

CURRICULUM VITAE

University of Idaho

NAME: Matthew Hedman

DATE: December 2022

RANK OR TITLE: Associate Professor

DEPARTMENT: Physics

OFFICE LOCATION AND CAMPUS ZIP:

Engineering/Physics Building Room 323
U. Idaho, Moscow, Idaho 83844-0903

OFFICE PHONE: 208-885-6389

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WEB: <http://webpages.uidaho.edu/mhedman/>

DATE OF FIRST EMPLOYMENT AT UI: August 2013

DATE OF TENURE: Tenured 2019

DATE OF PRESENT RANK OR TITLE: August 2019

EDUCATION BEYOND HIGH SCHOOL:

Degrees: Ph.D.	Princeton University	Princeton NJ	2002, Physics
B.A.	Grinnell College	Grinnell IA	1996, Physics and Anthropology

Certificates and Licenses: N/A

EXPERIENCE:

Teaching, Extension and Research Appointments:

2019-Present Associate Professor at U. Idaho, Moscow ID
2013-2019 Assistant Professor at U. Idaho, Moscow ID
2015-Present Co-Investigator on the Europa Clipper Mission,
2011-2018 Participating Scientist on the Cassini Mission,
2011-2013 Senior Research Associate at Cornell University, Ithaca NY
2004-2011 Research Associate at Cornell University, Ithaca, NY
2002-2004 Research Fellow at the Kavli Institute for Cosmological Physics, Chicago IL
1996-2002 Graduate Research Assistant at Princeton University, Princeton NJ

Academic Administrative Appointments: N/A

Non-Academic Employment including Armed Forces: N/A

Consulting: N/A

(List company/institute name, title, brief description, date)

TEACHING ACCOMPLISHMENTS: (Academic and Extension teaching)**Areas of Specialization:** Physics and Astronomy**Courses Taught:**

University of Idaho:

2025 Spring PHYS 542 Electromagnetic Theory II
 2025 Fall PHYS 541 Electromagnetic Theory I
 2025 Fall PHYS200 Physics Seminar
 2024 Spring PHYS 112. General Physics II
 2023 Fall PHYS 103 General Astronomy
 2023 Fall PHYS200 Physics Seminar
 2022 Spring PHYS 542 Electromagnetic Theory II
 2022 Fall PHYS 541 Electromagnetic Theory I
 2022 Fall PHYS200 Physics Seminar
 2021 Spring PHYS 112 General Physics II
 2021 Fall PHYS103 General Astronomy
 2021 Fall PHYS200 Physics Seminar
 2021 Spring PHYS542 Electromagnetic Theory II
 2020 Fall PHYS 541 Electromagnetic Theory I
 2020 Spring PHYS 112 General Physics II
 2019 Fall PHYS 103 General Astronomy
 2019 Spring PHYS 342 Electromagnetic Fields II
 2019 Spring PHYS 542 Electromagnetic Theory II
 2018 Fall. PHYS 541 Electromagnetic Theory I
 2018 Spring PHYS 211 Engineering Physics I
 2018 Spring PHYS499 Relativistic Physics
 2017 Fall PHYS 103 General Astronomy
 2017 Spring PHYS 542 Electromagnetic Theory II
 2016 Fall PHYS 541 Electromagnetic Theory I
 2016 Spring PHYS 541 Electromagnetic Theory II
 2015 Fall PHYS 103 General Astronomy
 2015 Spring PHYS 541 Electromagnetic Theory I
 2014 Fall PHYS 542 Electromagnetic Theory II
 2013 Spring PHYS 541 Electromagnetic Theory I

Cornell University

2012 Fall ASTR 1102 Our Solar System (with S. Squyres)

Students Advised:

Undergraduate Students: (advised to completion of degree, number per year)

Responsible for advising 6-10 undergraduates/year

Advised to Completion:

S. Callos (2022),
 M. Dillon (2021),
 M. Young (2020),
 B. Bridges (2019),
 C. Beard (2019),
 B. Carter (2017),
 C. Chivers (2017),
 N. LeBaron (2016),
 A. Burke (2016),
 J. Brown (2015)

Undergraduate students participating in research projects:

U. Idaho:

A. Zhang (2024)
 S. Callos (2021-2022)
 M. Dillon (2019-2021),
 A. Davies (2018-2019),
 M. Young (2018-2019),
 B. Bridges (2017-2019),
 A. Dahal (2017-2018),
 B. Carter (2015-2017),
 S. Grazer (2015-2016),
 M. Powell (2014),
 R. Iler (2013-2014)

Cornell University:

Z. Pontratolfti, R. Salmon (REU 2013),
 C. Gosmeyer (REU 2012),
 J. A. Burt (2010-2012)
 M. Rehnberg (REU 2010),
 W. Freeman (REU 2009)

Graduate Students:

Current Graduate Students

W. Easterwood (2023-Present)
 V. Afigbo (2021-Present)

Graduate Students advised to completion of degree-major:

H. Sharma (2018-2023, Ph.D. currently Fraud Strategy Analyst at Goldman-Sachs)
 K. Denny (2021-2023, M.S. currently Minnesota department of Human Services)
 J. A'Hearn (2016-2022, Ph.D. currently data scientist at PACCAR)
 R. Chancia (2015-2019, Ph.D. currently post-doc at RIT)

Served on graduate thesis committee:

E. Atang Ph.D. (U. Idaho) 2023
 A. Ross-Browning M.S. (U. Idaho) 2023
 W. Miller M.S. (U. Idaho) 2022
 M. Heslar M.S. (U. Idaho) 2022
 S. Kreyche Ph.D. (U. Idaho) 2022
 D. Coulter M.S. (U. Idaho) 2022
 R. Jerousek Ph.D. (U. Central Florida) 2017
 S. Mackenzie Ph.D. (U. Idaho) 2017
 Ah. Alanazi M.S. (U. Idaho) 2017
 A. Alsiari M.S. (U. Idaho) 2017
 Aq. Alanazi M.S. (U. Idaho) 2017
 P. Herd M.S. (U Idaho) 2015
 W. T. Hatchett, M.S. (U. Idaho) 2015
 B-A. Fouetio Kenge, Ph.D. (U. Idaho) 2014
 C. Cook, M.S (U. Idaho) 2013
 M. El Moutamid (Paris) 2013
 D. Jontof-Hutter, Ph.D. (U. Maryland) 2012

Postdoctoral Scholars supported:

D. Dhingra (2014-2017, Now at IIT Kanpur)

Materials Developed: (non-scholarship activity)

Courses Developed: PHYS 541 Electromagnetic Theory I
PHYS 542 Electromagnetic Theory II

Non-credit Classes, Workshops, Seminars, Invited Lectures, etc.:

Spring 2014 U. Idaho HIST404 History of Modern Science: Lecture on the Cassini Mission
Spring 2014 U. Idaho PHYS484/584 Astrophysics: Lecture on Planetary Rings
Fall 2014 U. Idaho PHYS103 General Astronomy: Lecture on Star Lifetimes
Fall 2014 U. Idaho ECE591 Research Colloquium: Lecture on Dust Dynamics
Spring 2015 PNACP Workshop: Lecture on Cassini Mission
Fall 2015 CITA Seminar on Ring Seismology
Fall 2016 U. Idaho Renfrew Colloquium on the Cassini Mission
Spring 2020 Boise First Friday Seminar on Saturn's Rings
Fall 2021 APL Ice Giants Seminar on Neptune's Rings and Moons
Spring 2023 U. Idaho Renfrew Colloquium on JWST
Spring 2023 U. Idaho College of Science Seminar on JWST
Spring 2024 Caltech Planetary Science Seminar on Uranian rings

