Thomas M. Esposito

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Research Interests

Direct imaging of circumstellar debris disks and exoplanets. High-contrast imaging and data reduction. Modeling planet-disk interaction and disk composition to explore planetary system evolution. Refining long-period transiting exoplanet ephemerides for detailed followup. Astronomical instrumentation and adaptive optics.

Education

University of California, Los Angeles (UCLA), Los Angeles, CA

Ph.D., Astronomy, August 2015, *Advisor: Prof. Michael Fitzgerald*

M.S., Astronomy, June 2011

Georgetown University, Washington, DC

B.S., Physics, May 2008, *Cum Laude, with Honors in Physics*

Research Experience

Postdoctoral Scholar, Astronomy — *Sep 2015–present*
UC Berkeley, Berkeley, CA

Directly imaging and analyzing new circumstellar disks and giant exoplanets with the Gemini Planet Imager Exoplanet Survey (GPIES). Lead analyst of four-year GPIES debris disk polarimetric imaging survey. Coronagraphic observations with Keck NIRC2 and *Hubble Space Telescope*. Reduction of angular differential imaging data. High-dimensional MCMC modeling of planet-disk interaction and disk composition to indirectly detect planets and study early system evolution. NASA NExSS member.

Research Assistant, Exoplanets — *Feb 2020–present*
SETI Institute, Mountain View, CA

Lead analyst for exoplanet transit science with Unistellar Citizen Scientist network. Processing and analyzing light curves for exoplanet ephemeris measurements. Developing Python pipeline for transits, asteroid occultations, and planetary defense.

Graduate Student Researcher, Advisor: Prof. Michael Fitzgerald — *2010–2015*
UCLA, Los Angeles, CA

Studied planetary system evolution through high-contrast imaging of debris disks and exoplanets. Developed a technique to forward model and correct for self-subtraction of extended emission in angular differential imaging. Member of the UCLA Infrared Laboratory and OSIRIS imager upgrade team.

Selected Publications

***Esposito, T.**, Kalas, P., Fitzgerald, M. P., Millar-Blanchaer, M. A., Duchêne, G., Patience, J., Hom, J., Perrin, M. D., De Rosa, R. J., and 58 coauthors. "Debris Disk Results from the Gemini Planet Imager Exoplanet Survey's Polarimetric Imaging Campaign", 2020, *The Astronomical Journal*, Volume 160, Issue 1, 24 — *Jul 2020*

Hom, J., Patience, J., **Esposito, T.**, Duchêne, G., Worthen, K., Kalas, P., Jang-Condell, H., Saboi, K., Arriaga, P., Mazoyer, J., and 50 coauthors. "First Resolved Scattered-light Images of Four Debris Disks in Scorpius-Centaurus with the Gemini Planet Imager", 2020, *The Astronomical Journal*, Volume 159, Issue 1, 31 — *Jan 2020*

De Rosa, R. J., **Esposito, T.**, Hirsch, L. A., Nielsen, E. L., Marley, M. S., *Dec 2019*
Kalas, P., Wang, J. J., Macintosh, B. "The Possible Astrometric Signature of a Planetary-mass Companion to the Nearby Young Star TW Piscis Austrini (Fomalhaut B): Constraints from Astrometry, Radial Velocities, and Direct Imaging", 2019, *The Astronomical Journal*, Volume 158, Issue 6, 225

***Esposito, T.**, Kalas, P., Rice, M., Choquet, E., Ren, B., *Jul 2018*
Perrin, M. D., Chen, C. H., Arriaga, P., Chiang, E., Nielsen, E., Duchêne, G., and 47 coauthors.
"Direct Imaging of the HD 35841 Debris Disk: A Polarized Dust Ring from Gemini Planet Imager and an Outer Halo from *HST*/STIS", 2018, *The Astronomical Journal*, Volume 156, Issue 2, 47

Ren, B., Dong, R., **Esposito, T.**, Pueyo, L., Debes, J. H., *Apr 2018*
Poteet, C. A., Choquet, E., Benisty, M., Chiang, E., and 4 coauthors.
"A Decade of MWC 758 Disk Images: Where Are the Spiral-arm-driving Planets?", 2018, *The Astrophysical Journal Letters*, Volume 857, Issue 1, L9

