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EMPLOYMENT

- Smithsonian Institution**, National Air and Space Museum, Washington, DC
2001–10, 12–p. *CEPS Chair*: 2019–pres. *Geologist*: Martian and terrestrial desert geomorphology and paleohydrology, 2012–pres. *Geologist*: Pre- and post-doctoral research, 2001–2010.
Planetary Science Institute, Tucson, AZ
2010–2012 *Research Scientist*: Fluvial geomorphology of early Mars and Titan, planetary geologic mapping, landing site characterization, and field studies of Mars-analog landforms.
Visiting Scientist: NASA Goddard Space Flight Center, Greenbelt, MD.
Science Applications International Corporation, McLean, VA
1999–2001 *GIS Analyst*: Web design, technical editing, and GIS support for VMap1 Coproducer Working Group (National Imagery and Mapping Agency client).
University of Virginia Department of Environmental Sciences, Charlottesville, VA
2001 *Teaching Assistant*: Orphaned Lands Assessment (abandoned mineral mines and quarries).
1997–1999 *Teaching Assistant*: GIS, Physical Geology, Rocks and Minerals, Structural Geology Labs.
1998–1999 *Research Assistant*: Viking spacecraft image processing and photomosaics.
Southern Environmental Law Center, Charlottesville, VA
1997–1998 *Intern*: Non-point source pollution, environmental effects of suburban development.

EDUCATION

- 2001–2005 **University of Virginia**, Ph.D., 2005, Environmental Sciences
Dissertation: *Paleolakes and the Crustal Dichotomy Boundary on Mars*, 305 p.
1997–2000 **University of Virginia**, M.S., 2000, Environmental Sciences
Thesis: *Geomorphic Evolution of Part of Terra Cimmeria on Mars*, 107 p.
1993–1997 **Virginia Polytechnic Institute and State University**, B.S., 1997, Geological Sciences
Emphasis on Earth systems and structural geology
1997 **Louisiana State University**, Field Geology
Geologic mapping, section measurement, and surveying in the Colorado Front Range
1995 **South Dakota School of Mines and Technology**, Field Paleontology
Camarasaurus dig in the Morrison Formation near Sundance, Wyoming

PUBLICATIONS (peer-reviewed)

37. Weitz, C. M., Wilson, S. A., Grant, J. A., and **Irwin, R. P., III**. Geologic map of western Ladon basin, Mars, MTM Quadrangles, -15032 and -20032, USGS Scientific Investigation Map, scale 1:1,000,000, in press.
36. Weitz, C. M., Bishop, J. L., Grant, J. A., Wilson, S. A., **Irwin, R. P., III**, Saranath, A., Itoh, Y., and Parente, M. (2022). Clay sediments derived from fluvial activity in and around Ladon basin, Mars. *Icarus*, 384, 115090. <https://doi.org/10.1016/j.icarus.2022.115090>.
35. Williams, R. M. E., **Irwin, R. P., III**, Noe Dobrea, E. Z., Howard, A. D., Dietrich, W. E., Cawley, J. C. (2021). Inverted channel variations identified on a distal portion of a bajada in the central Atacama Desert, Chile. *Icarus*, 393, 107925. doi: <https://doi.org/10.1016/j.geomorph.2021.107925>
34. Cawley, J. C., & **Irwin, R. P., III** (2018). Evolution of escarpments, pediments, and plains in the Noachian highlands of Mars. *Journal of Geophysical Research: Planets*, 123, 3167–3187. <https://doi.org/10.1029/2018JE005681>.

