James W. Head, III
Curriculum Vitae

James W. Head, III
Louis & Elizabeth Scherck Distinguished Professor
Department of Earth, Environmental and Planetary Sciences
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Google Scholar
https://scholar.google.com/citations?user=GgICCQIAAAAJ&hl=en
(Total citations: 57,383, h-index: 115 and i10-index: 802)

Home Address:
80 Fosdyke St.
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Education:
Washington and Lee University B.S. 1964
Brown UniversityPh.D 1969
"An Integrated Model of Carbonate Depositional Basin Evolution: Late Cayugan (Upper Silurian) and Helderbergian (Lower Devonian) of the Central Appalachians."
Washington and Lee University, Honorary Degree Ph.D 1995

Executive Summary:
In 2018, I wrote >50 letters of recommendation for students, and numerous tenure and promotion letters and 25 nomination letters for awards for individuals. I also participated in the professional activities of eleven organizations and reviewed >25 journal manuscripts and 5 proposals. In 2018 27 articles were published, in press or in review and my articles were cited 4108 times (overall cited 57,383, h-index: 115 and i10-index: 802 - https://scholar.google.com/citations?user=GgICCQIAAAAJ&hl=en). Four proposals were submitted 1) Mars Express/NASA Project Extended Mission (HRSC), renewal submitted and awarded $60,000.00. 2) Lunar Orbitor Laser Altimeter (LOLA), renewal submitted and $875,000.00 to be awarded in early 2019. 3) Detrended LOLA Topography and Detection of Low-Amplitude Topographic Features (LDAP) proposal submitted, 2018. 4) Lunar Structure, Composition and Processes for Exploration (LunaSCOPE) – SSERVI, proposal submitted, 2018 (Co-I).

In the Spring of 2018 I taught GEOL 2920K: The Hydrological Cycle on Mars (7 students) and in the Fall of 2018 I taught GEOL 2870: Planetary Evolution: The origin and evolution of the Moon (13 students). NASA Administrator Jim Bridenstine and Apollo 17 Astronaut Jack Schmitt both lectured in this class. Weekly individual research meetings with students and regular Friday afternoon research meetings were held with my students and staff. Two PhD students, Erica Jawin and James Cassanelli graduated in 2018. Sierra Kaufman and Adeene Denton completed their MSc. in 2018. I mentored eight graduate students and encouraged and guided them in research and provided them opportunities to present their work at many national and international professional meetings (GSA, AGU, LPSC, LEAG, etc.).

Advisees were encouraged to be involved in Sheridan Center activities and encouraged to apply for fellowships, Ashley Palumbo received the NASA NESSF fellowship for her second year and was awarded an LPI Career Development award for LPSC 49; Sierra Kaufman received the American Indian Graduate Center Scholarship; Ariel Deutsch was awarded the NASA AS&ASTAR fellowship for her third year, and won Best Poster Award for "Impact Bombarded Ice on the Moon" at the 2018 International Symposium on Lunar & Planetary Science, Macau, China; and James Cassanelli was awarded the LPI Career Development award for LPSC 49. Many of these graduate students had first-author publications this year as well. This year, I took graduate students (Ariel Deutsch and Ashely Palumbo) to China to present and attend several conferences including the 2018 International Symposium on

Lunar & Planetary Science. I meet with graduate students individually for an hour weekly and together in a Research Meeting every Friday afternoon.

>50 abstracts for presentations at professional meetings were submitted and published in 2018. I received invitations to present papers at national and international conferences in China, as well as Russia and the US. I gave several invited talks on my research (Macau University, CHINA; Beijing International Forum on Lunar and Deep Space Exploration, CHINA; NASA Headquarters; Geological Society of America's annual meeting and at the Rhode Island Netopian Club. I was interviewed for IEEE Spectrum Newsletter, Brown Alumni Magazine and for a National Geographic Documentary "Apollo, the Ultimate Experience".

Academic and Professional Appointments:

NASA Headquarters (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 from Apollo 7-17, including:
1) Study and analysis of lunar areas of scientific interest as potential Apollo landing sites,
2) Detailed analysis of selected landing sites and planning of geologic traverses,
3) Scientific training of Apollo astronauts in the field and classes,
4) Participation in Houston Mission Control during Apollo missions,
5) Participation in selection and planning of lunar scientific experiments and,
6) Study of returned samples as a member of the NASA Sample Preliminary Examination Team (Apollo 15-17), debriefing of the Apollo crews following their return from the Moon, further post-mission analysis of the geology of visited sites with the USGS Field Geology Team, and analysis of returned surface and orbital images to provide context and feed-forward to site selection for the following missions.

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.

California Institute of Technology, Pasadena, CA December 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.

Ohio State University 2012
Bownocker Lecturer

Brown University 1973-Present
Assistant Professor (Research) 1973-1974
Associate Professor (Research) 1974-1975
Associate Professor 1975-1980
Professor 1980-Present
James Manning Professor 1990-1995
Louis & Elizabeth Scherck Distinguished Professor 1995-Present

China University of Geoscience, Wuhan 2016 - Present
Visiting Professor

Academic honors, awards, honorary societies:

Medal for Exceptional Scientific Achievement, National Aeronautics and Space Administration, "Working with the Field Geology Investigation Team, he prepared the flight crew of Apollo 15 on the scientific objectives of the Hadley-Apennine landing site and the techniques and procedures to be employed to fulfill the objectives. This work contributed significantly to the scientific accomplishments of the crew." 1971

Special Commendation, Geological Society of America, "On behalf of all geoscientists, this certificate of special commendation is issued to James W. Head, III in recognition of his effective contributions to the geologic training of astronauts assigned to the United States program of lunar exploration. His participation in the Apollo program has provided a significant and unique service to geology, geologists, and the public.", 1973

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

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

National Air and Space Museum Trophy "awarded annually for outstanding achievements in the fields of Aerospace Science and Technology." presented to the Magellan Project Team, Washington, DC., 1992

Public Service Medal, National Aeronautics and Space Administration, "for exceptional contributions to the Magellan Mission to Venus throughout all its phases.", awarded at the Jet Propulsion Laboratory, Pasadena, CA, 1992

American Association for the Advancement of Science (AAAS), Elected Fellow "Fellows are AAAS members whose efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished. "James Head is being honored for pioneering comparative planetology studies of the Earth, Moon, Mars, Venus, and the Galilean moons of Jupiter; for research on the processes that form and modify the surfaces, crusts, and lithospheres of these planets; for critical contributions to historic spacecraft missions; and for teaching.", 1993

Honorary Degree: Doctor of Science, Washington and Lee University Board of Trustees, Lexington, Virginia, 1995

G. K. Gilbert Award of the Geological Society of America Planetary Geology Division "Named for G. K. Gilbert, who clearly recognized the importance of a planetary perspective in solving terrestrial geological problems, the award is made for outstanding contributions to the solution of fundamental problems of planetary geology in its broadest sense.", 2002

American Academy of Arts and Sciences, Elected Fellow "Founded in 1780, the American Academy of Arts and Sciences elected Fellows are leaders in the academic disciplines, the arts, business, and public affairs.", 2006

Runcorn-Florensky Medal of the European Geosciences Union "Awarded to James W. Head for his outstanding work in studying volcanism and tectonism in the formation and evolution of planetary crusts and for developing remarkable US-European research collaborations in Earth and planetary sciences." 2010.

