

**Marc J. Kuchner**

NASA/Goddard Space Flight Center  
Exoplanets and Stellar Astrophysics Laboratory  
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**Employment and Education**

Astrophysicist, GS 14, Goddard Space Flight Center, 2005–  
Hubble Fellow, Russell Fellow, and Council of Science and Technology Fellow,  
Princeton University, 2003–2005  
Michelson Postdoctoral Fellow, Harvard-Smithsonian Center for Astrophysics, 2000–2003  
Ph. D. Astronomy with a Minor in Physics, Caltech, Thesis *Exozodiacal Dust*  
Advisor: Prof. Michael E. Brown, 2000  
A. B. Physics, Astronomy and Astrophysics with Honors, Harvard University, 1994

**Experience and Awards**

Marquis Who's Who In America, 2007–  
Stellar Imager Concept Study Proposal Team, 2007–  
TPF-O Concept Study Proposal Team, 2007–  
SPC SMEX Proposal Team, 2007–  
Bern International Space Science Institute Team, “Exozodiacal Dust Disks and  
DARWIN”, 2007–  
Scientific Organizing Committee, Extreme Planetary Systems, Santorini, 2007  
Science Director's Council, Goddard Space Flight Center, 2007  
Astrophysics Science Division Prize Committee, Goddard Space Flight Center, 2007  
Science Advisor, Baltimore Museum of Science Planetarium Show, *Beyond*  
Scientific Organizing Committee, TPF/Darwin Conference, 2006  
New Worlds Discoverer Science Team, 2006–  
Gemini/Near Infrared Coronagraphic Imager(NICI) Campaign Science Team, 2005  
Chair, Lab Chief Search Committee, GSFC Exoplanets and Stellar Astrophys. Lab., 2006  
Subaru HiCiao Adaptive Optics Instrument Preliminary Design Review Panelist, 2005  
Session Chair, STSCI Nearby Resolved Debris Disks Workshop, 2005  
Science Advisor, Boston Museum of Science Planetarium Show, *Far Far Away:  
The Worlds of Star Wars*, 2005

Organizer, Exoplanets Seminar Series, GSFC, 2005–  
 Terrestrial Planet Finder Coronagraph Science & Technology Definition Team, 2005–2006  
 Chair, Committee on Circumstellar Disks  
 Scientific Organizer (1 of 4), Aspen Winter Conference on Planet Formation, 2005  
 NASA Review Panelist: TPF/SSO, ATP, 2004, 2005, 2006  
 Organizer, Princeton Conference on General Astrophysics with TPF, 2004  
<http://astro.princeton.edu/~mkuchner/ancillarysci.html>  
 Terrestrial Planet Finder (TPF) Science Working Group, 2002–2004  
 Chair, Committee on General Astrophysics and Comparative Planetology  
 Northrop Grumman Space Technology TPF Science Advisory Team, 2003–  
 Space Infrared Interferometric Telescope (SPIRIT) Science Team, 2003–  
 Founder, Astrobiology Seminar Series, Princeton University, 2003  
 Aspen Gemini Future Instrumentation Workshop: U.S. Delegate, 2003  
 Eclipse Coronagraph Science Team, 2002–  
 Fourier-Kelvin Space Interferometer (FKSI) Science Team, 2002–  
 Princeton Extra-Solar Planets Advanced Mission Concepts Team, 2002  
 Harvard-Smithsonian CfA Giant Segmented Mirror Telescope Committee, 2002  
 Chair, Extrasolar Planets Session, AAS Division of Planetary Sciences Meetings, 2001,2002  
 Ball Aerospace TPF Architecture Team, 2001  
 Founder, Planet Formation Discussion Group, Harvard-Smithsonian CfA, 2001  
 Solar System Dust Panel, Planetary Science Decadal Survey, 2001  
 Developed ZODIPIC, popular exozodiacal dust model, 2000–

