

# Veronica J. Bray

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*A geologically-trained planetary scientist, with over 20 years of surface science research, and over 10 years of experience with mission operations and design.*

## Education

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**PhD in Planetary Science - 2004 to 2008, Imperial College London, UK.**

“Impact Crater Formation on the Icy Satellites” (Supervisors: G. S. Collins and J. V. Morgan)

**MSci Planetary Science, Valedictorian & 1<sup>st</sup> Class - 2000 to 2004, University College London, UK.**

MSci: “Meander geometry of venusian canali” (Supervisor: A. P. Jones)

BSc: “Origin and morphological evolution of palimpsests” (Supervisor: J. E. Guest)

## Professional Positions

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**Associate Research Professor** (July 2023 – Present)

Lunar and Planetary Laboratory/University of Arizona, Tucson, AZ.

**Spacecraft-Science Operations Engineer** (Oct 2013 – Present)

Mars Reconnaissance Orbiter’s High Resolution Imaging Science Experiment (HiRISE).

Lunar and Planetary Laboratory/University of Arizona, Tucson, AZ.

**Research Scientist** (Dec 2011 – June 2023)

Independent research: Impact cratering observations and modeling.

Supervision of 4 graduate students and 1 undergraduate NASA Space Grant intern.

Lunar and Planetary Laboratory/University of Arizona, Tucson, AZ.

**Postdoctoral Research Associate** (Sept 2008 – Dec 2011)

Crater formation on the Moon, Mars and Icy Satellites (Advisors: Alfred McEwen and Jay Melosh)

University of Arizona, Tucson, AZ.

**Visiting Scientist** (Jan 2009 - Jan 2010)

Icy Moon Topography (Advisor: Paul Schenk). Lunar and Planetary Institute, Houston, TX.

**Visiting International Scholar** (Feb - Dec 2006)

Enceladus Fractures (Advisor: Elizabeth Turtle), Lunar and Planetary Laboratory, Tucson, AZ.

**Chicxulub Seismic Experiment – Field Team Member** (Dec 2005 to Jan 2006)

Seismometer installation, Yucatan, Mexico. (Lead by Joanna Morgan, Imperial College, London).

## Mission Involvement

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- Artemis III Science Team/Lunar Environment Monitoring Station (LEMS)
  - Seismometer science team (Mar 2024 – Present)
- Mars Reconnaissance Orbiter (MRO)/High Resolution Imaging Science Experiment (HiRISE)
  - Science Team (Sept 2008 – Present).
  - Mission Operations - Targeting Specialist (Oct 2013 – Present).
- LRO/Lunar Reconnaissance Orbiter Camera (LROC)
  - Science Team (2008 – Present).
  - PSP Targeting Action Team (2008-2011).
- New Horizons - Geology and Geophysics Investigation Team (2014 – Present).
- Cassini – Associate Science Team Member (2006 – Mission end).

## **Mission/Technology Development and Field Testing**

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**Seismometer development and operations team member** - Lunar Environment Monitoring Station (LEMS). NASA-A3DI (PI: Mehdi Benna, UMBC).

**Interim PI (Mar 2024 onward) and ConOps Lead** – Penetrator design, power-data-communications requirements for 10 day mission to a binary asteroid. Seismometer to Investigate Internal Asteroid Structure (SIAS), MATISSE (PI: Dani DellaGiustina).

**Science Consultant and ConOps Lead** for Seismometer for Lunar Network (SLN), NASA-DALI Project (PI: Hop Bailey, UA)

**ConOps Lead** – Mission timeline and data collection design for a landed icy worlds mission. Seismometer to Investigate Ice and Ocean Structure (SIOS), NASA-ICEE2 (PI: Hop Bailey, UA).

**Field Test Planning (Co-I)** for the SIOS in Europa Analogs in Antarctica, Alaska and at the Hiawatha Crater in Greenland.

**ConOps Lead** – Mission operations and sensor design requirements for the Seismometer to Investigate Internal Asteroid Structure, NASA-MATISSE (PI: Dani DellaGiustina, UA).

**Science Consultant (Co-I)** for Cold-Lightweight Images for Europa (C-LIFE) NASACLDTCH (PI: Shane Byrne, UA).

**Co-I** Magnetometer, Altimetry, Gravity, and Imagery of Callisto (MAGIC). Mission Proposal, Discovery Program 2019 (PI David Smith, MIT).

