Michael P. Fitzgerald

CONTACT INFORMATION

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RESEARCH INTERESTS

Formation and evolution of circumstellar material, particularly extrasolar planets. Indirect and direct techniques for detection of planetary systems. High-contrast imaging of circumstellar debris. Design and construction of astronomical instruments.

EDUCATION

University of California, Berkeley

Ph.D., Astrophysics, 2007

M.A., Astrophysics, 2002

California Institute of Technology

B.S., Engineering and Applied Science, 2000

HONORS AND AWARDS

2008–2009 AAAS Newcomb Cleveland Prize **2010**
Michelson Postdoctoral Fellow **September, 2007 – June, 2010**

ACADEMIC EXPERIENCE

University of California, Los Angeles

Assistant Professor **July, 2009 – present**
Research includes adaptive optics, coronagraphy, near- and mid-infrared imaging of circumstellar debris disks and extrasolar planets, and the design and construction of astronomical instrumentation. Member of the Infrared Laboratory. Instructor in the Department of Physics and Astronomy.

- Astro 180 — Astrophysics Laboratory, Fall 2011.
- Astro 180 — Astrophysics Laboratory, Winter 2011.

Lawrence Livermore National Laboratory

Michelson Postdoctoral Fellow **September, 2007 – June, 2010**
Research includes adaptive optics coronagraphy and mid-infrared imaging of circumstellar debris disks and extrasolar planets. Optical and opto-mechanical design of an adaptive optics polarimeter. Advised by Dr. Bruce Macintosh.

University of California, Berkeley

Graduate Student **August, 2000 – August, 2007**
Ph.D. research and graduate level coursework in astrophysics. Course topics included radiation processes, gas and fluid dynamics, instrumentation, stellar structure and evolution, the interstellar medium, stellar dynamics and galactic structure, cosmology, and astrophysical computational techniques. Scientific research included study of circumstellar debris through adaptive optics coronagraphy, detection of substellar companions, and high-precision astrometry with adaptive optics. A particular emphasis was on advancing experimental technique. Instrumentation work included implementation of new detector readout schemes on the IRCAL camera, and development of a point-spread function reconstructor on the Lick adaptive optics system. Advised by Professors James Graham and Geoffrey Marcy.

Graduate Student Instructor **August – December, 2002**

Head graduate student instructor conducting upper-level undergraduate optical astronomy laboratory.

- AY 120 — Optical Astronomy Laboratory, Fall 2002.

Graduate Student Instructor **August, 2000 – May, 2001**
Conducted discussion sections and office hours for introductory astronomy courses.

- AY 12 — The Planets, Spring 2001.
- AY 10 — Introduction to Astronomy, Fall 2000.

California Institute of Technology

Undergraduate Student **September, 1996 – June, 2000**
Courses included classical and quantum physics, mechanical engineering, electrical engineering (emphasis on digital circuits), optics (including astronomical instrumentation), computational and neural systems, applied mathematics, control of dynamical systems.

Publications

Kennedy, G. M., Wyatt, M. C., Sibthorpe, B., Duchêne, G., Kalas, P., Matthews, B. C., Greaves, J. S., Su, K. Y. L., Fitzgerald, M. P. "99 Herculis: Host to a Circumbinary Polar-ring Debris Disk." *Monthly Notices of the Royal Astronomical Society*, in press.

Ammons, S. M., Severson, S., Armstrong, J. D., Crossfield, I., Do, T., Fitzgerald, M., Harrington, D., Hickenbotham, A., Hunter, J., Johnson, J., Johnson, L., Li, K., Lu, J., Maness, H., Morzinski, K., Norton, A., Putnam, N., Roorda, A., Rossi, E., Yelda, S. "The Adaptive Optics Summer School Laboratory Activities." *ASP Conference Series* 436 (2010): 394–404.

