

## Brandon C. Johnson

Assistant Professor  
Department of Earth, Environmental and Planetary Sciences  
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### Education

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**Ph.D. Physics**, “The formation of distal impact ejecta”, Advisor H. Jay Melosh  
2013 - Purdue University

**B.S. Physics** with Mathematical Sciences Minor (summa cum laude)  
2009 - Michigan Technological University

### Professional Appointments

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#### Brown University

2015 - Present      Assistant Professor

#### Massachusetts Institute of Technology

2014 - 2015      Postdoctoral Associate – Advisor: Maria Zuber

#### Purdue University

2010 - 2014      Graduate Research Assistant – Advisor: H. Jay Melosh

2009 - 2010      Graduate Research Assistant

2009 - 2010      Graduate Teaching Assistant

#### Michigan Technological University

2006 - 2009      Undergraduate Research Assistant

2006 - 2009      Undergraduate Teaching Assistant

### Publications

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\*Denotes Student Advisee †Denotes Postdoctoral Advisee

#### Submitted / in press

Moore, T. C., M. M. Range, B. K. Arbic, **B. C. Johnson**. The Global Impact of the Cretaceous - Paleogene Tsunami. (Submitted to *Paleoceanography and Paleoclimatology*)

Range, M. M., B. K. Arbic, **B. C. Johnson**, T. C. Moore, et al. The Chicxulub impact produced a powerful global tsunami. (Submitted to *GRL*)

Osinski, G. R., H. J. Melosh, et al. Lunar Impact Features and Processes. *New Views of the Moon 2*.

\*Wiggins, S. E., **B. C. Johnson**, T. J. Bowling, H. J. Melosh, †E. A. Silber. Impact Fragmentation and the Development of the Lunar Megaregolith. (*JGR Planets*, revision submitted)

Bowling, T. J., **B. C. Johnson**, E. L. Walton, H. J. Melosh, T. G. Sharp. Dwelltime at high pressure of meteorites during impact ejection from Mars. (*Meteoritics and Planetary Science*, in revision)

**Johnson, B. C.**, J. C. Andrews-Hanna, G. S. Collins, A. M. Freed, H. J. Melosh, M. T. Zuber. Controls on the formation of lunar multiring basins. (JGR Planets, in press <https://doi.org/10.1029/2018JE005765>)

Bowling, T. J., F. J. Ciesla, T. M. Davison, J. E. C. Scully, J. C. Castillo-Rogez, S. Marchi, **B. C. Johnson**. Post-Impact Thermal Structure and Cooling Timescales of Occator Crater on Dwarf Planet 1 Ceres. (Icarus, in press, doi: 10.1016/j.icarus.2018.08.028.)

### Published

Fu, R. R., B. P. Weiss, D. L. Schrader, **B. C. Johnson**. Records of Magnetic Fields in the Chondrule Formation Environment. In S. Russell, H. Connolly Jr., & A. Krot (Eds.), *Chondrules: Records of Protoplanetary Disk Processes* (pp. 324-340). Cambridge: Cambridge University Press (2018).

**Johnson, B. C.**, F. J. Ciesla, C. P. Dullemond, H. J. Melosh. Formation of chondrules by planetesimal collisions. In S. Russell, H. Connolly Jr., & A. Krot (Eds.), *Chondrules: Records of Protoplanetary Disk Processes* (pp. 343-360). Cambridge: Cambridge University Press (2018).

Sori, M. M., P. B. James, **B. C. Johnson**, J. M. Soderblom, S. C. Solomon, M. A. Wieczorek, M. T. Zuber. Isostatic compensation of the lunar highlands. *J. Geophys. Res. Planets* 123, 645–665 (2018).

Andrews-Hanna, J. C., J. W. Head, **B. C. Johnson**, J. T. Keane, W. S. Kieffer, P. J. McGovern, G. A. Neumann, M. A. Wieczorek, M. T. Zuber. Ring faults and ring dikes around the Orientale basin on the Moon. *Icarus* 310, 1–20 (2018).