Honors and Awards:

SCHOLARSHIP ACCOMPLISHMENTS: (Including scholarship of teaching and learning, artistic creativity, discovery, and application/integration)

Publications, Exhibitions, Performances, Recitals:**---Published since arriving at U. Idaho****Refereed/Adjudicated (6)**

[6] **M.M. Hedman**, 2023. A planetary ring in a surprising place. *Nature* 614:232-233

[5] J. F. Carbary, **M.M. Hedman**, T.W. Hill, X. Jia, W. Kurth, L. Lamy, G. Provan, 2019. The mysterious periodicities of Saturn: Clues to the rotation rate of the planet for *Saturn in the 21st Century* by K. Baines, M. Flasar, N. Krupp and T. Stallard (eds.), Cambridge

[4] F. Postberg, A.J. Coates, R.N. Clark, C. Dalle Ore, C.J. Hansen, **M.M. Hedman**, F. Scipioni, J.H. Waite Jr., 2018. Plume and Surface Composition of Enceladus for *Enceladus and the Icy Moons of Saturn* by P.M. Schenk, R.N. Clark, C.J.A. Howett, A.J. Verbiscer, J.H. Waite Jr (eds), University of Arizona.

[3] D.B. Goldstein, **M.M. Hedman**, M. Manga, M. Perry, J. Schmidt, J. Spitale, B. Teolis, 2018. Plume Dynamics for *Enceladus and the Icy Moons of Saturn* by P.M. Schenk, R.N. Clark, C.J.A. Howett, A.J. Verbiscer, J.H. Waite Jr (eds), University of Arizona.

[2] **M.M. Hedman**, 2018, An Introduction to Planetary Ring Dynamics for *Planetary Rings Systems* by M.S. Tiscareno and C. Murray (eds.), Cambridge

[1] **M.M. Hedman**, S. Hsu, F. Postberg, S. Renner, D. Hamilton and C. Mitchell, 2018, Dusty Rings for *Planetary Rings Systems* by M.S. Tiscareno and C. Murray (eds.), Cambridge

Peer Reviewed/Evaluated (94)

[94] D.L. Blaney, K. Hibbitts, S. Diniega, A.G. Davies, R.N. Clark, R.O. Green, **M.M. Hedman**, Y. Langevin, J. Lunine, T.B. McCord, S. Murchie, C. Paranicas, F. Seelos, J.M. Soderblum, M.L. Cable, R. Eckert, D.R. Thompson, S.K. Trumbo, C. Bruce, S.R. Lundeen, H.A. Bender, M.C. Helmlinger, L.B. Moore, P. Mouroulis, Z. Small, H. Tang, B. Van Gorp, P.W. Sullivan, S. Zareh, J.I. Rodriguez, I. McKinley, D.V. Hahn, M. Bowers, R. Hourani, B.A. Bryce, D. Nuding, Z. Bailey, A. Rettura, E.D. Zarate. 2024 The Mapping Imaging Spectrometer for Europa (MISE). *Space Science Reviews* 220:80. *Contributed text and figures regarding potential plume observations with MISE.*

[93] M. Ciarniello, G. Filacchione, P.D. Nicholson, **M.M. Hedman**, S. Charnoz, J.N. Cuzzi, M. El Moutamid, A.R. Hendrix, N. Rambaux, K.E. Miller O. Mousis, K. Baillie, P.R. Estrada, J.H. Waite (2024) The Origin and Composition of Saturn's Ring Moons. *Space Science Reviews* 220:72. *Contributed figures and text regarding trends in spectral properties across the small moons.*

[92] K.E. Miller, G. Filacchione, J.N. Cuzzi, P.D. Nicholson, **M.M. Hedman**, K. Baillie, R.E. Johnson, W.-L. Tseng, P.R. Estrada, J.H. Waite, M. Ciarniello, C. Ferrari, Z. Zhang, A. Hendrix, J.I. Moses, H.-W. Hsu. (2024) The Composition of Saturn's Rings. *Space Science Reviews* 220:72. *Contributed figures and text on the composition of the D ring and reviewed overall text.*

[91] R.J. Cartwright, B.J. Holler, W.M. Grundy, S.C. Tegler, M. Neveu, U. Raut, C.R. Glein, T.A. Nordheim, J.P. Emery, J.C. Castillo-Rogez, E. Quirico, S. Protopapa, C.B. Beddingfield, **M.M. Hedman**, K. de Kleer, R.A. DeColibus, A.N. Morgan, R. Wochner, K.P. Hand, G.L. Villanueva, S. Faggi, N. Pinilla-Alonso, D.E. Trilling, M.M. Mueller. 2024. JWST Reveals CO Ice, Concentrated CO₂ Deposits, and Evidence for Carbonates Potentially Sourced from Ariel's Interior. *ApJL* 970:L29. *Contributed some thoughts on the interpretation of spectral features.*

[90] T.M. Becker, M.Y. Zolotov, M.S. Gudipati, J.M. Soderblom, M.A. McGrath, B.L. Henderson, **M.M. Hedman**, M. Choukroun, R.N. Clark, C. Chivers, N.S. Wolfenbarger, C.R. Glein, J.C. Castillo-Rogez, O. Mousis, K.M. Scanlan, S. Diniega, F.P. Seelos, W. Goode, F. Postberg, C. Grima, H.-W. Hsu, L. Roth, S.K. Trumbo, K.E. Miller, K. Chan, C. Paranicas, S.M. Brooks, K.M. Soderlund, W.B. McKinnon, C.A. Hibbitts, H.T. Smith, P.M. Molyneux, G.R. Gladstone, M.L. Cable, K.P. Hand, S.D. Vance, S.M. Howell, L.C. Quick, I. Mishra, A.M. Rymer, C. Briois, D.L. Blaney, U. Raut, J.H. Waite, K.D. Retherford, E. Shock, P. Withers, J.H. Westlake, I. Jun, K.E. Mandt, B.J. Buratti, H. Korth, R.T. Pappalardo, the Europa Clipper Working Group. 2024. Exploring the Composition of Europa with the Upcoming Europa Clipper Mission. *SSR* 220:49. *Contributed text on Clipper plume observations.*

[89] K. Denny, **M.M. Hedman**, D. Bockelee-Morvan, G. Filacchione, F. Capaccioni. 2024. Constraining Time Variations in Enceladus's Water-vapor Plume with Near-Infrared Spectra from Cassini's Visual and Infrared Mapping Spectrometer *PSJ* 5:144. *Supervisor for paper led by Graduate student, reviewed paper and supported analysis.*

[88] **M.M. Hedman**, M.S. Tiscareno, M.R. Showalter, L.N. Fletcher, O.R.T. King, J. Harkett, M.T. Roman, N. Rowe-Gurney, H.B. Hammel, S.N. Milam, M. El Moutamid, R.J. Cartwright, I. de Pater, E.M. Molter. 2024 Water-Ice Dominated Spectra of Saturn's Rings and Small Moons. *JGR Planets* 129:e2023JE008236. *Led the data analysis and the writing of this paper.*

