geology and Geophysics Task Group, 1984-1985.

Magellan (formerly Venus Radar Mapper Radar Investigation Group), 1984-1992.

Mars Orbiter Laser Altimeter/Radiometer Team, 1987-present.

MESSENGER, Mission to Mercury, Co-investigator, 1999-2010.

Principal Investigator: MINMAP Imaging Spectrometer, Lunar Scout II mission, 1992.

Co-Principal Investigator: Proposed Venera Discovery Mission to Venus, 1992.

Co-Investigator: SAGE, proposed new Frontiers lander on Venus, 2004.

Co-Investigator: Moonrise Mission to the Moon, proposed New Frontiers sample return, 2004.

Co-Investigator: ARES, Mars Scout Airplane, 2003-05.

Co-Investigator: Moon Mineralogy Mapper, 2005-present.

Co-Investigator: Lunar Orbiter Laser Altimeter (LOLA) on the NASA Lunar Reconnaissance Orbiter, 2007-present.

International

Soviet Venera 15/16 mission, Guest Investigator: USSR Academy of Sciences, Moscow, USSR, February 1985.

USSR Academy of Sciences, Moscow, USSR, February 1985.

Soviet Phobos Mission, Interdisciplinary Scientist: 1986-1990.

ESA Mars Express Mission, HRSC Camera Co-Investigator, 1996-present.

Service to the Profession:

Committee Memberships:

NASA

Co-Chairman: Lunar Sample Review Panel (Lunar and Planetary Institute), 1973-1974.
Headquarters Lunar Advisory Committee. Provided NASA with advice on programs and policy matters, 1973-1976.
Lunar and Planetary Photography and Cartography Committee, provides NASA with photographic and cartographic advice and information, Chairman 1974-1978.
Advisory Subcommittee on Geodynamics and Geology, Office of Space and Terrestrial Applications, 1978-1982.
Planetary Geology Proposal Review Panel, 1979-1982.
NASA Ad Hoc Committee on Planetary Surface Penetrator Missions, 1975-1976.
Science Working Group on Inner Planet Missions, Solar System Exploration Committee, 1981-1982.
Space and Earth Science Advisory Committee, 1982-1985.
Planetary Geology Proposal Review Panel, Chairman: 1982-1983.
NASA Delegation to Interagency Consultative Group (NASA, Japanese Space Agency, European Space Agency, Soviet Union-Interkosmos), 1983-1986.
Solar System Exploration Management Council, two-year term to advise NASA Director of Solar System Exploration Division on planetary exploration, 1984.-1986.
Visiting Science Committee, NASA Goddard Space Flight Center, Chairman: 1986-1987.
Mars Exploration Strategy Group, National Aeronautics and Space Administration, 1986-1988.
NASA Mars Rover Sample Return Science Working Group, 1986-1988.
NASA Mars Program Science Steering Group, 1987-1988.
NASA Interagency Consultative Group Panel on Planetary and Primitive Bodies, 1987-1989.
Advisory Council Task Force on International Relations in Space, 1986-1988.
Soviet Relations Advisory Committee, 1988.
U.S. Delegation to the United States/Russian Joint Working Group on Solar System Exploration, 1988-1992.
Mars Evolution of Tectonics and Volcanism (NASA Program), Steering Committee, 1989.
NASA Shuttle/Salyut Payloads Study Group, Earth Observations Team.
Terrestrial Planetary Bodies Science Working Group, Chairman: 1994-1996.
Solar System Exploration Subcommittee, 1994-1998.
Solar System Exploration Subcommittee, Space Science Advisory Committee, 1995 to 1998.
New Millennium Science Working Group, 1995-1997.
Office of Space Science Strategic Planning to 2015 Committee, 1995-1998.
Space Studies Board, SSE Panel, 2004 – present.
2030 Mars Science Focus Team, 2004-present.
NASA Advisory Council Planetary Science Subcommittee, 5/06 – present.
MEPAG Human Exploration of Mars Science Analysis Group (HEM-SAG), 2007-08.
Geological Society of America Committee on the Young Scientist Award, 2006-2009.

