

Fred J. Ciesla

CONTACT INFORMATION

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EDUCATION

2003 PhD in Planetary Sciences, University of Arizona, Tucson, AZ
1998 BA *cum laude* in Physics, Cornell University, Ithaca, NY

EMPLOYMENT

2013-Present Associate Professor, Enrico Fermi Institute, University of Chicago
2012-Present Associate Professor, Department of the Geophysical Sciences, University of Chicago
2008-2012 Assistant Professor, Department of the Geophysical Sciences, University of Chicago
2006-2008 Postdoctoral Fellow, Department of Terrestrial Magnetism, Carnegie Institution of Washington
2004-2005 National Research Council Associate, NASA Ames Research Center

RESEARCH INTERESTS

- The physical and chemical evolution of protoplanetary disks
- Chemical and physical effects of planetesimal collisions
- Delivery of water to Earth and other terrestrial planets around stars of all types

HONORS AND AWARDS

2014 Elected Fellow of The Meteoritical Society
2011 Alfred O. C. Nier Prize from The Meteoritical Society
2003 Kuiper Memorial Award for Graduate Achievement, Department of Planetary Sciences, University of Arizona
2002 NASA Group Achievement Award for role in NEAR Shoemaker Mission

PROFESSIONAL SERVICE

- Chair of *Gordon Research Conference on Origins of Solar Systems* in 2015
- Academic Program Review Committee of University of Arizona Department of Planetary Sciences 2014
- Vice-Chair of *Gordon Research Conference on Origins of Solar Systems* in 2013
- Invited Contributor for Workshop on developing NASA's Astrobiology Research Roadmap in 2013
- Community Discussion Leader for Astrobiology focus on Formation of Habitable Planets for Astrobiology Research Roadmap 2013
- Co-Convener of "Dynamics and Chemistry in Protoplanetary Disks" Session for 23rd V. M. Goldschmidt Conference 2013
- Member of Cosmochemistry Management Operations Working Group (2012-)
- Chair of McKay Student Award Committee for 75th Meteoritical Society Meeting in 2012
- Co-Convener of "Dust to Planetesimals" Session for 21st V. M. Goldschmidt Conference 2011
- Co-Convener of "Material Circulation in the Early Solar System" Session for the *Japan Geoscience Union Meeting* 2010
- Co-chair of *Workshop on Experimentation and Modeling in Cosmochemistry: From Nebulae to Planets* in Nancy, France July 11-13 2009
- Program Committee for Lunar and Planetary Science Conference 2008

- Judge for Dworkin Student Awards at the Lunar and Planetary Science Conference 2007
- Associate Editor, *ASP Conference Series 341: Chondrites and the Protoplanetary Disk* (A. N. Krot, E. R. D. Scott, and B. Reipurth, Eds.) 2005. Astronomical Society of the Pacific, San Francisco.
- Peer Reviewer for *Science*, *Astrophysical Journal*, *Icarus*, *Meteoritics & Planetary Science*, *Monthly Notices of the Royal Astronomical Society*, *Astronomy & Astrophysics*, *Earth & Planetary Science Letters*, *Geochimica et Cosmochimica Acta*, *Earth, Moon & Planets*, *Proceedings of the National Academy of Sciences*, *Meteorites and the Early Solar System II*, *Chondrites and the Protoplanetary Disk*
- Panel Chair, Member and External Reviewer for NASA (SSO, PGG, EXO, COS, OPR), NSF (AST), U.S.-Israel Binational Science Foundation, and German Research Foundation (DFG) Funding Committees

MENTORING

Le Yang, PhD Student, 2009-2014

Samuel Simon, High School Student, Summer 2010

Thomas Davison, Postdoctoral Researcher, 2011-2013

External Member of Thesis Committee for Emmanuel Jacquet, Le Museum National d'Histoire Naturelle (June 2012)

Hannah Diamond-Lowe, Undergraduate Researcher, 2012

Molly Simon, Undergraduate Researcher, 2012-2013 (Honors Thesis)

Tad Komacek, Undergraduate Researcher, 2012-2013 (Honors Thesis)

Alex Lanzano, Undergraduate Researcher, 2012-2014 (Honors Thesis)

Cecilia Sanders, Undergraduate Member of Leadership Alliance, Summer 2014

Rich Lyons, PhD Candidate, 2014-Present

BOOK CHAPTERS

Davis, A. M., C. M. O'D. Alexander, F. J. Ciesla, M. Gounelle, A. N. Krot, M. I. Petaev, T. Stephan (2014) Samples of the Solar System: Recent Developments. In *Protostars and Planets VI* (C. Dullemond Ed.) University of Arizona Press, Tucson. In Press.