[87] I.J. Daubar, A.G. Hayes, G.C. Collins, K.L. Craft, J.A. Rathbun, J.R. Spencer, D.Y. Wyrick, M.T. Bland, A.G. Davies, C.M. Ernst, S.M. Howell, E.J. Leonard, A.S. McEwen, J.M. Moore, C.B. Phillips, L.M. Prockter, L.C. Quick, J.E.C. Scully, J.M. Soderblom, S.M. Brooks, M. Cable, M.E. Cameron, K. Chan, C.J. Chivers, M. Choukroun, C.J. Cochrane, S. Diniega, A.J. Dombard, C.M. Elderm, C. Gerekos, C. Glein, T.K. Greathouse, C. Grima, M.S. Gudipati, K.P. Hand, C. Hansen, P. Hayne, **M.M. Hedman**, K. Hughson, X. Jia, J. Lawrence, H.M. Meyer, J. Miller, R. Parekh, G.W. Patterson, D.M. Persaud, S. Piqueux, K.D. Retherford, K.M. Scanlan, R. Schenk, B. J. Buratti, H. Korth, D. Senske, R. Pappalardo. 2024. Planned Geological Investigations of the Europa Clipper Mission. *Space Science Reviews* 220:18. *Contributed some text on Clipper plume observations.*

[86] R.G. French, **M.M. Hedman**, P.D. Nicholson, P.-Y. Longaretti, C.A. McGhee-French, 2024. The Uranus system from occultation observations (1977-2006): Rings, pole direction, gravity field and masses of Cressida, Cordelia and Ophelia. *Icarus* 411:115957. *Contributed to the interpretation of these results (particular for the masses of the satellites) and wrote some of the text in this paper.*

[85] L.B. Fletcher, O.R.T. King, J. Harkett, H.B. Hammel, M.T. Roman, H. Melin, **M.M. Hedman**, J.I. Moses, S. Guerlet, S.N. Milam, M.S. Tiscareno. 2023. Saturn's atmosphere in northern summer revealed by JWST/MIRI *JGR Planets* 128:e2023JE007924. *Helped with some aspect of the data processing based on experience with other observations.*

[84] R.G. French, P.D. Nicholson, C.A. McGhee-French, P.-Y. Longaretti, **M.M. Hedman**, J. Colwell, E.A. Marouf, N. Rappaport, S. Flury, J. Fong, R. Maguire, G. Steranka. 2023. The complex shape of the outer edge of Saturn's B ring, as observed in Cassini occultation data. *Icarus* 405:115678. *Contributed to the interpretation of these variations and to some of the text in the paper.*

[83] J.H. Roberts, W.B. McKinnon, C.M. Elder, G. Tobie, J.B. Biersteker, D. Young, R.S. Park, G. Steinbrugge, F. Nimmo, S.M. Howell, J.C. Castillo-Rogez, M.L. Cable, J.N. Abrahams, M.T. Blans, C. Chivers, C.J. Cochrane, A.J. Dombard, C. Ernst, A. Genova, C. Gerekos, C. Glein, C.D. Harris, H. Hay, P.O. Hayne, **M.M. Hedman**, H. Hussman, X. Jia, K. Khurana, W.S. Kiefer, R. Kirk, M. Kivelson, J. Lawrence, E.J. Leonard, J.I. Lunine, E. Mazaico, T.B. McCord, A. McEwen, C. Paty, L.C. Quick, C.A. Raymond, K.D. Retherford, L. roth, A. Rymer, J. Saur, K. Scanlan, D.M. Schroeder, D.A. Senske, W. Shao, K. Soderlund, E. Spiers, M.J. Styczinski, P. Tortora, S.D. Vance, M.N. Villarreal, B.P. Weiss, J.H. Westlake, P. Withers, N. Woldenbarger, B. Buratti, H. Korth, R.T. Pappalardo. 2023. The Interior Thematic Working Group: Exploring the Interior of Europa with Europa Clipper. *Space Science Reviews* 219:46. *Contributed some text on Clipper plume observations.*

[82] I. de Pater, E. Lellouch, D.F. Strobel, K. de Kleer, T. Fouchet, M.H. Wong, B.J. Holler, J. Stansberry, P.M. Fry, M.E. Brown, D. Bockelee-Morvan, S.K. Trumbo, L.N. Fletcher, **M.M. Hedman**, E.M. Molter, M. Showalter, M.S. Tiscareno, S. Cazaux, R. Hueso, S. Luszcz-Cook, H. Melin, C. Moeckel, A. Mura, G. Orton, L. Roth, J. Saur, F. Tosi. 2023. An energetic eruption with associated SO 1.707 micron emissions at Io's Kanehekili fluctus and a brightening event at Loki patera observed by JWST. *JGR Planets* 128:8 e2023JE007872. *Provided some help with processing JWST NIRSpec data based on other observations.*

[81] H. Sharma, **M.M. Hedman**, S. Vahidinia. 2023, New insights into variations in Enceladus plume particle launch velocities from Cassini-VIMS spectral data. *PSJ* 4:106. *Supervisor for paper led by Graduate student, reviewed paper and supported analysis.*

[80] **M.M. Hedman**, I. Regan, T. Becker, S.M. Brooks, I. de Pater, M. Showalter. 2023. Examining Uranus' Zeta ring in Voyager 2 wide-angle-camera Observations. Quantifying the ring's Structure in 1986 and its Modifications prior to the year 2007. *PSJ* 4:104. *Led the data analysis and the paper writing.*

[79] G.L. Villanueva, H.B. Hammel, S.N. Milam, V. Kofman, S. Faggi, C.R. Glein, R. Cartwright, L. roth, K.P. Hand, L. Paganini, J. Spencer, J. Stansberry, B. Holler, N. Rowe-Gurney, S. Protopapa, G. Strazzulla, G. Luzzi, G. Cruz-Mermy, M. El Moutamid, **M.M. Hedman**, K. Denny 2023. *Nature Astronomy* 7:1056-1062. *Along with Graduate Student K. Denny we helped validate the detection of the water vapor in the Enceladus plume using comparisons with Cassini-VIMS data.*

[78] A.A. Simon, **M.M. Hedman**, P.D. Nicholson, M.R. Showalter, S. Callos. 2023. Hubble detects start of a new Saturn ring spoke season. *GRL* 50:e2022GL101904. *Along with UG student S. Callos, contributed to writing by helping to put these Hubble observations in context with Cassini data we are currently analyzing.*

[77] P.D. Nicholson, R.G. French, C.A. McGhee-French, P.-Y. Longaretti, **M.M. Hedman**, M. El Moutamid, J. Colwell, E.A. Marouf, N. Rappaport, S. Flury, J. Fong, R. Maguire, G. Steranka. 2023. The seven-lobed shape of the outer edge of Saturn's A ring. *Icarus* 390:115287. *Contributed to*

discussions regarding the variations in the A-ring's shape their potential implications.

