Dr. David A. Minton

Associate Professor

Purdue University • Department of Earth, Atmospheric, and Planetary Sciences
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Employment

2018–Pres.	**Associate Professor with Tenure**, Purdue University, West Lafayette, IN.
2011–2018	**Assistant Professor**, Purdue University, West Lafayette, IN.
2009–2011	**Research Scientist**, Southwest Research Institute, Boulder, CO.

Education

2005–2009	**Ph.D. in Planetary Sciences** The University of Arizona, Tucson, AZ. Dissertation: *Dynamical History of the Asteroid Belt and Implications for Terrestrial Planet Bombardment* Advisor: Renu Malhotra
2003–2005	University of Maryland, College Park, MD. Project: *Magnetohydrodynamic control of incipient boundary layer separation in supersonic flow* Advisors: Mark Lewis and David Van Wie
2001–2003	**B.S. in Aerospace Engineering - Summa Cum Laude** North Carolina state University, Raleigh, NC.
1999–2000	**A.S. in College Transfer** Central Piedmont Community College, Charlotte, NC.

Internships

2003	NASA Langley Aerospace Research Summer Scholar, Hampton, VA.

Refereed Publications

Co-authors under direct advisement: [P]=Post-doc; [G]= Graduate student; [U]= Undergraduate student

[43] Du[P] J., **Minton D.A.**, Blevins[G] A.M., Fassett C.I., Huang Y.H. (2025). Spectral Analysis of the Morphology of Fresh Lunar Craters II: Two-Dimensional Surface Elevations of the Continuous Ejecta, Wall, and Floor *Journal of Geophysical Research: Planets.* In Review.

[42] Ćuk M., Anand[G], K.P., **Minton D.A.** (2025). Two Possible Orbital Histories of Phobos. *Planetary Science Journal.* In Review.

[41] Blevins[G] A.M., **Minton D.A.**, Huang Y.H., Du[P] J., Tremblay, M.M., Fassett, C.I. (2025). Apollo Impact Melts Record a Rapidly Declining Impact Rate in the Late Imbrian. *Journal of Geophysical Research: Planets.* 130, e2024JE008722. doi: 10.1029/2024JE008722

[40] Hirabayashi M, Fassett C.I., Costello E.S., **Minton D.A.**, (2024). Crater Equilibrium State Characterization given Crater Production from a Single Power Law. *Planetary Science Journal* 5:250. doi: 10.3847/PSJ/ad8883

[39] Du[P] J., **Minton D.A.**, Blevins[G] A.M., Fassett C.I., Huang Y.H. (2024). Spectral Analysis of the Morphology of Fresh Lunar Craters I: Rim Crest, Floor, and Rim Flank Outlines. *Journal of Geophysical Research: Planets.* 129:11, e2024JE008357. doi: 10.1029/2024JE008357

[38] Hayes C.W., **Minton D.A.**, Kloos J.L., Moores J.E. (2024). Topography-enhanced ultra-cold trapping at the LCROSS impact site. *Journal of Geophysical Research: Planets.* 129, e2023JE007925. doi: 10.1029/2023JE007925

[37] Huang Y.H., Riedel C., Soderblom J.M., Krein S.B., Orgel C., Conrad J.W., Hirabayashi M., and **Minton D.A.** (2024) Global lunar crater density using buffered non-sparseness correction. *Planetary Science Journal* 5, 155. doi: 10.3847/PSJ/ad4ceb

[36] Osinski G.R., Melosh H. J., Andrews-Hanna J., Baker D., Denevi B., Dhingra D., Ghent R., Hayne P.O., Hill P., James P.B., Jaret S., Johnson B.C., Kenkmann T., Kring D., Mahanti P., **Minton D.A.**, Neish C.D., Neumann G., Plescia J., Potter R.W.K., Richardson J., Silber E.A., Soderblom J.M., Zanetti M. Zellner N.E.B. (2023). Lunar Impact Features and Processes. *Reviews in Mineralogy and Geochemistry*, 89(1), 339–371. doi: 10.2138/rmg.2023.89.08

