

Matthew Steven Tiscareno

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Education

2004 Ph.D., Planetary Science, University of Arizona
1998 B.S., Planetary Science, California Institute of Technology

Research Experience

Cornell University, Ithaca, New York
2004 – Research Associate, advisor: Joseph A. Burns
University of Arizona, Tucson, Arizona
1999 – 2004 Graduate Research Assistant, advisor: Renu Malhotra (previously Paul Geissler, Carolyn Porco)
California Institute of Technology, Pasadena, California
1996 – 1999 Undergraduate Research Assistant, advisor: Michael E. Brown (previously G. Edward Danielson)

Current Research Interests

Remote sensing of planetary rings
Dynamical behavior and evolution of dense rings
Disk-moon dynamical interactions
Orbital dynamics of diffuse rings
Orbital and rotational dynamics of planetary and satellite systems

Team Memberships and Associations

Cassini Imaging Team Associate (J.A. Burns, Team Member)
Uranus System Mission Proposal Team Member (M. Hofstadter, PI)
Neptune System “Argo” Mission Proposal Team Member (C.J. Hansen, PI)

External Funding

Period	Role	\$K	Source	Short title
2010-2013	PI	100	NASA Cassini Data Analysis	Saturn’s Rings and Moonlets
2008-2010	PI	100	NASA Cassini Data Analysis	Disk-Moon Interactions in Saturn’s Rings

Refereed Journal Articles

Citations	Reference	Source: Thomson Reuters
-	Tiscareno, M.S. , P.C. Thomas, and J.A. Burns 2009. The rotation of Janus and Epimetheus. <i>Icarus</i> 204 , 254-261 (arXiv:0904.3515).	
-	Morrison, S.J., P.C. Thomas, Tiscareno, M.S. , J.A. Burns, and J. Veverka 2009. Grooves on small saturnian satellites and other objects: Characteristics and significance. <i>Icarus</i> 204 , 262-270.	
-	Tiscareno, M.S. , and R. Malhotra 2009. Chaotic diffusion of resonant Kuiper Belt objects. <i>Astron. J.</i> 138 , 827-837 (arXiv:0807.2835).	
-	Hedman, M.M., J.A. Burns, M.S. Tiscareno , and C.C. Porco 2009. Organizing some very tenuous things: Resonant structures in Saturn’s faint rings. <i>Icarus</i> 202 , 260-279.	
-	Weiss, J.W., C.C. Porco, and M.S. Tiscareno 2009. Ring edge waves and the masses of nearby satellites. <i>Astron. J.</i> 138 , 272-286.	
-	Hedman, M.M., C.D. Murray, N.J. Cooper, M.S. Tiscareno , K. Beurle, M.W. Evans, and J.A. Burns 2009. Three tenuous rings/arcs for three tiny moons. <i>Icarus</i> 199 , 378-386.	
2	Tiscareno, M.S. , J.A. Burns, M.M. Hedman, and C.C. Porco 2008. The population of propellers in Saturn’s A Ring. <i>Astron. J.</i> 135 , 1083-1091 (arXiv:0710.4547).	