[76] J.A. A'Hearn, **M.M. Hedman**, C.R. Mankovich, H. Aramona, M. S. Marley. 2022. Ring Seismology of the Ice Giants Uranus and Neptune *PSJ* 3:194. *Supervisor for paper led by graduate student, reviewed paper and supported analysis.*

[75] C. Paranicas, E. Roussos, K. Dialynas, P. Kollmann, N. Krupp, **M.M. Hedman**, R.C. Allen, G. Hospodarsky. 2022. The Electric Field outward of Saturn's Main Rings *ApJ* 934:11. *Just contributed some general thoughts on the topic and some suggestions on a draft of the paper.*

[74] **M.M. Hedman**, P.D. Nicholson, M. El Moutamid, S. Smotherman. Reading the Recent History of Saturn's Gravity Field in its Rings. *PSJ* 3:61. *Performed analysis, developed theory and wrote most of this paper, based in part on work done by former student S. Smotherman.*

[73] I.J. Cohen, C. Beddingfield, R. Chancia, G. DiBraccio, **M.M. Hedman**, S. MaKenzie, B. Mauk, K.M. Sayanagi, K.M. Soderlund, E. Turtle, C. Ahrens, C.S. Arridge, S.M. Brooks, E. Bunce, S. Charnoz, A. Coustenism R.A. Dillman, S. Dutta, L.N. Fletcher, R. Harbison, R. Helled, R. Holme, L. Jozwiak, Y. Kasaba, P. Kollmann, S. Luzcz-Cook, K. Mandt, O. Moussism A. Mura, G. Murakami, M. Parisim A. Rymer, S. Stanley, K. Stephan, R.J. Vervack, M.H. Wong, P. Wurz 2022 The Case for a New Frontiers-Class Uranus Orbiter: System Science at an Underexplored and Unique World with a Mid-scale Mission. *PSJ* 3:58. *Along with former student R. Chancia, wrote material related to the rings science goals of this mission concept.*

[72] M. Parisi, M. Vaquero, **M.M. Hedman**, M.S. Tiscareno. 2022. Gravity Investigation of Saturn's Inner System with the Innovative Skimmer Concept. *PSJ* 3:19. *Contributed to discussion of how the gravitational constraints near the F ring could clarify population of moonlets in this ring. Reviewed entire paper.*

[71] H. Sharma, **M.M. Hedman**, D.H. Wooden, A. Colaprete. A.M. Cook. 2021. Constraining Low-Altitude Lunar Dust using the LADEE-UVS Data *JGR-Planets* 126:e2021JE006935 *Supervisor for paper led by graduate student, reviewed paper and supported analysis.*

[70] R.G. French, B. Bridges, **M.M. Hedman**, P.D. Nicholson, C. Mankovich, C.A. McGhee-French. 2021. Kronoseismology V: A panoply of waves in Saturn's C ring driven by high-order planetary oscillations. *Icarus* 370:114660. *Work inspired by discoveries made by former student B. Bridges. Confirmed findings and analysis by first author, reviewed paper.*

[69] A.M. Rymer, K.D. Runyon, B. Clyde, J.I. Núñez, R. Nikoukar, K.M. Soderlund, K. Sayanagi, M. Hofstddter, L.C. Quick, S.Alan Stern, T. Becker, **M.M. Hedman**, I. Cohen, F. Crary, J.J. Fortney, J. Vertesi, C. Hansen, I. de Pater, C. Paty, T. Spilker, T. Stallard, G.B. Hospodarsky, H. Todd Smith, H. Wakeford, S.E. Moran, A. Annex, P. Schenk, M. Ozimek, J. Arrieta, R.L. McNutt, Jr., A. Masters, A.A. Simon, S. Ensor, C.T. Aplan, J. Bruzzi, D.A. Pathoff, C. Scott, C. Campo, C. Keupiarz, C.J. Cochrane, C. Gantz, D. Rodriguez, D. Gallagher, D. Hurley, D. Crowley, E. Abel, E. Provornikova, E.P. Turtle, G. Clark, J. Wilkes, J. Hunt, J.H. Roberts, J. Rehm, K. Murray, L. Wolfrath, L.N. Fletcher, L. Spilker, E.S. Martin, M. Parisi, M. Norkus, N. Izenberg, R. Stough, R.J. Vervack, Jr., K. Mandt, K.B. Stevenson, S. Kijewski, W. Cheng, J.D. Feldman, G. Allen, D. Prabhu, S. Dutta, C. Young, J. Williams. 2021. Neptune Odyssey: A Flagship Conceor for the Exploration of the Neptune-Trion System. *PSJ* 2:184. *Participated in the study that led to this mission concept, providing expertise on rings and small moons. Helped write Section 4.*

[68] **M.M. Hedman**, M. Young. 2021. Evidence that a Novel Type of Satellite Wake Might Exist in Saturn's E Ring. *PSJ* 2:127. *Performed analysis and wrote paper based on discoveries made by former student M. Young*

[67] **M.M. Hedman**, R.O. Chancia. 2021. Uranus' Hidden Narrow Rings *PSJ* 2:107. *Performed analysis and wrote paper based on discoveries made by former student R.O. Chancia*

- [66] J.A. A'Hearn, **M.M. Hedman**, D.P. Hamilton. 2021. Modeling Saturn's D68 Clumps as a Co-orbital Satellite System *PSJ* 2:74. *Supervisor for paper led by graduate student, , reviewed paper and supported analysis*
- [65] **M.M. Hedman**, B. Bridges. 2020. Changes in a dusty ringlet in the Cassini Division after 2010. *PSJ* 1:43.
- [64] L.C. Quick, A. Roberge, A. Barr-Milnar, **M.M. Hedman**. 2020. Forecasting rates of volcanic activity on terrestrial exoplanets and implications for cryovolcanic activity on extrasolar ocean worlds. *PASP* 132:1014.
- [63] R.G. Jrousek, J.E. Colwell, **M.M. Hedman**, R.G. French, E.A. Marouf, L.W. Esposito, P.D. Nicholson. 2020. Saturn's C ring and Cassini Division: Particle sizes from Cassini UVIS, VIMS and RSS occultations. *Icarus* 344:113365.
- [62] P.D. Nicholson, T. Ansty, **M.M. Hedman**, D. Creel, J. Ahlers, R.A. Harbison, R.H. Brown, R.N. Clark, K.H. Baines, B.J. Buratti, C. Sotin, S. V. Badman. 2020. Occultation observations of Saturn's rings with Cassini VIMS *Icarus* 344:113356.
- [61] **M.M. Hedman**, P. Helfenstein, R.O. Chancia, P. Thomas, E. Roussos, C. Paranicas, A.J. Verbiscer. 2020. Photometric analyses of Saturn's small moons: Aegaeon, Methone and Pallene are dark; Helene and Calypso are bright. *AJ* 159:129.
- [60] S.M. Kreyche, J.W. Barnes, B.L. Quarles, J.J. Lissauer, J.E. Chambers, **M.M. Hedman** 2020. Retrograde-rotating exoplanets experience obliquity excitations in an eccentricity-enabled resonance. *PSJ* 1:8.
- [59] L.C. Quick, **M.M. Hedman**. 2020. Characterizing deposits emplaced by cryovolcanic plumes on Europa. *Icarus* 343:113667
- [58] R.G. French, C.A. McGhee-French, P.D. Nicholson, **M.M. Hedman**, N.J. Rappaport, E.A. Marouf, P.-Y. Longaretti, J. Hahn. 2020. Unusual one-armed density waves in the Cassini Division of Saturn's rings. *Icarus* 339:113600
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The forces that sculpt Saturn's rings. August 2010 Cassini CHARM telecom

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[75] **M.M Hedman**, M.S. Tiscareno, I. de Pater, H.B. Hammel, R. Cartwright, R.G. French, P.D. Nicholson, M.T. Roman, M. El Moutamid. New insights into the spectra and structure of the Uranian rings from JWST. 2024 meeting of the Division for Planetary Sciences.