[35] Ćuk M., Hamilton D.P., **Minton D.A.**, Stewart S.T. (2023). Sesquinary Catastrophe for Close-in Moons with Dynamically Excited Orbits. *Astrophysical Journal* 957, 62. doi: 10.3847/1538-4357/acf613

[34] Wishard[G] C., Pouplin[G] J.L.L., Elliott[G] J.R., Singh[G] D., Anand[G] K.P., **Minton D.A.** (2023). Swiftest: An N-body Integrator for Gravitational Systems. *Journal of Open Source Software*, 8, 5409. doi: 10.21105/joss.05409

[33] Fassett C.I., Beyer R.A., Deutsch A.N., Hirabayashi M., Leight C.J., Mahanti P., Nypaver C.A., Thomson B.J., **Minton D.A.** (2022). Topographic Diffusion Revisited: Small Crater Lifetime on the Moon and Implications for Volatile Exploration. *Journal of Geophysical Research: Planets* 127, e2022JE007510. doi: 10.1029/2022JE007510

[32] Huang[P] Y.H., Soderblom J.M., **Minton D.A.**, Hirabayashi M., Melosh H.J. (2022). Bombardment history of the Moon constrained by crustal porosity. *Nat. Geosci.* 15(7) doi: 10.1038/s41561-022-00969-4

[31] Safrit T.K., Steckloff J.K., Bosh A.S., Nesvorný D., Walsh K., Brasser R., **Minton D.A.**, (2021). The Formation of Bilobate Comet Shapes through Sublimative Torques. *Planetary Science Journal* 2, 14. doi: 10.3847/PSJ/abc9c8

[30] Ćuk M, **Minton D.A.**, Pouplin[G] J.L.L., Wishard[G] C. (2020). Evidence for a Past Martian Ring from the Orbital Inclination of Deimos. *Astrophysical Journal Letters*, 896, L28. doi: 10.3847/2041-8213/ab974f

[29] Riedel C., **Minton D.A.**, Michael G., Orgel C., van der Bogert C.H., Hiesinger H. (2020) Degradation of Small Simple and Large Complex Lunar Craters: Not a Simple Scale Dependence. *Journal of Geophysical Research: Planets*, 125, e2019JE006273. doi: 10.1029/2019JE006273

[28] Richardson J.E., Steckloff J.K., **Minton D.A.** (2020) Impact-produced seismic shaking and regolith growth on asteroids 433 Eros, 2867 Šteins, and 25143 Itokawa. *Icarus.* 347, 113811. doi: 10.1016/j.icarus.2020.113811

[27] **Minton D.A.**, Fassett C.I., Hirabayashi M., Howl[U] B.A., Richardson J. (2019) The equilibrium size-frequency distribution of small craters reveals the effects of distal ejecta on lunar landscape morphology. *Icarus*, 326:63. doi: 10.1016/j.icarus.2019.02.021

[26] Graves[G] K.J., **Minton D.A.**, Molaro J.L., Hirabayashi M. (2019). Resurfacing Asteroids from Thermally Induced Surface Degradation. *Icarus*, 322, 1–12. doi: 10.1016/j.icarus.2019.01.003

[25] Hesselbrock[G] A.J., **Minton D.A.** (2019). Three Dynamical Evolution Regimes for Coupled Ring-satellite Systems and Implications for the Formation of the Uranian Satellite Miranda. *The Astronomical Journal*, *157*(1), 30. doi: 10.3847/1538-3881/aaf23a

[24] Huang[G] Y.H., **Minton D.A.**, Zellner N.E.B., Hirabayashi M., Richardson J.E., Fassett C.I. (2018). No Change in the Recent Lunar Impact Flux Required Based on Modeling of Impact Glass Spherule Age Distributions. *Geophysical Research Letters*, *45*(14), 6805. doi: 10.1029/2018GL077254

[23] Elliott[U] J.R., Huang[G] Y.H., **Minton D**, Freed A. (2018). The length of lunar crater rays explained using secondary crater scaling. *Icarus*, *312*, 231. doi: 10.1016/j.icarus.2018.04.015