### **Teaching and Advising**

Advisor, Michelson Postdoctoral Fellow, Hannah Jang-Condell, 2007–  
 University of Maryland Astronomy Ph. D. Student: Daniel Jontof-Hutter, 2006–  
 University of Maryland Physics Ph. D. Student: Christopher Stark, 2005–  
 Goddard NRC Postdoctoral Fellow: Aki Roberge, 2005–  
 Eleanor Roosevelt High School Senior Intern: James Greene, 2005  
 Princeton Undergraduate Junior Paper: Daniel Miller, 2003  
 Harvard Undergraduate Senior Thesis: Sean Moran, 2002  
 Harvard REU Summer Student: Joannah Metz, 2002  
 Thesis Committee, SAO Predoctoral Student: Tommy Grav, 2002  
 Johns Hopkins University Physics Ph. D. Student: Rich Barry, 2006–  
 Lecturer in Astronomy, Rio Hondo College, 1996

### Grants

- PI, HST Theory Grant, *Modeling Coronagraphic Images of  $\beta$  Pictoris and other Debris Disks with Gas* (\$73 K), 2007
- Co-I, EPOXI Discovery Mission, 2007
- Co-I, HST Grant, *High Contrast Imaging of Dusty White Dwarfs* (\$55 K), 2007
- Co-I, *Spitzer* Grant, *Time Variable Accretion in White Dwarfs with Debris Disks* (\$22 K), 2007
- Co-I, *Spitzer* Grant, *Directly Detecting a Planet around a White Dwarf* (\$38 K), 2007
- Co-I, FQXi Grant, *The Characterization and Search for Life on Hot Rocky Exoplanets* (\$65 K), 2007
- Co-I, *Spitzer* Grant, *Resolving Mysteries: Ultra-Cool White Dwarfs and the Age of The Galaxy* (\$71 K), 2006
- Co-I, *Spitzer* Grant, *Dust around solitary millisecond pulsars* (\$20 K), 2006
- Co-I, CorSpec TPF-C Instrument Concept Study (\$ 300 K), 2005
- Co-I, CorCam TPF-C Instrument Concept Study (\$ 300 K), 2005
- Co-I, Mag30Cam TPF-C Instrument Concept Study (\$ 300 K), 2005
- Co-I, ARPA Grant, *Development of Binary Silicon Free Standing Image Masks for TPF-C* (\$ 300 K), 2005
- Co-I, *Spitzer* Grant, *Follow-up Study of Unusual White Dwarfs: Planets, Disks, and Deep 8 Micron Deficits* (\$72 K), 2005
- PI, *Spitzer* Grant, *Survey for Planets and Exozodiacal Dust Around White Dwarfs* (\$57 K), 2004
- Co-I, NASA Origins Grant, *Spectra and Biomarkers of Extrasolar Planets* (\$100 K), 2003–2005
- Science PI, Keck Interferometer Nuller Commissioning Science Team, *Circumstellar Disk Detection with the Keck Nuller* (\$210 K), 2003–2004
- Co-I, Keck Interferometer 2-Micron Commissioning Science Team, *Resolving Young Stellar Objects on Sub-AU Scales* (\$110 K), 2002–2003

### Publications in Refereed Journals

“Extrasolar Carbon Planets” by M. J. Kuchner and S. Seager, submitted to the *Astrophysical Journal Letters*, (astro-ph/0504214).

“High-Resolution N-Band Observations of the Nova RS Ophiuchi with the Keck Interferometer Nuller” by R.K. Barry, W.C. Danchi, J.L. Sokoloski, C. Koresko, J.P. Wisniewski, E. Serabyn, W. Traub, M. Kuchner & M.A. Greenhouse, submitted to the *Astrophysical Journal*.

“Mass-Radius Relationships for Solid Exoplanets” by S. Seager, M. J. Kuchner, C. A. Hier-Majumder and B. Militzer, *Astrophysical Journal*, in press., (astro-ph/0707.2895)

“The New Class of Dusty DAZ White Dwarfs” by T. von Hippel, M. J. Kuchner, M. Kilic, F. Mullally, W. T. Reach and D. E. Winget, *Astrophysical Journal*, Vol. 662, pg. 544, (2007).

“A Spitzer White Dwarf Infrared Survey” by F. Mullally, M. Kilic, W. T. Reach, M. J. Kuchner, T. von Hippel, A. Burrows, and D. E. Winget, *Astrophysical Journal Supplement*, Vol. 171, pg. 206, (2007).