N.L.Bowen Award, AGU Fall Meeting, "The award recognizes outstanding contributions to volcanology, geochemistry, or petrology." 2013

Teaching with Technology Award, Brown University, "Awarded for the most effective use of technology in advancing teaching and learning goals." 2013

M.V. Keldysh Medal, "for International Space Science Collaboration for four decades", Moscow, Russia, 2014

Penrose Medal, the highest award of the Geological Society of America. "Awarded in recognition of eminent research in pure geology, for outstanding original contributions or achievements that mark a major advance in the science of geology." 2015

Distinguished Advisor, Macau University of Science and Technology; Guest Faculty Member, China University of Geosciences. 2016

Shoemaker Distinguished Lunar Scientist Medal, NASA Solar System Exploration Research Virtual Institute. 2016

Foreign Member of the Russian Academy of Sciences. Elected 2017

Research Interests, Strategy and Directions:
Research interests relate 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 planetary history 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 a planet's history?). Specific emphasis has been placed on the following areas and themes:

1) *Geological mapping of planets and satellites:* Following the pioneering work of Shoemaker and Wilhelms, apply basic geological observations to define geologic units and assess stratigraphic relationships to map the geology of planets and satellites and deconvolve their geological and thermal history. Use these principles and practices to assess geological problems on local, regional and global scales on the Moon, Mars, Venus and Mercury, asteroids, and the Galilean satellites. Particular emphasis is on the role of volcanism and its relation to tectonism and planetary thermal evolution.

2) *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 (approximately 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 human and robotic deep submersible dives.

3) *Ascent and eruption of magma on the Earth and other terrestrial planetary bodies:* Apply knowledge of the geology of Earth volcanism to the basic principles of ascent and eruption and develop theoretical treatments for ascent and eruption under the conditions typical of each of the other planetary bodies. Compare the observed geological record of each planetary body to these predictions and document the dominant styles of volcanism and planetary advective heat transfer and loss.

4) *Assess the nature of impact craters and basins on the terrestrial planets and document the impact cratering flux:* Use the observed geological record of the cratering process to analyze the most important geologic aspects of cratering and how these change with increasing size, from simple to complex craters, and peak-ring basins to multi-ring basins. Use comparative planetology to assess differences in environment and internal structure. Assess the relationship of impact cratering to volcanism in both an active and passive mode.

5) *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.

6) *Crustal formation and evolution on one-plate planets:* How do crusts form and evolve? Use remote sensing and sample data in the analysis of secondary and tertiary crust on Mars, Venus and the Earth's Moon and assessment of implications for Mercury and early Earth.

7) *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.

8) *Geological evolution of Mars:* Apply basic geologic and mapping principles to understand the major processes operating and their changing relative importance as a function of time. 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?

9) *The history of water on Mars:* Assess the presence and state of water on Mars throughout its geology history. 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? Was the hydrological cycle on Mars ever fully vertically integrated, or has it been horizontally stratified (characterized by a global cryosphere) throughout its history?

10) *The history of climate on Mars:* Use the geologic record, particularly the record of non-polar ice-related deposits, as a basis to deconvolve the climate history of Mars and the importance of various spin-axis/orbital

parameters in determining the evolution of climate. Work with Mars General Circulation Models (GCM) to assess the role of explosive and effusive volcanism in producing punctuated changes and overall evolutionary changes. What is the recent and ancient history of the polar caps? What is the nature of the cryosphere and how has it changed with time? What is the history of the water table? Was early Mars "warm and wet" or "cold and icy"? How is the history of water linked to environments conducive to life?

11) *Glaciation and climate change in the Antarctic Dry Valleys:* Explore glacial and periglacial processes in the most Mars-like environment on Earth. Understand the factors involved in polygon, gully, debris-covered glacier, and recurring slope lineae formation through a detailed field program of geologic fieldwork and quantitative multi-season environmental monitoring. Assess the role of current climate change in ultra-stable environments.

Work in Progress:
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 a planet's history?). Recently, specific emphasis has been placed on the following areas:

1) *Water on Mars and Mars Climate History:* Analysis of data continued from instruments on board the Mars Global
Surveyor and Mars Express spacecraft including exciting tests for the possibility of very large standing bodies of water on Mars (seas and oceans) in its past history and their evolution, and the early hydrological cycle (origin and timing of valley networks).

2) *Evolution of Mars Polar Caps:* New data from MOLA have given us insight into the nature of the polar caps of Mars. Our work at Brown suggests that there are residual ice deposits many kilometers away from both the north and south present ice caps and that it they had a much greater extent in the previous history of Mars, after which they melted back to their present position.

3) *Cold-Based Tropical Mountain Glaciers on Earth and Mars:* In conjunction with Professor
David Marchant (Boston University) we are examining the applicability of terrestrial cold-based polar glaciers to Mars through field work in the Dry Valleys of Antarctica and analysis of martian landforms. We have made great progress in the identification of non-polar ice deposits and their origin.

4) *Mars Volcanism, Niches for Life, and Landing Site Selection:* We have focused on the volcanic record and the role volcanism plays in the resurfacing of the planet and in crustal formation and evolution. Among several themes, we specifically have been assessing how volcanism can create shallow crustal environments (e.g., dike emplacement, heating, melting of ground ice) that might be conducive to the production of niches favorable to life. We have pursued early Mars deltaic environments and presented these at the Mars Site Lander workshop. We have pursued research to determine where these sites might be located on Mars, and how to plan for their exploration.

5) *Global Evolution of Venus:* Continuing strides have been made in interpretation of the global tectonics of Venus and understanding implications for Earth. We made several more steps in documenting the global geological history of Venus and its tectonic and volcanic processes, and have provided evidence for possible catastrophic and episodic volcanic and tectonic activity late in the history of Venus. These findings have important implications for the formation of continents on Earth, the processes that might have initiated plate tectonics on our own planet, and the formation of large igneous provinces on Earth, themes that are presently being pursued. We 10 submitted our map of Venus Quad 1 (Snegurochka) to the USGS in 2010, and saw our map of Quad 7 (Lakshmi) published in 2010. I am a Co-I on a proposal to send a lander to Venus.

6) *Tectonics and Cryovolcanism on Ganymede and Europa:* Continuing analysis of data from the
Galileo mission has shown that the tectonic evolution of the icy galilean satellites is much different than previously thought. High-resolution data of Ganymede have shown different wavelengths of deformation and that the patterns of deformation are more organized and systematic than previously thought. This, compared to the underformed surface of Callisto, has permitted us to develop much better models for the factors responsible for the very different behavior of these two planet-sized icy satellites. We have developed a new concept, tectonic resurfacing, to

potentially explain much of the bright terrain on Ganymede, and are developing global models for the strain history of Ganymede, comparing this to the features on Europa, and why it may be different from Callisto. We have developed a theoretical basis for the ascent and eruption of magma (liquid water) on Ganymede and Europa and are presently assessing cryomagmatic and cryovolcanic processes. We are submitted a global geologic map of Ganymede.

