

Steven J. Desch

Assistant Professor
School of Earth and Space Exploration
Arizona State University

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Positions:

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| Assistant Professor | Arizona State University | 2003–Present |
| NASA Astrobiology Fellow / Carnegie Fellow | Carnegie Institution of Washington Department of Terrestrial Magnetism | 2000–2003 |
| National Research Council Postdoctoral Fellow | NASA Ames Research Center | 1998–2000 |

Education:

| | | | |
|----------------------|--|---|------|
| Ph.D. (Physics) | University of Illinois, Urbana-Champaign | – | 1998 |
| M. S. (Astrophysics) | University of Chicago | – | 1992 |
| M. S. (Physics) | Rensselaer Polytechnic Institute, Troy, NY | – | 1991 |
| B. S. (Physics) | Rensselaer Polytechnic Institute, Troy, NY | – | 1990 |

Honors & Awards:

2003 Alfred O. Nier Prize of the Meteoritical Society

Courses Taught:

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| Sp 2006 | AST-521 | Stars and Interstellar Medium I |
| Fa 2005 | AST-321 | Intro. Planetary & Stellar Astrophysics |
| Sm 2005 | AST-114 | Astronomy Lab II |
| Sm 2005 | AST-112 | Intro. Stars, Galaxies & Cosmology |
| Sp 2005 | AST-422 | Astrophysics II |
| Fa 2004 | AST-421 | Astrophysics I |
| Sp 2004 | AST-521 | Stars and Interstellar Medium I |
| Sp 2004 | AST-591 | (Graduate) Astrophysics Seminar |
| Sp 2004 | AST-494 | (Undergraduate) Astrophysics Seminar |

Undergraduate Mentoring:

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|---------|-----------------|--|
| Su 2006 | Bruce Nourish | <i>Protostar Dynamics in the Orion Nebula Cluster</i> (ASU) |
| Su 2005 | Carola Ellinger | <i>Yields of Radionuclides Injected by Clumpy Supernovae into Protoplanetary Disks</i> (ASU) |
| Su 2002 | Leah Hutchison | <i>Astromineralogy of the TW Hydrae Disk</i> (NSF REU Program, Carnegie Institution of Washington) |
| Su 2001 | Danielle Moser | <i>Testing a Prediction of the Shock Wave Model of Chondrule Formation</i> (NSF REU Program, Carnegie Institution of Washington) |

Graduate Principal Advisor:

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|-------------------|--|
| Melissa Morris | <i>Phyllosilicate Production and Detection in Protoplanetary Disks</i> (MS expected Dec. 2006) |
| Jason Cook | <i>Water Ice and Nitrogen Chemistry in Comets, Charon, and other Solar System Icy Bodies</i> (Ph.D. expected May 2007) |
| Nicolas Ouellette | <i>On the Origins of the Short-Lived Radionuclides in the Early Solar System</i> (Ph.D. expected Dec. 2007) |
| Beatrice Perret | <i>A Combined Hydrodynamics / Photoionization Simulation of Photoevaporation in H II Regions</i> (Ph.D. expected 2008) |

Grants:

1. *Dust Transport and Charging in Martian and Terrestrial Dust Devils*, PI with G. R. Wilson; Jet Propulsion Laboratory Director's Research and Development Fund Award # 1277588, to Arizona State University, Sept. 13, 2005 - Sept. 30, 2006; \$74,900 (\$50,300 to ASU)
2. *Transient Heating of Protoplanetary Disk Material by Shocks*, NASA Origins of Solar Systems, to Arizona State University, Jan. 1, 2006 - Dec. 31, 2008; \$195,000.
3. *Transport and Charging of Dust in Terrestrial and Martian Dust Devils: Does Mars have Lightning?*, NASA Mars Fundamental Research Program, to Arizona State University, Jan. 1, 2006 - Dec. 31, 2008; \$188,718.