33. Matsubara, Y., Howard, A. D., & **Irwin, R. P., III** (2018). Constraints on the Noachian paleoclimate of the Martian highlands from landscape evolution modeling. *Journal of Geophysical Research: Planets*, 123. <https://doi.org/10.1029/2018JE005572>.
32. **Irwin, R. P., III**, Wray, J. J., Mest, S. C., & Maxwell, T. A. (2018). Wind-eroded crater floors and intercrater plains, Terra Sabaea, Mars. *Journal of Geophysical Research: Planets*, 123, 445–467. <https://doi.org/10.1002/2017JE005270>.
31. Cawley, J. C., & **Irwin, R. P., III** (2018). Subsurface erosion, scarp retreat, and sedimentation at Mountain Lake, Virginia, USA: Groundwater geomorphology in a flow-through lake with subsurface drainage. *Earth Surface Processes and Landforms*, 43(8), 1663–1676. doi: <https://doi.org/10.1002/esp.4345>.
30. **Irwin, R. P., III**, Lewis, K. W., Howard, A. D., & Grant, J. A. (2015). Paleohydrology of Eberswalde crater, Mars. *Geomorphology*, 240, 83–101. doi:10.1016/j.geomorph.2014.10.012.
29. **Irwin, R. P., III**, S. Tooth, R. A. Craddock, A. D. Howard, and A. R. Baptista (2014), Origin and development of theater-headed valleys in the Atacama Desert, northern Chile: Morphological analogs to Martian valley networks, *Icarus*, 243, 296–310, doi:10.1016/j.icarus.2014.08.012.
28. Tanaka, K. L., J. A. Skinner, Jr., J. M. Dohm, **R. P. Irwin, III**, E. J. Kolb, C. M. Fortezzo, T. Platz, G. G. Michael, and T. M. Hare (2014), Geologic map of Mars, *U.S. Geol. Surv. Sci. Inv. Map 3292*, scale 1:20,000,000.
27. **Irwin, R. P., III**, and J. A. Grant (2013), Geologic map of MTM –15027, –20027, –25027, and –25032 quadrangles, Margaritifer Terra region of Mars, *U.S. Geol. Surv. Sci. Inv. Map 3209*, scale 1:1,000,000.
26. Wray, J. J., S. T. Hansen, J. Dufek, G. A. Swayze, S. L. Murchie, F. P. Seelos, J. R. Skok, **R. P. Irwin III**, and M. S. Ghiorso (2013), Prolonged magmatic activity on Mars inferred from the detection of felsic rocks, *Nat. Geosci.*, doi:10.1038/NGEO1994.
25. Williams, R. M. E., **R. P. Irwin III**, D. M. Burr, T. Harrison, and P. McClelland (2013), Variability in Martian sinuous ridge form: Case study in the Aeolis/Zephyria Planum region and lessons from the Mirackina Paleoriver, South Australia, *Icarus*, 225, 308–324, doi:10.1016/j.icarus.2013.03.016.
24. **Irwin, R. P., III**, K. L. Tanaka, and S. J. Robbins (2013), Distribution of Early, Middle, and Late Noachian cratered surfaces in the Martian highlands: Implications for resurfacing events and processes, *J. Geophys. Res. Planets*, 118, 278–291, doi:10.1002/jgre.20053.
23. Burr, D. M., J. T. Perron, M. P. Lamb, **R. P. Irwin III**, G. C. Collins, A. D. Howard, L. S. Sklar, J. M. Moore, Máté Ádámkóvics, V. R. Baker, S. A. Drummond, and B. A. Black (2013), Fluvial features on Titan: Insights from morphology and modeling, *Geol. Soc. Am. Bull.*, 125, 299–321, doi:10.1130/B30612.1.
22. Craddock, R. A., A. D. Howard, **R. P. Irwin III**, S. Tooth, R. M. E. Williams, and P.-S. Chu (2012), Drainage network development in the Keanakākoʻi tephra, Kilauea Volcano, Hawaiʻi: Implications for fluvial erosion and valley network formation on early Mars, *J. Geophys. Res.*, 117, E08009, doi:10.1029/2012JE004074.
21. **Irwin, R. P., III**, and J. R. Zimbelman (2012), Morphometry of Great Basin pluvial shore landforms: Implications for paleolake basins on Mars, *J. Geophys. Res.*, 117, E07004, doi:10.1029/2012JE004046.
20. Williams, R. M. E., **R. P. Irwin III**, J. R. Zimbelman, and T. C. Chidsey Jr. (2011), Field guide to exhumed paleochannels near Green River, Utah: Terrestrial analogs for sinuous ridges on Mars, in *Analogues for Planetary Exploration*, edited by W. B. Garry and J. E. Bleacher, *Geol. S. Am. Special Paper* 483.
19. Grant, J. A., **R. P. Irwin III**, S. A. Wilson, D. Buczkowski, and K. Siebach (2011), A lake in Uzboi Vallis and implications for Late Noachian–Early Hesperian climate on Mars, *Icarus*, 212, 110–122.
18. **Irwin, R. P., III**, R. A. Craddock, A. D. Howard, and H. L. Flemming (2011), Topographic influences on development of Martian valley networks, *J. Geophys. Res.*, 116, E02005, doi:10.1029/2010JE003620.
17. Grant, J. A., **R. P. Irwin III**, and S. A. Wilson (2010), Aqueous depositional settings in Holden crater, Mars, in *Lakes on Mars*, edited by N. A. Cabrol and E. A. Grin, pp. 323–346, Elsevier, Amsterdam.