[74] **M.M. Hedman**, T.M. Becker, S.M. Brooks, R.J. Cartwright. I. de Pater, M. El Moutamid, R.G. French, S. Hsu, R.G. Jerousek, P.D. Nicholson, D. Souami, M.S. Tiscareno. Science Drivers for Observations of the Uranian Rings and Inner Moons. 2024 GSFC Workshop on the Uranus Flagship Mission.

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[69] **M.M. Hedman**, R. Cartwright, M. Cuk, R.S. French, L. Spilker, S.M. Brooks. How Uranus' small

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[68] **M.M. Hedman**, M.S. Marley, C.R. Mankovich, J.W. Dewberry, *R.O. Chancia*, P.D. Nicholson. Using the Uranian ring system to probe the interior of an Ice Giant. 2023 Uranus Flagship mission meeting.

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[66] **M.M. Hedman**, R.G. French, P.D. Nicholson, M.R. Showalter. Resonantly-generated brightness variations in the Uranian rings seen in Voyager 2 images. 2023 Meeting of the Division for Dynamical Astronomy.

[65] **M.M. Hedman**, The Uranian Ring-Moon System. 2022 Fall Meeting of the American Geophysical Union (invited).

[64] *H. Sharma*, **M.M. Hedman**, S. Vahidinia. New Insights into Enceladus Plume Particle Launch Velocities. 2022 Fall Meeting of the American Geophysical Union.

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[62] *S. Callos*, **M.M. Hedman**, D. Hamilton. A Comprehensive Survey of Spokes in Cassini Images of Saturn's B ring. 2022 meeting of the Division for Planetary Sciences.

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[60] *K. Denny*, **M.M. Hedman**, D. Bockelee-Morvan, G. Filacchione, F. Capaccioni. Possible Water Vapor Emission Feature in Near-Infrared Enceladus Plume Spectra from Cassini-VIMS. 2022 meeting of the Division for Planetary Sciences.

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[52] *M. Dillon*, **M.M. Hedman**. Evidence of a highly inclined dusty ringlet in Saturn's C ring. 2021 meeting of the Division for Planetary Sciences (virtual)

[51] *J.A. A'Hearn*, **M.M. Hedman**, C. Mankovich, M. Marley. Ice Giant Ring Seismology. 2021 European

Planetary Science Conference (virtual)

[50] **M.M. Hedman**, M. El Moutamid, P. Nicholson, M. Tiscareno. Recording history in planetary rings with density waves. 2021 meeting of the Division for Dynamical Astronomy (virtual)

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[47] **M.M. Hedman**, M. El Moutamid, P.D. Nicholson. Reading Saturn's recent history in its Rings. 2020 meeting of the Division for Planetary Science (virtual)

[46] **M.M. Hedman**, *B. Bridges*. Sudden changes in the structure and orbit of one of Saturn's dusty rings. 2020 meeting of the Division for Dynamical Astronomy (virtual)

[45] *M. Young*, **M.M. Hedman**. Evidence for a new type of moonlet wake near Enceladus. 2020 meeting of the Division for Dynamical Astronomy (virtual)

[44] *J.A. A'Hearn*, **M.M. Hedman**, D.P. Hamilton. Periodic orbits for small N co-orbital satellite systems. 2020 meeting of Division for Dynamical Astronomy (virtual)

[43] **M.M. Hedman**, *R.O. Chancia*, G. Provan, S. Cowley, S. Ye. Using dusty rings to trace asymmetries in Saturn's magnetosphere. 2019 meeting of the American Geophysical Union, San Francisco, CA.

[42] *H. Sharma*, **M.M. Hedman**, D.H. Wooden, A. Colaprete, A. Cook. Constraining low-altitude lunar dust from the LADEE/UVS data. 2019 European Planetary Science Conference/Division of Planetary Science, Geneva, Switzerland.

[41] *J. A'Hearn*, **M.M. Hedman**, D.P. Hamilton. Are moonlets hidden among the clumps in Saturn's innermost ringlet? 2019 European Planetary Science Conference/Division of Planetary Science, Geneva, Switzerland.

[40] **M.M. Hedman**, P. Helfenstein, *R.O. Chancia*, E. Roussos, C. Paranicas, A. Verbiscer. Some of Saturn's Small Satellites have Surprisingly Stygian Surfaces: Evidence for Proton-Induced Darkening in the Saturn System. 2019 European Planetary Science Conference/Division of Planetary Science, Geneva, Switzerland.

[39] *R. Chancia*, **M.M. Hedman**. Re-examining the rings of Uranus in the Voyager 2 Images. 2019 meeting of the Division for Dynamical Astronomy, Boulder, CO.

[38] *J. A'Hearn*, **M.M. Hedman**, D.P. Hamilton. Are moonlets hidden among the clumps in Saturn's innermost ringlet? 2019 meeting of the Division for Dynamical Astronomy, Boulder CO.

[37] **M.M. Hedman**. Constraining the Surface Ages of Icy Objects in the Outer Solar System with Cosmogenic Lithium, Beryllium and Boron. 2019 Lunar and Planetary Science Conference, Houston, TX.

[36] **M.M. Hedman**. What has been happening to Saturn's innermost ringlet. 2018 meeting of the Division for Planetary Science, Knoxville, TN.

[35] *J. A'Hearn*, **M.M. Hedman**. Dynamics of multiple bodies in a corotation resonance. 2018 meeting of the Division for Planetary Science, Knoxville, TN.

[34] *B. Bridges*, **M.M. Hedman**. An evolving dusty ringlet in Saturn's rings. 2018 meeting of the Division for Planetary Science, Knoxville, TN.

[33] *R. Chancia*, **M.M. Hedman**. Post-Cassini update on the D-ring's resonant structures. 2018 meeting of

the Division for Planetary Science, Knoxville, TN.

[32] *J. A'Hearn, M.M. Hedman.* Dynamics of multiple bodies in a corotation resonance. 2018 meeting of the Division for Dynamical Astronomy, San Jose, CA.

[31] *R. Chancia, M.M. Hedman.* The structure of Jupiter's main ring from New Horizons. 2018 meeting of the Division for Dynamical Astronomy, San Jose, CA.

[30] *M.M. Hedman, P.D. Nicholson.* Axisymmetric waves in Saturn's rings. 2018 meeting of the Division for Dynamical Astronomy, San Jose, CA.

[29] *R.O. Chancia, M.M. Hedman, S. Ye, W.S. Kurth.* New patterns in the dust off the edge of Saturn's main rings. 2017 meeting of the Division for Planetary Science, Provo, UT.

[28] *J. A'Hearn, M.M. Hedman,* Using four-body problems to explore Aegaeon's orbital evolution.. 2017 meeting of the Division for Planetary Science, Provo, UT.

