

**RESEARCH CORPORATION FOR SCIENCE ADVANCEMENT
Cottrell Scholar Award Application**

LIST OF REFERENCES. Annotate the proposal with a list of references from the primary literature. Include all authors and titles. If more space is required, attach a maximum of one additional page. Use Arial 10 or 11 point font.

Research Proposal References

- [1] A.J. Liu, and S.R. Nagel, "The Jamming Transition and the Marginally Jammed Solid" *Annual Review of Condensed Matter Physics*, **1**, 347 (2010)
- [2] Kiwing To, Pik-Yin Lai, and H. K. Pak, "Jamming of Granular Flow in a Two-Dimensional Hopper," *Physical Review Letters*, **86**, 71 (2001)
- [3] Iker Zuriguel, Angel Garcimartín, Diego Maza, Luis A. Pugnaloni, and J. M. Pastor, "Jamming during the discharge of granular matter from a silo," *Physical Review E*, **71**, 051303 (2005)
- [4] C. C. Thomas and D. J. Durian, "Geometry dependence of the clogging transition in tilted hoppers," *Physical Review E*, **87**, 052201 (2013)
- [5] I. Zuriguel, "Invited review: Clogging of granular materials in bottlenecks," *Papers in Physics*, **6**, 060014 (2014)
- [6] I. Zuriguel, R.C. Hidalgo, C. Lozano, A. Janda, P. Gago, J.P. Peralta, L.M. Ferrer, L.A. Pugnaloni, E. Clément, D. Maza, I. Pagonabarrag, and A. Garcimartín, "Clogging transition of many-particle systems flowing through bottlenecks," *Scientific Reports*, **4**, 7324, (2014)
- [7] W.A. Beverloo, H.A. Leniger, and J. van de Velde, "The flow of granular solids through orifices," *Chemical Engineering Science*, **15**, 260 (1961)
- [8] C. Mankoc, A. Janda, R. Arévalo, J. M. Pastor, I. Zuriguel, A. Garcimartín, D. Maza, "The flow rate of granular materials through an orifice," *Granular Matter* **9**, 407 (2007)
- [9] S. M. Rubio-Largo, A. Janda, D. Maza, I. Zuriguel, and R. C. Hidalgo, "Disentangling the Free-Fall Arch Paradox in Silo Discharge," *Physical Review Letters* **114**, 238002 (2015)
- [10] C. C. Thomas and D. J. Durian, "Fraction of Clogging Configurations Sampled by Granular Hopper Flow," *Physical Review Letters*, **114**, 178001 (2015)
- [11] Iker Zuriguel, Angel Garcimartín, Diego Maza, Luis A. Pugnaloni, and J. M. Pastor, "Jamming during the discharge of granular matter from a silo," *Physical Review E*, **71**, 051303 (2005)
- [12] K.N. Nordstrom, E. Verneuil, P.E. Arratia, A. Basu, Z. Zhang, A.G. Yodh, J.P. Gollub, and D.J. Durian, "Microfluidic Rheology of Soft Colloids Above and Below Jamming," *Physical Review Letters*, **105**, 175701 (2010)
- [13] Emily Gardel, E. Seitaridou, Kevin Facto, E. Keene, K. Hattam, Nalini Easwar and Narayanan Menon, "Dynamical Fluctuations in Dense Granular Flows," *Philosophical Transactions of the Royal Society A*, **367**, 5109 (2009)
- [14] David L. Henann and Ken Kamrin, "Continuum Modeling of Secondary Rheology in Dense Granular Materials," *Physical Review Letters* **113**, 178001 (2014)
- [15] Xia Hong, Meghan Kohne, and Eric R. Weeks, "Clogging of soft particles in 2D hoppers," <https://arxiv.org/abs/1512.02500>, (2016)
- [16] E. Thackray and K.N. Nordstrom, "Soft Particle Clogging and Flow in a Hopper," in preparation for *Physical Review Letters*.
- [17] Iker Zuriguel, Alvaro Janda, Angel Garcimartin, Celia Lozano, Roberto Arevalo, and Diego Maza, "Silo Clogging Reduction by the Presence of an Obstacle," *Physical Review Letters* **107**, 278001 (2011)
- [18] A. Garcimartin, J. M. Pastor, L. M. Ferrer, J. J. Ramos, C. Martin-Gomez, and I. Zuriguel, "Flow and clogging of a sheep herd passing through a bottleneck," *Physical Review E*, **91**, 022808 (2015)
- [19] K. Endo, K. Anki Reddy, and H. Katsuragi, "Obstacle-shape effect in a two-dimensional granular silo flow field," <https://arxiv.org/abs/1706.04791v1> , (2017)
- [20] Xiaoyan Sun, Yang Li, Yuqiang Ma, and Zexin Zhang, "Direct observation of melting in a two-dimensional driven granular system," *Scientific Reports*, **6**, 24056 (2016)
- [21] E.T. Owens and K.E. Daniels, "Sound propagation and force chains in granular materials" *Europhysics Letters*, **94**, 54005 (2011)
- [22] M. L. Manning and A.J. Liu, "Vibrational Modes Identify Soft Spots in a Sheared Disordered Packing," *Physical Review Letters*, **107**, 108302 (2011)
- [23] N. Murdoch, B. Rozitis, K. Nordstrom, S. F. Green, P. Michel, T.-L. de Lophem, and W. Losert, "Granular Convection in Microgravity" *Physical Review Letters*, **110**, 018307 (2013)
- [24] Junyao Tang and R. P. Behringer, "Orientation, flow, and clogging in a two-dimensional hopper: Ellipses vs. disks," *Europhysics Letters* **114** (2016)
- [25] Francisco Vivanco, Sergio Rica, and Francisco Melo, "Dynamical arching in a two dimensional granular flow," *Granular Matter* **14** (2012) [note: received January 2009]
- [26] S. M. Rubio-Largo, D. Maza, and R. C. Hidalgo, "Large-scale numerical simulations of polydisperse particle flow in a silo," *Computational Particle Mechanics*, 2196-4386 (2016)