Research and Creative Activities:

Refereed Publications

1. Comment on “Li and Be isotopic variations in an Allende CAI: Evidence for the in situ decay of short-lived ^{10}Be and for the possible presence of the short-lived nuclide ^7Be in the early solar system,” by M. Chaussidon, F. Robert and K. D. McKeegan S. J. Desch and N. Ouellette, *Geochim. Cosmochim. Acta*, in press (2006).
2. Comet Grains and Implications for Heating and Radial Mixing in the Protoplanetary Disk (**invited review**) D. Wooden, S. J. Desch, D. Harker, H.-P. Gail & L. Keller, in *Protostars and Planets V*, eds. B. Reipurth, D. Jewitt & K. Keil (University of Arizona: Tucson), in press (2006).
3. From Dust to Planetesimals: Implications for the Solar Protoplanetary Disk from Short-Lived Radionuclides in Meteorites (**invited review**) M. Wadhwa, Y. Amelin, G. W. Lugmair, B. Meyer, M. Gounelle & S. J. Desch, in *Protostars and Planets V*, eds. B. Reipurth, D. Jewitt & K. Keil (University of Arizona: Tucson), in press (2006).
4. Transient Heating Events in the Protoplanetary Nebula (**invited review**) H. C. Connolly, Jr., S. J. Desch, R. D. Ash & R. H. Jones, in *Meteorites and the Early Solar System II*, eds. D. Lauretta & H. Y. McSween, Jr. (University of Arizona: Tucson), 383 (2006).
5. Understanding our Origins: Star Formation in H II Regions J. J. Hester & S. J. Desch, in *Chondrites and the Protoplanetary Disk*, eds. A. Krot, E. Scott & B. Reipurth, Astronomical Society of the Pacific Conference Series 341, 107 (2005).
6. A Supernova Injected Radionuclides into our Protoplanetary Disk N. Ouellette, S. J. Desch, J. J. Hester & L. A. Leshin, in *Chondrites and the Protoplanetary Disk*, eds. A. Krot, E. Scott & B. Reipurth, Astronomical Society of the Pacific Conference Series 341, 527 (2005).
7. Heating of Chondritic Materials in Solar Nebula Shocks (**invited review**) S. J. Desch, F. J. Ciesla, L. L. Hood & T. Nakamoto, in *Chondrites and the Protoplanetary Disk*, eds. A. Krot, E. Scott & B. Reipurth, Astronomical Society of the Pacific Conference Series 341, 849 (2005).
8. Linear Analysis of the Magnetorotational Instability, Including Ambipolar Diffusion, with Application to Protoplanetary Disks S. J. Desch, *Ap. J.*, 608, 509 (2004).
9. On the Origin of the Kleine K ugelchen called Chondrules (**invited review**) S. J. Desch & H. C. Connolly, Jr., *Chemie der Erde* 64, 95 (2004).
10. An Interstellar Origin for the Beryllium 10 in Calcium-rich, Aluminum-rich Inclusions S. J. Desch, H. C. Connolly, Jr., & G. Srinivasan, *Ap. J.*, 602, 528 (2004).
11. Progress in Planetary Lightning (**invited review**) S. J. Desch, W. J. Borucki, C. T. Russell & A. Bar-Nun *Rep. Progr. Phys.* 65, 955 (2002).
12. Annealing of Silicate Dust by Nebular Shocks at 10 AU, D. E. Harker & S. J. Desch, *Ap. J.* 565, L109 (2002).
13. A Model of the Thermal Processing of Particles in Solar Nebula Shocks: Application to the Cooling Rates of Chondrules S. J. Desch & H. C. Connolly, Jr. *Metic. & Planet. Sci.* 37, 183 (2002).
14. Shock Processing of Interstellar Nitrogen Compounds in the Solar Nebula, M. E. Kress, S. J. Desch, C. E. Dateo & G. Benedix, *Adv. Sp. Res.* 30, 1473 (2002).
15. The Magnetic Decoupling Stage of Star Formation S. J. Desch & T. Ch. Mouschovias, *Ap. J.* 550, 314 (2001).