Do, T., Fitzgerald, M. P., Ammons, S. M., Crossfield, I., Yelda, S., Armstrong, J. D., Severson, S. "A Fourier Optics and Wavefront Sensing Laboratory." *ASP Conference Series* 436 (2010): 160–170.

Perrin, M. D., Graham, J. R., Larkin, J. E., Wiktorowicz, S., Maire, J., Thibault, S., Fitzgerald, M. P., Doyon, R., Macintosh, B. A., Gavel, D. T., Oppenheimer, B. R., Palmer, D. W., Saddlemyer, L., Wallace, J. K. "Imaging Polarimetry with the Gemini Planet Imager." *Proceedings of the SPIE*, 7736 (2010): 192–200.

Adkins, S. M., Bell, J., Conrad, A., Fitzgerald, M. Kupke, R., Larkin, J. E., Laiterman, L., Lyke, J., Max, C., McGrath, E., Pollard, M., Panteleev, S., Thomas, S., Wizinowich, P. "DAVINCI: A high-performance imager and integral field spectrograph for the W. M. Keck Observatory's next-generation adaptive optics facility." *Proceedings of the SPIE*, 7735 (2010): 253–264.

Maness, H. L., Kalas, P., Peek, K. M. G., Chiang, E. I., Scherer, K., Fitzgerald, M. P., Graham, J. R., Hines, D. C., Schneider, G., Metchev, S. A. "Hubble Space Telescope Optical Imaging of the Eroding Debris Disk HD 61005." *Astrophysical Journal* 707 (2009): 1098–1114.

Fitzgerald, M. P., Kalas, P., Graham, J. R. "Orbital Constraints on the β Pic Inner Planet Candidate with Keck Adaptive Optics." *Astrophysical Journal* 706 (2009): L41–45.

Chen, C. H., Fitzgerald, M. P., Smith, P. S. "A Possible Icy Kuiper Belt around HD 181327," *Astrophysical Journal* 689 (2008): 539–544.

Kalas, P., Graham, J. R., Chiang, E., Fitzgerald, M. P., Clampin, M., Kite, E. S., Stapelfeldt, K., Marois, C., Krist, J. "Optical Images of an Exosolar Planet 25 Light-Years from Earth," *Science* 322 (2008): 1345-1348.

Maness, H. L., Fitzgerald, M. P., Paladini, R., Kalas, P., Duchêne, G., Graham, J. R. "CARMA Millimeter-Wave Aperture Synthesis Imaging of the HD 32297 Debris Disk," *Astrophysical Journal*

686 (2008): L25–28.

Kalas, P., Duchêne, G., Fitzgerald, M. P., Graham, J. R. "Discovery of a Large Debris Disk Around the F2V Star HD 15745," *Astrophysical Journal* 671 (2007): L161–164.

Fitzgerald, M. P., Kalas, P. G., Graham, J. R. "A Ring of Warm Dust in the HD 32297 Debris Disk," *Astrophysical Journal* 670 (2007): 557–564.

Fitzgerald, M. P., Kalas, P. G., Duchêne, G., Pinte, C., Graham, J. R. "The AU Mic Debris Disk: Multiwavelength Imaging and Modeling," *Astrophysical Journal* 670 (2007): 536–556.

Kalas, P., Fitzgerald, M. P., Graham, J. R. "Discovery of Extreme Asymmetry in the Debris Disk Surrounding HD 15115," *Astrophysical Journal* 661 (2007): L85–88.

Kalas, P., Graham, J. R., Clampin, M. C., and Fitzgerald, M. P. "First Scattered Light Images of Debris Disks around HD 53143 and HD 139664," *Astrophysical Journal* 637 (2006): L57–60.

Fitzgerald, M. P., and Graham, J. R. "Speckle Statistics in Adaptively Corrected Images," *Astrophysical Journal* 637 (2006): 541–547.