**Chicxulub Seismic Experiment - Land Team Member**, Dec 2005 to Jan 2006, Yucatan, Mexico (PI: Joanna Morgan, Imperial College and Sean Gulick, University of Texas).

## **Teaching**

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### **Undergraduate/Graduate Lecturing**

- ASTRO-PTYS-GEO 214: Astrobiology. Lunar and Planetary Laboratory, University of Arizona, Fall 2026, Spring 2025, Fall 2024, 2011 and 2012.
- Barnes Lecturer - 2023. Institute for Geophysics, University of Texas at Austin, TX.
- Contributing Lecturer for PTYS 416: Asteroids, Comets and Kuiper Belt Objects, Lunar and Planetary Laboratory, University of Arizona, Fall 2022.
- Demonstrator - Undergraduate Field Mapping Course (~65 students), Imperial College, London, UK. 2005.
- Graduate Teaching Assistant – Computing and Physics undergraduate courses (~50 students), Imperial College, London, UK. 2004-2005

**Course Designer and Workshop Lead** – Impact rock hand-specimen kit workshop for educators, Planetary Science Institute, Tucson, AZ. 2012-2014.

## **Student Involvement**

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**Graduate Students.** December 2008 – Present.

Advisor: Design and fund projects, directs research and manuscript writing, defense chair/committee. Committee: Thesis topic input and guidance, co-author contributions, final defense committee.

- Robin van Auken (Advisor, LPL, PhD ~ 2029, Surface Processes on Icy Bodies).
- Jill McDonald (Project collaborator, APL. PhD ~ 2025, Impacts into Europa)
- Namya Baijal (Committee, LPL, PhD~2027, Impact simulations into asteroids).
- Rishi Chandra (Committee, LPL. PhD ~ 2026, Hiawatha crater seismics)

- Mackenzie Mills (Committee, LPL, PhD ~2025, Martian Surface Processes).
- Sam Moruzzi (Committee, LPL, PhD~2024, Geophysical Evolution of Sputnik Basin, Pluto).
- Patrick O'Brien (Committee, LPL, PhD 2022, Lunar topography).
- Corwin Atwood-Stone (Co-Advisor, LPL, PhD 2020, Lunar surface processes).
- Catherine Elder (Co-Advisor, University of Arizona, PhD 2015, Icy worlds processes).
- Ning Ding (Co-Advisor, China University of Geoscience, PhD 2016, Martian geology).
- Erin Fitch (Co-Advisor, University of Arizona, MPhil 2010, computer modeling of impact).

**NASA Space Grant Students.** September 2021 – 2024.

Linnae Larson (Project collaborator, University of Arizona), Impact spallation in ice.

Shea Defour-Remy (Mentor, University of Arizona), Multi-ring basin formation.

### **Undergraduate Directed Research**

Fall 2025 - Jigisha Kshirsagar (Development of course materials for Terraforming EPO)

2023-2024 - Reed Spurling (Cratering-related advice for current projects, Mars).

### **PTYS 214 Undergraduate Preceptors**

Spring 2012 – Kira Karns, Charles Loy, Sam Rickert, Mike Collins (Astrobiology)

Fall 2024 - Olivia Cox (Life in the Cosmos)

Spring 2025 – Jigisha Kshirsagar (Life in the Cosmos)