**Johnson, B. C.**, C. S. Campbell. Drop height and volume control the mobility of long runout landslides on the Earth and Mars. *Geophys. Res. Lett.* 44, 12091–12097 (2017).

†Silber, E. A., **B. C. Johnson**. Impact crater morphology and the structure of Europa's ice shell. *J. Geophys. Res. Planets* 122, 2685–2701 (2017).

**Johnson, B. C.**, \*R. Y. Sheppard, \*A. C. Pascuzzo, \*E. A. Fisher, \*S. E. Wiggins. Porosity and salt content determine if subduction can occur in Europa's ice shell. *J. Geophys. Res. Planets* 122, 2765–2778 (2017).

Melosh, H. J., J. Kendall, B. Horgan, **B. C. Johnson**, T. J. Bowling, P. G. Lucey, G. J. Taylor. South Pole–Aitken basin ejecta reveal the Moon's upper mantle. *Geology* 45, 1063–1066 (2017).

†Silber, E. A., G. R. Osinski, **B. C. Johnson**, R. A. F. Grieve. Effect of impact velocity and acoustic fluidization on the simple-to-complex transition of lunar craters. *J. Geophys. Res. Planets* 122, 800–821 (2017).

**Johnson, B. C.**, K. J. Walsh, D. A. Minton, A. N. Krot, H. F. Levison. Timing of the formation and migration of giant planets as constrained by CB chondrites. *Science Advances* 2, e1601658 (2016).

**Johnson, B. C.**, D. M. Blair, G. S. Collins, H. J. Melosh, A. M. Freed, G. J. Taylor, J. W. Head, M. A. Wieczorek, J. C. Andrews-Hanna, F. Nimmo, J. T. Keane, K. Miljković, J. M. Soderblom, M. T. Zuber. Formation of the Orientale Lunar Multiring Basin. *Science* 354, 441–444 (2016).

- Zuber, M. T., D. E. Smith, G. A. Neumann, S. Goossens, J. C. Andrews-Hanna, J. W. Head, W. S. Kiefer, S. W. Asmar, A. S. Konopliv, F. G. Lemoine, I. Matsuyama, H. J. Melosh, P. J. McGovern, F. Nimmo, R.J. Phillips, S. C. Solomon, G. J. Taylor, M. M. Watkins, M. A. Wieczorek, J.G. Williams, J. C. Jansen, **B. C. Johnson**, J. T. Keane, E. Mazarico, K. Miljković, R. S. Park, J. M. Soderblom, D. Yuan. Gravity Field of the Orientale Basin from the Gravity Recovery and Interior Laboratory (GRAIL) Mission. *Science* 354, 438–441 (2016).
- Johnson, B. C.**, T. J. Bowling, A. J. Trowbridge, A. M. Freed. Formation of the Sputnik Planum basin and the thickness of Pluto’s subsurface ocean. *Geophys. Res. Lett.* 43, 10068–10077 (2016).
- Miljković, K., G. S. Collins, M. A. Wieczorek, **B. C. Johnson**, J. M. Soderblom, G. A. Neumann, M. T. Zuber. Subsurface morphology and scaling of lunar impact basins. *J. Geophys. Res. Planets* 121, 1695–1712 (2016).
- Johnson, B. C.**, C. S. Campbell, H. J. Melosh. Reply to comment by Iverson on “The reduction of friction in long runout landslides as an emergent phenomenon”, *J. Geophys. Res. Earth Surf.* 121, 2243–2246 (2016).
- Johnson, B. C.**, C. S. Campbell, H. J. Melosh. Reply to comment by Davies and McSaveney on “The reduction of friction in long runout landslides as an emergent phenomenon”, *J. Geophys. Res. Earth Surf.* 121, 1721–1723 (2016).
- Johnson, B. C.**, C. S. Campbell, H. J. Melosh. The reduction of friction in long runout landslides as an emergent phenomenon. *J. Geophys. Res. Earth Surface* 121, 881–889 (2016).
- Johnson, B. C.**, G. S. Collins, D. A. Minton, T. J. Bowling, B. M. Simonson, M. T. Zuber. Spherule layers, crater scaling laws, and the population of ancient terrestrial impactors. *Icarus* 271, 350–359 (2016).
- Parkos, D., A. Alexeenko, M. Kulakhmetov, **B. C. Johnson**, H. J. Melosh. NO<sub>x</sub> Production and Rainout from Chicxulub Impact Ejecta Reentry. *J. Geophys. Res. Planets* 120, 2152–2168 (2015).
- Milbury, C., **B. C. Johnson**, H. J. Melosh, G. S. Collins, D. M. Blair, J. M. Soderblom, F. Nimmo, C. J. Bierson, R. J. Phillips, M. T. Zuber. Pre-Impact Porosity Controls the Gravity Signature of Lunar Craters. *Geophys. Res. Lett.* 42, 9711–9716 (2015).
- Soderblom, J. M., A. J. Evans, **B.C. Johnson**, H. J. Melosh, K. Miljković, R. J. Phillips, J. C. Andrews-Hanna, C. J. Bierson, J. W. Head III, C. Milbury, G. A. Neumann, F. Nimmo, D. E. Smith, S. C. Solomon, M. M. Sori, M. A. Wieczorek, M. T. Zuber. The fractured Moon: Production and saturation of porosity in the lunar highlands from impact cratering. *Geophys. Res. Lett.* 42, 6939–6944 (2015).
- Steckloff, J. K., **B. C. Johnson**, T. Bowling, H. J. Melosh, D. Minton, C. M. Lisse, K. Battams. Dynamic Sublimation Pressure and the Catastrophic Breakup of Comet ISON. *Icarus* 258, 430–437 (2015).
- Johnson, B. C.**, D. A. Minton, H. J. Melosh, M.T. Zuber. Impact jetting as the origin of chondrules. *Nature* 517, 339–341 (2015).