7) *Antarctic Geoscience:* We have been working in the Mars-like Antarctic Dry Valleys and have documented the nature of microclimate zones there and their relationship to Mars. This has given us fresh insight into the origin of gullies on Mars and the nature of recent climate change there.
Data collection is ongoing. Fieldwork included 3 weeks in the Antarctic Dry Valleys (late November, 2010).

8) *Lunar Exploration:* Data from two recent missions (Moon Mineralogy Mapper aboard Chandrayaan-1 and the Lunar Orbiter Laser Altimeter [LOLA]) on which I am a co-investigator have revealed new insight into crater morphology. Analysis of a detailed global topographic map of the Moon based on LOLA data shows that the older highland impactor population can be clearly distinguished from the younger population in the lunar maria, which has implications for the earliest history of all planets in the inner solar system, including the poorly preserved impact record of Earth.

9) *Volcanism on Mercury and Crustal Evolution:* Recent attention has been placed on global geological mapping of Mercury using the new global MESSENGER image and altimetry data set. In tandem, we have focused on the generation, ascent and eruption of magma, how this differs from other planets, and what it means for the volcanic resurfacing history of Mercury.

Research, Scholarship and Service to the University, Profession, The Government and the Public:
To the United States Government:
Member: Office of the President-Elect Ronald Reagan's Transition Team, National Aeronautics and Space Administration, November 1980-January 1981.
Member: NASA Delegation to Interagency Consultative Group (NASA, Japanese Space Agency, European Space Agency, Soviet Union-Interkosmos), 1983-1986.
Member: U.S. Congress Office of Technology Assessment, Study on US/Russian Cooperation in Space, November 1994.
Advisor: President's Science Advisor Dr. Jay Keyworth, Venus science/exploration, 1982.
Member: U.S. Delegation to the United States/Russian Joint Working Group on Solar System Exploration, 1988-1992.

To the Profession:
National Academy of Sciences/National Research Council (NAS/NRC)
Chairman: Panel on Comparative Planetology of the Committee on the Solid-Earth Sciences, National Research Council, Commission on Physical sciences, Mathematics, and Resources, 1988-1990.
Member: Solar System Exploration Decadal Study: National Research Council, 1999-2003.
Member: Steering Committee on the Solid-Earth Sciences, National Research Council, Commission on Physical Sciences, Mathematics, and Resources, 1988-1990
Member: Future of Space Science Task Group on Technology (FOSS-T), Space Studies Board, Aeronautics & Space Engineering Board, National Research Council, December 1994-June 1996.
Reporter for Comparative Planetology: National Academy of Sciences, U.S. Geodynamics Committee, 1978-1982.
Member: Committee on Earth Sciences, Space Science Board, National Academy of Sciences: 1979-1982.
Member: U.S. National Committee for the International Union of Geodesy and Geophysics, National Research Council, National Academy of Sciences, 1978-1980

National Aeronautics and Space Administration (NASA)
Co-Chairman: Lunar Sample Review Panel (National Aeronautics and Space Administration, Lunar and Planetary Institute), 1973-1974.
Member: National Aeronautics and Space Administration Headquarters Lunar Advisory Committee. Provided NASA with advice on programs and policy matters, 1973-1976.

Chairman: Lunar and Planetary Photography and Cartography Committee composed of members from universities and National Aeronautics and Space Administration centers. Operated through the Lunar and Planetary Institute, provides NASA with photographic and cartographic advice and information, l974-1978.
Member: NASA Committee on Planetary Surface Penetrator Missions, 1975-1976.
Member: NASA Shuttle/Salyut Payloads Study Groups, Earth Observations Team. A working group that studies and identifies investigations that may be conducted on the Shuttle/Salyut project, 1977-1978.
Member: National Aeronautics and Space Administration Advisory Subcommittee on Geodynamics and Geology, Office of Space and Terrestrial Applications, 1978-1982.
Member: Planetary Geology Proposal Review Panel, National Aeronautics and Space Administration, 1979-1982
Director: Brown University Regional Planetary Data Center, National Aeronautics and Space Administration, 1979-1984.
Member: Science Working Group on Inner Planet Missions, Solar System Exploration Committee, National Aeronautics and Space Administration, 1981-1982.
Chairman: Planetary Geology Proposal Review Panel, National Aeronautics and Space Administration, 1982-1983.
Member: Space and Earth Science Advisory Committee, National Aeronautics and Space Administration, 1982-1985.
Vice-Chairman: NASA Venus Radar Mapper Geology and Geophysics Task Group, 1984-1985.
Member: Solar System Exploration Management Council, two-year term to advise NASA Director of Solar System Exploration Division on planetary exploration, 1984-1986.
Member: Planetary Geosciences Working Group, National Aeronautics and Space Administration, 1984-1986.
Chairman: Solar System Exploration Management Council, National Aeronautics and Space Administration, 1985-1988.
Chairman: Visiting Science Committee, NASA Goddard Space Flight Center, 1986-1987.
Member: Mars Exploration Strategy Group, National Aeronautics and Space Administration, 1986-1988.
Member: NASA Mars Rover Sample Return Science Working Group, 1986-1988.
Member: Advisory Council Task Force on International Relations in Space, National Aeronautics and Space Administration, 1986-1988.
Member: NASA Mars Program Science Steering Group, 1987-1988.
Member: Soviet Relations Advisory Committee, National Aeronautics and Space Administration, 1988.
Member: Steering Committee, Mars Evolution of Tectonics and Volcanism (NASA Program), 1989.
Member: NASA Lunar and Planetary Imaging Instrument Definition and Study Team, 1990.
Chairman: National Aeronautics and Space Administration Terrestrial Planetary Bodies Science Working Group, 1994-1996.
Member: National Aeronautics and Space Administration Solar System Exploration Division Committee on Research and Analysis, October 1994.
Member: National Aeronautics and Space Administration Solar System Exploration Subcommittee, Space Science Advisory Committee, 1995-1998.
Member: NASA New Millennium Science Working Group, 1995-1997.
Member: NASA Office of Space Science Strategic Planning to 2015 Committee, 1995-1996.
Member: NASA Committee on the Strategy of Earth-Like Planets, 1996-1998.
Member: NASA's Planetary Geology and Geophysics Program Review Panel (PGGRP), May 1999-2000.
Member: NASA Advisory Council, Planetary Sciences Subcommittee, 2006-2010

Jet Propulsion Laboratory (JPL)
Consultant: International Mars Exploration Programs, Jet Propulsion Laboratory, 1986-1988.
Organizer: Jet Propulsion Laboratory Mission Design Workshop; co-operative mission design involving fifteen undergraduate and graduate students and staff from Brown University and JPL scientists and engineers, Summer, 1996, 1997, 1998.

Geological Society of America (GSA)
Member: Executive Committee, Planetary Geology Section, Geological Society of America, 1981-1989.
Vice-Chairman: Planetary Geology Division of the Geological Society of America, 1986-1987.