### **Public Outreach**

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- **Planetary ReaCH: Effective Planetary Engagement.** Workshop participant and demonstrator at the Boys and Girls Club of Arizona (Spring 2025).
- **Presenter at Tucson Schools** - “Solar System Tour”, Physics (momentum and inertia) and other activities and presentations for K-12 levels. 2-3 events per year, Years: 2016-Present.
- **“Ask a Scientist”** YouTube responses to space-related questions from Elementary, Middle and High-School students in the US, Europe and Africa. 18 videos, 2018 – Present. [www.youtube.com/@veronicabray](http://www.youtube.com/@veronicabray)
- **Image caption writer for HiRISE** - <https://www.uahirise.org/catalog/captions/>
- **Featured Image article author for LROC** - <http://lroc.sese.asu.edu/posts>
- **Illustrator and writer of Children’s science books:** “Moon Shadow – An Eclipse Story” (2023), “The Animagnals” (2024) and “The Moh Scale of Mineral Hardness – a Lullaby!” (to be released 2025).
- **Science Consultant and on-location scientist** for the BBC/NOVA “The Planets – II” Series. Three of five episodes (Documentary series aired Fall 2024).
- **Scientist for UnXplained: Mysteries of the Universe with William Shatner** (History Channel). Two episodes: “Alien Moons” and “Frontiers in Space Exploration” (2024).
- **Guest on “TalkTV with Trisha Goddard”.** 7<sup>th</sup> April 2024 Total Solar Eclipse Special. <https://www.youtube.com/watch?v=SozaBi25fHw>
- **Pluto Palooza science speaker.** Touring event produced by Geoffrey Haines-Stiles to bring New Horizons Mission data to schools and remote community locations. Hawai’i 2018.
- **Course Designer and Workshop Lead** – Impact rock hand-specimen workshop for educators, Planetary Science Institute, Tucson, AZ, 2012-2014.
- **Lectures and hands-on impact demonstrations** for the public at Yuri’s Night events, LPL’s Summer Science Saturdays, UA’s Festival of Books, etc. 2012-Present.
- Numerous **public talks** in person and online, all experiences and ages.

## Professional Service

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### Current:

- Department Life Committee Chair, LPL, July 2026 - Present.
- Book Editor, Impact Cratering Across the Solar System, Elsevier, March 2023 - Present.
- National Academies Panel on Mars Geosciences (Part of the National Academies science strategy for the human exploration of Mars). March 2024 – Dec 2025.
- Imperial College Court member (2021- 2025).
- Planetary Crater Consortium (PCC) committee member. July 2022 – August 2025.
- Various Working Groups (OPAG, SBAG, LEAG, Ocean Worlds Working Group (OWWG)).
- Diversity, Equity and Inclusion committee member, LPL, July 2022 – July 2025.
- Department Life Committee, Lunar and Planetary Laboratory (LPL), July 2022 – July 2024; July 2025 – present.
- Dworkin student award Judge, LPSC, Various years since 2010.

### Past:

- Staff Scientist Representative to Faculty, Lunar and Planetary Lab (June 2012 – June 2013)
- Lunar and Planetary Science Conference Program Committee Member (2011 and 2012)
- DPS 2014 conference science organizing committee member
- NASA proposal review panel member and/or external reviewer (Various years since 2009)
- Reviewer for Nature, Science, MAPS, Icarus, JGR, GRL, etc. (each year since 2006)
- Reviewer for the books “Science of Solar System Ices” (Edited by J. Castillo and others),
- “Impact Cratering: Processes and Products” (G. Osinski and E. Pierrazzo Eds)

## Honours and Awards

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- Asteroid 204570 VeronicaBray (2005 EA317).
- Barnes Lecturer - 2023. Institute for Geophysics, University of Texas at Austin, TX
- Imperial College’s Inaugural “Emerging Leader” alumni award, February, 2020.
- NASA Group Achievement Award to the New Horizons Science Team, 2016.
- NASA Group Achievement Award to the HiRISE targeting team during the Comet Siding Spring encounter with Mars.
- NASA Group Achievement Award to the HiRISE Science Team, 2011
- NASA Group Achievement Award to the LRO Team, 2010
- Diploma of Imperial College, 2009
- Janet Watson Departmental Scholarship, Imperial College, 2004 – 2007
- European Space Agency (ESA) student scholarship, 2006
- Dean’s Award (Valedictorian) 2004 in Planetary Science, University College London
- Planetary Science Prize for Academic Excellence, University College London, 2001

## **PI Funding Sources**

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*Does not include pending funding sources or Co-I roles on proposals.*

### **Palimpsest Formation on Ganymede.**

PI: Veronica Bray, Budget: \$161,398, NASA Solar System Workings, 10/2026 – Present.

### **Investigation of the historic heat flow and near surface internal structure of Callisto through analysis of cratering trends.**

PI: Veronica Bray, Budget: \$375,159, NASA Solar System Workings, 09/2019 – 11/2025.

### **Mapping and modeling high-mobility impact melts in Tycho crater, The Moon.**

PI: Veronica Bray, Budget: \$30,000, NASA Lunar Reconnaissance Orbiter Camera, ASU, 2/2024-09/2024.