16. **Irwin, R. P., III**, and T. R. Watters (2010), Geology of the Martian crustal dichotomy boundary: Age, modifications, and implications for modeling efforts, *J. Geophys. Res.*, *115*, E11006, doi:10.1029/2010JE003658.
15. **Irwin, R. P., III**, and J. A. Grant (2009), Large basin overflow floods on Mars, in *Megaflooding on Earth and Mars*, edited by D. M. Burr, V. R. Baker, and P. A. Carling, pp. 209–224, Cambridge University Press, Cambridge, U.K.
14. Zimbelman, J. R., **R. P. Irwin III**, S. H. Williams, F. Bunch, A. Valdez, and S. Stevens (2009), The rate of granule ripple movement on Earth and Mars, *Icarus*, *203*, 71–76, doi:10.1016/j.icarus.2009.03.033.
13. Williams, R. M. E., **R. P. Irwin III**, and J. R. Zimbelman (2009), Evaluation of paleohydrologic models for terrestrial inverted channels: Implications for application to martian sinuous ridges, *Geomorphology*, *107*, 300–315, doi:10.1016/j.geomorph.2008.12.015.
12. **Irwin, R. P., III**, A. D. Howard, and R. A. Craddock (2008), Fluvial valley networks on Mars, in *River Confluences, Tributaries, and the Fluvial Network*, edited by S. Rice, A. Roy, and B. Rhoads, pp. 409–430, John Wiley, West Sussex, U.K.
11. Grant, J. A., **R. P. Irwin III**, J. P. Grotzinger, R. E. Milliken, L. L. Tornabene, A. S. McEwen, C. M. Weitz, S. W. Squyres, T. D. Glotch, and B. J. Thomson (2008), HiRISE imaging of impact megabreccia and sub-meter aqueous strata in Holden crater, Mars, *Geology*, *36*, 195–198, doi:10.1130/G24340A.1.
10. Watters, T. R., P. J. McGovern, and **R. P. Irwin III** (2007), Hemispheres apart: The crustal dichotomy on Mars, *Annu. Rev. Earth Pl. Sc.*, *35*, 621–652.
9. Weitz, C. W., **R. P. Irwin III**, F. C. Chuang, M. C. Bourke, and D. A. Crown (2006), Formation of a terraced fan deposit in Coprates Catena, Mars, *Icarus*, *184*, 436–451.
8. Howard, A. D., J. M. Moore, and **R. P. Irwin III** (2005), An intense terminal epoch of widespread fluvial activity on early Mars: 1. Valley network incision and associated deposits, *J. Geophys. Res.*, *110*, E12S14, doi:10.1029/2005JE002459.
7. **Irwin, R. P., III**, A. D. Howard, R. A. Craddock, and J. M. Moore (2005), An intense terminal epoch of widespread fluvial activity on early Mars: 2. Increased runoff and paleolake development, *J. Geophys. Res.*, *110*, E12S14, doi:10.1029/2005JE002460.
6. **Irwin, R. P., III**, R. A. Craddock, and A. D. Howard (2005), Interior channels in Martian valley networks: Discharge and runoff production, *Geology*, *33*(6), 489–492.
5. **Irwin, R. P., III**, T. R. Watters, A. D. Howard, and J. R. Zimbelman (2004), Sedimentary resurfacing and fretted terrain development along the crustal dichotomy boundary, Aeolis Mensae, Mars, *J. Geophys. Res.*, *109*, E09011, doi:10.1029/2004JE002248.
4. **Irwin, R. P., III**, A. D. Howard, and T. A. Maxwell (2004), Geomorphology of Ma'adim Vallis, Mars, and associated paleolake basins, *J. Geophys. Res.*, *109*, E12009, doi:10.1029/2004JE002287.
3. **Irwin, R. P., III**, T. A. Maxwell, A. D. Howard, R. A. Craddock, and D. W. Leverington (2002), A large paleolake basin at the head of Ma'adim Vallis, Mars, *Science*, *296*, 2209–2212.
2. **Irwin, R. P., III**, and A. D. Howard (2002), Drainage basin evolution in Noachian Terra Cimmeria, Mars, *J. Geophys. Res.*, *107*(E7), 10.1029/2001JE001818.
1. **Irwin, R. P., III**, and R. E. Davis (1999), The relationship between the Southern Oscillation Index and tropical cyclone tracks in the Eastern North Pacific, *Geophys. Res. Lett.*, *26*, 2251–2254.

NASA RESEARCH GRANTS

Principal Investigator (total awarded to date as PI: \$1.79 million)

2021–2024 Timing and spatial variability of post-Noachian fluvial erosion on Mars, \$250K.

2017–2020 Runoff production on early Mars, Mars Data Analysis Program, \$125K

2016–2019 Extent, timing, and causes of late fluvial erosion on Mars, Mars Data Analysis Program, \$146K.

2014–2017 Development of intercrater plains in the Martian highlands, Planetary Geology and Geophysics Program, \$155K

- 2011–2014 Landscape evolution modeling in the Noachian highlands of Mars, Planetary Geology and Geophysics Program, \$240K.
- 2011–2014 Exposed stratigraphy on the floors of Noachian impact craters on Mars, Mars Data Analysis Program, \$335K
- 2008–2012 Noachian denudation of the Martian highlands, Mars Data Analysis Program, \$229K
- 2007–2012 Geomorphology of theater-headed valleys, Mars Fundamental Research Program, \$202K
- 2005–2009 Process controls on Martian drainage basin evolution, Mars Data Analysis Program, \$111K