[27] *M.M. Hedman, J.A. Burns, P.D. Nicholson, M.S. Tiscareno, M.W. Evans, E. Baker.* One last look from the dark side: Cassini's final views of Saturn's rings from the planet's shadow. 2017 meeting of the Division for Planetary Science, Provo, UT.

[26] *R.O. Chancia, M.M. Hedman, R.G. French.* Weighing Uranus' moon Cressida with the eta ring.. 2017 meeting of the Division for Dynamical Astronomy, London, UK

[25] *M.M. Hedman, M. el Moutamid, P.D. Nicholson.* Drifting waves in Saturn's C ring, evidence for changes in Saturn's interior. 2017 meeting of the Division for Dynamical Astronomy, London, UK

[24] *M.M. Hedman, D. Wooden, A. Colaprete, A. Cook.* Possible evidence for low-altitude dust in LADEE-UVS data. 2017 workshop on the Dust, Atmosphere and Plasma environment of the Moon and small bodies.

[23] *D. Dhingra, M. Hedman, R.N. Clark, F. Postberg.* Spatial variability in Enceladus' plume material across tiger stripes: Observed correlations and implications. 2016 meeting of the American Geophysical Union, San Francisco, CA.

[22] *D. Dhingra, M. Hedman, R.N. Clark.* Spatial variability in Enceladus' plume material: Convergence of evidence or coincidence? 2016 meeting of the Division for Planetary Sciences, Pasadena, CA.

[21] *R.O. Chancia, M.M. Hedman, B. Carter.* Structures in the D ring and Roche Division tied to asymmetries in Saturn's magnetosphere. 2016 meeting of the Division for Planetary Sciences, Pasadena, CA.

[20] *M.M. Hedman, P.D. Nicholson.* Estimating the mass of Saturn's B ring. 2016 meeting of the Division for Planetary Sciences, Pasadena, CA.

[19] *R.O. Chancia, M.M. Hedman.* Persistent pattern speeds in Saturn's D ring. 2016 meeting of the Division for Dynamical Astronomy, Nashville, TN.

[18] *B. Carter, M.M. Hedman.* A dusty ringlet with connections to both Prometheus and the F ring. 2016 meeting of the Division for Dynamical Astronomy, Nashville, TN.

[17] *M.M. Hedman, P.D. Nicholson, M. El Moutamid, S. Graven.* An array of asymmetries in Saturn's structure revealed by its rings. 2016 meeting of the Division for Dynamical Astronomy, Nashville, TN.

[16] *D. Dhingra, M.M. Hedman, R.N. Clark.* Near Infrared spectral systematics of Enceladus' plume: Links to formation conditions and dominant controls; 2016 Lunar and Planetary Science conference, Woddlans, TX.

[15] **M.M. Hedman**, P.D. Nicholson. The mass of Saturn's B ring from hidden density waves; 2015 meeting of the American Geophysical Union, San Francisco, CA

[14] *R.O. Chancia*, **M.M. Hedman**, R.G. French; A new look back at the structure in Uranus' narrow rings; 2015 meeting of the Division for Planetary Sciences, National Harbor, MD

[13] *D. Dhingra*, **M.M. Hedman**, R.N. Clark; Structural diversity of the 3-micron absorption band in Enceladus' plume from Cassini VIMS; 2015 meeting of the Division for Planetary Sciences, National Harbor, MD

[12] **M.M. Hedman**, M.R. Showalter, J.A. Burns. Corrugations and Spirals: Recent Disturbances in Saturn's D ring. 2015 European Planetary Science Congress Meeting, Nantes, France

[11] **M.M. Hedman**, What happened to Saturn in December of 2011? 2015 meeting on the Magnetospheres of the Outer Planets, Atlanta, GA

[10] **M.M. Hedman**; Wavelet analyses of Saturn's rings: Extracting masses and motions from wavelet phases; 2015 meeting of the Northwest Section of the American Physical Society, Pullman, WA (Invited)

[9] *D. Dhingra*, **M.M. Hedman**, R.N. Clark, P.D. Nicholson; Spectral characterization of spatially resolved water ice plumes on Enceladus using Cassini VIMS data; 2015 Lunar and Planetary Sciences Congress, Houston, TX

[8] **M.M. Hedman**; The Cassini spacecraft reveals Saturn's rings; 2014 Meeting of the Pacific Northwest Association for College Physics, Bellingham, WA

[7] **M.M. Hedman**, P.D. Nicholson; How massive is Saturn's B ring? Clues from cryptic density waves; 2015 meeting of the Division for Dynamical Astronomy, Pasadena, CA

[6] **M.M. Hedman**, J.A. Burns, M. Showalter; A New pattern in Saturn's D ring; 2014 fall meeting of the American Geophysical Union, San Francisco, CA

[5] **M.M. Hedman**; What's going on around the outer planets? A report of recent ring research; 2014 meeting of the Division for Planetary Science, Tucson, AZ (Invited)

[4] **M.M. Hedman**, R.G. French, C. McGhee-French; What can Uranus' rings tell us about Uranus' internal structure? 2014 Workshop on the study of the Ice Giant planets, Laurel, MD

[3] **M.M. Hedman**, P.D. Nicholson; An unusual density wave in Saturn's C ring, evidence for a supersonic resonance? 2014 meeting of the Division for Dynamical Astronomy, Philadelphia, PA

[2] **M.M. Hedman**, J.A. Burns, C.C. Porco; The dark side of Saturn's rings: Comparing eclipse observations from Cassini; 2013 meeting of the American Geophysical Union, San Francisco, CA

[1] **M.M. Hedman**, P.D. Nicholson; Kronoseismology: Determining Saturn's acoustic normal mode frequencies using density waves in the rings; 2013 meeting of the Division for Planetary Science, Denver, CO

---Presented prior to arriving at U. Idaho (26)

[26] **M.M. Hedman**, J.A. Burns, P.D. Nicholson, M.R. Showalter, M.S. Tiscareno; Delving into D-ring dynamics: Probes of Saturn's interior and clues to its recent history; 2013 meeting of the Division for Dynamical Astronomy, Paraty, Brazil

[25] **M.M. Hedman**, J.A. Burns, M.R. Showalter, D.P. Hamilton; Dust dynamics in the Encke gap: Hill's equations and ion interactions; 2012 meeting of the American Geophysical Union, San Francisco, CA

[24] **M.M. Hedman**, C. Gosmeyer, P.D. Nicholson; Monitoring Enceladus' activity with Cassini-VIMS;

2012 meeting of the American Geophysical Union, San Francisco, CA

[23] **M.M. Hedman**, P.D. Nicholson, H. Salo; Probing periodic patterns in Saturn's inner A ring with Cassini-VIMS; 2012 meeting of the Division for Planetary Sciences, Reno, NV

[22] **M.M. Hedman**, Dynamics of dusty rings; 2012 meeting of the Division for Dynamical Astronomy; Mount Hood, OR

[21] **M.M. Hedman**, P.D. Nicholson, G. Filacchione, F. Capaccioni, M. Ciarniello, R.N. Clark, J.N. Cuzzi, Cassini VIMS Team; Correlations between spectra and structures in Saturn's rings; 2011 meeting of the American Geophysical Union, Pasadena, CA and 2011 European Planetary Science Conference, Nantes, France