“Theoretical Limits on Extrasolar Terrestrial Planet Detection with Coronagraphs” by O. Guyon, E. A. Pluzhnik, M. J. Kuchner, B. Collins, and S. T. Ridgway, *Astrophysical Journal Supplement*, Vol. 167, pg. 81, (2006).

“No Expanding Fireball: Resolving the Recurrent Nova RS Ophiuchi with Infrared Interferometry” by J. D. Monnier, R. K., Barry, W. A., Traub, B. F., Lane, R. L. Akeson, S. Ragland, P. A. Schuller, H. Le Coroller, J. -P. Berger, R. Millan-Gabet, E. Pedretti, F. P. Schloerb, C. Koresko, N. P. Carleton, M. G. Lacasse, P. Kern, F. Malbet, K. Perraut, M. J. Kuchner, and M. W., Muterspaugh, *Astrophysical Journal*, Vol. 647, pg. L127, (2006).

“Laboratory Testing of a Lyot Coronagraph Equipped with an Eighth-Order Notch Filter Image Mask” by J. R. Crepp, J. Ge, A. D. Vanden Heuvel, S. P. Miller, and M. J. Kuchner, *Astrophysical Journal*, Vol. 646, pg. 1252, (2006).

“The Importance of Phase in Nulling Interferometry and a Three Telescope Closure-Phase Nulling Interferometer Concept” by W. C. Danchi, J. Rajagopal, M. Kuchner, J. Richardson, and D. Deming, *Astrophysical Journal*, Vol. 645, pg. 1554, (2006).

“The Orbit and Occultations of KH 15D” by J.N. Winn, C.M. Hamilton, W.J. Herbst, J.L. Hoffman, M.J. Holman, J.A. Johnson and M.J. Kuchner, *Astrophysical Journal*, Vol. 644, pg. 510, (2006).

“The Mystery Deepens: Spitzer Observations of Cool White Dwarfs” by M. Kilic, T. von Hippel, F. Mullally, W. T. Reach, M. J. Kuchner, D. E. Winget, A. Burrows, and D. Saumon, *Astrophysical Journal*, Vol. 642, pg. 1051, (2006).

“Keck Interferometer Observations of FU Orionis Objects” by R. Millan-Gabet et al., *Astrophysical Journal*, Vol. 641, pg. 547, (2006).

“The Dust Cloud Around the White Dwarf G29-39” by W. T. Reach, M. J. Kuchner, T. von Hippel, A. Burrows, F. Mullally, M. Kilic, and D. E. Winget, *Astrophysical Journal Letters*, Vol. 635, pg. 161, (2005).

“Eighth-Order Image Masks for Terrestrial Planet Finding” by M. J. Kuchner, J. Crepp, and J. Ge, *Astrophysical Journal*, Vol. 628, pg. 466, (2005).

“The Near-Infrared Size-Luminosity Relations for Herbig Ae/Be Disks” by J. D. Monnier et al. 2004, *Astrophysical Journal*, Vol. 624, pg. 832, (2005).

“The Dynamical Influence of a Planet at Semimajor Axis 3.4 AU on the Dust Around  $\epsilon$  Eridani” by S. M. Moran, M. J. Kuchner and M. J. Holman, *Astrophysical Journal*, Vol. 612, pg. 1163, (2004).

“A Minimum-Mass Extrasolar Nebula” by M. J. Kuchner, *Astrophysical Journal*, Vol. 612, pg. 1147, (2004).

“Using Notch Filter Masks for High Contrast Imaging of Extrasolar Planets” by J. H. Debes, J. Ge, M. J. Kuchner and M. Rogosky, *Astrophysical Journal*, Vol. 608, pg. 1095, (2004).

“Detection of Close-In Extrasolar Giant Planets Using the Fourier-Kelvin Stellar Interferometer” by W. C. Danchi, D. Deming, M. J. Kuchner and S. Seager, *Astrophysical Journal Letters*, Vol. 597, pg. L57 (2003).