Co-Investigator

- 2013–2016 Sinuous channels in volcanic provinces on the Earth and Mars, Christopher Hamilton, PI, Planetary Geology and Geophysics Program.
- 2013–2016 Geologic mapping to constrain the sources and timing of fluvial activity in western Ladon basin, Mars, Catherine Weitz, PI, Planetary Geology and Geophysics Program.
- 2013–2016 Investigations of Mars-analog inverted fluvial landforms, Rebecca Williams, PI, Mars Fundamental Research Program.
- 2011–2014 Geologic mapping in southern Margaritifer Terra to determine the timing and origin of valleys and fans, John Grant, PI, Planetary Geology and Geophysics Program.
- 2008–2012 Mapping, characterization, and analysis of channel/valley features on Titan, Devon Burr, PI, Cassini Data Analysis Program, \$197K
- 2007–2011 Field investigations of pluvial landforms in the western United States as analogs to features on Mars, James Zimbelman, PI, Mars Fundamental Research Program, \$126K
- 2006–2011 Assessing the preservation of fluvial pathways in the terrestrial geologic record, Rebecca Williams, PI, Mars Fundamental Research Program, \$231K
- 2006–2010 Geologic indicators of lacustrine environments on Mars, Ted Maxwell, PI, \$160K
- 2006–2010 Gradation on Mars: Processes, timing, and analogs, John Grant, PI, Planetary Geology and Geophysics Program, \$80K
- 2006–2012 New global geologic map of Mars, Kenneth Tanaka, PI, Planetary Geology and Geophysics Program, \$529K
- 2005–2009 Analysis and modeling of dichotomy boundary and tectonic features on Mars, Tom Watters, PI, \$170K
- 2003–2006 Evaluation of possible lacustrine features in the Martian highlands, Ted Maxwell, PI, \$145K

CONFERENCES (only first-author presentations included)

- 73. Irwin, R. P., III, Craddock, R. A., Grant, J. A., Howard, A. D., Moore, J. M., Morgan, A. M., Ramirez, R. M., and Wilson, S. A. (2023). Three distinct phases of fluvial erosion on Mars. *54th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2964, talk.
- 72. Irwin, R. P., III (2022). Mars surface processes that influenced ancient runoff production and preservation of drainage networks. *53rd Lunar and Planetary Science Conference*, Houston, Texas, abstract 2691, poster.
- 71. Irwin, R. P., III, and Wolfe, E (2021). Spatially and temporally variable degradation of large post-Noachian impact craters: A record of paleoclimate and climate change on Mars. *52nd Lunar and Planetary Science Conference*, Houston, Texas, abstract 2729, talk.
- 70. Irwin, R. P., III (2020). Unconformity-bounded geologic units in Noachian terrain on Mars. *Annual Meeting of Planetary Geologic Mappers*, abstract 7051.
- 69. Irwin, R. P., III, and Cawley, J. C. (2020). Erosion of the Noachian highland substrate on Mars. *51st Lunar and Planetary Science Conference*, Houston, Texas, abstract 2949.
- 68. Irwin, R. P., III, and Wolfe, E (2020). Spatially and temporally variable erosion of the largest post-Noachian impact craters on Mars (Invited). *Geological Society of America Annual Meeting*, abstract 249-1, talk.
- 67. Irwin, R. P., III, and Cawley, J. C. (2019). Variable substrates and morphology of Martian valley networks. *50th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2459, talk.