Member: Geological Society of America Joint Technical Program Committee, 1987.
Chairman: Planetary Geology Division of the Geological Society of America, 1987-1988.
Member: Diversity in the Geosciences Committee, 2017 - present

American Geophysical Union (AGU)
Member: Nominating Committee of Planetology Section, American Geophysical Union, 1983.
Member: Space Exploration Initiative panel, American Geophysical Union, 1992.
Member: James B. Macelwane Medal Committee, American Geophysical Union, 1994-1997.
Member: American Geophysical Union Planetology Section Executive Committee, 1994-1998.
Member: AGU EOS Editor Search Committee, 1998-1999.
Member: AGU Publications Committee, 1998-2000.
President-Elect, Planetology Section, American Geophysical Union, 1998-1999.
President of the Planetary Sciences Section: The American Geophysical Union, 1999-2000.

Universities Space Research Association (USRA)
Member: Universities Space Research Association Lunar and Planetary Science Council. A council appointed by the USRA Board of Trustees to advise on matters of lunar and planetary science and to report on activities of the Lunar and Planetary Institute, 1973-1976.
Convenor: Universities Space Research Association (USRA) Lunar and Planetary Science Council.
Oversees the activities of the Lunar and Planetary Science Institute and advises Universities Space Research Association Board of Trustees, 1976-1978.
Vice-Chairman: Universities Space Research Association Council of Institutions. Council is composed of representatives of 52 member institutions, 1979.
Chairman: Council of Institutions, Universities Space Research Association, 1980.
Member: Board of Trustees, University Space Research Association, 1980-1981.

Lunar and Planetary Institute (LPI)
Member: 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.).
Educational Visiting Scientist: Space Shuttle Astronaut Training Program, Lunar and Planetary Institute, 1978.
Member: Early Crustal Genesis Workshops, Lunar and Planetary Institute: A study group accessing research directions in the question of the genesis of planetary crusts, November 1981.
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.
Member: Planetary Meetings Steering Committee, Lunar and Planetary Institute, Houston, TX, 1984-1985.

Participation in NASA and International Space Missions and Experiments:
Apollo Lunar Exploration Program: 1968-1972.
Viking Guest Scientist: NASA Viking Lander Missions to Mars, 1976.
Member: Synthetic Aperture Radar Team, NASA Venus Magellan Mission. Participation in the planning and execution of the Venus mission and in the analysis of the data, 1979-1993.
Member: Shuttle Imaging Radar-C (SIR-C) Science Working Group, National Aeronautics and Space Administration, 1984.
Member: Shuttle Imaging Radar-B (SIR-B) Science Team, National Aeronautics and Space Administration, 1984-1987.
Member: NASA Project Galileo Imaging Team, Jet Propulsion Laboratory, Mission to Jupiter and its satellites. Participation in the planning and execution of mission and analysis of data; Lunar Encounter 1 leader; Ganymede leader, 1977-1997.
Member: NASA Galileo Europa Mission Solid State Imaging Team, Leader and Designer of even Europa orbits, 1997-2000.
Member: Magellan (formerly Venus Radar Mapper) Mission Project Science Group - NASA Jet Propulsion Laboratory, Chair of volcanism group, 1983-1993.
Guest Investigator: Venera 15/16 mission, USSR Academy of Sciences, Moscow, USSR, 1985.

Interdisciplinary Scientist: Soviet Phobos Missions, 1986-1990.
Member: Mars Global Surveyor (MGS) Mars Orbiter Laser Altimeter Team, 1987-2005.
Interdisciplinary Scientist: Russian Mars 94/96 Mission, 1990-1996.
Principal Investigator: MINMAP Imaging Spectrometer, Lunar Scout II mission, 1992.
Co-Investigator: High Resolution Stereo Camera (HRSC), Mars Express Mission, European Space Agency, 1992-present.
Co-investigator: MESSENGER, Mission to Mercury, NASA Discovery Program, 1999-2017.
Affiliated Scientist: Mars Reconnaissance Orbiter (MRO) Shallow Radar SHARAD experiment.
Co-Investigator: SAGE, proposed New Frontiers lander on Venus, 2004 -.
Co-Investigator: Moonrise Mission to the Moon, proposed New Frontiers sample return, 2004 to present.
Co-Investigator: ARES, Mars Scout Airplane, 2003-2005.
Co-Investigator: Moon Mineralogy Mapper, Imaging Spectrometer on board the Indian Chandrayaan-1 Mission to the Moon, 2005-2011.
Co-Investigator: Lunar Orbiter Laser Altimeter (LOLA) on the NASA Lunar Reconnaissance Orbiter, 2007-present.
Participating Scientist: Russian Phobos Sample Return Mission, 2005-2012.
Participating Scientist: Russian Luna Lander Missions: 2010 to present.
Participating Scientist: Lunar Gravity Recovery and Interior Laboratory (GRAIL) mission, 2012-2014.

Participation in Oceanic Research Cruises:
Deep Sea Submersible exploration dives in Alvin (Seamount 6, Pacific Ocean) and Pisces (Loihi Seamount, near Hawaii), studying ocean-floor volcanic effusion and explosive processes, as well as an MBARI cruise to the Gorda Ridge exploring explosive volcanism processes with the remotely operated vehicle Tiburon.

Participation in National Science Foundation Antarctic Research Program:
Extensive field program (five field seasons) in the Antarctic Dry Valleys studying processes related to the preservation and behavior of ice and assessing the magnitude of climate change in microclimate zones. Application of these findings to interpreting the climate history of Mars.

Group Achievement Awards:
Recipient: National Aeronautics and Space Administration Group Achievement Award to the Shuttle Imaging Radar-B Science Team, "In recognition of outstanding achievements in the application of Shuttle Imaging Radar-B (SIR-B) data to Earth science. This research demonstrated the value of imaging radar for understanding Earth systems and provided vital information for future spaceborne radar investigations", Washington, D.C., September 21, 1990.
Recipient: National Aeronautics and Space Administration Group Achievement Award for Galileo Orbiter Instrument Design, Development, and Test to James W. Head III, Solid State Imaging Subsystem, "In recognition of outstanding accomplishment in the design, development, test, and integration of the Galileo Orbiter science instruments, which comprise a highly synergistic, state-of-the-art science payload destined for an intense and comprehensive investigation of the Jupiter system, Washington, D.C., May 9, 1991.

Recipient: National Aeronautics and Space Administration Group Achievement Award for the Magellan Science Group to James W. Head, Radar Scientist, "In recognition of outstanding achievement in performing the various science tasks that have been a major part of the successful Magellan mission", Washington, D.C., June 30, 1992.

Recipient: National Aeronautics and Space Administration Group Achievement Award for the Galileo Gaspra Encounter Team, presented to James W. Head III, Galileo Flight Team, "In recognition of the outstanding effort in the overall planning, sequence design, and development and execution of the first-ever spacecraft encounter of an asteroid, 951 Gaspra, and the precursor navigation campaign that enabled this exceptional event", Washington, DC., February 10, 1993.
Superior Performance Award: Galileo Solid State Imaging Team, "For Superior Performance and exceptional ledership in the planning and execution of the Solid State Imaging experiment at the first Galileo encounter with Earth's Moon", November 2, 1995.