USRA

Universities Space Research Association Lunar and Planetary Science Council. Member: 1973-1976; Convener 1976-1978.
Universities Space Research Association Council of Institutions. Council is composed of representatives of 52 member institutions, Vice-chairman 1979; Chairman 1980; Board of Trustees member 1980-1981.
Venus Exploration Analysis Group (VEXAG) Focus Group, 9/05 – present.

JPL

International Mars Exploration Programs, Pasadena, Consultant: CA, 1986-1988.

Jet Propulsion Laboratory Mission Design Workshop; cooperative mission design involving fifteen undergraduate and graduate students and staff from Brown University and JPL scientists and engineers, Co-organizer: Summer, 1996-1998, 2002-2003.

MEPAG Special Regions Science Analysis Group (SR-SAG), 11/05 – present.

NAS/NRC

Committee on Earth Sciences, Space Science Board, National Academy of Sciences: 1979-1982.

Steering Committee on the Solid-Earth Sciences, National Research Council, Commission on Physical Sciences, Mathematics, and Resources, 1988-1990.

Panel on Comparative Planetology of the Committee on the Solid-Earth Sciences, National Research Council, Commission on Physical sciences, Mathematics, and Resources, 1988-1990.

NAS/NRC National Research Council Space Studies Board, Aeronautics and Space Engineering Board, Future of Space Science Committee on Technology, 1995-1996.

NAS/NRC Space Studies Board Solar System Exploration Survey Committee, Steering Group 2002-2002.

Other

Imbrium Consortium: A multidisciplinary study of the lunar Imbrium basin, 1976-77. Participants included J. Wood (Harvard), E. Anders (Chicago), M. Dence (Canada), T. McCord (U. Hawaii), M. Tatsumoto (USGS), and R. Walker (Wash. Univ.).

Team leader: "Basaltic Volcanism as a Stage in the Evolution of the Planets: A Pilot Program in Comparative Planetology," Distribution and morphology of basalt deposits on planets team. Objective of the project was to document the nature of basaltic volcanism as a stage in planetary evolution through research, synthesis, and team interaction. Each team consisted of about eight scientists in the field of interest. A major book was the end product: Basaltic Volcanism on the Terrestrial Planets, by the Basaltic Volcanism Study Project 1976-1979, Lunar and Planetary Institute, Pergamon Press, 1981.

U.S. National Committee for the International Union of Geodesy and Geophysics, National Research Council, National Academy of Sciences, 1978-1980.

Reporter for Comparative Planetology: National Academy of Sciences, U.S. Geodynamics Committee, 1978-1982.

"The Photography of Space Exploration," Consultant: Grey Art Gallery and Study Center, New York University, 1981.

Space Science Working Group, Association of American Universities, Steering Committee, 1982-1985.

International Space University, Faculty Advisor to the Space Sciences Division, 1987-1990.

Commission on Comparative Planetology, International Union of Geological Sciences, President: 1984-1992.

Steering Committee, Project on the Future of U.S. Space Policy, Center for Strategic and International Studies (CSIS), Washington, DC, 1988-1989.

Smithsonian Council of the Smithsonian Institution (advisory group to Director), 1987-1993.

International Scientific Council on Phobos, 1988.

International Association of Volcanology & Chemistry of the Earth's Interior (IAVCEI) Task Group on Large-Volume Basaltic Provinces, Steering Group Member 1993-1996.

U.S. Congress Office of Technology Assessment, Study on US/Russian Cooperation in Space, November, 1994.

Steering Committee for the Large Igneous Provinces (LIPs) Commission of IAVCEI, 2004 – present.

Conferences organized

- Brown University/Vernadsky Institute Microsymposium: Co-convener of Microsymposia 1 (March 1985) through 49 (March 2009). Begun during the Cold War era, the Brown Vernadsky symposia have been convened in Providence, Houston, Moscow, and Armenia. These symposia continue to provide a semiannual forum for Russian, European and American scientists to discuss and collaborate on research efforts.
- Convener of 28 special sessions at Conferences of American Geophysical Union, Geological Society of America, European Geophysical Society, International Union of Geodesy and Geophysics, and Lunar and Planetary Science Conference.