66. Irwin, R. P., III, and Cawley, J. C. (2018). A high-resolution perspective on Martian valley networks. *AGU Fall Meeting*, abstract P53F-3034, poster.
65. Irwin, R. P., III, and J. C. Cawley (2018), Variable, low-magnitude fluvial erosion on early Mars, *49th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2894, talk.
64. Irwin, R. P., and J. C. Cawley (2017), Environmental implications of the largest post-Noachian craters on Mars, *48th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2906, talk.
63. Irwin, R. P., III, Y. Matsubara, and J. C. Cawley (2016), Runoff production from intercrater plains on Mars, *AGU Fall Meeting*, abstract P21C-2126, poster.
62. Irwin, R. P. (2016), Noachian geomorphic surfaces and implications for the paleoclimate of Mars, *47th Lunar and Planetary Science Conference*, Houston, Texas, abstract 3015, poster.
61. Irwin, R. P., J. J. Wray, and J. A. Grant (2015), Phases of erosion and deposition recorded in Holden crater outcrops, *Second Landing Site Workshop for the 2020 Mars Rover*, Monrovia, California, talk.
60. Irwin, R. P. (2015), Development of intercrater plains on Mars, *46th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2906, poster.
59. Irwin, R. P., K. W. Lewis, A. D. Howard, and J. A. Grant (2014), Paleohydrology of Eberswalde crater, Mars, *Binghamton Geomorphology Symposium*, Knoxville, TN, invited talk.
58. Irwin, R. P., and Y. Matsubara (2014), Late water cycles on early Mars and their possible causes, *8th International Conference on Mars*, Pasadena, California, abstract 1446, talk.
57. Irwin, R. P. (2014), Holden crater rover targets, *First Landing Site Workshop for the 2020 Mars Rover*, Arlington, Virginia, talk.
56. Irwin, R. P. (2014), Eberswalde delta in Margaritifer Terra, *First Landing Site Workshop for the 2020 Mars Rover*, Arlington VA, talk.
55. Irwin, R. P., K. L. Tanaka, and S. J. Robbins (2014), Noachian resurfacing in the Martian highlands: Analysis of a new global geologic map and crater database, *45th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2685, talk.
54. Irwin, R. P., and Y. Matsubara (2013), Late-stage fluvial erosion in a changing climate on early Mars, *American Geophysical Union Fall Meeting*, San Francisco, California, abstract P23F-1837, poster.
53. Irwin, R. P., A. D. Howard, J. M. Moore, R. A. Craddock, and Y. Matsubara (2013), The geomorphic record of climate change on early Mars, *Geological Society of America Annual Meeting*, Denver, Colorado, abstract 275-5, invited talk.
52. Irwin, R. P., K. L. Tanaka, and S. J. Robbins (2013), Noachian resurfacing in the Martian highlands: Analysis of new global geologic map and crater database, *Planetary Geologic Mappers Meeting*, Washington, D.C., talk.
51. Irwin, R. P. (2013), Testing links between impacts and fluvial erosion on post-Noachian Mars, *44th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2958, talk.
50. Irwin, R. P. (2012), Rapid climate change and implications for habitability on Mars, *American Geophysical Union Fall Meeting*, San Francisco, California, abstract P11B-1835, poster.
49. Irwin, R. P., J. J. Wray, T. A. Maxwell, S. C. Mest, and S. T. Hansen (2012), Wind-eroded stratigraphy on the floor of a Noachian impact crater, Noachis Terra, Mars, *Third Int. Conf. on Early Mars*, Lake Tahoe, Nevada, abstract 7066, poster.
48. Irwin, R. P., and J. R. Zimbelman (2012), Pluvial shore landforms in the Great Basin, USA: Analogs to Martian paleolake basins, *43rd Lunar and Planetary Science Conference*, Houston, Texas, abstract 2061, poster.
47. Irwin, R. P. (2011), Multiple epochs of fluvial denudation in a changing climate on early Mars, *American Geophysical Union Fall Meeting*, San Francisco, California, abstract P13E-03, talk.
46. Irwin, R. P. (2011), Candidate targets for exploration by MSL in Holden crater, *5th MSL Landing Site Workshop*, Monrovia, CA, talk.
45. Irwin, R. P. (2011), Fluvial Processes Tiger Team summary of the candidate MSL landing sites, *5th MSL Landing Site Workshop*, Monrovia, CA, talk.
44. Irwin, R. P. (2011), Timing, duration, and hydrology of the Eberswalde crater paleolake, Mars, *42nd Lunar and Planetary Science Conference*, Houston, Texas, abstract 2748, talk.

43. Irwin, R. P., A. R. Baptista, R. A. Craddock, A. D. Howard, and S. E. Tooth (2010), Erosion of theater-headed tributaries by overland flow in the Atacama Desert, northern Chile: Analogs to Martian valley networks, *American Geophysical Union Fall Meeting*, San Francisco, California, abstract P13B-1375, poster.
42. Irwin, R. P. (2010), Overview of the setting in Holden crater, *Fourth Mars Science Laboratory Landing Site Workshop*, Pasadena, California, talk.
41. Irwin, R. P., and J. A. Grant (2010), Geologic mapping in southern Margaritifer Terra, *Planetary Geologic Mappers Meeting*, Flagstaff, AZ, talk.
40. Irwin, R. P., F. Pendrill, T. A. Maxwell, A. D. Howard, and R. A. Craddock (2010), Wind-eroded floor deposits in Noachian degraded craters on Mars, *First Int. Conf. on Mars Sedimentology and Stratigraphy*, El Paso, TX, abstract 6028, talk.
39. Irwin, R. P., R. A. Craddock, A. D. Howard, and H. L. Flemming (2010), Topographic controls on Martian valley networks: Implications for climate change during the Noachian Period, *41st Lunar and Planetary Science Conference*, Houston, Texas, abstract 2436, talk.
38. Irwin, R. P., C. M. Fortezzo, S. E. Tooth, A. D. Howard, J. R. Zimbelman, C. J. Barnhart, A. J. Benthem, C. C. Brown, and R. A. Parsons (2009), Box canyon Tributaries to Escalante and Glen Canyons, Utah: Analogs to Martian Valley Networks, *7th Int. Conference on Geomorphology*, Melbourne, Australia, abstract 774, talk.
37. Irwin, R. P., T. A. Maxwell, A. D. Howard, and M. A. Higbie (2009), Floor materials of open paleolake basins on Mars, *40th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2358, poster.
36. Irwin, R. P., C. M. Fortezzo, S. E. Tooth, A. D. Howard, J. R. Zimbelman, C. J. Barnhart, A. J. Benthem, C. C. Brown, and R. A. Parsons (2009), Origin of theater-headed tributaries to Escalante and Glen Canyons, Utah, *40th Lunar and Planetary Science Conference*, Houston, Texas, abstract 1644, poster.
35. Irwin, R. P., C. M. Fortezzo, S. E. Tooth, A. D. Howard, J. R. Zimbelman, C. J. Barnhart, A. J. Benthem, C. C. Brown, and R. A. Parsons (2008), Origin of theater-headed tributaries to Escalante and Glen Canyons, Utah: Analogs to Martian valley networks, *American Geophysical Union Fall Meeting*, San Francisco, California, abstract P41A-1351, poster.
34. Irwin, R. P., C. M. Fortezzo, S. E. Tooth, A. D. Howard, J. R. Zimbelman, C. J. Barnhart, A. J. Benthem, C. C. Brown, and R. A. Parsons (2008), Origin of theater-headed tributaries to Escalalante and Glen Canyons, Utah, *Second Workshop on Mars Valley Networks*, Moab, Utah, talk, organizing committee.
33. Irwin, R. P., (2008), Notional traverses and science targets in Holden crater, *Third Mars Science Laboratory Landing Site Workshop*, Monrovia, California, talk.
32. Irwin, R. P., and J. A. Grant (2008), Geology of Holden crater and the Holden and Ladon multi-ring impact basins, Margaritifer Terra, Mars, *Planetary Geologic Mappers Meeting*, Flagstaff, Arizona, talk.
31. Irwin, R. P., J. A. Grant, and A. D. Howard (2008), The alluvial fan complex in Holden crater: Implications for the environment of early Mars, *39th Lunar and Planetary Science Conference*, Houston, Texas, abstract 1869, talk.
30. Irwin, R. P., J. A. Grant, J. P. Grotzinger, R. E. Milliken, J. W. Rice Jr., M. C. Malin, and K. E. Edgett (2007), Mars Science Laboratory investigation of aqueous stratigraphy in Holden crater, *Second Mars Science Laboratory Landing Site Workshop*, Pasadena, California, talk.
29. Irwin, R. P., T. A. Maxwell, and A. D. Howard (2007), Water budgets on early Mars: Empirical constraints from paleolake basin and watershed areas, *7th International Conference on Mars*, Pasadena, California, abstract 3400, poster.
28. Irwin, R. P. (2007), Palaeoflood hydrology on Mars: Results and uncertainties, *Fourth International Palaeoflood Workshop*, Crete, Greece, talk.
27. Irwin, R. P., and T. R. Watters (2007), The crustal dichotomy of Mars: Geological constraints and testing of geophysical models, *American Geophysical Union Joint Assembly*, Acapulco, Mexico, abstract P23A-07, talk, program committee.