- Freed, A. M., **B. C. Johnson**, D. M. Blair, H. J. Melosh, G. A. Neumann, R. J. Phillips, S. C. Solomon, M. A. Wieczorek, M. T. Zuber. The Formation of Lunar Mascon Basins from Impact to Contemporary Form *J. Geophys. Res. Planets* 119, JE004657 (2014).
- Johnson, B. C.**, T. J. Bowling. Where have all the craters gone? The Earth's bombardment history and the expected terrestrial cratering record. *Geology* 42, 587–590 (2014).
- Johnson, B. C.**, T. J. Bowling, H. J. Melosh. Jetting during vertical impacts of spherical projectiles. *Icarus* 238, 13–22 (2014).
- Johnson, B. C.**, H. J. Melosh. Formation of melt droplets, melt fragments, and accretionary impact lapilli during a hypervelocity impact. *Icarus* 228, 347–363 (2014).
- Bowling, T. J., **Johnson B. C.**, H. J. Melosh, B. A. Ivanov, D. P. O'Brien, R. Gaskell, S. Marchi. Antipodal topography created by the Rheasilvia impact on asteroid 4 Vesta. *J. Geophys. Res. Planets* 118, 1821–1834 (2013).
- Melosh, H. J., A. M. Freed, **B. C. Johnson**, D. M. Blair, J. C. Andrews-Hanna, G. A. Neumann, R. J. Phillips, D. E. Smith, S. C. Solomon, M. A. Wieczorek, M. T. Zuber. The Origin of Lunar Mascon Basins. *Science* 340, 1552–1555 (2013).
- Yue, Z., **B. C. Johnson**, D. A. Minton, H. J. Melosh, K. Di, W. Hu, Y. Liu. Projectile remnants in central peaks of lunar impact craters. *Nature Geosciences* 6, 435–437 (2013).
- Johnson, B. C.**, C. M. Lisse, C. H. Chen, H. J. Melosh, M. C. Wyatt, P. Thebault, W. G. Henning, E. Gaidos, L. T. Elkins-Tanton, J. C. Bridges, A. Morlok. A self-consistent model of the circumstellar debris created by a giant hypervelocity impact in the HD172555 system. *The Astrophysical Journal* 761, 45–58 (2012).
- Johnson, B. C.**, H. J. Melosh. Impact spherules as a record of an ancient heavy bombardment of Earth. *Nature* 485, 75–77 (2012).
- Johnson, B. C.**, H. J. Melosh. Formation of spherules in impact produced vapor plumes. *Icarus* 217, 416–430 (2012).