“Volatile-Rich Earth-Mass Planets in the Habitable Zone” by M. J. Kuchner, *Astrophysical Journal Letters*, Vol. 596, pg. L105 (2003).

“Notch Filter Masks: Practical Image Masks for Planet-Finding Coronagraphs” by M. J. Kuchner and D. N. Spergel, *Astrophysical Journal*, Vol. 594, pg. 617, (2003).

“The Geometry of Resonant Signatures in Debris Disks with Planets” by M. J. Kuchner and M. J. Holman, *Astrophysical Journal*, Vol. 588, pg. 1110, (2003).

“Halting Planet Migration in the Evacuated Centers of Protoplanetary Disks” by M. J. Kuchner and M. Lecar, *Astrophysical Journal Letters*, Vol. 574, pg. L87 (2002).

“Long-Term Dynamics and the Orbital Inclinations of the Classical Kuiper Belt Objects” by M. J. Kuchner, M. E. Brown, and M. Holman, *Astronomical Journal*, Vol. 124, pg. 1221 (2002).

“Structure in the Dusty Debris Around Vega” by D. J. Wilner, M. J. Holman, M. J. Kuchner, and P. T. P. Ho, *Astrophysical Journal Letters*, Vol. 569, pg. 115 (2002)

“A Coronagraph with a Band-Limited Mask for Finding Terrestrial Planets” by M. J. Kuchner and W. Traub, *Astrophysical Journal*, Vol. 570, pg. 900 (2002).

“Ground-Based Coronagraphy with High Order Adaptive Optics” by A. Sivaramakrishnan, C. D. Koresko, R. B. Makidon, T. Berkefeld, and M. J. Kuchner, *Astrophysical Journal*, Vol. 552. pg. 397 (2001).

“Interferometric Detection of Pulsations of the Cepheid  $\zeta$  Geminorum” by B. F. Lane, M. J. Kuchner, A. F. Boden, M. Creech–Eakman and S. R. Kulkarni, *Nature*, Vol. 407, pg. 485 (2000).

“A Search for Exozodiacal Dust and Faint Companions around Sirius, Procyon, and Altair with the NICMOS Coronagraph” by M. J. Kuchner and M. E. Brown, *Publications of the Astronomical Society of the Pacific*, Vol. 112, pg. 827 (2000).

“A Search for Resonant Structures in the Zodiacal Cloud with COBE DIRBE: The Mars Wake and Jupiter’s Trojan Clouds” by M. J. Kuchner, W. T. Reach and M. E. Brown, *Icarus*, Vol. 145, pg. 44 (2000).

“The Visual Orbit of 64 Piscum” by A. Boden et al. *Astrophysical Journal*, Vol. 527, pg. 360 (1999).

“The Energetic Afterglow of the Gamma-Ray Burst of 14 December 1997” by A. N. Ramaprakash et al., *Nature*, Vol. 393, pg. 43 (1998).

“Keck Speckle Imaging of the White Dwarf G29-38: No Brown Dwarf Companion Detected” by M. J. Kuchner, C. D. Koresko, and M. E. Brown, *Astrophysical Journal Letters*, Vol. 508, pg. L81 (1998).

“An 11.6 Micron Keck Search For Exo-Zodiacal Dust” by M. J. Kuchner, M. E. Brown and C. D. Koresko, *Publications of the Astronomical Society of the Pacific*, Vol. 110, pg. 1336 (1998).

“Evidence for Ni-Co-Fe decay in Type Ia Supernovae” by M. J. Kuchner, R. P. Kirshner, P. A. Pinto, and B. Leibundgut, *Astrophysical Journal Letters*, Vol. 426, pg. L89 (1994).

### Invited Review Papers

“General Astrophysics with the Optical Terrestrial Planet Finder Mission” K. Stapelfeldt, C. Beichman, and M. Kuchner, *New Astronomy* Vol. 49, pg. 396, (2005)

“Planetary Perturbers in Debris Disks” by M. J. Kuchner, *Earth, Moon and Planets: First Decadal Review of the Kuiper Belt* eds. J. Davies and L. Barrera, (2003)

“Terrestrial Planet Finding with a Visible Light Coronagraph” by M. J. Kuchner and D. N. Spergel, *Scientific Frontiers in Research on Extrasolar Planets*, ASP Conference Series, Vol. 294, pg. 603, eds. D. Deming and S. Seager, astro-ph/0305522, (2003).