16. *Large-Scale Thermal Events in the Solar Nebula: Evidence from Fe,Ni Metal Grains in Primitive Meteorites* A. Meibom, S. J. Desch, A. N. Krot, J. N. Cuzzi, M. I. Petaev, L. Wilson & K. Keil, *Science* 288, 839 (2000).
17. *The Generation of Lightning in the Solar Nebula* S. J. Desch & J. N. Cuzzi, *Icarus* 143, 87 (2000).
18. *Radiative Cooling and Viscous Dissipation in Molecular Accretion Disks at the Nuclei of Galaxies* S. J. Desch, B. K. Wallin & W. D. Watson, *Ap. J.* 496, 775 (1998).
19. *Ambipolar Diffusion and Far-Infrared Polarization from the Galactic Center Circumnuclear Disk* S. J. Desch & W. G. Roberge, *Ap. J.* 475, L115-118 (1997).

Other Publications

1. *How to Make a Chondrule* Steve Desch, *Nature* 441, 416-417 (2006).
2. *Astromineralogy: Dust in another Solar System* Steve Desch, *Nature* 431, 636 (2004).
3. *The Cradle of the Solar System* J. Jeff Hester, Steven J. Desch, Kevin R. Healy & Laurie A. Leshin, *Science* 304, 1116 (2004).

Published Conference Abstracts

1. *Investigations into Dust Charging and Transport in Martian and Terrestrial Dust Devils*, S. J. Desch, G. R. Wilson, B. Perret, L. D. V. Neakrase & R. Greeley *Lunar Planet. Sci. Conf.* 37, 1983 (2006).
2. *Near-Infrared Spectra of Charon: Support for Cryovolcanism on Kuiper Belt Objects?* Cook, J. C., S. J. Desch, T. Roush, T. R. Geballe & C. A. Trujillo *Lunar Planet. Sci. Conf.* 37, 2107 (2006).
3. *Evaporation / Condensation of Chondritic Chondrule Precursors in Nebula Shocks*, Alexander, C. M. O'D. & S. J. Desch *Lunar Planet. Sci. Conf.* 37, 2303 (2006).
4. *Efficiency of Mixing of Supernova Ejecta into Nearby Protoplanetary Disks*, N. Ouellette & S. J. Desch *Lunar Planet. Sci. Conf.* 37, 2348 (2006).
5. *Injection of Short-Lived Radionuclides by a Nearby Supernova into a Protoplanetary Disk*, N. Ouellette & S. J. Desch *Protostars and Planets V*, 8467 (2005).
6. *A Nearby Supernova Injected Radionuclides into our Solar System*, S. J. Desch, N. Ouellette & J. J. Hester *Meteoritic. Planet. Sci. Abs.* 40, 5264 (2005).
7. *Limitations on the Production of Short-Lived Radionuclides by Irradiation in the Early Solar System* S. J. Desch *Meteoritic. Planet. Sci. Abs.* 40, 5265 (2005).
8. *Visible and Near-Infrared Spectra of Comet 29P/Schwassmann-Wachmann 1*, J. C. Cook, S. J. Desch & S. Wyckoff *Div. Planet. Sci.* 37, 16.05 (2005).
9. *The Meaning of Iron 60: A Nearby Supernova Injected Short-Lived Radionuclides into our Protoplanetary Disk* S. J. Desch & N. Ouellette *Lunar Planet. Sci. Conf.* 36, 1327 (2005).
10. *Understanding our Origins: Star Formation in H II Region Environments* J. J. Hester, K. R. Healy & S. J. Desch *Amer. Astron. Soc.* 205, 105.01 (2005).
11. *A Systematic Survey of Star Formation with the ORION MIDEX Mission*, P. Scowen et al. *Amer. Astron. Soc.* 205, 109.05 (2005).
12. *The Aerogel Model for the Origin of the Short-Lived Radionuclides in the Early Solar System* S. J. Desch, N. Ouellette, J. J. Hester & L. A. Leshin *Amer. Astron. Soc.* 205, 127.03 (2005).