## **Talks**

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### **Invited**

- Basin formation on the Moon and Pluto. Science colloquium for American Museum of Natural History planetarium show (2018).
- Formation of the Sputnik Planitia basins and the thickness of Pluto's subsurface ocean. Keynote Rhode Island Space Grant Symposium (2018).
- Planetesimal Collisions. Workshop on Accretion Processes in Planet-Forming Regions, JPL (2018).
- Formation of Chondrules by Planetesimal Collision. Chondrules and Protoplanetary Disk, Natural History Museum, London (2017).
- The Formation of Impact Ejecta Layers and Chondrules. Brown University (2015).
- Formation and Evolution of the Orientale Basin. Microsymposium 56, The Crust of the Moon: Insights Into Early Planetary Processes (2015).

The Formation of the Orientale Lunar Multi-Ring Basin. Brown University (2014).

A new model for distal impact ejecta and, perhaps, chondrules. California Institute of Technology (2014).

The formation of distal impact ejecta. University of Chicago (2013).

### **Contributed**

**Johnson, B. C.**, C. S. Campbell, M. M. Sori. Fall Height and Volume Control Landslide Mobility Throughout the Solar System. *49<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1555 (2018).

**Johnson, B. C.**, J. C. Andrews-Hanna, G. S. Collins, A. M. Freed, H. J. Melosh, M. T. Zuber. Multiring Basin Formation: Controls on Ring Location and Spacing. *48<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1536 (2017).

**Johnson, B. C.**, T. J. Bowling, A. J. Trowbridge, A. M. Freed. Formation of the Sputnik Planum basin and the thickness of Pluto's subsurface ocean. *AGU fall meeting*, P44A-06 (2016).

**Johnson, B. C.**, K. J. Walsh, D. A. Minton. Late Formation and Migration of Giant Planets as Constrained by Formation of CB Chondrites. *47<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1136 (2016).

**Johnson, B. C.**, T. J. Bowling, H. J. Melosh. Steps Toward Implementing the Grady-Kipp Fragmentation Model in an Eulerian Hydrocode. *47<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1492 (2016).

**Johnson, B. C.**, J. C. Andrews-Hanna, G. S. Collins, H. J. Melosh, J. W. Head, D. M. Blair, A. M. Freed, K. Miljković, J. M. Soderblom, M. T. Zuber. The Formation of Lunar Multi-Ring Basins. *46<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1362 (2015).

**Johnson, B. C.**, D. A. Minton, H. J. Melosh. The Impact Origin of Chondrules. *45<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1471 (2014).

**Johnson, B. C.**, and H. J. Melosh. Jetting During the Vertical Impact of a Spherical Projectile. *Large Meteorite Impacts and Planetary Evolution V*, Abstract #3014 (2013).

**Johnson, B. C.**, D. M. Blair, A. M. Freed, H. J. Melosh, J. C. Andrews-Hanna, G. A. Neumann, R. J. Phillips, D. E. Smith, S. C. Solomon, M. A. Wiczorek, M. T. Zuber. The Origin of Mascon Basins, Part I. Impact and Crater Collapse. *44<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1456 (2013).

**Johnson, B. C.**, T. J. Bowling, H. J. Melosh. Formation of Valhalla-Like Multi-Ring Basins. *44<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1719 (2013).

**Johnson, B. C.**, H. J. Melosh. Distal Impact Ejecta: Melt Droplets, Impact Lapilli, and Tektites. *43<sup>rd</sup> Lunar and Planetary Science Conference*, Abstract #1456 (2012).

**Johnson, B. C.**, H. J. Melosh. New Estimates for the Number of Large Impacts Throughout Earth's History. *Early Solar System Impact Bombardment II*, Abstract #4027 (2012).