### **Investigating crustal strength historic heat flow and the Sputnik impact.**

PI: Veronica Bray, Budget: \$21,950, NASA New Horizons, SWRI, 10/2020-12/2021.

### **Combining sample analysis and numerical modeling to reconstruct the origin and evolution of Flynn Creek Crater**

PI: Veronica Bray, Budget: \$53,017, NASA Planetary Geology and Geophys., 10/1/15 – 9/30/18

### **Erosion on Titan as Revealed by its Craters**

PI: Veronica Bray, Budget: \$8,927, NASA Outer Planets Research Program 05/01/13 – 04/30/16

### **Ejecta and Melt Interactions During Impact Ejecta Emplacement on the Moon.**

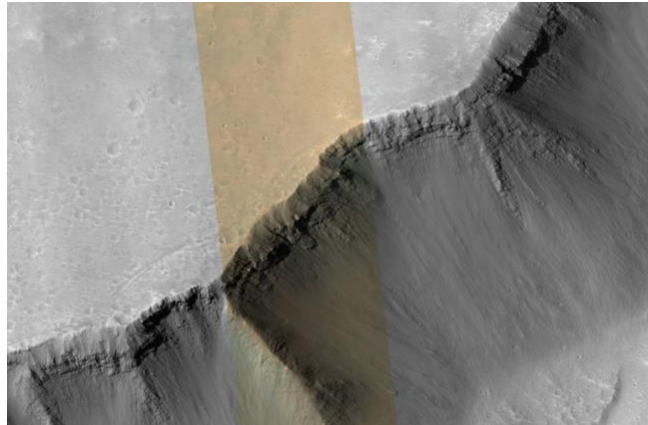
PI: Veronica Bray, Budget: \$398,090, NASA Lunar Data Analysis Program 04/24/15 – 04/23/18

### **Impact Mechanics and Central Pit Formation on Icy Bodies.**

PI: Veronica Bray, Budget: \$286,313, NASA Outer Planets Research Program 09/2009 – 08/2012

## Publications

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*Between the years of 2013 and Present, I have been a half-time science operations engineer, reducing the amount of time available for publication/science efforts to 0.5FTE. However, my time with the HiRISE has instead produced 10,000 (9,525 as of August 2025) images of Mars that I planned and commanded.*

### **In Prep:**

**Bray, V. J. et al. (In Prep)**, Impact melt surges in early crater formation.

**Bray, V. J. et al. (In Prep)**, Global variations in Callisto's ice crust over time from multi-ring basin morphology.

**Bray, V. J. et al. (In Prep)**, A Mission Concept: Seismometer to Investigate Internal Asteroid Structure (SIAS).

### **In Press/Accepted/In Revision:**

McDonald\* et al., (In Revision). Surface-to-Subsurface transport via small cratering events on Europa. *JGR Planets*.

Rae, A. S. P. and **V. J. Bray** (Accepted). Impact Effects on Target Geology. In *Impact Cratering Across the Solar System*, Elsevier, edited by Catherine Neish and Veronica Bray. <https://eartharxiv.org/repository/view/5936/>

Robbins, S. J., **V. J. Bray** and P. M. Schenk (Accepted). Crater Morphology and Morphometry. In *Impact Cratering Across the Solar System* Elsevier, edited by Catherine Neish and Veronica Bray.

## 2025:

Brouwer, G. et al., (2025). Topographic Relaxation of Complex Impact Craters in a Clathrate Crust on Titan. *PSJ* 6(9):217.

National Academies of Sciences, Engineering, and Medicine. 2025. *A Science Strategy for the Human Exploration of Mars*. Washington, DC: The National Academies Press. 240 pages. DOI: <https://doi.org/10.17226/28594>

Nicholson et al., (2025). Multiple lines of evidence for a hypervelocity impact origin for the Silverpit Crater. *Nat. Comms.* 16:8312.

Chandra, R. et al (2025). Seismic Evidence of Impact Breccia and Unlithified Sediments under Hiawatha Glacier. *JGR* 130(7). <https://doi.org/10.1029/2024JF008247>

**Bray, V. J.** et al., (2025). Crater Dimensions on the Dwarf Planets. *Planet. Sci. J.* 6:37. <https://iopscience.iop.org/article/10.3847/PSJ/ad9fec>.