[20] **M.M. Hedman**, J.A. Burns, P.C. Thomas, M.S. Tiscareno, M.W. Evans. Physical properties of the small moon Aegaeon (Saturn LIII); 2011 European Planetary Science Conference, Nantes, France

[19] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno; Of horseshoes and heliotropes: The dynamics of dust in the Encke Gap; 2011 meeting of the Division for Dynamical Astronomy, Austin, TX

[18] **M.M. Hedman**, P.D. Nicholson, M.R. Showalter, Cassini VIMS Team; Spectroscopic identification of clumps in the F ring; 2010 meeting of the Division for Planetary Science, Pasadena, CA

[17] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, C.C. Porco; A corrugated curiosity in Saturn's C ring; 2010 meeting of the Division for Dynamical Astronomy, Boston, MA

[16] **M.M. Hedman**, P.D. Nicholson; A resonance-based model for the architecture of the Cassini Division; 2009 meeting of the American Geophysical Union, San Francisco, CA

[15] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, C.C. Porco; Curious corrugations in the C ring; 2009 meeting of the Division of Planetary Science; Fajardo, PR

[14] **M.M. Hedman**, P.D. Nicholson, VIMS Team; The architecture of the Cassini Division I; 2009 meeting of the Division for Dynamical Astronomy, Virginia Beach, VA

[13] **M.M. Hedman**, P.D. Nicholson, M.R. Showalter; Cassini-VIMS observations of particles in Enceladus' plume and the E ring; 2008 European Planetary Science Conference, Munster, Germany

[12] **M.M. Hedman**, C.D. Murray, N.J. Cooper, M.S. Tiscareno, K. Beurle, M.W. Evans, J.A. Burns; A trio of tiny moons with tenuous rings; 2008 meeting of the Division of Planetary Science, Ithaca, NY

[11] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, P.D. Nicholson, C.C. Porco; Cassini observations of Lindblad resonances in low optical depth rings; 2008 meeting of the Division for Dynamical Astronomy, Boulder, CO

[10] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, P.D. Nicholson, C.C. Porco; Possible resonances with Saturn's rotation in the rings; 2007 meeting of the American Geophysical Union, San Francisco, CA

[9] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, C.C. Porco; The heliotropic rings of Saturn; 2007 meeting of the Division for Planetary Sciences, Orlando, FL

[8] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, C.C. Porco; Structures in Saturn's G ring; 2007 of the Division for Dynamical Astronomy, Ann Arbor, MI

[7] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, P.D. Nicholson, C.C. Porco, G.H. Jones, E. Roussos, N. Krupp, C. Paranicas; Multi-Instrument studies of an arc in Saturn's G ring; 2006 meeting of the American Geophysical Union, San Francisco, CA

[6] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, P.D. Nicholson, C.C. Porco, G. Jones, E. Roussos, N.

Krupp; An arc in Saturn's G ring; 2006 meeting of the Division for Planetary Science, Pasadena, CA

[5] **M.M. Hedman**, P.D. Nicholson, B.D. Wallis; Cassini-VIMS observations of stellar occultations by Saturn's rings; 2005 meeting of the American Geophysical Union, San Francisco, CA

[4] **M.M. Hedman**, J.A. Burns, M.S. Tiscareno, P.D. Nicholson, M.R. Showalter, J.N. Cuzzi, C.C. Porco, Cassini Imaging Team; Cassini's discoveries in the D and G rings; 2005 meeting of the Division for Planetary Science, Cambridge, UK

[3] **M.M. Hedman**, J.A. Burns, C.D. Murray, M.S. Tiscareno, J.N. Cuzzi, C.C. Porco, H. Dones, A. Brahic, C. Ferrari; Faint rings and things according to Cassini; 2004 Division for Planetary Science, Louisville, KY

[2] **M.M. Hedman**, D. Barkats, J.O. Gundersen, S.T. Staggs; Results from the first observing season of PIQUE; 2000 meeting of the American Astronomical Society, San Jose, CA

[1] **M.M. Hedman**; PIQUE, A status Report; 2000 Kavli Institute for Theoretical Physics meeting, Santa Barbara, CA

Patents: (provide title/description, patent number and date) NONE

Grants and Contracts Awarded: (provide principal and co investigators, title, sponsor, funding dates, amount)

M.M. Hedman (PI University of Idaho). Europa Plumes with MISE. NASA Europa ICONs program 2024. Total Budget \$20,875 1 person-months/year. Total funds for UI: \$20,875

M.M. Hedman (PI University of Idaho), S. MacKenzie (Co-I APL), H. Sharma (Collaborator U. Idaho). Exploring the Color of the Enceladus Plume. NASA Cassini Data Analysis Program 2024-2027. Total Budget \$546,020 1 person-months/year. Total funds for UI: \$288,110

P.D. Nicholson (PI Cornell University), M. El Moutamid (Co-I Cornell University), R. French (Co-I Wellesley College), **M.M. Hedman** (Co-I University of Idaho), M. Tiscareno (Collab. SETI Institute), G. Stewart (Collab U. Colorado). Vertical Structure in Saturn's Rings. NASA Cassini Data Analysis Program 2023-2025. Total Budget \$619,197 1.5 person-months/year. Total funds for UI: \$158,229

M.M. Hedman (PI University of Idaho). Evaluating the Extent of Uranus' Inner Ring. JPL 2022. 1 person-month. Total funds to UI: \$16,376

M.M. Hedman (PI University of Idaho), M. Marley (Co-I U. Arizona), J. Fortney (Collaborator UCSC). Seismological Studies of the Ice Giants. NASA Solar System Workings Program, 2021-2024, Total Budget \$242,783 1.0 person-months/year. Total funds for UI: \$178,271

M.M. Hedman (PI University of Idaho), R. French (Co-I SETI Institute), D.P. Hamilton (Co-I U. Maryland). The Recent History of Saturn's Dusty Rings. NASA Cassini Data Analysis Program, 2021-2024, Total Budget \$543,223 1.0 person-months/year. Total funds for UI: \$275,386

M.M. Hedman (PI University of Idaho), S. Vahidinia (Co-I NASA Ames), D. Dhingra (Collaborator). Investigating the Enceladus plume with Cassini-VIMS remote-sensing data. NASA Cassini Data Analysis Program, 2018-2022, Total Budget \$330,244, 1.0 person-months/year. Total funds to UI: \$208,915

D.P. Hamilton (PI University of Maryland), **M.M. Hedman** (Co-I, University of Idaho). NASA Cassini Data Analysis Program, 2018-2022, Total Budget \$439,191, 1.0 person-months/year. Total funds to UI to date: \$27,898

M.M. Hedman (PI University of Idaho), R.G. French (Co-I Wellesley College), M. El Moutamid (Collaborator Cornell U), J. Fuller (Collaborator, Caltech), P.D. Nicholson (Collaborator Cornell U.) Using Saturn's