**Johnson, B. C.**, H. J. Melosh. New Estimates of the Sizes and Impact Velocities of Archean Impactors. *Geological Society of America Annual Meeting* (2011).

**Johnson B. C., H. J. Melosh.** Homogeneous Nucleation of Silica Dust Following a Hypervelocity Impact. *42<sup>nd</sup> Lunar and Planetary Science Conference*, Abstract #1069 (2011).

## **Grants**

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### **Current**

Title: True Polar Wander of Terrestrial Planets and its Implications for the Long Term Stability of Polar Volatiles

PI: Isamu Matsuyama and James Keane (Science PI)

Role: Co-I

Source: NASA Solar System Workings (SSW)

Amount: \$382,982 (\$59,481 to Brown)      Duration: 2017-2020

Title: Structure of Lunar Basins and Moon's Lithosphere as Constrained by GRAIL gravity and LOLA topography

Role: PI

Source: NASA Lunar Data Analysis Program (LDAP)

Amount: \$424,037 (\$338,567 to Brown)      Duration: 2017-2020

### **Awaiting Decision**

Title: Lunar Structure, Composition and Processes for Exploration (LunaSCOPE)

PI: Jack Mustard

Role: Co-I

Source: NASA Solar System Exploration Research Virtual Institute (SSERVI)

Duration: 2019-2024

Title: The Impact of Titan's Impacts

PI: Jason Soderblom

Role: Co-I

Source: NASA Cassini Data Analysis Program (CDAP)

Amount: \$472,405 (\$101,726 to Brown)      Duration: 2019-2022

Title: Constraining Ceres' subsurface structure at geological landmarks using the Dawn gravity and shape data

PI: Ryan Park and Anton Ermakov (Science PI)

Role: Co-I

Source: NASA Discovery Data Analysis Program (DDAP)

Amount: \$247,778 (\$52,140 to Brown)      Duration: 2019-2022

## **Service**

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### **University**

2018-present      Planetary Climate Task Force

2018      DEEPS tectonophysics search committee

2018-present      Computer committee

2017-2018      Colloquium organizer spring 2018

2017      DEEPS tectonophysics search committee

2016-2017      BEARCORE (Ethics)

2016-2017 DEEPS curriculum committee  
2015-2016 DEEPS geophysical modeling search committee

Preliminary examination committee member

Alyssa Pascuzzo (2018) - Chair  
Rachel Sheppard (2017)  
Michael Bramble (2017)  
Alexander Trowbridge (Purdue, 2017)

Graduate student advising (not including primary advisees)

Matthew Jones  
Christopher Kremer  
Elizabeth Fisher

### **Profession**

Reviewer for: *Science*, *Science Advances*, *Earth Planet. Sci. Lett.*, *Nature Astronomy*, *Geophys. Res. Lett.*, *J. Geophys. Res. Planets*, *Meteoritics & Planetary Science*, *Astrophysical Journal Letters*, *The Astrophysical Journal*, *Astrobiology*

Outstanding reviewer recognition from *Earth and Planetary Science Letters*

Outstanding reviewer recognition from *Icarus*

NASA review panelist (~yearly) and ad hoc reviewer (several/year)

### **Academic honors**

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Ronald Greeley Early Career Award in Planetary Science (AGU, 2018)

Lark-Horovitz Award, for outstanding research in physics (Purdue University, 2013)

Nininger Meteorite Award (Center for Meteorite Studies Arizona State University, 2012)

NS Mackie Endowed Scholarship (Michigan Technological University, 2007)

Class of 1965 Endowed Scholarship (Michigan Technological University, 2006)

Board of Control Scholarship (Michigan Technological University, 2005-2009)

### **Teaching and Advising**

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#### **Courses**

2018 (Fall) GEOL 1390: Planetary Surface Processes  
2018 (Spring) GEOL 2880: Planetary Cratering  
2017 (Spring) GEOL 2920B: Ocean Worlds  
2016 (Fall) GEOL 2910P: Origin and evolution of planetary systems  
2016 (Spring) GEOL 2880: Planetary Cratering