26. Irwin, R. P., and T. R. Watters (2007), The crustal dichotomy of Mars: Geological constraints and testing of geophysical models, *38th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2301, talk.
25. Irwin, R. P. (2006), Basin overflow floods on Mars, *American Geophysical Union Fall Meeting*, San Francisco, California, abstract P34B-06, talk.
24. Irwin, R. P., and J. A. Grant (2006), Aqueous sedimentary deposits in Holden Crater: Landing site for the Mars Science Laboratory, *First Mars Science Laboratory Landing Site Workshop*, Pasadena, California, talk.
23. Irwin, R. P., A. D. Howard, and R. A. Craddock (2006), Theater-headed valleys: The roles of overland flow and groundwater sapping, *37th Lunar and Planetary Science Conference*, Houston, Texas, abstract 1912, talk.
22. Irwin, R. P., and T. R. Watters (2005), Geomorphology of the Martian crustal dichotomy boundary: Implications for age and origin, *American Geophysical Union Fall Meeting*, San Francisco, California, abstract H33C-1400, poster.
21. Irwin, R. P., and J. R. Zimbelman (2005), Sedimentary deposits in impact craters on Mars: Comparison with terrestrial pluvial lake basins, *Geological Society of America Annual Meeting*, Salt Lake City, Utah, abstract 92487, talk.
20. Irwin, R. P. (2005), Rim breaching and ponding in Martian impact craters, *Workshop on the Role of Volatiles and Atmospheres on Martian Impact Craters*, Laurel, Maryland, abstract 3039, talk.
19. Irwin, R. P. (2005), A hiatus and brief, intense reactivation of Martian valley networks around the Noachian/Hesperian transition, *Brown-Vernadsky Microsymposium 41*, Houston, Texas, talk.
18. Irwin, R. P., T. A. Maxwell, A. D. Howard, R. A. Craddock, and J. M. Moore (2005), A Noachian/Hesperian hiatus and erosive reactivation of Martian valley networks, *36th Lunar and Planetary Science Conference*, Houston, Texas, abstract 2221, talk.
17. Irwin, R. P., R. A. Craddock, A. D. Howard, and T. A. Maxwell (2004), Channels in Martian valley networks: discharge and runoff production, *Second Conference on Early Mars*, Jackson Hole, Wyoming, abstract 8040, talk.
16. Irwin, R. P., and T. R. Watters (2004), Crustal dichotomy boundary and fretted terrain development at Aeolis Mensae, Mars, *Hemispheres Apart: The origin and modification of the Martian crustal dichotomy*, Houston, Texas, abstract 4025, talk.
15. Irwin, R. P. (2004), Channels in Martian valley networks: discharge estimates and paleoclimate implications, *Workshop on Martian Valley Networks*, Kohala Coast, Hawaii, abstract, talk, organizing committee.
14. Irwin, R. P., R. A. Craddock, and A. D. Howard (2004), Inefficient fluvial erosion and effective competing processes: Implications for Martian drainage density, *Workshop on Martian Valley Networks*, Kohala Coast, Hawaii, abstract, talk, organizing committee.
13. Irwin, R. P., R. A. Craddock, A. D. Howard, and T. A. Maxwell (2004), Inefficient fluvial erosion and effective competing processes: Implications for Martian drainage density, *35th Lunar and Planetary Science Conference*, Houston, Texas, abstract 1991, talk given by R. Craddock.
12. Irwin, R. P., T. A. Maxwell, and A. D. Howard (2004), Geomorphology and hydraulics of Ma'adim Vallis, Mars, during a Noachian/Hesperian boundary paleoflood, *35th Lunar and Planetary Science Conference*, Houston, Texas, abstract 1852, talk, session chair.
11. Irwin, R. P., R. A. Craddock, A. D. Howard, and T. A. Maxwell (2004), Inefficient fluvial erosion and effective competing processes: Implications for Martian drainage density, *Brown-Vernadsky Microsymposium 39*, Houston, Texas, talk.
10. Irwin, R. P., and T. A. Maxwell (2003), Multiple generations of Martian valley networks: Reconciling immature valley networks with extensive fluvial erosion, *6th International Conference on Mars*, Pasadena, California, abstract 3243, talk, session chair.
9. Irwin, R. P., T. R. Watters, A. D. Howard, T. A. Maxwell, and J. R. Zimbelman (2003), Origin of Aeolis Mensae, Mars, fretted terrain in a thick sedimentary deposit, *6th International Conference on Mars*, Pasadena, California, abstract 3092, poster.