Selected Presentations

Fitzgerald, M. P. "Gemini Planet Imager: Instrument Status and Campaign Overview," Center for Adaptive Optics Fall Retreat, Lake Arrowhead, California, USA, November 2011

Fitzgerald, M. P. "High Spatial Resolution Imaging of a Dynamically Perturbed Debris Disk," Extreme Solar Systems II, Jackson, Wyoming, USA, September 2011

Fitzgerald, M. P. "Adaptive Optics Imaging of Circumstellar Debris Disks," OCIW Colloquium, Pasadena, California, USA, June 2011 (invited).

Fitzgerald, M. P. "Adaptive Optics Imaging of Circumstellar Debris Disks," Caltech Astronomy Colloquium, May 2011 (invited).

Fitzgerald, M. P. "High-Contrast Imaging of Circumstellar Disks," Center for Adaptive Optics Fall Retreat, Lake Arrowhead, California, USA, November 2009 (invited review).

Fitzgerald, M. P. "High-Contrast Imaging Orbital Constraints of the β Pic b Planet Candidate," 2009 Sagan/Michelson Fellows Symposium, Pasadena, California, USA, November 2009 (invited).

Fitzgerald, M. P. "Adaptive Optics Coronagraphy of Circumstellar Debris Disks," 214th Meeting of the American Astronomical Society, Pasadena, California, USA, June 2009 (invited).

Fitzgerald, M. P. "Tracing Planet Formation through Circumstellar Debris," University of California, Los Angeles, USA, April 2009 (invited).

Fitzgerald, M. P., Graham, J. R., Kalas, P. G., Duchêne, G. "Thermal Emission from a Newly Resolved Debris Disk: HD 131835," 213th Meeting of the American Astronomical Society, Long Beach, California, USA, January 2009.

Fitzgerald, M. P., Graham, J. R., Kalas, P. G., Duchêne, G. "Thermal Emission from a Newly Resolved Debris Disk: HD 131835," New Light on Young Stars: Spitzer's View of Circumstellar Disks, Pasadena, California, USA, October 2008.

Fitzgerald, M. P., Kalas, P. G., Graham, J. R., Duchêne, G., Pinte, C. "High-Resolution Imaging and Modeling of Circumstellar Debris: Architectures of Planetary Systems," 207th Meeting of the

American Astronomical Society, Seattle, Washington, USA, January 2007.

Fitzgerald, M. P., Kalas, P. G., Duchêne, G., Pinte, C., Graham, J. R. "Keck AO and Circumstellar Debris," Center for Adaptive Optics Fall Retreat, Yosemite, California, USA, November 2006.

Fitzgerald, M. P., Kalas, P. G., Duchêne, G., Pinte, C., Graham, J. R. "The AU Mic Debris Disk: Multiwavelength Imaging and Modeling," Keck Science Meeting, University of California, Irvine, California, USA, September 2006.

Fitzgerald, M. P., Gates, E., Gavel, D., Palmer, D. "PSF Reconstruction at Lick." Center for Adaptive Optics Spring Retreat, University of California, Santa Cruz, California, USA, March 2006.

Fitzgerald, M. P., Graham, J. R., Poyneer, L. A. "Experimental Characterization of High Contrast Imaging through Atmospheric Turbulence." Center for Adaptive Optics Fall Retreat, Lake Arrowhead, California, USA, November 2005.

Fitzgerald, M. P., Graham, J. R., Kalas, P., and Matthews, B.C. "High Resolution Near-Infrared Imaging of the Debris Disk around AU Mic." 205th Meeting of the American Astronomical Society, San Diego, California, USA, January 2005.

Fitzgerald, M. P., Kalas, P., Graham, J. R. "AO Coronagraphy of a Circumstellar Debris Disk: Multicolor Imaging of AU Microscopii." Center for Adaptive Optics Fall Retreat, Lake Arrowhead, California, USA, November 2004.

Fitzgerald, M. P. "Astrometry with Adaptive Optics." Astrometry 2004, Flagstaff, Arizona, USA, October 2004.