RESEARCH CORPORATION FOR SCIENCE ADVANCEMENT
Cottrell Scholar Award Application

Educational Proposal References

- [1] African American Women in Physics, <http://aawip.com/aawip-members/>, 2017.
- [2] Mount Holyoke College Common Data Set, https://www.mtholyoke.edu/iresearch/data_set, 2016-17.
- [3] American Institute of Physics, <https://www.aip.org/statistics/minorities>
- [4] Department records, Mount Holyoke College Physics Department. Our 3-year average for 2012-2014 is 10, as reported in [6], but since then they have been generally larger. Currently, we have 14 to graduate in 2018, and 17 declared for 2019.
- [5] Patrick Mulvey, John Tyler, Starr Nicholson, and Rachel Ivie, "Size of Undergraduate Physics and Astronomy Programs," AIP Statistical Research Center, February 2017.
- [6] Patrick J. Mulvey and Starr Nicholson, "Physics Bachelors Degrees," AIP Statistical Research Center, November 2015.
- [7] National Center for Education Statistics, <https://nces.ed.gov/>, 2017
- [8] NSF Survey of Earned Doctorates, <https://www.nsf.gov/statistics/srvydoctorates/>, 2016.
- [9] Statistics on URM PhDs 1995-2013, <https://www.aps.org/programs/education/statistics/phdpopulation.cfm>, Source: IPEDS Completion Survey. <https://surveys.nces.ed.gov/ipeds/>
- [10] Dina Verdín and Allison Godwin, "First in the Family: A Comparison of First-Generation and Non-First-Generation Engineering College Students" *Frontiers in Education*, 2015
- [11] Catherine Hill, Christianne Corbett, and Andress St. Rose, "Why so few? Women in Science, Technology, Engineering, and Mathematics," *AAUW*, 2010.
- [12] Mount Holyoke College Admissions Office
- [13] Susan White and Casey Langer Tesfayel, "Female Students in High School Physics", AIP Statistical Research Center, July 2011
- [14] APS Women in Physics Statistics, <https://www.aps.org/programs/women/>, 2017.
- [15] Zahra Hazari, Gerhard Sonnert, Philip M. Sadler, and Marie-Claire Shanahan, "Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice: A gender study," *Journal of Research In Science Teaching* **47**, 2010.
- [16] Moses Rifkin, "Addressing Underrepresentation: Physics Teaching for All," *The Physics Teacher* **54**, 2016
- [17] Gwen Marchand and Gita Taasobshirazi, "Stereotype threat and women's performance in physics," *International Journal of Science Education* **35**, 2013.
- [18] Louise Archer, Julie Moote, Becky Francis, Jennifer DeWitt, and Lucy Yeomans, "The "Exceptional" Physics Girl: A Sociological Analysis of Multimethod Data From Young Women Aged 10–16 to Explore Gendered Patterns of Post-16 Participation," *American Educational Research Journal* **54**, 2017.
- [19] APS Statistics on URMs in Physics, <https://www.aps.org/programs/education/statistics/urm.cfm>, Sources: IPEDS Completion Survey, AIP Statistical Research Center, US Census
- [20] Katemari Rosa and Felicia Moore Mensah, "Educational pathways of Black women physicists: Stories of experiencing and overcoming obstacles in life," *Physical Review Physics Education Research* **12**, 2016.
- [21] NSF Awards 1720810, 1721021, and 1720917, awarded 2017.
- [22] National Academy of Engineering and National Research Council, *STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research*, 2014.
- [23] A 2012 external review of the department by AAPT notes there should be improvements to the website, and while the department has good intentions, has yet to make many substantial changes.