- rings to probe oscillations and asymmetries in the planet's interior. NASA Cassini Data Analysis Program, 2017-2022, Total Budget \$323,937, 1.0 person-months/year. Total funds to UI: \$226,662
- D. Blaney (PI JPL), K. Hibbitts (Deputy PI APL), C. Bruce (PM JPL), A. Santo (Deputy PM APL), R. Green (IS JPL), R. Clark (Co-I PSI), B. Dalton (Co-I JPL), A. Davies (Co-I JPL), **M.M. Hedman** (Co-I University of Idaho), Y. Langevin (Co-I University of Paris), J. Lunine (Co-I Cornell University), T. McCord (Co-I Bear Fight Institute), S. Murchie (Co-I APL), C. Parnicas (Co-I APL), F. Seeles (Co-I APL), J. Soderblum (Co-I MIT), Mapping Imaging Spectrometer for Europa (MISE), NASA Europa Instrument Investigation Program, Funding Dates and Budget TBD: Total funds to UI to date \$69,411
- M.M. Hedman** (PI University of Idaho), D. Wooden (Co-I NASA Ames), A. Colaprete (Co-I NASA Ames), A. Cook (Co-I NASA Ames) Looking at lunar dust with LADEE, NASA Lunar Data Analysis Program 2015-2022, Total Budget \$225,650, 1.5 person-months/year. Total funds to UI: \$212,594
- M.M. Hedman** (PI University of Idaho), R.G. French (Co-I Wellesley College), Uranian ring dynamics and constraints on Uranus' internal structure from occultation data, NASA Solar System Workings Program, 2015-2022, Total Budget \$340,202, 1.5 person-months/year. Total funds to UI: \$163,075
- M.M. Hedman** (PI University of Idaho), D.P. Hamilton (Co-I University of Maryland), The Structure, composition and history of Saturn's faint rings, NASA Cassini Data Analysis Program, 2015-2021, Total Budget \$425,412, 2-2.5 person-months/year. Total funds to UI: \$287,779
- P.D. Nicholson (PI Cornell University), **M.M. Hedman** (Co-I Cornell University/University of Idaho) Periodic and variable structure in Saturn's A and B rings, NASA Cassini Data Analysis Program, 2014-2017, Total Budget \$304,945, 3-4 person-months/year. Total funds to UI: \$98,350
- M.M. Hedman** (PI Cornell University/University of Idaho), M.R. Showalter (Co-I SETI Institute) Seasonal and temporal evolution of Saturn's faint rings, NASA Cassini Data Analysis Program, 2012-2015, Total Budget \$401,415, 3-4 person-months/year. Total funds to UI \$234,947.
- M.M. Hedman** (PI Cornell University), P.D. Nicholson (Co-I Cornell University) Irregular and time-variable structures in Saturn's main rings, NASA Cassini Data Analysis Program, 2011-2013, Total Budget \$121,483
- M.M. Hedman** (PI Cornell University), M.R. Showalter (Co-I SETI Institute) Structure and dynamics of Saturn's faint rings, NASA Cassini Data Analysis Program, 2009-2012, Total Budget \$312,105
- P. Gierasch (PI Cornell University), D. Banfield (Co-I Cornell University), P.D. Nicholson (Co-I Cornell University), **M.M. Hedman** (Co-I Cornell University), B. Conrath (Co-I Cornell University), Saturn limb studies: Helium, winds and composition, NASA Cassini Data Analysis Program, 2009-2012, Total Budget \$455,504
- M.R. Showalter (PI SETI Institute), **M.M. Hedman** (Co-I Cornell University), Dynamics and evolution of Saturn's faint rings, NASA Cassini Data Analysis Program, 2007-2009

Honors and Awards: UI College of Science Early Career Award

SERVICE:

Major Committee Assignments:

- U. Idaho Physics Dept. Graduate Admissions Committee 2013-Present
- U. Idaho Physics Dept. Academic Standards Committee 2015-Present
- U. Idaho Physics Dept. Website Committee 2016-2021
- U. Idaho Library Affairs Committee 2016-2019, 2023-Present

Professional and Scholarly Organizations

(including memberships, committee assignments, editorial services, offices held and dates)

Member of Panel on Giant Planet Systems for the Planetary Science
and Astrobiology Decadal Survey 2023-2032

Member of American Geophysical Union
Member of American Astronomical Society
Committee Member of the Division for Dynamical Astronomy 2011-2013
Secretary for Division for Dynamical Astronomy 2022-Present

Organized Rings 2011 Scientific Workshop
Served on VOC for 2020 Virtual Division of Planetary Sciences Meeting

Reviewed articles for Journals
Icarus (27 reviews, 22 since arriving at U. Idaho)
The Astrophysical Journal (3 since arriving at U. Idaho)
Monthly Notices of the Royal Astronomical Society (3 since arriving at U. Idaho)
Geophysics Research Letters (1 since arriving at U. Idaho)
Planetary Science Journal (3 since arriving at U. Idaho)
Nature (1 since arriving at U. Idaho)

Panelist for JWST Telescope Allocation Committee (2024)
External Reviewer for NASA Research Analysis Programs (2011-2022)
Panelist for NASA Programs (2007,2010,2016, 2017)
External Reviewer for NSF Office of Polar Programs (2009, 2011, 2012)

Outreach Service: (Including popular press, interview articles, newspaper articles, workshops-seminars-tours organized, Extension impact statements)

Presentation on Europa Clipper at Spacepoint 2023 Summer Solstice Sci-Fest in Sandpoint.

Presentations on JWST's capabilities as part of 2023 NESSP

"Amateur finds new images of Uranus' rings in 35-year-old data" Sky and Telescope 10.22.2022

"What Cassini continues to reveal about Saturn" Planetary Society New Story 9.13.2022

University of Idaho Telescope Grand Opening Celebration and Star Party. 9.9.2022

"Are Water Plumes Spraying from Europa?" JPL News Story 11.30.2021.

"How Old are Saturn's Rings?" Boise State Public Radio 2.7.2020.

"Are Saturn's rings really as young as the dinosaurs?" Quanta Magazine 11.21.2019

"How long is a day on Saturn?" National Geographic 1.23.2019

"Cassini at Saturn: A retrospective" Scientific American 9.12.2017

"Cassini the Saturn spacecraft's fond farewell" Newsday 9.5.2017

"Some of Uranus' small moons are doomed to collide" New Scientist. 9.4.2017

“Casting Shadows” Pacific Northwest Inlander, 8.17.2017

“What Cassini can teach us” Here we have Idaho, Spring 2017

“Uranus moons discovery: Two new ‘moonlets’ found orbiting planet” The independent 11.17.2016

“Demystifying the final frontier—Data suggests there may be a moon orbiting Uranus” UI Argonaut y 11.16.2016

“Wavy rings point to two undiscovered moons at Uranus” Cosmos 10.23.2016

“Uranus might have two dark moons we’ve never seen before” New Scientist 10.14.2016

“Rings, moons and the age of the universe – UI researcher measures mass of Saturn’s brightest ring.” UI Argonaut 02.16.2016

“Saturn’s ring mystery: Why are opacity and density mismatched?” Christian Science Monitor 2/5/2016

“Saturn’s rings: Less than meets the eye?” Astronomy Magazine 2.3.2016

“Something strange is happening inside Saturn” space.com 11.29.2015

“Cassini spies mysterious object named ‘Peggy’ at edge of Saturn’s rings” Wired, 12.10.2013

“NASA Image of Saturn shows and Idaho professor’s work” Boise State Public Radio 11.18.2013

“Saturn, Earth shine in amazing new photo by NASA Probe” Space.com 11.12.2013

Community Service: (non-academic unrelated to employment) NONE

Honors and Awards: NONE

PROFESSIONAL DEVELOPMENT: No workshops and seminars attended