- 12 **Tiscareno, M.S.**, J.A. Burns, P.D. Nicholson, M.M. Hedman, and C.C. Porco 2007. Cassini imaging of Saturn's rings II: A wavelet technique for analysis of density waves and other radial structure in the rings. *Icarus* **189**, 14-34 (astro-ph/0610242).
- 6 Hedman, M.M., J.A. Burns, **M.S. Tiscareno**, C.C. Porco, G.H. Jones, E. Roussos, N. Krupp, C. Paranicas, and S. Kempf 2007. The source of Saturn's G Ring. *Science* **317**, 653-656.
- 4 Hedman, M.M., J.A. Burns, M.R. Showalter, C.C. Porco, P.D. Nicholson, A.S. Bosh, **M.S. Tiscareno**, R.H. Brown, B.J. Buratti, K.H. Baines, and R. Clark 2007. Saturn's dynamic D Ring. *Icarus* **188**, 89-107.
- 5 **Tiscareno, M.S.**, P.D. Nicholson, J.A. Burns, M.M. Hedman, and C.C. Porco 2006. Unravelling temporal variability in Saturn's spiral density waves: Results and predictions. *Astrophys. J. Lett.* **651**, L65-L68 (astro-ph/0609242).
- 15 **Tiscareno, M.S.**, J.A. Burns, M.M. Hedman, C.C. Porco, J.W. Weiss, L. Dones, D.C. Richardson, and C.D. Murray 2006. 100-meter-diameter moonlets in Saturn's A Ring from observations of 'propeller' structures. *Nature* **440**, 648-650.
- 138 Porco, C.C., and 35 colleagues (including **M.S. Tiscareno**) 2005. Imaging of Titan from the Cassini spacecraft. *Nature* **434**, 159-168.
- 65 Porco, C.C., and 34 colleagues (including **M.S. Tiscareno**) 2005. Cassini imaging science: Initial results on Saturn's rings and small satellites. *Science* **307**, 1226-1236.
- 44 Porco, C.C., and 34 colleagues (including **M.S. Tiscareno**) 2005. Cassini imaging science: Initial results on Phoebe and Iapetus. *Science* **307**, 1237-1242.
- 39 Porco, C.C., and 34 colleagues (including **M.S. Tiscareno**) 2005. Cassini imaging science: Initial results on Saturn's atmosphere. *Science* **307**, 1243-1247.
- 21 **Tiscareno, M.S.**, and R. Malhotra 2003. The dynamics of known Centaurs. *Astron. J.* **126**, 3122-3131 (astro-ph/0211076).
- 94 Porco, C.C., and 23 colleagues (including **M.S. Tiscareno**) 2003. Cassini imaging of Jupiter's atmosphere, satellites, and rings. *Science* **299**, 1541-1547.
- 5 **Tiscareno, M.S.**, and P.E. Geissler 2003. Can redistribution of material by sputtering explain the hemispheric dichotomy of Europa? *Icarus* **161**, 90-101.
- Total number of citations: First-author papers: 55 All papers: 450
 Citations per pre-2009 item: First-author papers: 9.17 All papers: 34.62
 h-index (see Wikipedia article): First-author papers: 5 All papers: 8

Refereed Book Chapter

Colwell, J.E., P.D. Nicholson, **M.S. Tiscareno**, C.D. Murray, R.G. French, and E.A. Marouf 2009. The structure of Saturn's rings. In Dougherty, M., Esposito, L., and Krimigis, T., eds. *Saturn from Cassini-Huygens* (Springer).

Popular Articles

Tiscareno, M.S., and M.M. Hedman 2009. News and views: Saturn's colossal ring. *Nature* **461**, 1064-1065.
Tiscareno, M.S. 2007. Ringworld Revelations. *Sky & Telescope* **113** (2), 32-39.

Articles Submitted for Publication

Tiscareno, M.S., *et al.* An analytic parameterization of self-gravity wakes in Saturn's rings, with application to occultations and propellers. *Astron. J.*

Drafts in Preparation

Tiscareno, M.S., *et al.* Direct observations of orbital evolution of disk-embedded mass in Saturn's rings. *Nature*.
Tiscareno, M.S., *et al.* Cassini imaging search rules out narrow rings around Rhea. *Science*.
Tiscareno, M.S., *et al.* Observations of impacts onto Saturn's rings. *Nature*.
Tiscareno, M.S., *et al.* The curious character of the inner edge of Saturn's A Ring. *Icarus*.

Press Releases and other Media-Related Activities

Discovery of signatures of individual disk-embedded moonlets ('propellers'), *Nature* article, *Nature* podcast interview, NASA and Cassini press release, broad coverage, March 2006.
 Discovery that 'propellers' are confined to three narrow belts, one of Cassini's "Top 10 Science Highlights of 2008"
 Saturn equinox observations, including discovery of impact clouds, shadows cast by moonlets, NASA and Cassini press release, broad coverage, September 2009.