Editorships

- *Proceedings of the Lunar Science Conference*, Associate Editor: 1974.
- *Geophysical Research Letters*, American Geophysical Union, Associate Editor: 1974-1976.
- *The Earth, Moon and Planets*, Associate Editor: 1974-present.
- *Journal of Geophysical Research*, American Geophysical Union, Associate Editor: 1976-1978.
- *Earth, Moon and Planets*, Volumes 50/51, "Geology and Tectonics of Venus", special issue, Co-Editor: 1990.
- *Planetary and Space Science*, Pergamon Press Ltd., Editorial Advisory Board, 1992-1998.

Invited lectures and papers

Over 200 invited lectures and papers presented at universities, museums, agencies, national and international conferences, and on broadcast media. Locations include United States, Canada, Armenia, Austria, Belgium, England, France, Germany, Iceland, Italy, the Netherlands, Russia, and Spain.

Recent titles include:

"Water on Mars: Recent Results on Oceans and Polar Deposits"

"The Moon: Keystone to Understanding Planetary Geological Processes and History"

"Discovery and Beauty in Galileo's Images of the Jupiter System"

"Geological Exploration of the Terrestrial Planets: A New Perspective on Earth"

"Recent Ice Ages on Mars"

University-related Activities

Commencement speaker, Honors Convocation, 2002; Mid-year Commencement, 2003.

Senior Class Marshall, Commencement 1984-present.

Featured speaker at university fora, colloquia, seminars and alumni outreach events.

Teaching and Advising

Teaching at Brown has ranged from the introductory level (Freshman Seminar and Geological Sciences 5) to graduate seminars and graduate thesis supervision. In addition to the courses listed below, numerous Independent Study Projects and Senior Theses have been supervised. At present, several graduate theses are under supervision.

Geological Sciences 0050: Mars, Moon, and the Earth

Geological Sciences 0160: Exploration of Mars (Freshman Seminar)

Geological Sciences 0810: Planetary Geology

Geological Sciences 1960: Oceans on Planets

Geological Sciences 2810: Planetary Geology Seminar.

Geological Sciences 2860: Planetary Volcanology.

Geological Sciences 2870: Planetary Evolution.

Geological Sciences 2910: Problems in Antarctic Geoscience.

Geological Sciences 292K: The Hydrological Cycle of Mars

Geological Sciences/Biological Sciences/Environment. Sciences Seminar on Global Biodiversity.

Masters Degrees Supervised

Roberta Jennings, 1975
Rex Bryan, 1977
Paul Spudis, 1977
Lisa Gaddis, 1981
James Garvin, 1981
David Janke, 1981
Virgil Sharpton, 1981
Paul Helfenstein, 1981
Eric Christiansen, 1981
Carl Baum, 1983
William Ehmann, 1983
Duane Bindschadler, 1986
Nicholas Carras, 1987
Ellen Stofan, 1985
Richard Vorder Bruegge, 1987
Sharon Frank, 1989
David Senske, 1989
Kari Magee Roberts, 1989
Paul Fisher, 1990
Jeffrey Burt, 1992
Susan Keddie, 1992
Betina Pavri, 1992
Eric Grosfils, 1993
Irene Antonenko, 1995
Martha Gilmore, 1995
R. Aileen Yingst, 1995
Louise Prockter, 1996
Geoffrey Collins, 1996
Kevin Jones, 1997
Nicole Spaun, 1999
Kathryn Fishbaugh, 2000
Emily Stewart, 2000
Karen Jager, 2002
Brian Kortz, 2001
Patrick Russell, 2001
Bradley Thomson, 2001
Benjamin Webb, 2002
Sarah Milkovich, 2002
Elizabeth Fuller, 2003
Gil Ghatan, 2004
Gerald Patterson, 2004
Caleb Fassett, 2005
Shawn McColley, 2005
Rebecca Parsons, 2005
Joseph Levy, 2006
David Shean, 2006
Seth Kadish, 2008
Laura Kerber, 2008
Lillian Ostrach, 2008
Samuel Schon, 2008
Debra Hurwitz, 2009.