“Keck Interferometer Nuller Shared-Risk Science Program” by M. J. Kuchner, *Hunting for Planets: Ground-based European Nulling Interferometry Experiment Workshop*, <http://www.strw.leidenuniv.nl/~genie/abstracts/kuchner.html>, (2002).

### Invited Talks

Carnegie Institute of Washington, Dept. of Terrestrial Magnetism, Colloquium, 9/07

Extreme Solar Systems International Conference, Santorini, 6/07

University of Hawaii, Astronomy Colloquium, 3/07

University of Washington, Astronomy Colloquium, 1/07

The 3rd Workshop on Development of Extra-solar Planetary Science, Tokyo, 12/06

TPF/Darwin Conference 2006, 11/06

Caltech Planetary Science Department, Seminar, 5/06

Carnegie Institution of Washington, Dept. of Terrestrial Magnetism, Seminar, 2/06

University of Grenoble Observatory (LAOG), Seminar, 2/06

European Research Course in Atmospheres (ERCA), Grenoble, 2 Lectures, 2/06

Institute of Astronomy (IAP), Pierre and Marie Curie Univ., Paris, Seminar, 1/06

University of Maryland, Department of Astronomy, Seminar 12/05

George Washington University, Department of Physics, Colloquium 11/05  
University of Maryland, Department of Astronomy, Colloquium 11/05  
Goddard Space Flight Center, Astrobiology Seminar, 11/05  
Amazing Light: A Symposium in Honor of Charles Townes, 10/05  
University of Hawaii, Colloquium, 9/05  
University of Kyoto Dept. of Physics, Seminar, 5/05  
Early Earth Meeting, Makuhari, Japan, 5/05  
National Astronomical Observatory of Japan, Colloquium, 5/05  
University of Tokyo, Tokyo Area Planet Formation Seminar, 5/05  
Space Telescope Science Institute, Colloquium, 3/05  
Space Telescope Science Institute, Seminar, 12/04  
University of Michigan, Department of Astronomy, Colloquium, 12/04  
Penn State University, Department of Astronomy and Astrophysics, Colloquium, 10/04  
University of Florida, Department of Astronomy, Colloquium, 10/04  
University of Delaware, Physics Colloquium, 5/04  
University of Toronto, Department of Astronomy and Astrophysics, Colloquium, 5/04  
American Museum of Natural History, Astrophysics Seminar, 5/04  
Goddard Space Flight Center, LASP Divison Seminar, 4/04  
Kavli Institute of Theoretical Physics, Planet Formation Conference, 3/04  
University of Texas at Austin, Department of Astronomy, Colloquium, 3/04  
Institute for Advanced Study, Planet Formation Working Group Seminar, 3/04  
Coronagraphic Methods for the Detection of Terrestrial Planets, Lorentz Center Workshop,  
2/04  
University of Pennsylvania, Department of Astronomy, Colloquium, 11/03  
Stony Brook University, Department of Physics and Astronomy, Seminar, 10/03  
Maryland Astrophysics Conference: The Search for Other Worlds, 10/03  
Princeton University, Department of Astrophysical Sciences, Colloquium, 9/03  
International Astronomical Union General Assembly: Star Formation at High Angular  
Resolution, 8/03  
University of Michigan, Department of Astronomy, Colloquium, 3/03  
University of Toronto, Department of Astronomy and Astrophysics, Colloquium, 2/03  
Carnegie Institution of Washington, Dept. of Terrestrial Magnetism, Colloquium, 2/03  
Penn State University, Department of Astronomy and Astrophysics, Colloquium, 12/02  
Dartmouth University, Physics Colloquium, 4/02  
Lunar and Planetary Institute, Seminar, 3/02  
University of Arizona, Department of Astronomy, Seminar, 3/00

### Selected Conference Proceeding

“A Spectroscopic Search For Massive Thorne-Żytkow Objects” by M. J. Kuchner, D. Vakil, V. V. Smith, D. L. Lambert, B. Plez, and E. S. Phinney, *Stellar Collisions, Mergers, and Their Consequences*, ed. M. Shara, ASP Conference Series, Vol. 263, pg. 131 (2000).