[22] Hirabayashi[P] M., Howl[G] B.A., Fassett C.I., Soderblom J.M., **Minton D.A.**, Melosh H.J. (2018). The Role of Breccia Lenses in Regolith Generation From the Formation of Small, Simple Craters: Application to the Apollo 15 Landing Site. *Journal of Geophysical Research: Planets*, *123*(2), 527. doi: 10.1002/2017JE005377

[21] Graves[G] K.J., **Minton D.A.**, Hirabayashi[P] M, DeMeo F, Carry B. (2018). Resurfacing asteroids from YORP spin-up and failure. *Icarus*, *304*, 162–171. doi: 10.1016/j.icarus.2017.08.025

[20] Huang[G] Y.H., **Minton D.A.**, Hirabayashi[P] M., Elliott[U] J.R., Richardson J.E., Fassett C.I., Zellner N.E.B. (2017). Heterogeneous impact transport on the Moon. *Journal of Geophysical Research: Planets*, *122*(6), 1158. doi: 10.1002/2016JE005160

[19] Fassett C.I., Crowley M.C., Leight C., Dyar M.D., **Minton D.A.**, Hirabayashi[P] M., Thompson B.J., Watters, W.A. (2017). Evidence for rapid topographic evolution and crater degradation on Mercury from simple crater morphometry. *Geophysical Research Letters*, *44*(11), 5326. doi: 10.1002/2017GL073769

[18] Hesselbrock[G] A.J., **Minton D.A.** (2017). An ongoing satellite–ring cycle of Mars and the origins of Phobos and Deimos. *Nature Geoscience, 10*(4), 266–269. doi: 10.1038/ngeo2916

[17] Hirabayashi[P] M., **Minton D.A.**, Fassett C.I. (2017). An analytical model of crater count equilibrium. *Icarus, 289*, 134. doi: 10.1016/j.icarus.2016.12.032

[16] Johnson B.C., Collins G.S., **Minton D.A.**, Bowling T.J., Simonson B.M., Zuber M.T. (2016). Spherule layers, crater scaling laws, and the population of ancient terrestrial impactors. *Icarus, 271*, 350. doi: 10.1016/j.icarus.2016.02.023

[15] Johnson B.C., Walsh K.J., **Minton D.A.**, Krot A.N., Levison H.F. (2016). Timing of the formation and migration of giant planets as constrained by CB chondrites. *Science Advances, 2*(12), e1601658–e1601658. doi: 10.1126/sciadv.1601658

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[13] Steckloff J.K., Johnson B.C., Bowling T.J., Melosh H.J., **Minton D.A.**, Lisse C.M., Battams K. (2015). Dynamic sublimation pressure and the catastrophic breakup of Comet ISON. *Icarus, 258*, 430–437. doi: 10.1016/j.icarus.2015.06.032

[12] **Minton D.A.**, Richardson J.E., Fassett C.I. (2015). Re-examining the main asteroid belt as the primary source of ancient lunar craters. *Icarus, 247*(0), 172. doi: 10.1016/j.icarus.2014.10.018

[11] Johnson B.C., **Minton D.A.**, Melosh H.J., Zuber M.T. (2015). Impact jetting as the origin of chondrules. *Nature, 517*(7), 339–341. doi: 10.1038/nature14105

[10] **Minton D.A.**, Levison H.F. (2014). Planetesimal-driven migration of terrestrial planet embryos. *Icarus, 232*(0), 118–132. doi: 10.1016/j.icarus.2014.01.001

[9] Fassett C.I., **Minton D.A.** (2013). Impact bombardment of the terrestrial planets and the early history of the Solar System. *Nat. Geosci., 6*(7), 520. doi: 10.1038/ngeo1841

[8] Yue Z., Johnson B.C., **Minton D.A.**, Melosh H.J., Di K., Hu W., Liu Y. (2013). Projectile remnants in central peaks of lunar impact craters. *Nature Geoscience, 6*(6), 435. doi: 10.1038/ngeo1828

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[5] **Minton D.A.**, Malhotra R. (2010). Dynamical erosion of the asteroid belt and implications for large impacts in the inner Solar System. *Icarus, 207*(2), 744–757. doi: 10.1016/j.icarus.2009.12.008