Invited Talks

- “TBD”, 1 February 2010, University of Colorado, Department Colloquium
“Saturn’s rings: Direct observations of disk-embedded masses”, 17 September 2009,
Cornell University, Department Colloquium
“Saturn’s rings: An accessible astrophysical disk”, 10 January 2008,
Winter AAS Meeting, Special Session (“The Dynamics of Astrophysical Disks”)
“Knots and ripples in the fabric of Saturn’s rings”, 5 December 2007,
University of Maryland, Department Colloquium
“Ring reconnaissance with weak waves”, 13 December 2006,
Fall AGU Meeting, Session P34A (“Planetary Rings: Observation and Theory”)

Abstracts and Presentations at Scientific Meetings

Only presentations given in person are listed below. An additional 26 co-author presentations are not listed.

- Tiscareno, M.S., et al.** 2009. Observations of ejecta clouds produced by impacts onto Saturn’s rings.
Fall AGU, P54A-08.
- Tiscareno, M.S., et al.** 2009. Rings research in the next decade. *Fall AGU, P52A-09.*
- Tiscareno, M.S., et al.** 2009. Saturn’s A Ring has no inner edge. *DPS 41, 25.04*
- Burns, J.A., **M.S. Tiscareno, et al.** 2009. Giant propellers outside the Encke Gap in Saturn’s rings. *DPS 40, 30.07*
- Tiscareno, M.S., et al.** 2008. An analytic parameterization of self-gravity wakes. *DPS 40, 21.06*
- Torrey, P.A., **M.S. Tiscareno, J.A. Burns, and C.C. Porco.** Mapping complexity: The wavy edges of the Encke and Keeler Gaps in Saturn’s rings. *DDA 39, 15.19*
- Tiscareno, M.S., J.A. Burns, and P.C. Thomas** 2008. The rotation of Janus and Epimetheus. *DDA 39, 13.03*
- Tiscareno, M.S., et al.** 2007. The population of propellers in Saturn’s A Ring. *DPS 39, 10.05*
- Tiscareno, M.S., et al.** 2007. Numerical simulations of the G Ring arc. *DDA 38, 12.03*
- Tiscareno, M.S., et al.** 2006. Density wave metamorphosis. *DPS 38, 38.07*
- Tiscareno, M.S., et al.** 2006. Sampling Saturn’s rings with weak density waves. *DDA 37, 14.06*
- Tiscareno, M.S., et al.** 2006. Disk response to variable forcing: The rings and co-orbital satellites of Saturn, *DDA 37, 8.04*
- Tiscareno, M.S., et al.** 2005. Cassini ISS observations of the Encke and Keeler Gaps in Saturn’s rings.
Fall AGU, P33B-0245
- Burns, J.A., and **M.S. Tiscareno** 2005. Saturn’s ring images/dynamics by Cassini. *Fall AGU, P31D-01*
- Tiscareno, M.S., et al.** 2005. Wavy edges and other disturbances in Saturn’s Encke and Keeler Gaps. *DPS 37, 64.02*
- Tiscareno, M.S., et al.** 2004. Faint rings and things according to Cassini. *Fall AGU, P35A-1461*
- Burns, J.A., **M.S. Tiscareno, et al.** 2004. Weak waves and wakes in Saturn’s rings: Observations by Cassini ISS.
DPS 36, 19.12
- Tiscareno, M.S., and R. Malhotra** 2004. Chaotic diffusion of resonant Kuiper Belt objects. *DPS 36, 17.08*
- Tiscareno, M.S., and R. Malhotra** 2003. The dynamics of known Centaurs. *DDA 34, 2.06*
- Tiscareno, M.S., and R. Malhotra** 2003. The effects of planet-size resonant KBOs. *DPS 35, 39.22*
- Tiscareno, M.S., and R. Malhotra** 2002. Centaurs: The transition between the Kuiper Belt and Jupiter-family comets. *DPS 34, 9.02*
- Tiscareno, M.S., and P.E. Geissler** 2002. Re-distribution of material on the surface of Europa via sputtering.
LPSC 33, 1978.
- Tiscareno, M.S., and C.C. Porco** 2001. Cassini ISS search for inner satellites of Jupiter. *DPS 33, 37.09*

Academic Work

- Tiscareno, M.S.** 2004. Chaotic diffusion in the outer solar system, and other topics. Ph.D. thesis, Univ. of Arizona.