Ph.D Degrees Supervised

- Charles Wood, "Morphometric Studies of Planetary Landforms: Impact Craters and Volcanoes", 1978
- B. Ray Hawke, "Evolution of the Early Lunar Crust: The Role of Impact Melting, Secondary Cratering, and Highland Volcanism", 1978
- Mark Settle, "Studies of Impact Cratering Processes", 1978
- Mark Cintala, "The Role of Planetary Variables in Impact Cratering Processes", 1979.
- James Whitford-Stark, "Lunar Volcanic Complexes and Eruption Styles, 1980
- Wendy Hale, "Central Peaks and Rings in Craters and Basins", 1982
- James Garvin, "Geological Analyses of the Surfaces of Venus and Mars from Lander Spacecraft Images and Orbital Radar Observations", 1984
- Virgil Sharpton, "Analysis of Topography and Implications for the Tectonic Evolution of the Moon and Venus", 1984
- Paul Helfenstein, "Derivation and Analysis of Geological Constraints on the Emplacement and Evolution of Terrains on Ganymede from Applied Differential Photometry", 1985
- Scott Murchie, "The Tectonic and Volcanic Evolution of Ganymede and its Implications for the Satellite's Internal Structure and Evolution", 1988
- Ellen Stofan, "Geology of Coronae and Domal Structures on Venus and Models of Their Origin", 1989
- Duane Bindshadler, "Models for the Origin of the Tessera Terrain: A Study of the Tectonics of Venus", 1989
- Richard Vorder Bruegge, "Tectonic Evolution of Ishtar Terra: Processes of Crustal Shortening and Thickening on Venus", 1990
- David Senske, "Geology and Mechanisms for the Origin of Regional Volcanic Rises in the Equatorial Region of Venus, 1992
- Kari Magee Roberts, "Formation and Emplacement of Large-Volume Flow Units on Venus: Implications for the Production of Flood Basalts and Evolution of Plume-Related Structures", 1994
- Susan Keddie, "Large Volcanoes on Venus: The Effects of Mantle Plume Characteristics and Neutral Buoyancy Zone Development on Their Formation, Distribution, and Evolution", 1994
- Eric Grosfils, "The Emplacement of Giant Radiating Dike Swarms on Venus: Implications for Magma Stalling and Reservoir Formation, the Origin of Shallow Stress Fields, and the Recent Geologic History of the Planet", 1995
- Martha Gilmore, "Tessera Terrain on Venus: Style, Sequence and Duration of Deformation", 1997
- Irene Antonenko, "Volumes of Cryptomasic on the Western Limb of the Moon: Implications for Lunar Volcanism", 1998.
- Cathy Weitz, "Lunar Pyroclastic Deposits and Effusive Constructs: Petrology, Eruption Styles and Spectral Properties", 1998.
- R. Aileen Yingst, "Characteristics of Lunar Lava Ponds as Indicators of Magma Transport Mechanisms and Local-Scale Geology of Ganymede Bright Terrain as Shown by Galileo Very High Resolution Images", 1998.
- Louise Prockter, "Lithospheric accretion and destruction processes on Ganymede and Europa", 1999.
- Geoffrey Collins, "Driving mechanisms for grooved terrain tectonics on Ganymede and chaotic terrain formation on Europa Constraints from Galileo data", 2000.
- Nicole Spaun, "Chaos, lenticulae, and lineae on Europa: Implications for geological history, crustal thickness, and the presence of an ocean", 2001.
- Patrick Russell, "On the activity of water on Mars: Investigations into the groundwater system and the stability of ice in the crater-interior environment:", 2004

- Kathryn Fishbaugh, "Geologic history of the North Polar Region of Mars from the Late Hesperian to the present: Stratigraphy, melting and retreat", 2004.
- Sarah Milkovich, "Geological Evidence for Climate Change During the Amazonian Period of Mars: Polar Layer Stratigraphy and Tropical Glacier Formation", 2005.
- Gerald Patterson, "An analysis of the mechanical behavior of tectonically active icy satellite lithospheres through geologic mapping, geomorphic analysis, and geophysical modeling", 2007.
- Caleb Fassett, "The Nature and Evolution of Valley Networks on Mars: Geological Constraints On Surface Conditions", 2008.
- Joseph Levy, "Polygonally Patterned Ground on Earth and Mars: Understanding Climate Evolution and Frozen Ground Processes on Planetary Surfaces", 2009.
- Gareth Morgan, "Ice-Related Landforms on the Earth and Amazonian Mars: Geomorphic Evidence for Processes of Ice Flow and the Generation of Melt Water". 2009.