Ciesla, F. J. and A. P. Boss (2013) The Solar Nebula. In *Treatise on Geochemistry Volume 1: Meteorites, Comets, and Planets* (A. M. Davis, Ed.) Elsevier Science, Amsterdam. In Press.

Ciesla, F. J. and C. P. Dullemond (2010). The Evolution of Protoplanetary Disk Structures. In *Protoplanetary Dust: The Astrochemical and Cosmochemical Perspectives* (D. Apai and D. S. Lauretta, Eds.) Cambridge University Press, Cambridge. pp. 66-96.

Grossman, L., J. R. Beckett, A. V. Fedkin, S. B. Simon and F. J. Ciesla (2008). Redox Conditions in the Solar Nebula: Observational, Theoretical, and Experimental Constraints. In *Reviews in Mineralogy and Geochemistry Series: Oxygen in Earliest Solar System Materials and Processes* (G. Macpherson, Ed.) Mineralogical Society of America, Chantilly. pp. 93-140.

Ciesla, F. J. and S. B. Charnley (2006). The Physics and Chemistry of Nebular Evolution. In *Meteorites and the Early Solar System II* (D. S. Lauretta and H. Y. McSween, Eds.) University of Arizona Press, Tucson. pp. 209-230.

Cuzzi, J. N., F. J. Ciesla, M. I. Petaev, A. N. Krot, E. R. D. Scott, and S. J. Weidenschilling (2005). Nebular Evolution of Thermally Processed Solids: Reconciling Models and Meteorites. In *ASP Conference Series 341: Chondrites and the Protoplanetary Disk* (A. N. Krot, E. R. D. Scott, and B. Reipurth, Eds.) Astronomical Society of the Pacific, San Francisco. pp. 732-773.

Ciesla, F. J. (2005). Chondrule-forming Processes--An Overview. In *ASP Conference Series 341: Chondrites and the Protoplanetary Disk* (A. N. Krot, E. R. D. Scott, and B. Reipurth, Eds.) Astronomical Society of the Pacific, San Francisco. pp. 811-820.

Desch, S. J., F. J. Ciesla, L. L. Hood, and T. Nakamoto (2005). Heating of Chondritic Materials in Solar Nebula Shocks. In *ASP Conference Series 341: Chondrites and the Protoplanetary Disk* (A. N.

- Krot, E. R. D. Scott, and B. Reipurth, Eds.) Astronomical Society of the Pacific, San Francisco. pp. 849-872.
- Hood, L. L., F. J. Ciesla, and S. J. Weidenschilling (2005). Chondrule Formation in Planetesimal Bow Shocks: Heating and Cooling Rates. In *ASP Conference Series 341: Chondrites and the Protoplanetary Disk* (A. N. Krot, E. R. D. Scott, and B. Reipurth, Eds.) Astronomical Society of the Pacific, San Francisco. pp. 873-882.