Recipient: National Aeronautics and Space Administration Group Achievement Award for the Project Galileo Team to James W. Head III in recognition of significant outstanding contributions to the Galileo Probe and Orbiter to Jupiter, which marked the first entry into an outer planet atmosphere and the first spacecraft to orbit an outer planet, and included the relay of the data from the Probe to the Orbiter, April 9, 1996.

International:

President: Commission on Comparative Planetology, International Union of Geological Sciences, 1984-1992.
Chairman: Advisory Committee on Comparative Planetology, International Union of Geological Sciences, 1980-1984.
Representative: International Union of Geological Sciences representative to Planetary Meetings Steering Committee, 1985.
Member: Interagency Consultative Group Panel on Planetary and Primitive Bodies, 1987-1989. Invited Participant: International Space University, Faculty Advisor to the Space Sciences Division, 1987-1990.
Member: International Scientific Council on Phobos, Soviet Union, 1988.
Member: Steering Committee, Project on the Future of U.S. Space Policy, Center for Strategic and International Studies (CSIS), Washington, DC, 1988-1989.
Steering Group Member: International Association of Volcanology & Chemistry of the Earth's Interior (IAVCEI) Task Group on Large-Volume Basaltic Provinces, 1993-present.
Representative: International Union of Geological Sciences representative to the Coordinating Committee for the Moon and Planets, 1996-1997.

Other:
Member: Steering Committee, Space Science Working Group, Association of American Universities, 1982-1985.
Member: Council of the Smithsonian Institution (advisory group to the Director of the Smithsonian Institution), 1987-1993.
Member: AAS Division of Planetary Sciences Prize Committee (Gerard P. Kuiper Prize in Planetary Science and Harold C. Urey Prize in Planetary Science), 1989-1990.
Member: Selection Committee, National Space Club Science Award, 1989-1991.
Member: Director Search Committee, Carnegie Institution, Department of Terrestrial Magnetism, 1990.
Chair: Visiting Committee for the National Air and Space Museum: 1992.
Member: Stanford-Brown IGEM (The International Genetically Engineered Machine Competition), 2012-2016

Current Memberships in Professional Societies:
Geological Society of America (Fellow)
American Geophysical Union (Fellow)
American Association for the Advancement of Science (Fellow)
Meteoritical Society (Fellow)
American Astronomical Society
International Association of Volcanology and Chemistry of the Earth's Interior
European Union of Geosciences International Union of Geological Sciences
International Academy of Astronautics

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

To the Community:
Presented many dozens of invited talks to Rhode Island and New England schools, colleges, civic groups, amateur astronomy groups, Dozens of TV interviews, newspaper articles, popular magazine articles, NPR Science Fridays, etc. New York Times front-page article featuring the “MOLA global map of Mars in color”, May 28, 1999. New York Times front-page article featuring “Tantalizing Signs of Ancient Martian Ocean”, December 10, 1999. Providence Journal, front-page article featuring “Was there an Ocean on Mars?” December 10. 1999. BBC series on "The Planets": Featured in two episodes, "The Earth" and "The Moon".
NOVA Series on Apollo: “To the Moon” Appeared on numerous times. Consultant: Photo display (June 22 through August 1, 1981) and Contributor to the Catalog, "The Photography of Space Exploration," Grey Art Gallery and

Study Center, New York University. Appeared on Ted Koppel's "Brave New World" Network TV Program on Life in the Solar System. Newsweek: "The Search" quoted in the December 1999 issue.
The Weather Channel: Interview with Laura Detera, October 2013.

To the University:
Service:
Served on over 50 University and Departmental committees, including:
Commencement Forum Speaker 2013
Robot Block Party Sponsor/Participant 2014
President's Science Advisory Council (2008-2015)
Creative Art's Council 2014-present
Watson Institute Faculty Advisory Board, 1992-1997
William Rogers Award Selection Committee, 1994-present
Provost Search Committee, Co-Chairman: 1995
Society of Royce Fellows, Faculty Fellow, 1996-present.
Zeta Delta Xi co-educational fraternity, Faculty Advisor: 1996-present.
Academic Council Priorities Subcommittee, 1998-2001.

Teaching:
Teaching at Brown has ranged from the introductory level (Geological Sciences 5, Freshman Seminar) to graduate courses (e.g., Planetary Volcanology, Problems in Antarctic Geoscience, The Hydrological Cycle of Mars, Planetary Evolution, etc.) and seminars. Also involved are Masters and PhD thesis supervision, as well as numerous Independent Study Projects and Senior Theses.
At the introductory level, the non-prerequisite course "Earth, Moon and Mars" is designed to introduce science and non-science concentrators alike into deep space and deep time and to place the Earth in the context of the Solar System. The course enrollment averages about 150 students a semester and about 6000 Brown undergraduates have taken the course to date.
A pilot study in developing lunar science curriculum modules for university geology courses was funded by the National Aeronautics and Space Administration.
New teaching techniques are constantly being introduced including Immersive Virtual Reality planetary exploration laboratories in introductory courses.
Won the Brown "Teaching with Technology Award (2014).

Advising:
Academic Advisor ~15 freshman and sophomores for many years.

Masters Degrees Supervised (58)
1981: Lisa Gaddis; James Garvin; David Janke; Virgil Sharpton; Paul Helfenstein; Eric Christiansen
1983: Carl Baum; William Ehmann
1985: Ellen Stofan
1986: Duane Bindschadler
1987: Nicholas Carras; Richard Vorder Bruegge,
1989: Sharon Frank; David Senske; Kari Magee Roberts
1992: Jeffrey Burt; Susan Keddie; Betina Pavri
1993: Eric Grosfils
1995: Irene Antonenko; Martha Gilmore; R. Aileen Yingst
1996: Louise Prockter; Geoffrey Collins
1997: Kevin Jones
1999: Nicole Spaun
2000: Kathryn Fishbaugh; Emily Stewart,
2001: Brian Kortz; Patrick Russell; Bradley Thomson
2002: Karen Jager; Benjamin Webb; Sarah Milkovich
2003: Elizabeth Fuller
2004: Gerard Patterson; Gil Ghatan

2005: Caleb Fassett; Shawn McColley; Rebecca Parsons
2006: Joseph Levy; David Shean
2008: Laura Kerber; Lillian Ostrach; Samuel Schon
2009: Debra Hurwitz
2012: Timothy Goudge
2013: Michael Beach; Lauren Jozwiak; William Vaughan; Ken Ramsley
2014: David Kutai Weiss
2015: James Cassenelli; Erica Jawin
2016: Ariel Deutsch; Ashley Palumbo
2018: Adeene Denton; Sierra Kaufman

Ph.D Degrees Supervised (44)
1. Charles Wood, "*Morphometric Studies of Planetary Landforms: Impact Craters and Volcanoes*", August 18, 1978