### Popular Science Articles

“Interplanetary matter” by M. J. Kuchner in *The McGraw-Hill Encyclopedia of Science & Technology* (New York: McGraw-Hill) (2007).

“Interplanetary matter” by M. J. Kuchner in *The McGraw-Hill Encyclopedia of Science & Technology* (New York: McGraw-Hill) (2000).

### Selected Press Coverage

United Press International, “Scientists Model Possible Planets”, 10/07

MSNBC.com. “NASA Imagines Earthlike Worlds”, 10/07

New Scientist, “‘Sci-Fi’ Model Worlds Aid Planet Classification”, 10/07

Popular Science, “FYI: Lunar Slinkys”, 10/07

Wikipedia Article, “Marc Kuchner”, English and Swedish, 2007

comment in Baltimore Sun, “Newfound Planet Could Foster Life, Astronomers Say”  
4/5/2007

Nature, cover art, 7/2006

SpaceRef, “Space shield could help image Earth-like planets, says study” 7/6/2006

Universe Today, “Sky Shade Could Reveal Planets” 7/5/2006

comment in National Geographic, Nearby Star System Could Spawn Carbon-Rich Planets  
6/7/2006

comment in New Scientist, Stars dusty disc could create exotic worlds 6/7/2006

comment in Sky and Telescope Magazine, “The Birth of Carbon Planets?” 6/8/2006

profile in Baltimore Sun, “Astronomer Hopes To Spot an Inviting Planet or Two”  
3/19/2006

Sky and Telescope Magazine, “Peering Into Planetary Graveyards” 3/10/2006

New York Times, “Someday The Sun Will Go Out and The World Will End (But  
Don’t Tell Anyone)” 2/14/2006

Sydney Morning Herald, “Dust to Dust: What Survives the Death of a Solar System”  
1/13/2006

www.spaceref.com, “NASA’s Spitzer Finds Possible Comet Dust Around Dead  
Star” 1/12/2006

Scientific American, Quote of the Day, 1/11/2006

Discover Magazine, “Planetary Peculiarities” 5/2005



Iran Daily, "Distant Planets Could be Made of Diamond" 4/17/2005

NPR Interview, Morning Edition, "The Race To Capture Extrasolar Planets" 3/2005

American Museum of Natural History Science Bulletin "Diamond-Studded Exoplanets"  
2/14/2005

IMAX Tycho Brahe Planetarium, "Exoplanetar med kul pa" 2/11/05

Sky and Telescope Magazine, "A Flurry of Exoplanet Discoveries" 2/11//2005

www.spacedaily.com "In the Stars: Odd Stars, Odder Planets" 2/10/2005

Wired News, "Star Wants Out of Milky Way" 2/9/2005

Astrobiology Magazine, "Carbon World" 2/8/ 2005

News@Nature.com, "Distant Planets Could Be Made of Diamond" 2/2005

Space.com, "Diamond Planets: Rich Possibilities for Other Worlds" 2/8/2005

National Geographic News, "Diamond Planets Hint at Dazzling Promise of Other Worlds"  
2/2005

comment in Science Now, "Coming Soon: A New Solar System" 8/12/2004

comment in Science Magazine, "NASA Backs Two Missions to Spot Promising Planets"  
4/23/2005

Vega model featured in Harvard Magazine, "A Gods Eye View of Space" 3/2004

Sky and Telescope Magazine, "Finding Waterworld" 9/2003

Boston Museum of Science: Current Science and Technology Center, "Marc Kuchner and  
the TPF" 2003-

Science News, "Dusty Doings" 5/4/2002

Space.com, "New Era Dawns in Search for Other Worlds" 1/23/2002

Sky and Telescope, "Vega's Clumpy Dust May Reveal Hidden Planet" 1/10/2002

SpaceRef.ca "Structure in Dust Around Vega May Be Signature of Planet" 1/9/2002