ARTICLES IN PEER REVIEWED JOURNALS

- Ciesla, F. J. (2014) The Phases of Water Ice in the Solar Nebula. *Astrophysical Journal Letters* 784, L1.
- Fischer, R. and F. J. Ciesla (2014) Dynamics of the terrestrial planets from a large number of N-body simulations. *Earth & Planetary Science Letters* 392, 48-58.
- Ciesla, F. J., T. M. Davison, G. S. Collins, and D. P. O'Brien (2013). Thermal Consequences of Impacts in the Early Solar System. *Meteoritics & Planetary Science* 48, 2559-2576.
- Davison, T. M., D. P. O'Brien, F. J. Ciesla, and G. S. Collins (2013) The Early Impact Histories of Meteorite Parent Bodies. *Meteoritics & Planetary Science* 48, 1894-918.
- Yang, L., F. J. Ciesla, and C.M.O'D. Alexander (2013) The D/H Ratio of Water in a Forming and Evolving Protoplanetary Disk. *Icarus* 226, 256-267.
- Abbot, D. S., N. B. Cowan, and F. J. Ciesla (2012). Indication of Insensitivity of Planetary Weathering Behavior and Habitable Zone to Surface Land Fraction. *Astrophysical Journal* 756, #178.
- Davison, T. M., F. J. Ciesla, and G. S. Collins (2012). Post-Impact Thermal Evolution of Planetesimals. *Geochemica et Cosmochimica Acta* 95, 252-269.
- Ciesla, F. J. and S. A. Sandford (2012). Organic Synthesis on Ice Grains in the Solar Nebula. *Science* 336, 452-454.
- Fedkin, A. V., L. Grossman, F. J. Ciesla, and S. B. Simon (2012). Mineralogical and Isotopic Constraints on Chondrule Formation from Shock Wave Thermal Histories. *Geochemica et Cosmochimica Acta* 87, 81-116.
- Yang, L. and F. J. Ciesla (2012). The Effects of Disk Building on the Distributions of Refractory Materials in the Solar Nebula. *Meteoritics & Planetary Science* 47, 99-119.
- Ciesla, F. J. (2011). Residence Times of Particles in Diffusive Protoplanetary Disk Environments II. Radial Motions and Dust Annealing. *Astrophysical Journal* 740, #9.
- Makide, K., K. Nagashima, A. N. Krot, G. R. Huss, F. J. Ciesla, E. Hellebrand, E. Gaidos, and L. Yang (2011). Heterogeneous Distribution of ²⁶Al at the Birth of the Solar System. *Astrophysical Journal* 733, L31.
- Jacobsen, B., J. Matzel, I. D. Hutcheon, A. N. Krot, Q-Z. Yin, K. Nagashima, E. C. Ramon, P. K. Weber, H. A. Ishii, and F. J. Ciesla (2011). Formation of Short-Lived Radionuclides in the Protoplanetary Disk During Late-Stage Irradiation of a Volatile-Rich Reservoir. *Astrophysical Journal* 731, L28(5pp).
- Ciesla, F. J. (2010). Residence Times of Particles in Diffusive Protoplanetary Disk Environments I. Vertical Motions. *Astrophysical Journal* 723, 514-529.
- Ciesla, F. J. (2010). The Distributions and Ages of Refractory Objects in the Solar Nebula. *Icarus* 208, 455-467.
- Davison, T. M., G. S. Collins, and F. J. Ciesla (2010). Numerical Modelling of Heating in Porous Planetesimal Collisions. *Icarus* 208, 468-481.
- Krot, A. N., K. Nagashima, F. J. Ciesla, B. S. Meyer, I. D. Hutcheon, A. M. Davis, G. R. Huss, and E. R. D. Scott (2010). Oxygen Isotopic Composition of the Sun and Mean Oxygen Isotopic Composition of the Protosolar Silicate Dust: Evidence from Refractory Inclusions. *Astrophysical Journal* 713, 1159-1166.
- Ciesla, F. J. (2009). Dynamics of High-Temperature Materials Delivered by Jets to the Outer Solar Nebula. *Meteoritics & Planetary Science* 44, 1663-1673.
- Ouellette, N., S. J. Desch, M. Bizzarro, A. P. Boss, F. J. Ciesla, and B. Meyer (2009). Injection