8. Irwin, R. P., T. R. Watters, A. D. Howard, T. A. Maxwell, and R. A. Craddock (2003), Dichotomy boundary at Aeolis Mensae, Mars: Fretted terrain developed in a sedimentary deposit, *34th Lunar and Planetary Science Conference*, Houston, Texas, abstract 1824, talk.
7. Irwin, R. P. (2003), Geologic units in Gusev Crater, *4th Mars Exploration Rover Landing Site Workshop*, Arcadia, California, talk.
6. Irwin, R. P., T. A. Maxwell, D. W. Leverington, R. A. Craddock, and A. D. Howard (2002), Ancient Martian drainage basin re-integration by sediment infilling and basin overflow, *Geological Society of America Annual Meeting*, Denver, Colorado, abstract 26-9, talk.
5. Irwin, R. P., T. A. Maxwell, A. D. Howard, R. A. Craddock, and D. W. Leverington (2002), Identification of a large paleolake basin at the head of Ma'adim Vallis, Mars, *3rd Mars Exploration Rover Landing Site Selection Workshop*, Arcadia, California, talk.
4. Irwin, R. P., T. A. Maxwell, A. D. Howard, and R. A. Craddock (2002), Topographic controls on Martian valleys and lakes, *33rd Lunar and Planetary Science Conference*, Houston, Texas, abstract 1705, talk.
3. Irwin, R. P., A. D. Howard, T. A. Maxwell, and R. A. Craddock (2002), Drainage basin disruption and re-integration processes in the Martian highlands, *33rd Lunar and Planetary Science Conference*, Houston, Texas, abstract 1729, poster.
2. Irwin, R. P., and R. A. Craddock (2001), Drainage basin integration in the Martian highlands, *Field Trip and Workshop on the Martian Highlands and Mojave Desert Analogs*, LPI Contrib. 1101, abstract, talk.
1. Irwin, R. P., and A. D. Howard (2001), Cratering and fluvial erosion in Noachian Terra Cimmeria, Mars, *32nd Lunar and Planetary Science Conference*, Houston, Texas, abstract 1377, poster.

FIELD STUDIES

Australia: Interaction of fluvial and aeolian processes, Simpson Desert; inverted topography, Queensland, S. Australia

Atacama Desert, Chile: Origin of theater-headed valleys, hydrology of inverted paleochannels

Colorado Plateau, Utah/Arizona: Origin of theater-headed valleys, hydrology of inverted paleochannels

Great Basin, Nevada/Utah/Oregon: Topography of paleolake shorelines, channels fed by large springs

Island of Hawai'i: initiation of drainage network in Ka'u Desert, Kilauea Volcano; theater-headed valleys in Kohala

Mountain Lake, Virginia: causes of cyclic draining and refilling of the only natural lake in the southern Appalachians