Service to the Science Community

- Tiscareno, M.S., and 49 colleagues** 2009. Rings research in the next decade. White paper submitted to the NRC Planetary Science Decadal Survey.
- 2008 DPS Meeting (Ithaca NY) Local Organizing Committee (co-chairs Jim Bell and Beth Clark)
- Grant Proposal Review Panels: NASA (2008), NSF (2008)
- Grant Proposal External Reviews: NASA (2008, 2009)
- NASA Postdoctoral Program External Reviews (2009)
- Manuscript Reviews: *Science, Nature, Icarus, Astronomical Journal, Planetary and Space Science, Geophysical Research Letters*

Memberships

American Astronomical Society (AAS)
AAS Division for Planetary Sciences (DPS)
AAS Division on Dynamical Astronomy (DDA)
International Astronomical Union (IAU)
American Geophysical Union (AGU)
American Scientific Affiliation (ASA)

Awards and Fellowships

UA Graduate Teaching Award, 2002
LPL Graduate Teaching Award, 2002
National Science Foundation (NSF) Graduate Research Fellowship, 2000-2003
UA Graduate College Fellowship, 1999-2000
McLean Brothers Scholarship, 1994-1998

Teaching Experience

Guest Lecturer: Planetary Physics graduate course, Cornell University (Fall 2009)
Guest Lecturer: Celestial Mechanics graduate course, Cornell University (Spring 2007)
Guest Lecturer: Space Exploration undergraduate course, Cornell University (Fall 2006, Fall 2007)
Graduate Teaching Assistant: Planetary Science for undergraduate non-science majors, University of Arizona (six semesters, Fall 1999 through Spring 2003), includes several occasions as a Guest Lecturer
Undergraduate Teaching Assistant: Geology for undergraduate non-science majors, California Institute of Technology (Spring 1998)
Undergraduate Teaching Assistant: Introduction to Planetary Science for undergraduate geology/planetary majors, California Institute of Technology (Spring 1997)

Mentoring of Students

I have been the primary research advisor for the following students, under the supervision of Professor J.A. Burns
2009 – Breanna M. Byington '11, Astronomy, Rings research
2007 – 2008 Paul A. Torrey '08, Astronomy, Rings research,
Placement: Ph.D. student, Astronomy, Harvard University

In addition, I have played a significant supporting role in mentoring two other undergraduates and four graduate students in the Burns/Nicholson research group.

Education and Public Outreach

Teaching a class ("Introduction to the Solar System") to twelve Ithaca-area middle-school and high-school students, 10 sessions from 2/2009 to 5/2009
Heavily involved (including selecting images and writing captions) in preparing an exhibit of Cassini images that appeared at the American Museum of Natural History, New York City; Johnson Museum of Art, Ithaca NY; National Air and Space Museum, Washington DC, 2007/2008
Presentation of recent Cassini results to Ithaca-area students, 11/2008
Teaching a class ("Science and Faith") at New Life Presbyterian Church, Ithaca NY, 21 sessions from 9/06 to 5/07
Presentation of recent Cassini results to K-12 teachers visiting Cornell for an Educator Workshop – 2/05, 3/07, 11/07, 2/09
Presentation of recent Cassini results to high-school students visiting Cornell – 6/05, 7/05, 5/07, 6/07, 4/08, 3/09
Presentation of recent Cassini results to Cornell alumni, 5/2005
Presentation ("Rockets") given to Ithaca-area students, 10/2007
Presentation ("What is a planet? Pluto and its place in the solar system") given to Ithaca-area students, 9/2006
Presentation of Student Showcase research to state legislators in Phoenix, 2/2003
Science Fair Judge, St. Michael's Elementary School, Tucson – 2000, 2001, 2003