## 2024:

Ballouz, R. L. et al. (2024). Shaking and Tumbling: Short- and Long-Timescale Mechanisms for Resurfacing of Near-Earth Asteroid surfaces from planetary tides and predictions of the 2029 Earth Encounter by (99942) Apophis. *Planet. Sci. J.* 5, 251. <https://iopscience.iop.org/article/10.3847/PSJ/ad84f2>

Fraser et al. (2024) Candidate Distant Trans-Neptunian Objects Detected by the New Horizons Subaru TNO Survey. *Planet. Sci. J.* <https://arxiv.org/abs/2407.21142>

Nicholson, U., W. Powell, S.P.S. Gulick, T. Kenkmann, **V. J. Bray**, D. Duarte, G. S. Collins (2024). Into the Nadir: 3D anatomy of a K-Pg age marine impact crater. *Nature Comms.* 5:547.

Kirchoff, M. R., A. Barr, M. Bland, **V. J. Bray**, E. G. Rivera-Valentin and P. M. Schenk. (2024), The cratering record of Ganymede: Surface ages, impactor populations, and evolutionary history. In “*Ganymede*”, Editors: M. Volwerk, T. Spohn, M. McGrath, and X. Jia. Cambridge University Press.

**Bray, V. J.** and P. M. Schenk (2024). Crater Morphometry on Callisto. *Planet. Sci. J.* 5, 188. <https://iopscience.iop.org/article/10.3847/PSJ/ad61dd>

DellaGiustina D., R. Ballouz, K. Walsh, A. Marusiak, **V. Bray**, S. Bailey (2024). Seismology of rubble-pile asteroids in binary systems” *Monthly Notices of the Royal Astronomical Society* 528(4):6568-6580.

Bland, M. T. and **Bray, V. J.** (2024). The inevitability of large shallow craters on Callisto and Ganymede: Implications for crater depth-diameter trends. *Icarus* 408:115811.

**Bray, V. J.** et al., (2024). Corrigendum to “Ganymede crater dimensions – Implications for central peak and central pit formation and development. *Icarus* 407(1):115799.

### 2023:

Hedgepeth, J. E., C. D. Neish and **V. J. Bray.** (2023). Impact Crater Morphology on Pluto: Implications for Surface Composition and Evolution. *Planet. Sci. J.* 4(1):190.

McEwen, A. S. et al., (2023). The High-Resolution Imaging Science Experiment (HiRISE) in the MRO ESPs (2009-2022). *Icarus* 419: 115795.

Leiva R., et al. (2023). Six New TNOs. *Minor Planet Electronic Circular* # 2023-F132. <https://www.minorplanetcenter.net/mpec/K23/K23FD2.html>

### 2022:

Nicholson, U., **V. J. Bray**, S.P. Gulick and B. Aduomahor (2022). The Nadir crater offshore West Africa: A candidate Cretaceous-Paleogene impact structure. *Science Advances* 8(33):pp13.

**Bray, V. J.** et al., 2022. “False Peak” creation in the Flynn Creek marine-target impact crater. *Meteoritics and Planetary Science*. DOI: [10.1111/maps.13822](https://doi.org/10.1111/maps.13822)

Singer et al., 2022. Large-scale cryovolcanic resurfacing on Pluto. *Nature* **13**, Article number: 1542

Marusiak et al., (2022). The Detection of Seismicity on Icy Ocean Worlds by Single-Station and Small-Aperture Seismometer Arrays. *Earth and Space Science*: 9(3):e2021EA002065.

Schenk et al. (2022). Triton: Topography and Geology of a Probable Ocean World with Comparison to Pluto and Charon, *Remote Sens.* **13** (2021), 3476, doi:10.3390/rs13173476

### 2021:

**Bray, V. J.** (2021). The geological heart of a dwarf planet. *Geoscientist*: Volume 32. Editor: Amy Whitchurch.

Maguire et al. (2021). Geophysical constraints on the properties of a subglacial lake in northwest Greenland. *The Cryosphere*, Volume 15, Issue 7, 2021, pp.3279-3291. <https://doi.org/10.5194/tc-15-3279-2021>

Marusiak et al. (2021). The deployment of the Seismometer to Investigate Ice and Ocean Structure (SIIOS) in Northwest Greenland: An analog experiment for icy ocean world seismic deployments. *Seismological Research Letters* 92(3):2036-2049.