Fitzgerald, M. P. "Status of PSF Reconstruction at Lick Observatory." Workshop on Adaptive Optics Point Spread Function Reconstruction, Victoria, British Columbia, Canada, May 2004.

Fitzgerald, M. P. "PSF Reconstruction at Lick - Introduction and Status Report." Center for Adaptive Optics Fall Retreat, Yosemite, California, USA, September 2003.

Computer Skills

- Languages: x86 ASM, DSP5600x ASM, BASIC, FORTRAN, Pascal, C, C++, Unix shell scripting, Tcl/Tk, Perl, Python.
- High-level numerical languages: Mathematica, Matlab, IDL, Numerical Python.
- Applications: LaTeX, common word processing, spreadsheet, database, and presentation software. Revision control systems (CVS, svn, bzr). Optical design tools (e.g. ZEMAX), mechanical design (SolidWorks), and project management software.
- Operating Systems: Unix/Linux, Macintosh, Windows, VxWorks.
- General: Experience in digital circuit design, digital signal processors, real-time controllers, and UNIX system administration.

Other Academic and Professional Experience

Professional Experience

- *Keck Interferometer Project, Jet Propulsion Laboratory* **February – July, 2000**
  Software development for fringe tracker. Under the direction of Drs. Mark Colavita and Gautam Vasisht.

Caltech Summer Undergraduate Research Fellowships

- *Keck Interferometer Project, Jet Propulsion Laboratory* **June – August, 1999**
  See above.
- *Dept. of Artificial Intelligence, University of Edinburgh*, Scotland **June – August, 1998**

Designed and implemented communications protocol for autonomous robotic vehicle. Under the direction of Dr. John Hallam.

- *Stephen Quake Laboratory, California Institute of Technology* **June – August, 1997**
  Assisted in design, fabrication, and testing of microfluidic arrays for processing of DNA samples. Under the direction of Professor Stephen Quake.

Short Courses

- *Center for Adaptive Optics Professional Development Program* **March 2–6, 2007**
  Workshop on facilitating inquiry-based educational activities.
- *Center for Adaptive Optics Professional Development Workshop* **February 5–10, 2006**
  Introduction to facilitation of inquiry-based educational activities.
- *Center for Adaptive Optics Professional Development Workshop* **March 16–21, 2005**
  Introduction to inquiry-based education.
- *Michelson Summer School* **July 25–29, 2005**
  Emphasis on astrometric detection of extrasolar planets.
- *Michelson Summer School* **July 20–23, 2004**
  Emphasis on nulling interferometry and coronagraphy.
- *Center for Adaptive Optics Summer School* **August 9–15, 2003**
  Advanced instrumentation and techniques for adaptive optics.
- *Michelson Summer School* **June 24–28, 2002**
  Fundamentals of long-baseline interferometry with emphasis in the near infrared.
- *SPIE Short Course: High Dynamic Range Coronagraphy* **August 25, 2002**

Other Pedagogy

- *UCLA Research Experience for Undergraduates* **Summer, 2011**
  Supervised an undergraduate research student.
- *Center for Adaptive Optics Summer School* **August 7–12, 2011**
  Lecturer, "Measuring AO Performance."
- *Center for Adaptive Optics Summer School* **August 8–13, 2010**
  Lecturer, "Measuring AO Performance."
- *Center for Adaptive Optics Summer School* **August 9–14, 2009**
  Director.
- *Center for Adaptive Optics Fall Retreat* **November 6–9, 2008**
  Instructor, Career Development Workshop: Project Management.
- *Center for Adaptive Optics Summer School* **August 4–8, 2008**
  Instructor, Fourier Optics laboratory.
- *Center for Adaptive Optics Summer School* **August 6–10, 2007**
  Instructor, Fourier Optics laboratory.
- *Center for Adaptive Optics Summer School* **August 4–11, 2006**
  Instructor, Fourier Optics laboratory.
- *Center for Adaptive Optics Mainland Internship Program* **Summer, 2006**
  Supervised a community college student.