SCHOLARSHIPS AND HONORS

2014	2012 Presidential Early Career Award for Scientists and Engineers
2012	2011 American Geophysical Union Editors' Citation for Excellence in Refereeing
2005	University of Virginia Joseph K. Roberts Award (\$200)
2004	University of Virginia DuPont Fellowship (\$4,500)
2002, 2005	National Air and Space Museum, Performance Awards
2002–2004	Virginia Space Grant Fellowship (\$10,000 over 2 years)
2002	University of Virginia Chamberlain Fellowship (\$4,000)
2001	University of Virginia Dean's Fellowship (\$2,000)
1997	W. D. Lowry Field Camp Scholarship (\$1,000)
1993–1997	Virginia Scholars Scholarship (\$12,000 over 4 years)
1993–1997	Robert Byrd Scholarship (\$6,000 over 4 years)
1993–1994	Izaak Walton League Scholarship (\$1000 over 2 years)
1993	Virginia Tech Alumni Association Scholarship (\$1,000)
Honors	Virginia Tech Dean's List and President's List
	National Honor Society and Golden Key Honor Society
	Valedictorian of Warren County High School, Front Royal VA

PROFESSIONAL SERVICE

Smithsonian Congress of Scholars: NASM member, 2017–pres.; Academic Appointment Advisory Committee chair, 2017–2019; SCOS co-chair, 2019–2021; vice chair, 2021–2022; chair, 2022–2023. NASM Professional Accomplishments Evaluation Committee, 2017–2019, chair 2019. NASM Exhibits Beyond 2020 Committee, 2014. Post-doctoral fellows: Yo Matsubara, 2013–2017; Jon Cawley, 2016–2019; James Haber, 2023–pres. Interns: Sebastian Lungu, 2021; Edward Wolfe, 2020; Ixchal Gonzalez, 2019; Michelle Wray, 2014; Kelsey Wood, 2013; Florence Pendrill, 2009; Holly Flemming, 2007. Program committees: Lunar and Planetary Science Conference 37, 38, and 39, 2006–2008; American Geophysical Union Joint Assembly, 2007, 2008; First and Second Workshop on Mars Valley Networks, 2004, 2008. Proposal review panels: NASA Mars 2020 Rover Participating Scientist Program; Mars Fundamental Research Program, 3 years; Mars Data Analysis Program, 2 years (group chief, 1 year); Planetary Geology and Geophysics Program, 1 year; Moon and Mars Analog Mission Activities, 1 year; Cassini Data Analysis Program, 1 year; Outer Planets Research Program, 1 year, NLSI/SSSERVI, 1 year; Smithsonian Competitive Grants Program for Science, 2 years; PECASE, 2014–pres. Journal reviews: *Nature*, *Geology*, *Journal of Geophysical Research*, *Icarus*, *Geophysical Research Letters*, *Planetary and Space Science*, *Advances in Space Research*, *Computers and Geosciences*, *Journal of Maps*, U.S. Geological Survey planetary mapping. Co-proposed the Holden crater landing site for Mars Science Laboratory rover (made the short list of 4), 2006–2011. Mars Science Laboratory Fluvial Processes Tiger Team, 2010–2011. Seminars: *Georgia Tech* (Atlanta, GA), April 2, 2012; *Carnegie Institution of Washington* (Washington, DC), November 18, 2011; *NASA Goddard Space Flight Center* (Greenbelt, MD), February 22, 2010 and May 9, 2012; *Planetary Science Institute* (Tucson, AZ), July 29, 2009; *Lunar and Planetary Institute* (Houston, Texas), January 13, 2006; *Brown University* (Providence, Rhode Island), September 8, 2005; *California Institute of Technology* (Pasadena, California), December 7, 2004; *Roanoke College* (Salem, Virginia), April 7, 2004.

MEDIA AND PUBLIC OUTREACH

On-camera interviews: BBC World News (U.K. TV, multiple appearances, and radio, 1 appearance, live), Sky News (U.K. TV, live, 2 appearances), ITN News (U.K. TV), France 24 news (live, 2 appearances), Russia Today (live), Voice of America, Fox News affiliates (2 appearances), ABC 7 News (Washington, DC) for commentary on events in space exploration. Off-camera interviews: PBS NOVA, Today Show, Voice of Russia, WTOP. Print and other media interviews: Associated Press (2), *Science* (4), *Nature*, *Smithsonian Air and Space*, *Astronomy*, *Sky and Telescope*, *New Scientist*, *discovery.com* (2), *MIT News*, *Christian Science Monitor*, *Oxford American Magazine*, two local newspapers. Regular public lectures at the National Air and Space Museum and occasional offsite public programs to school and community groups.

OTHER ACTIVITIES

2008–pres. Huntington Club, a Condominium Unit Owners' Association, Inc. Co-chair, Redevelopment Committee, 2008–pres. Board of Directors, 2012–2016 and 2018–pres. Treasurer, 2009–2012. President, 2012–2016. Vice President, 2021–pres. Led the first successful vote of unit owners to redevelop a residential condominium with 87% approval in August 2017. 2014–2018 Detailed stock restoration of a 1973 VW Super Beetle, supported two other VW restorations. 1999 Private pilot certificate, single engine land. 1995–pres. Venture 21 sailboat, trips ranging up to 100 miles. 1994, 1997 Open water and advanced open water scuba certification.