Schenk et al. (2021). Compositional control on impact crater formation on mid-sized planetary bodies: Dawn at Ceres and Vesta, Cassini at Saturn. *Icarus*, Volume 359, article id. 114343.

Robbins et al. (2021). Depths of Pluto’s and Charon’s craters, and their simple-to-complex transition. *Icarus*, Volume 356, article id. 113902.

## 2020:

Buie, M., J. Hofgartner, **Bray, V. J.** and E. Lellouch (2020). Future exploration of the Pluto system. pp. 569-586 in: Stern, S. A., Young, L. A., Moore, J. M., Grundy, W. M., Binzel, R. P., (Eds.), *Pluto system after New Horizons*. University of Arizona Press, Tucson.

Marusiak, A. G. et al., (2020). The deployment of the seismometer tyo investigate ice and ocean structure (SIIOS) on Gulkana Glacier, Alaska. *Seismological Research Letters* 91(3):1901-1914. <https://doi.org/10.1785/0220190328>

Hurford, T. A. et al. (2020). Seismicity on Tidally Active Solid-Surface Worlds. *Icarus*, Volume 338, article id. 113466.

Spencer et al. (2020). The geology and geophysics of Kuiper Belt object (486958) Arrokoth. *Science*: Vol 367, Issue 6481.

Singer et al. (2020). Pluto and Charon craters and terrain age estimates. In: Stern, S. A., Young, L. A., Moore, J. M., Grundy, W. M., Binzel, R. P., (Eds.), *Pluto system after New Horizons*. University of Arizona Press, Tucson.

Beddingfield et al. (2020). Landslides on Charon. *Icarus*, Volume 335, article id. 113383.

## 2019:

Singer et al. (2019). Impact craters on Pluto and Charon reveal a deficit of small Kuiper belt objects. *Science* 363, 955.

Rymer et al. (2019). Solar System Ice Giants: Exoplanets in our Backyard. Decadal Survey on Astronomy and Astrophysics, science white papers, no. 176; *Bulletin of the American Astronomical Society*, Vol. 51, Issue 3, id. 176 (2019)

Stern et al. (2019). Initial results from the New Horizons exploration of 2014 MU<sub>69</sub>, a small Kuiper Belt object. *Science*: Vol 364, Issue 6441.

Cruikshank, D. P. et al. (2019). Prebiotic Chemistry of Pluto. *Astrobiology*. doi: 10.1089/ast.2018.1927

Robbins et al. (2019). Geologic Landforms and Chronostratigraphic History of Charon as Revealed by a Hemispheric Geologic Map. *JGR Planets* 124(1):155-174.

## 2018:

**Bray, V. J.**, C. Atwood-Stone, C. D. Neish, A. M. McEwen, N. A. Arttimeva, A. S. McEwen, J. N. McElwaine (2018). Lobate impact melt flows within the extended ejecta blanket of Pierazzo crater, the Moon. *Icarus*, 301:26-36.

Moore, J. M et al. (2018). Great Expectations: Plans and Predictions for New Horizons Encounter With Kuiper Belt Object 2014 MU<sub>69</sub> (“Ultima Thule”) *GRL* 45(16):7885-8697.

Robbins et al., (2018). Investigation of Charon's Craters With Abrupt Terminus Ejecta, Comparisons With Other Icy Bodies, and Formation Implications. *JGR Planets* 123(1):20-36.

Robbins et al. (2018). Measuring impact crater depth throughout the solar system. *MAPS* 53(4):583-637.

#### 2017:

White, O. L. et al., (2017) Impact crater relaxation on Dione and Tethys and relation to past heat flow, *Icarus* 288:37-52.

Robbins et al. (2017). Craters of the Pluto-Charon system. *Icarus*, Volume 287, p. 187-206.

#### 2016:

Atwood-Stone\*, C., **V. J. Bray**, A. S. McEwen (2016). A new study of crater concentric ridges on the Moon. *Icarus* 273. DOI: 10.1016/j.icarus.2016.03.012.

Nimmo et al., (2016). Reorientation of Sputnik Planitia implies a subsurface ocean on Pluto. *Nature*, Volume 540, Issue 7631, pp. 94-96 (2016).