2. B. Ray Hawke, *"Evolution of the Early Lunar Crust: The Role of Impact Melting, Secondary Cratering, and Highland Volcanism"*, September 21, 1978

3. Mark Settle, *"Studies of Impact Cratering Processes"*, November 20, 1978

4. Mark Cintala, "*The Role of Planetary Variables in Impact Cratering Processes*", November 30, 1979.

5. James Whitford-Stark, "*Lunar Volcanic Complexes and Eruption Styles"*, 1980

6. Wendy Hale, "*Central Peaks and Rings in Craters and Basins*", June 1982

7. James Garvin, *"Geological Analyses of the Surfaces of Venus and Mars from Lander Spacecraft Images and Orbital Radar Observations"*, May 1984

8.Virgil Sharpton, *"Analysis of Topography and Implications for the Tectonic Evolution of the Moon and Venus"*, November 1984

9. Paul Helfenstein, *"Derivation and Analysis of Geological Constraints on the Emplacement and Evolution of Terrains on Ganymede from Applied Differential Photometry"*, November 1985

10.Scott Murchie, "*The Tectonic and Volcanic Evolution of Ganymede and its Implications for the Satellite's Internal Structure and Evolution"*, April 1988

11. Ellen Stofan, *"Geology of Coronae and Domal Structures on Venus and Models of Their Origin"*, April 1989

12. Duane Bindschadler, *"Models for the Origin of the Tessera Terrain: A Study of the Tectonics of Venus"*, November 1989"

13. Richard Vorder Bruegge, "*Tectonic Evolution of Ishtar Terra: Processes of Crustal Shortening and Thickening on Venus"*, October 1990

14. David Senske, "*Geology and Mechanisms for the Origin of Regional Volcanic Rises in the Equatorial Region of Venus"*, September 1992

15. 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",* March 1994

16. Susan Keddie, "*Large Volcanoes on Venus: The Effects of Mantle Plume Characteristics and Neutral Buoyancy Zone Development on Their Formation, Distribution, and Evolution"*, September 1994

17. 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"*, July 1995

18. Martha Gilmore, *"Tessera Terrain on Venus: Style, Sequence and Duration of Deformation"*, September 1997

19. Irene Antonenko, *"Volumes of Cryptomaria on the Western Limb of the Moon: Implications for Lunar Volcanism"*, May 1998.

20. Cathy Weitz, *"Lunar Pyroclastic Deposits and Effusive Constructs: Petrology, Eruption Styles and Spectral Properties"*, May 1998.

21. 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"*, May 1998.

22. Louise Prockter, *"Lithospheric accretion and destruction processes on Ganymede and Europa"*, November 1999.

23. Geoffrey Collins, "*Driving mechanisms for grooved terrain tectonics on Ganymede and chaotic terrain formation on Europa: Constraints from Galileo data"*, May 2000.

24. Nicole Spaun, *"Chaos, lenticulae, and lineae on Europa: implications for geological history, crustal thickness, and the presence of an ocean"*, May 2002

25. Kathryn Fishbaugh, *"Geologic history of the north polar region of Mars from the late Hesperian to the present: stratigraphy, melting and retreat"*, May 2004

26. Sarah Milkovich, *"Geological evidence for climate change during the Amazonian period of Mars: polar layer stratigraphy and tropical glacier formation"*, May 2005

27. Patrick Russell, *"On the activity of water on Mars: investigations into the groundwater system and the stability of ice in the crater-interior environment"*, May 2005

28. Gerald Wes Patterson, *"An analysis of the mechanical behavior of tectonically active icy satellite lithospheres through geological mapping, geomorphic analysis, and geophysical modeling"*, May 2007

29. Caleb Fassett, *"The Nature and Evolution of Valley Networks on Mars: Geological Constraints on Surface Conditions"*, May 2008

30. Joseph Levy, *"Polygonally Patterned Ground on Earth and Mars: Understanding Climate Evolution and Frozen Ground Processes on Planetary Surfaces"*, May 2009

31. Gareth Morgan, *"Cold-Climate (Perlacial) Landforms on the Earth and Mars: Geomorphic Evidence for Ice-Related Flow and Conditions for the Generation of Meltwater"*, May 2009

32. Seth Kadish, *"Climate Change on Mars: The Nature and History of Non-Polar Ice-Rich Deposits"*, May 2011

33. Laura Kerber, *"The Dispersal of Pyroclastic Ash on Mercury and Mars"*, May 2011

34. Samuel Schon, "*Clues to Martian Paleoclimate: Ice Reservoirs, Sediment Transport, and Depositional Environments*", May 2012

35. Debra Hurwitz," The *relative roles of thermal and mechanical erosion by lava in shaping the surfaces of the terrestrial planets"*, May 2012

36. Mark Salvatore*," Geochemical signatures of stable planetary surfaces: Oxidative weathering processes on Earth and Mars"*, May 2013

37. David Hollibaugh Baker, *"The transition from complex crater to peak-ring basin on the Moon and Mercury: Observational constraints on impact basin formation"*, May 2013

38. Jennifer Whitten, *"The role of volcanism in the early history of the Moon and Mercury"*, May 2014

39. Timothy Goudge, *"Paleolakes on Mars: Insights into timing, morphology, and mineralogy.", May* 2015

40. Lauren Jozwiak, *"Shallow Magmatic Intrusions: Comparisons of Formation and Evolution on Terrestrial Bodies."*, May 2016

41. Kathleen Scanlon, *"Ice Sheet Melting Throughout Mars Climate History: Mechanisms, Rates, and Implications"*, May 2016

42. David Kutai-Weiss, "*Assessing the interaction of climate, hydrology, and impact cratering on Mars: Implications for the early martian climate"*, May 2017

43. Erica Jawin, "*Human Exploration Destinations: Non-Polar Ice on Mars and Large Pyroclastic Deposits on the Moon*", May 2018

44. James Cassanelli, "Evaluating the Hydrology of a Cold and Icy Early Mars", October 2018

Scholarship:
Journal Articles published or in press 2018

Andrews-Hanna, J. C., **J. W. Head III**, B. C. Johnson, J. T. Keane, W. S. Kiefer, P. J. McGovern, G. A. Neumann, M. A. Wieczorek, and M. T. Zuber (2018), *Ring faults and ring dikes around the Orientale basin on the Moon*, Icarus, 310, 1-20, doi: 10.1016/j.icarus.2017.12.012.

Cassanelli, J. P., and **J. W. Head III** (2018), *Formation of outflow channels on Mars: Testing the origin of Reull Vallis in Hesperia Planum by large-scale lava-ice interactions and top-down melting*, Icarus, 305, 56-79, doi: 10.1016/j.icarus.2018.01.001.

Cassanelli, J. P., and **J. W. Head III** (2018), *Large-scale lava-ice interactions on Mars: Investigating its role during Late Amazonian Central Elysium Planitia volcanism and the formation of Athabasca Valles*, Planetary and Space Science, 158, 96-109, doi: 10.1016/j.pss.2018.04.024.