- Mechanism of Short-Lived Radionuclides and Their Homogenization. *Geochemica et Cosmochemica Acta* 73, 4946-4962.
- Krot, A. N., Y. Amelin, P. Bland, F. J. Ciesla, J. Connelly, A. M. Davis, G. R. Huss, I. D. Hutcheon, K. Makide, K. Nagashima, L. E. Nyquist, S. S. Russell, E. R. D. Scott, K. Thrane, H. Yurimoto, and Q.-Z. Yin (2009). Origin and Chronology of Chondritic Components: A Review. *Geochemica et Cosmochemica Acta* 73, 4963-4997.
- Lyons, J. R., E. Bergin, F. J. Ciesla, A. M. Davis, S. J. Desch, K. Hashizume, T. Ireland, J.-E. Lee and R. A. Marcus (2009). Timescales for the Evolution of Oxygen Isotopic Compositions in the Solar Nebula. *Geochemica et Cosmochemica Acta* 73, 4998-5017.
- Ciesla, F. J. (2009). Two-Dimensional Transport of Solids in Viscous Protoplanetary Disks. *Icarus* 200, 655-671.
- Morris, M. A., S. J. Desch, and F. J. Ciesla (2009). The Effect of H₂O Line Cooling in Chondrule-Forming Shocks. *Astrophysical Journal* 691, 320-331.
- Ciesla, F. J. (2008). Radial Transport in the Solar Nebula: Implications for the Depletion of Moderately Volatile Elements in Chondritic Meteorites. *Meteoritics & Planetary Science* 43, 639-655.
- Alexander, C. M. O'd., J. N. Grossman, D. Ebel, and F. J. Ciesla (2008). The Formation Conditions of Chondrules and Chondrites. *Science* 320, 1617-1619.
- Ciesla, F. J. (2008). Observing Our Origins. *Science* 319, 1488-1489.
- Ciesla, F. J. (2007). Outward Transport of High-Temperature Materials Around the Midplane of the Solar Nebula. *Science* 318, 613-615.
- Ciesla, F. J. (2007). Dust Coagulation and Settling in Layered Protoplanetary Disks. *Astrophysical Journal* 654, L159-L162.
- Ciesla, F. J. (2006). Chondrule Collisions in Shock Waves. *Meteoritics & Planetary Science* 41, 1347-1360.
- Ciesla, F. J. and J. N. Cuzzi (2006). The Evolution of the Water Distribution in a Viscous Protoplanetary Disk. *Icarus* 181, 178-204.
- Ciesla, F. J. and D. S. Lauretta (2005). Radial Migration and Dehydration of Phyllosilicates in the Solar Nebula. *Earth and Planetary Science Letters* 231, 1-8.
- Pasek, M. A., J. A. Milsom, F. J. Ciesla, D. S. Lauretta, C. M. Sharp, and J. I. Lunine (2005). Sulfur Chemistry with Time-Varying Oxygen Abundance During Solar System Formation. *Icarus* 175, 1-14.
- Ciesla, F. J., L. L. Hood, and S. J. Weidenschilling (2004). Evaluating Planetesimal Bow Shocks as Sites for Chondrule Formation. *Meteoritics & Planetary Science* 39, 1809-1821.
- Ciesla, F. J., D. S. Lauretta, and L. L. Hood (2004). The Frequency of Compound Chondrules and Implications for Chondrule Formation. *Meteoritics & Planetary Science* 39, 531-544.
- Ciesla, F. J., D. S. Lauretta, B. A. Cohen, and L. L. Hood (2003). A Nebular Origin for Fine-Grained Phyllosilicates. *Science* 299, 549-552.
- Ciesla, F. J. and L. L. Hood (2002). The Nebular Shock Wave Model for Chondrule Formation: Shock Processing in a Particle-Gas Suspension. *Icarus* 158, 281-293.
- Hood, L. L. and F. J. Ciesla (2001). The Scale Size of Chondrule Formation Regions: Constraints Imposed by Chondrule Cooling Rates. *Meteoritics & Planetary Science* 36, 1571-1585.

INVITED SEMINARS AND COLLOQUIA

- Purdue University, Department of Earth, Atmospheric and Planetary Sciences, September 2014
- Adler Planetarium, Internal Research Seminar, November 2013
- University of Tennessee, Department of Earth and Planetary Sciences, September 2013
- University of Arizona, Astrobiology Lecture Series, May 2013
- Northwestern University, Department of Astronomy, May 2013
- Massachusetts Institute of Technology, Department of Earth and Planetary Sciences, November 2012
- University of Chicago, Enrico Fermi Institute, October 2012
- Cornell University, Department of Astronomy, September 2012

- Centre de Recherches Petrographiques et Geochimiques (Nancy, France), June 2012
- Le Museum National d'Histoire Naturelle (Paris, France), June 2012
- University of Florida, Department of Astronomy Colloquium, April 2012
- Lunar & Planetary Institute Seminar Series, June 2011
- Carnegie Institution, Department of Terrestrial Magnetism Colloquium, December 2010
- University of Chicago, Department of Astronomy and Astrophysics Colloquium, January 2010
- Penn State University, Department of Astronomy Colloquium, November 2007
- Smithsonian Institution, Department of Mineral Sciences Seminar, June 2007
- University of Chicago, Department of the Geophysical Sciences Colloquium, April 2007
- University of Chicago, Department of the Geophysical Sciences Colloquium, December 2006
- University of Arizona, Department of Astronomy Colloquium, November 2006
- UCLA, Department of Earth & Space Sciences Colloquium, October 2006
- NASA Goddard Space Flight Center, Extrasolar Planets Seminar, May 2006
- American Museum of Natural History, Earth and Planetary Sciences Seminar, June 2005
- University of Hawaii, Institute for Astronomy Seminar, February 2005
- University of Hawaii, Institute for Geophysics and Planetology Colloquium, February 2005
- NASA Ames Research Center, Astrophysics Seminar, June 2003