13. *A Systematic Survey of Star Formation with the ORION MIDEX Mission*, P. Scowen et al. *Amer. Astron. Soc.* 204, 11.04 (2004).
14. *Making Water Worlds: The Importance of Aluminum 26*, S. J. Desch & L. A. Leshin *Lunar and Planet. Sci. Conf.* 35, 1987 (2004).
15. *Late Injection of Radionuclides into Solar Nebula Analogs in Orion*, N. Ouellette & S. J. Desch *Lunar and Planet. Sci. Conf.* 35, 2116 (2004).
16. *An Interstellar Origin for the Beryllium 10 in CAIs and Implications for our Solar System's Birth Environment*, S. J. Desch, H. C. Connolly, Jr. & G. Srinivasan *Amer. Astron. Soc.* 7.01 (2004).
17. *A Cosmic-Ray Origin for CAI Beryllium 10*, S. J. Desch & H. C. Connolly, Jr. *Meteorit. Planet. Sci. Abs.* 38, A133 (2003).
18. *An Interstellar Origin for the Beryllium 10 in CAIs*, S. J. Desch, H. C. Connolly, Jr. & G. Srinivasan *Lunar Planet. Sci. Conf.* 34, 1394 (2003).
19. *Mineralogy of Silicate Dust Grains in the Disk around TW Hydrae* L. Hutchison & S. J. Desch *Div. Planet. Sci.* 34, 29.01 (2002).
20. *Constraining the Environment in which Chondrules were Melted by Nebula Shocks*, S. J. Desch, H. C. Connolly, Jr. & D. E. Moser, *Meteorit. Planet. Sci. Abs.* 37, A41 (2002).
21. *Constraining the Environment in which Chondrules were Melted by Nebula Shocks*, S. J. Desch, H. C. Connolly, Jr. & D. E. Moser, *Lunar and Planet. Sci. Conf.* 33, 1768 (2002).
22. *Annealing of Silicate Dust by Nebula Shocks at 10 AU*, D. E. Harker & S. J. Desch *Lunar and Planet. Sci. Conf.* 33, 2002 (2002).
23. *Shock Chemistry in the Inner Solar Nebula*, M. E. Kress & S. J. Desch, *Lunar and Planet. Sci. Conf.* 32, 2096 (2001).
24. *Melting of Chondrules and Type B CAIs by Nebula Shocks* S. J. Desch & H. C. Connolly, Jr., *Lunar and Planet. Sci. Conf.* 32, 2163 (2001).
25. *Shock Chemistry in the Inner Solar Nebula*, M. E. Kress & S. J. Desch, *Proceedings, NASA Astrobiology Institute*, 331 (2001).
26. *An Astrophysical Model for the Formation of Zoned Iron-Nickel Metal Grains in the Bencubbin/ CH-like Chondrites QUE 94411 and Hammadah Al Hamra 237*, A. Meibom, S. J. Desch, A. N. Krot, J. N. Cuzzi, J. A. Wood & K. Keil, *Meteorit. Planet. Sci. Abs.* 35, A107 (2001).
27. *Large-Scale Thermal Events Recorded in FeNi Metal Condensates in CH Chondrites*, A. Meibom, S. J. Desch, A. N. Krot, J. N. Cuzzi, M. I. Petaev, L. Wilson & K. Keil, *Lunar and Planet. Sci. Conf.* 31, 1777 (2000).
28. *Astrophysical Constraints on Chondrule Formation Theories*, S. J. Desch, *Lunar and Planet. Sci. Conf.* 31, 1923 (2000).
29. *The Generation of Lightning in the Solar Nebula*, S. J. Desch & J. N. Cuzzi, *Lunar and Planet. Sci. Conf.* 30, 1962 (1999).
30. *Electrostatics of Saltating Particles*, S. J. Desch & G. R. Wilson, *Lunar and Planet. Sci. Conf.* 28, 295 (1997).
31. *Infrared Polarization in the Molecular Disk at the Galactic Center*, S. J. Desch & W. G. Roberge, in *Polarimetry of the Interstellar Medium*, eds. W. G. Roberge & D. C. B. Whittet (ASP Vol. 97), p. 450 (1996).

32. *The Abundances of Charged Particles in Dense Protostellar Cores*, S. J. Desch, in *From Stardust to Planetesimals*, eds. M. E. Kress, A. G. G. M. Tielens & Y. Pendleton (NASA CP-3343), p. 143 (1996).
33. *Grain Alignment and Polarized Emission from Molecular Accretion Disks*, W. G. Roberge & S. J. Desch, *Bull. Amer. Astron. Soc.* 22, 1256 (1990).