#### **Current graduate students**

Emily Bjonnes (Advisor for Ph.D.; entered 9/2017)  
Adeene Denton (Advisor for Ph.D. (as of 11/2018; entered 9/2016)  
Sean Wiggins (Advisor for Ph.D.; entered 9/2016)

#### **Past Postdocs**

Dr. Elizabeth Silber

#### **Past Undergrads**

Katherine Pisani

## **Professional Memberships**

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American Geophysical Union  
Geological Society of America  
The Meteoritical Society

## **Selected Press Coverage**

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### **2019– Regarding Chicxulub tsunami work submitted to *GRL***

Huge Global Tsunami Followed Dinosaur-Killing Asteroid Impact. [EOS](#)  
Dinosaur-Killing Asteroid Triggered A Mile-High Tsunami Across The Globe. [Forbes](#)  
Dinosaur-Killing Asteroid Triggered Mile-High Tsunami That Spread Through Earth's Oceans. [Yahoo! News](#) (and others)

### **2017– Regarding Europa subduction work published in *JGR Planets***

Journal highlight with [commentary](#)  
New Evidence Points to Icy Plate Tectonics on Europa. [Gizmodo](#)  
Boost for Odds of Life? Jupiter Moon Europa May Have Plate Tectonics. [Space.com](#)

### **2016 – Regarding CB chondrite work published in *Science Advances***

Study Sheds Light On Jupiter’s Formation And Migration. [Yahoo! News](#) (and others)  
Research offers clues about the timing of Jupiter's formation. [Brown](#) (picked up by others)

### **2016 – Regarding Multiring basin work published in *Science***

Cover image of *Science* was selected as top 10 science images of 2016. [Science](#)  
Mystery of How the Moon Got Its Bull's-Eye May Be Solved. [Space.com](#)  
Research helps explain formation of ringed crater on the Moon. [Brown](#) (picked up by others)

### **2016 – Regarding Sputnik Planum (Pluto) work published in *Geophysical Research Letters***

Selected as in part as #40 of top 100 science discoveries of 2016 by [Discover Magazine](#)  
Does Pluto have a hidden ocean? Its 'heart' holds a clue. [LA Times](#)  
Pluto's Liquid Water Ocean Might Be Insanely Deep. [Gizmodo](#)

### **2016 – Regarding landslide work published in *JGR Earth Surface***

Journal highlight with [commentary](#) also highlighted in [Nature](#)  
Why do some landslides travel so much farther than others? [Science](#)  
Vibrations make large landslides flow like fluid. [Brown](#) (picked up by several outlets)

### **2015 – Regarding chondrule work published in *Nature***

Asteroids May Not Be Planet Building Blocks After All. [Space.com](#)  
A twist on planetary origins. [MIT news](#) (picked up by several outlets)  
Meteorite material born in molten spray as embryo planets collided. [Phys.org](#)

### **2014 – Regarding crater survival work published in *Geology***

Where have all the craters gone? [The Economist](#) (in print and online)  
Where have all the craters gone? [Phys.org](#)



**2013 – Regarding mascon work published in *Science***

Montesi, L. Solving the Mascon Mystery. [Science Perspective](#)

Revealed: The Awesome Explanation for the Moon's Extra Gravity. [Time](#)

The moon's mysteriously uneven gravity is explained at last. [LA Times](#)

Mystery of Moon's Lumpy Gravity Explained. [Space.com](#)

**2013 – Regarding projectile remnant work published in *Nature Geoscience***

Asphaug, E. Go and catch a falling star. [Nature Geoscience News & Views](#)

Surprise! Moon Craters May Hold Ancient Asteroid Pieces. [Space.com](#)

Alien Debris Found in Lunar Craters. [Discovery News](#)

**2012 – Regarding spherule work published in *Nature***

Kyte, F. T. Focus on ancient bombardment. [Nature News & Views](#)

Goldin, T. Earth's ancient catastrophes. [Nature Geoscience News & Views](#)

Asteroids Battered Young Earth Longer Than Thought. [Huffington Post](#) and [Space.com](#)