INVITED CONFERENCE TALKS

- *Circumstellar Disks and Planet Formation* (Ann Arbor, MI), 2014, TBD
- *Workshop on the Accretion and Early Differentiation of the Terrestrial Planets* (Nice, France), 2014
“The Evolution and Distribution of Volatiles in the Solar Nebula.”
- *The Life Cycle of Dust in the Universe: Observations, Theory, and Laboratory Experiments* (Taipei, Taiwan), 2013 “Chemical and Structural Evolution of Dust in Protoplanetary Disks”
- *Workshop on The Formation of the First Solids in the Solar System* (Kauai, HI), 2011 “Radial Transport and Survival of Refractory Inclusions in the Protoplanetary Disk.”
- *Gordon Research Conference on Origins of Solar Systems* (Holyoke, MA), 2011. “The Migration of Solids in Protoplanetary Disks” (Discussion Leader)
- *Workshop on Material Circulation in the Early Solar System II* (Sapporo, Japan), 2011. “Two-Dimensional Paths of Particles in the Solar Nebula: Irradiation Exposure and Organic Synthesis”
- *Japan Geoscience Union* (Tokyo, Japan), 2011. “Two-Dimensional Paths of Particles in the Solar Nebula: Irradiation Exposure and Processing”
- *Workshop on The Delivery of Volatiles & Organics: From Earth and ExoEarths in the Era of JWST* (Baltimore, MD) 2010. “The Transport of Water Ice in Protoplanetary Disks”
- *Workshop on Disks, Meteorites, Planetesimals* (New York, NY) 2010. “Thermal Evolution of Dust in the Protosolar Disk”
- *Workshop on Material Circulation in the Early Solar System* (Hakone, Japan), 2010. “Particle Paths in the Solar Nebula: Linking Physical and Chemical Models”
- *Japan Geoscience Union* (Tokyo, Japan), 2010. “Particle Paths in the Solar Nebula: Linking Physical and Chemical Models”
- *Workshop on Experimentation and Modeling in Cosmochemistry: From Nebulae to Planets* (Nancy, France), 2009. “The Dynamic Solar Nebula”
- *19th Annual V. M. Goldschmidt Conference* (Davos, Switzerland), 2009. “Reconciling Models of Dust Transport with the Chondritic Record” (Keynote)
- *19th Annual V. M. Goldschmidt Conference* (Davos, Switzerland), 2009. “The Effects of Planetesimal Collisions on the Volatile Content of Planetary Embryos”
- *Workshop on Planet Formation and Evolution: The Solar System and Extrasolar Planets* (Tübingen, Germany), 2009. “Radial Transport of Materials in Protoplanetary Disks: The Solar Nebula and Beyond”
- *Workshop on the STARDUST Mission* (Timber Cove, CA), 2008. “Radial Transport of Materials in the Solar Nebula: Theory and Modeling”

- *Workshop on Silicate Dust in Protostars: Astrophysical, Experimental and Meteoritic Links* (Tokyo, Japan), 2008. “Physical Models of Dust Transport in the Early Solar Nebula.”
- *18th Annual V. M. Goldschmidt Conference* (Vancouver, Canada), 2008. “Mixing It Up in the Solar Nebula.” (Keynote)
- *Gordon Research Conference on Origins of Solar Systems* (Holyoke, MA), 2007. “The Shock Wave Model for Chondrule Formation”
- *Workshop on Oxygen in the Earliest Solar System* (Gatlinburg, TN), 2005. “Astrophysical Modeling of the Distribution of Water in Protoplanetary Disks: Implications for Nebular Redox Conditions and Oxygen Isotopes.”
- *Workshop on Chondrites and the Protoplanetary Disk* (Kauai, HI), 2004. “Chondrule-Forming Processes--An Overview.”