Deutsch, A. N., **J. W. Head III**, N. Chabot, and G. A. Neumann (2018), *Constraining the thickness of polar ice deposits on Mercury using the Mercury Laser Altimeter and small craters in permanently shadowed regions*, Icarus, 305, 139-148, doi: 10.1016/j.icarus.2018.01.013.

Deutsch, A. N., **J. W. Head III**, K. R. Ramsley, C. M. Pieters, R. W. K. Potter, A. M. Palumbo, M. S. Bramble, J. P. Cassanelli, E. R. Jawin, L. M. Jozwiak, H. H. Kaplan, C. F. Lynch, A. C. Pascuzzo, L. Qiao, and B. P. Weiss (2018), *Science exploration architecture for Phobos and Deimos: The role of Phobos and Deimos in the future exploration of Mars*, Advances in Space Research, 62, 2174-2186, doi: 10.1016/j.asr.2017.12.017.

Evans, A. J., J. C. Andrews-Hanna, **J. W. Head III**, J. M. Soderblom, S. C. Solomon, and M. T. Zuber (2018), *Reexamination of early lunar chronology with GRAIL data: Terranes, basins, and impact fluxes*, J. Geophys. Res., 123, in press, doi: 10.1029/2017JE005421.

Guo, D., **J. W. Head III**, and M. A. Kreslavsky (2018), *Lunar Oriental impact basin secondary craters: Spatial distribution, size-frequency distribution, and estimation of fragment size*, J. Geophys. Res., 123, 1344-1367, doi: 10.1029/2017JE005446.

Head III, J. W., and C. M. Pieters (2018), *Geological evolution of the terrestrial planets: 60 years of exploration and discovery, in Sputnik: 60 Years Along the Path of Discoveries*, edited, pp. 199-223, in press, Moscow, Russia.

Huang, J., Z. Xiao, J. Flahaut, M. Martinot, **J. W. Head III**, X. Xiao, M. Xie, and L. Xiao (2018), *Geological characteristics of Von Kármán crater, northwestern South Pole-Aitken basin: Chang'E-4 landing site region*, J. Geophys. Res., 123, doi: 10.1029/2018JE005577.

Ivanov, M. A., H. Hiesinger, C. H. van der Bogert, C. Orgel, J. H. Pasckert, and **J. W. Head III** (2018), *Geologic history of the northern portion of the South Pole-Aitken basin on the Moon*, J. Geophys. Res., 123, 2585-2612, doi: 10.1029/2018JE005590.

Ivanov, M. A., A. M. Abdrakhimov, A. T. Basilevsky, N. E. Demidiv, E. N. Guseva, **J. W. Head III**, H. Hiesinger, A. A. Kohanov, and S. S. Krasilnikov (2018), *Geological characterization of the three high-priority landing sites for the Luna-Glob mission*, Planetary and Space Science, 162, 190-206, doi: 10.1016/j.pss.2017.08.004.

Jawin, E. R., **J. W. Head III**, and D. R. Marchant (2018), *Transient post-glacial processes on Mars: Geomorphologic evidence for a paraglacial period*, Icarus, 309, 187-206, doi: 10.1016/j.icarus.2018.01.026.

Jozwiak, L. M., **J. W. Head III**, and L. Wilson (2018), *Explosive volcanism on Mercury: Analysis of vent and deposit morphology and modes and eruption*, Icarus, 302, 191-212, doi: 10.1016/j.icarus.2017.11.011.

Jozwiak, L. M., L. Wilson, and **J. W. Head III** (2018), *Lunar floor-fractured craters provide evidence for ancient magmatic intrusions*, Science Trends.

Kane, S. R., G. Arney, D. Crisp, S. Domagal-Goldman, L. Glaze, C. Goldblatt, D. Grinspoon, **J. W. Head III**, A. Lenardic, C. Unterborn, and M. J. Way (2018), *Venus: The nearby exoplanetary laboratory, White Paper, Exoplanet Science Strategy*, National Academy of Sciences.

Kreslavsky, M. A., and **J. W. Head III** (2018), *Mars climate history: Insights from impact crater wall slope statistics,* Geophysical Research Letters, 45, 1751-1758, doi: 10.1002/2017GL075663.

Palumbo, A. M., and **J. W. Head III** (2018), *Early Mars climate history: Characterizing a "warm and wet" martian climate with a 3-D global climate model and testing geological predictions*, Geophysical Research Letters, 45, 10,249-10,258, doi: 10.1029/2018GL079767.

Palumbo, A. M., **J. W. Head III**, and R. D. Wordsworth (2018), *Late Noachian Icy Highlands climate model: Exploring the possibility of transient melting and fluvial/lacustrine activity through peak annual and seasonal temperatures*, Icarus, 300, 261-286, doi: 10.1016/j.icarus.2017.09.007.

Potter, R. W. K., **J. W. Head III**, D. Guo, J. Liu, and L. Xiao (2018), *The Apollo peak-ring impact basin: Insights into the structure and evolution of the South Pole-Aitken basin,* Icarus, 306, 139-149, doi: 10.1016/j.icarus.2018.02.007.

Qian, Y. Q., L. Xiao, S. Y. Zhao, J. N. Zhao, J. Huang, J. Flahaut, M. Martinot, **J. W. Head III**, H. Hiesinger, and G. X. Wang (2018), *Geology and scientific significane of the Rümker region in northern Oceanus Procellarum: China's Chang'E-5 landing region*, J. Geophys. Res., 123, 1407-1430, doi: 10.1029/2018JE005595.

Qiao, L., **J. W. Head III**, L. Xiao, L. Wilson, and J. D. Dufek (2018), *The role of substrate characteristics in producing anomalously young crater retention ages in volcanic deposits on the Moon: Morphology, topography, subresolution roughness, and mode of emplacement of the Sosigenes lunar irregular mare patch*, Meteoritics and Planetary Science, 53, 778-812, doi: 10.1111/maps.13003.

Rogers, A. D., N. H. Warner, M. P. Golombek, **J. W. Head III**, and H. M. Cowardin (2018), *Areally extensive surface bedrock exposures on Mars: Many are clastic rocks, not lavas*, Geophysical Research Letters, 45, 1767-1777, doi: 10.1002/2018GL077030.

Scanlon, K. E., **J. W. Head III**, J. L. Fastook, and R. D. Wordsworth (2018), *The Dorsa Argentea Formation and the Noachian-Hesperian climate transition*, Icarus, 299, 339-363, doi: 10.1016/j.icarus.2017.07.031.

Weiss, D. K., and **J. W. Head III** (2018), *Testing landslide and atmospheric-effects models for the formation of double-layered ejecta craters on Mars*, Meteoritics & Planetary Science, 53, 741-777, doi: 10.1111/maps.12859.

Wilson, L., and **J. W. Head III** (2018), *Lunar floor-fractured craters: Modes of dike and sill emplacement and implications of gas produciton and intrusion cooling on surface morphology and structure*, Icarus, 305, 105-122, doi: 10.1016/j.icarus.2017.12.030.