[4] **Minton D.A.**, Malhotra R. (2009). A record of planet migration in the main asteroid belt. *Nature, 457*(7233), 1109–1111. doi: 10.1038/nature07778

[3] Malhotra R., **Minton D.A.** (2008). Prospects for the Habitability of OGLE-2006-BLG-109L. *Astrophysical Journal Letters, 683*(1), L67–L70. doi: 10.1086/591419

[2] **Minton D.A.** (2008). The topographic limits of gravitationally bound, rotating sand piles. *Icarus, 195*(2), 698–704. doi: 10.1016/j.icarus.2008.02.009

[1] **Minton D.A.**, Malhotra R. (2007). Assessing the Massive Young Sun Hypothesis to Solve the Warm Young Earth Puzzle. *Astrophysical Journal, 660*(2), 1700–1706. doi: 10.1086/514331

Funding

2025-Pres. *Understanding how Distal Ejecta Shapes the Lunar Surface Through Observations and Modeling*.
NASA Lunar Data Analysis Program 80NSSC25K7050
PI: David Minton · Total Budget: $873k

2024-Pres. *Origin and Evolution of the Martian Moon System.*
NASA Emerging Worlds Program 80NSSC23K1266
PI: Matija Ćuk · Co-I Minton's Budget: $475k

2023-Pres. *Lunar Structure, Composition and Processes for Exploration (LunaSCOPE)*
NASA Solar System Exploration Research Institute 80NSSC23M0161
PI: Alexander Evans · Co-I Minton's Budget: $36k

2022-Pres. *Using Lunar Topography Data to Model Realistic Crater Morphology*
NASA Lunar Data Analysis Program 80NSSC21K1719
PI: David Minton · Total Budget: $695k

2020-2024 *Investigating a Ring Formation Mechanism for Centaurs and TNOs*
NASA Solar System Workings Program 80NSSC20K0857
PI: Julie Brisset · Co-I Minton's Budget: $296k

2018-2021 *Constraining Lunar Bombardment History by Modeling Age Distributions of Ancient Impact Melts*
NASA Solar System Workings Program 80NSSC19K0032
PI: Oleg Abramov · Co-I Minton's Budget: $294k

2019-2021 *Early Dynamics of the Inner Solar System*
NASA Emerging Worlds Program 80NSSC19K0512
PI: Matija Ćuk · Co-I Minton's Budget: $105k

2017-2018 *Chariot to the Moons of Mars*
NASA Planetary Science Deep Space SmallSat Program NNX17AK30G
PI: David Minton · Total Budget: $411k

2016-2020 *High resolution topography and radar observations of lunar craters and cratered surfaces*
NASA Lunar Data Analysis Program NNX17AI79A
PI: Caleb Fassett · Co-I Minton's Budget: $104k

2016-2020 *Constraining lunar crater saturation by modeling GRAIL porosity*
NASA Lunar Data Analysis Program NNX16AN62G
PI: David Minton · Total Budget: $546k

2016-2019 *Stop hitting yourself: Did most terrestrial impactors originate from terrestrial planets?*
NASA Emerging Worlds Program NNX16AI31G
PI: Alan Jackson · Co-I Minton's Budget: $263k

2016-2016 *Modeling the formation of Phobos and Deimos from a debris disk with impacts*
NASA Earth and Space Sciences Fellowship NNX16AP46H
Graduate Student: Andrew Hesselbrock · Total Budget: $90k

2015-2020 *Modeling regolith evolution during post-basin epoch of lunar history*
NASA Solar System Workings Program NNX15AL41G
PI: David Minton · Total Budget: $566k

2015-2018 *Tidal dissipation during close encounters*
NASA Earth and Space Sciences Fellowship NNX15AQ99H
Graduate Student: Kevin Graves · Total Budget: $105k

2015-2018 *Modeling the evolution of lunar impact glasses*
NASA Earth and Space Sciences Fellowship NNX15AV55H
Graduate Student: Ya Huei Huang · Total Budget: $105k