McKinnon et al. (2016) Convection in a volatile nitrogen-ice-rich layer drives Pluto's geological vigour, *Nature* 534(7605):82-85

Gladstone, G. Randall et al. (2016) The atmosphere of Pluto as observed by New Horizons. *Science* Vol. 351, Issue 6279.

Bagenal, F. et al. (2016) Pluto' interaction with its space environment: Solar wind, energetic particles, and dust. *Science* Vol. 351, Issue 6279.

Weaver, H. A. et al. (2016) The small satellites of Pluto as observed by New Horizons. *Science*, Vol. 351, Issue 6279.

Neish et al., (2016). Fluvial erosion as a mechanism for crater modification on Titan. *Icarus*, Volume 270, p. 114-129

Moore, Jeffrey M et al., (2016). The geology of Pluto and Charon through the eyes of New Horizons. *Science* Vol. 351, Issue 6279, pp. 1284-1293.

Grundy et al. (2016). The formation of Charon's red poles from seasonally cold-trapped volatiles. *Nature*, Volume 539, Issue 7627, pp. 65-68

#### 2015:

**Bray, V. J.** and Schenk, P. M. (2015). Pristine Crater Morphology on Pluto – Expectations for New Horizons. *Icarus* New Horizons special edition 246: 156-164.

**Bray, V. J.** et al. (2015). Seven invited chapters (central peak crater, peak-ring crater, central pit crater, crater wall, crater rim, canali, impact structure) In: Hargitai H, Kereszturi A (eds): *Encyclopedia of planetary landforms*. Springer. ISBN 978-1-4614-3133-6. 2354 pages.

Ding\*, N., **V. J. Bray**, A. S. McEwen, S. S. Sutton, C. H. Okubo, M. Chojnacki, L. L. Tornabene (2015). The central uplift of Ritchey crater, Mars. *Icarus* 252:255-270.

Moore, J. M., Howard, A. D., Schenk, P. M., McKinnon, W. B., Pappalardo, R. T., Ewing, R. C., Bierhaus, E. B., **Bray, V. J.** and Spencer, J. R. (2015). Geology before Pluto: pre-New Horizons encounter considerations. *Icarus* New Horizons special edition 246: 65-81.

Stern, A. S. and the New Horizons Team (2015). The Pluto system: Initial results from its exploration by New Horizons. *Science*, Vol. 350, Issue 6258.

#### **2014:**

**Bray, V. J.**, G. S. Collins, J. V. Morgan, H. J. Melosh and P. M. Schenk (2014). Hydrocode simulation of Ganymede and Europa cratering trends – How thick is Europa’s crust?. *Icarus* 231:394-406.

Neish, C. D., J. Maddedn, L. M. Carter, B. R. Hawke, T. Giguere, **V. J. Bray**, G. R. Osinski, J. T. S. Cahill (2014). Global distribution of lunar impact melt flows. *Icarus* 239:105-117.

#### **2013:**

Neish. C. D., R. Kirk, R. Lorenz, **V. Bray**, P. Schenk, B. Stiles, E. Turtle, K. Mitchell, A. Hayes.(2013) Topography of Craters on Titan. *Icarus* 223(1):82-90.

#### **2012:**

**Bray, V. J.**, C. Atwood-Stone, and A. S. McEwen (2012), Investigating the transition from central peak to peak-ring basins using central feature volume measurements from the Global Lunar DTM 100m, *Geophys. Res. Lett.* 39:L21201.

**Bray, V. J.**, P. M. Schenk,H. J. Melosh, J. V. Morgan, G. S. Collins. Ganymede crater dimensions – implications for peak and pit formation and development. (2012) *Icarus*, 217:115-129.

Elder\*, C. M., **V. J. Bray**, H. J. Melosh (2012). The theoretical plausibility of central pit formation via melt drainage. *Icarus* 221:831–843.

Tornabene, L. L., G. R. Osinski, A. S. McEwen, J. M. Boyce, **V. J. Bray**, C. M. Caudill, J. A. Grant, S. Mattson, and P. J. Mouginis-Mark (2012). Widespread crater-related pitted materials on Mars: Further evidence for the role of target volatiles during the impact process. *Icarus*, 220:348-368.

#### **2010:**

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