Wilson, L., and **J. W. Head III** (2018), *Controls on lunar basaltic volcanic erupton structure and morphology: Gas release patterns in sequential eruption phases,* Geophysical Research Letters, 45, 5852-5859, doi: 10.1029/2018GL078327.

Wu, Y. Z., L. Li, X. Luo, Y. Lu, Y. Chen, C. M. Pieters, A. T. Basilevsky, and **J. W. Head III** (2018), *Geology, tectonism and composition of the northwest Imbrium region*, Icarus, 303, 67-90, doi: 10.1016/j.icarus.2017.12.029.

Interviews and Online Media Reports

"Finding Water", Erik Ness, Brown Alumni Magazine, January/February 2018
"China Promises the Moon: The next step might be the first-ever soft landing on the far side" Jeff Foust, IEEE Spectrum Newsletter, January 1, 2018.
"Apollo, the Ultimate Experience", National Geographic Documentary, François Pomès and Oliver Faissolle, September 2018.
"Mars moon got its grooves from rolling stones, study suggests", Brown University, Kevin Stacey, November 2018.
"Giant grooves on Mars's moon Phobos may be caused by rolling boulders", New Scientist, Leah Crane, November 2018.
"With First-Ever Landing on Moon's Farside, China Enters "Luna Incognita"", Leonard David, Scientific American, December 2018.
"China's Lunar Lander to Explore Moon's Farside", Joe Palca, NPR, December, 2018 – January 2019.

Maps Published

Collins, G. C., **J. W. Head III**, G. W. Patterson, R. T. Pappalardo, L. M. Prockter, B. K. Lucchitta, and J. P. Kay (2013), Global geologic map of Ganymede, U.S. Geological Survey Scientific Investigations Map 3237, pamphlet 4 p., 1 sheet, scale 1:15,000,000, doi: 10.3133/sim3237. Pamphlet. Readme. Metadata. Database (107.3MB). Movie. Mosaic Globe.

Invited Lectures

The Climate History of Mars: A Geological Perspective, Arizona State University Colloquium Series, February 7, 2018, Tempe AZ.

Deciphering Mars Noachian Geological and Climate History: A Stratigraphic View of Major Geologic Processes and their Climatic Consequences, Arizona State University, Colloquium Series, February 7, 2018, Tempe AZ.

Deep Space Gateway Facilitates Exploration of Planetary Crusts: A Human/Robotic Exploration Design Reference Campaign to the Lunar Orientale Basin., Deep Space Gateway Science Concept Workshop, February 27-March 1, 2018, Denver CO.

The future of lunar exploration: goals, objectives and international cooperation (Keynote address)- International Symposium on Lunar & Planetary Science, June 12-15, 2018, Macau, China.

A theoretical model for the formation of ring moat dome structures (rmds): products of second boiling in the distal parts of lunar basaltic lava flows - International Symposium on Lunar & Planetary Science, June 12-15, 2018, Macau, China.

Deciphering the Noachian Geological and Climate History of Mars, International Symposium on Lunar & Planetary Science, June 12-15, 2018, Macau, China.

Controls on lunar basaltic volcanic eruption structure and morphology: gas release patterns in sequential eruption phases, International Symposium on Lunar & Planetary Science, June 12-15, 2018, Macau, China.

Climate History of Mars, Open lecture, China University of Geosciences, June 18 – 24, 2018, Wuhan China.

The Climate History of Mars and Implications for Future Robotic and Human Exploration, Center for Lunar and Planetary Sciences, Institute of Geochemistry, Chinese Academy of Science, June 24-30, 2018, Guiyang, China.

Exploration of the Moon from Luna to Yutu: Current Understanding and Future Goals, Center for Lunar and Planetary Sciences, Institute of Geochemistry, Chinese Academy of Science, June 24-30, 2018, Guiyang, China.

The Geologic History of the Moon: Outstanding Questions and Goals for Future Exploration, July 1-4, 2018, Chinese Academy of Sciences, Beijing, China.

The Geologic and Climate History of Mars: Outstanding Questions and Goals for Future Exploration, July 1-4, 2018, Chinese Academy of Sciences, Beijing, China.

Presented Papers
Two Oceans on Mars?: History, Problems, and Prospects. 49th Lunar and Planetary Science Conference, March 19-23, 2018, Woodlands, Tx.

Magmatic Ascent and Eruption Processes on Mercury, Mercury: Current and Future Science of the Innermost Planet, May 1-3, 2018, USRA, Columbia, MD.

Deciphering Noachian geological and climate history of Mars: major geologic processes and their climatic consequences, 9th Moscow Solar System Symposium, Moscow, Russia, October 8-12, 2018.

Lunar basaltic volcanic eruptions: gas release patterns and variations in lava vesicularity: fissures, mare flows, and ring moat dome structure (RMDS) morphology, 9th Moscow Solar System Symposium, Moscow, Russia, October 8-12, 2018.

The late noachian climate of mars: evidence from geomorphology, stratigraphy, climate modeling and terrestrial analogs, Geological Society of America's Annual Meeting, Indianapolis, Indiana, November 4-7, 2018.

Papers, Proposals and Thesis Reviewed (2018)
I have reviewed >25 papers for professional journals and 5 proposals

Letters of Recommendation written (2018)
I prepared and submitted >50 letters of recommendation

Research grants:
Current grants (2018):

Project Title: Early Mars Climate History: Distinguishing Sources of Transient Atmospheric Warming and Climate Change to Assess the Nature of the Noachian/Hesperian Climate
Program Name: NASA Earth and Space Science Fellowship (NESSF) Program
Budget: $45,000 (September 2018 – August 2019)
Principal Investigator: James W. Head III

Project Title: Analysis of Polar Deposits on Mercury and the Moon
Program Name: National Aeronautics and Space Administration - Goddard
Budget: $55,000 (September 2018 – August 2019)
Principal Investigator: James W. Head III

Project Title: Lunar Orbiter Laser Altimeter (LOLA)
Program Name: National Aeronautics and Space Administration - Goddard
Performance/Budget: $625,000 (August 2013 – August 2023)
Principal Investigator: James W. Head III

Project Title: Mars Express/NASA Project Extended Mission FY19-FY20 (HRSC)
Program Name: Jet Propulsion Laboratory
Performance/Budget: $209,998 (October 2013 – September 2020)
Principal Investigator: James W. Head III

Project Title: Evolution and Environment of Exploration Destinations: Science and Engineering Synergism (SSERVI)
Program Name: National Aeronautics and Space Administration - Ames
Performance/Budget: $ 5,905,773 (January 2014 – February 2020)
Co-Investigator: James W. Head III

Proposals submitted (2018):
Project title: Lava Flow Melting of Surface/Cryospheric Ice on Mars: Documentation and Characterization of Associated Structures
Program Name: NASA/ Mars Data Analysis Program
Principle Investigator

Project title: Detrended Topography of the Moon and Detection of Low-Amplitude Topographic Features
Program Name: NASA/ Lunar Data Analysis Program
Principle Investigator

Project title: Lunar Structure, Composition and Processes for Exploration (LunaSCOPE)
Program Name: Solar System Exploration Research Virtual Institute (SSERVI)
Co-Investigator