Invited Talks at Meetings

1. *Meteoritic Constraints on Protoplanetary Disks*, invited talk at the Workshop, From Protoplanetary Disks to Planetary Systems, London Ontario, May 17-18, 2006
2. *Shock Heating: Effects on Chondritic Material*, invited talk at the Chondrites and the Protoplanetary Disk meeting, Kauai, Hawaii, November 8-11, 2004
3. *Chondrule Formation*, invited talk at the Gordon Research Conference on Origins of Solar Systems, Bristol, Rhode Island, July 5-9, 2003

Contributed Talks at Topical Conferences

1. *Development of a Numerical Model of Dust Charging and Transport in Dust Devils*, Workshop on Dust Devils on Earth and Mars, Flagstaff, Arizona, September 19, 2005
2. *Limitations on the Production of Short-Lived Radionuclides by Irradiation in the Early Solar System*, 68th Annual Meeting of the Meteoritical Society, Gatlinburg, Tennessee, September 12, 2005
3. *The Meaning of Iron 60: A Nearby Supernova Injected Radionuclides into our Protoplanetary Disk*, Lunar and Planetary Science Conference XXXVI, Houston, Texas, March 18, 2005
4. *The Aerogel Model for the Origin of the Short-Lived Radionuclides in the Early Solar System*, 205th Meeting of the American Astronomical Society, San Diego, California, January 12, 2005
5. *Late Injection of Radionuclides into Solar Nebula Analogs in Orion*, Lunar and Planetary Science Conference XXXV, Houston, Texas, March 15, 2004
6. *An Interstellar Origin for the Beryllium 10 in CAIs*, Steward Observatory Internal Symposium, Tucson AZ, October 6, 2003
7. *An Interstellar Origin for the Beryllium 10 in CAIs*, 66th Annual Meeting of the Meteoritical Society, Muenster, Germany, July 28, 2003
8. *An Interstellar Origin for the Beryllium 10 in CAIs*, Lunar and Planetary Science Conference XXXIV, Houston, Texas, March 21, 2003
9. *Constraining the Environment in which Chondrules were Melted by Solar Nebula Shocks*, 65th Annual Meeting of the Meteoritical Society, Los Angeles, California, July 22, 2002
10. *Constraining the Environment in which Chondrules were Melted by Solar Nebula Shocks*, Lunar and Planetary Science Conference XXXIII, Houston, Texas, March 12, 2002
11. *Melting of Chondrules and Type B CAIs by Solar Nebula Shocks*, Lunar and Planetary Science Conference XXXII, Houston, Texas, March 12, 2001
12. *Signatures of Disequilibrium Chemistry in the Solar Nebula*, American Chemical Society Meeting, Washington DC, August 18, 2000
13. *Astrophysical Constraints on Chondrule Formation Theories*, Lunar and Planetary Science Conference XXXI, Houston, Texas, March 16, 2000
14. *The Generation of Lightning in the Solar Nebula*, Lunar and Planetary Science Conference XXX, Houston, Texas, March 17, 1999

Colloquia and Seminars

1. *Meteoritic Constraints on Protoplanetary Disks*, American University of Beirut, Beirut, Lebanon, July 4, 2006
2. *Origin of the Short-Lived Radionuclides in the Early Solar System*, University of California, Los Angeles, Los Angeles, CA, November 30, 2004
3. *Chondrule Formation by Solar Nebula Shocks*, Indiana University, Bloomington, Indiana, April 20, 2004
4. *Meteoritic Constraints on Astrophysical Models of Star and Planet Formation*, Arizona State University, Tempe, AZ, January 21, 2004
5. *Chondrule Formation*, University of Arizona, Tucson, AZ, November 18, 2003
6. *Chondrule Formation*, Society of Physics Students, Arizona State University, Tempe, AZ, September 3, 2003
7. *Magnetic Fields, Meteorites and Me*, Arizona State University, Tempe, AZ, April 14, 2003
8. *The Magnetic Decoupling Stage of Star Formation*, George Mason University, Fairfax, VA, March 7, 2003
9. *The Magnetic Decoupling Stage of Star Formation*, Department of Terrestrial Magnetism, Carnegie Institute of Washington, Washington DC, March 3, 2003
10. *The Magnetic Decoupling Stage of Star Formation*, University of Georgia, Athens, GA, February 20, 2003
11. *Melting of Chondrules by Nebula Shocks*, University of Chicago, Chicago, IL, November 15, 2002
12. *Melting of Chondrules by Nebula Shocks*, Rensselaer Polytechnic Institute, Troy, NY, September 9, 2002
13. *Melting of Chondrules by Nebula Shocks*, Department of Terrestrial Magnetism, Carnegie Institute of Washington, Washington DC, July 10, 2002
14. *Melting of Chondrules by Nebula Shocks*, American Museum of Natural History, New York, NY, June 28, 2002
15. *Are Magnetorotational Instabilities Relevant to Protoplanetary Disks?*, University of Maryland, College Park, MD, March 26, 2002
16. *Melting of Chondrule by Nebula Shocks*, Rutgers University, New Brunswick, NJ, November 28, 2001
17. *Generation of Lightning in the Solar Nebula*, Department of Terrestrial Magnetism, Carnegie Institute of Washington, Washington DC, September 22, 2001
18. *Generation of Lightning in the Solar Nebula*, NASA Goddard Space Flight Center, Greenbelt, MD January 11, 2001
19. *Generation of Lightning in the Solar Nebula*, University of Maryland, College Park, MD, November 7, 2000
20. *Lightning in the Solar Nebula*, Lockheed-Martin Corporation, Palo Alto, CA, April 8, 1999
21. *The Magnetic Decoupling Stage of Star Formation*, NASA Ames Research Center, Moffett Field, CA, December 13, 1998
22. *The Generation of Lightning in the Solar Nebula*, Center for Star Formation, NASA Ames Research Center, Moffett Field, CA, May 10, 1996

Presentations in Mass Media

1. *Hubble and Beyond: Telescopes in Space*, Discovery Science Channel, January 25, 2005
2. *The Best of Our Knowledge*, WAMC Radio (NPR), September 2002

Service:

- Dept. Tiger Team Committee (2003-2004)
- Dept. Committee on Committees (2004-2005)
- Dept. Faculty Search Committee (2004-2005)
- Dept. Computer Committee [chair] (2005-2006)
- Dept. IT Hiring Committee (2005-2006)
- Coll. Steering Committee, School of Earth and Space Exploration (2004-2006)
- Coll. Vision Subcommittee, School of Earth and Space Exploration (2004-2005)
- Coll. SESE Director Search Committee (2005-2006)
- Prof. Scientific Organizing Committee, Chondrites and the Protoplanetary Disk Meeting, Kauai, Hawaii, November 8-11, 2004
- Prof. Associate Editor, Conference Proceedings, Chondrites and the Protoplanetary Disk
- Prof. Reviewer for *The Astrophysical Journal*
- Prof. Reviewer for *Earth and Planetary Science Letters*
- Prof. Reviewer for *Geochimica Cosmochimica Acta*
- Prof. Reviewer for *Geophysical Research Letters*
- Prof. Reviewer for *Icarus*
- Prof. Reviewer for *Journal of Geophysical Research*
- Prof. Reviewer for *Meteoritics and Planetary Science*
- Prof. Reviewer for *Monthly Notices of the Royal Astronomical Society*
- Prof. Reviewer for *Nature*
- Prof. Reviewer for *Science*
- Prof. Reviewer for W. H. Freeman Publishing Co. (*Universe*, by Freedman)
- Prof. Reviewer for Brooks Cole / Thomson Publishing Co. (*Foundations of Astronomy*, by Seeds)
- Prof. Panel Reviewer for Dudley Observatory Fullam Award (2002)
- Prof. Panel Reviewer for NASA Origins Program (2001, 2006)
- Prof. External Reviewer for NASA Origins Program
- Prof. External Reviewer for NASA Cosmochemistry Program
- Prof. External Reviewer for NASA Mars Fundamental Research Program
- Prof. External Reviewer for NASA Planetary Geology and Geophysics Program