Nielsen, E. L., De Rosa, R. J., Rameau, J., Wang, J. J., **Esposito, T.**, *Dec 2017*
Millar-Blanchaer, M. A., Marois, C., Vigan, A., Ammons, S. M., and 49 coauthors.
"Evidence that the Directly-Imaged Planet HD 131399 Ab is a Background Star", 2017, *The Astronomical Journal*, Volume 154, Issue 6, 218

Millar-Blanchaer, M. A., **Esposito, T.**, Stahl, K., and 6 coauthors *Sep 2017*
"High-Contrast Observations of Circumstellar Disks with the Gemini Planet Imager's Polarimetry Mode", 2017, *Proc. SPIE*, Vol 10407, doi: 10.1117/12.2275823

***Esposito, T.**, Fitzgerald, M. P., Graham, J. R., Kalas, P., Lee, E. J., *Oct 2016*
Chiang, E., Duchêne, G., Wang, J. J., Millar-Blanchaer, M. A., and 14 coauthors.
"Bringing 'The Moth' to Light: A Planet-Sculpting Scenario for the HD 61005 Debris Disk", 2016, *The Astronomical Journal*, Vol 152, Issue 4, 85

***Esposito, T.** *Aug 2015*
"Exploring Planetary System Evolution Through High-Contrast Imaging", 2015, PhD Thesis, UCLA

***Esposito, T.**, Fitzgerald, M. P., Kalas, P., Graham, J. R. *Jan 2014*
"Modeling Self-Subtraction in Angular Differential Imaging: Application to the HD 32297 Debris Disk", 2014, *The Astrophysical Journal*, 780, 25-43

Selected Presentations

***Esposito, T.**, Kalas, P., Fitzgerald, M. P., and the GPIES team. *Aug 2019*
"Polarizing Planetary Systems: New Debris Disks Resolved on Solar System Scales by GPIES." Selected talk. *Extreme Solar Systems IV*, Reykjavík, Iceland

***Esposito, T.**, Kalas, P., Fitzgerald, M. P., and the GPIES team. *Apr 2019*
"Debris Disk Results from the Gemini Planet Imager Exoplanet Survey: Resolving Disks on Solar System Scales with Polarimetry." Invited Talk. *Astrophysics Luncheon Seminar*, NASA Jet Propulsion Laboratory, La Cañada Flintridge, CA

***Esposito, T.**, Kalas, P., Fitzgerald, M. P., and the GPIES team. *Jan 2019*
"25 Debris Disks Resolved on Solar System Scales with the Gemini Planet Imager." Selected talk. *233rd Meeting of the American Astronomical Society*, Seattle, WA

***Esposito, T.**, Rice, M., Duchêne, G., Choquet, E., Ren, B., Perrin, M., *Nov 2016*
Follette, K. B., Arriaga, P., and the GPIES team.
"A New Ring Around a Young Star Resolved with STIS and GPI." Selected talk.
High-Contrast Imaging in Space, Space Telescope Science Institute, Baltimore, MD

***Esposito, T.**, Fitzgerald, M. P., Kalas, P., Graham, J. R., *Jan 2015*
Millar-Blanchar, M. A., and the GPIES team.

"Exploring Planetary System Evolution Through High-Contrast Imaging." Selected talk. *225th Meeting of the American Astronomical Society*, Seattle, WA

Computer Skills

Languages: fluent in Python, Jupyter notebooks, LaTeX; experience with IDL, *nix, SQL, C/C++, HTML, XML

Methods: MCMC, Principal Component Analysis, multidimensional model fitting

Software: git, subversion, SAO DS9, MySQL Workbench, Slack, emacs, Google Drive, Dropbox, Illustrator, Photoshop, Inkscape, Gimp

Awards

Best talk, 3rd prize. UCLA Earth & Space Sciences Student Symposium, Los Angeles, CA — *Apr 2013*

UCLA Astronomy Division Fellowship — *2009*

Teaching Experience (abridged)

Mentoring astronomy undergraduates — *Sep 2017–May 2018*
Astronomy Dept. mentoring program, UC Berkeley

Discussion section teaching assistant (TA) — *Winter 2014, Winter 2010*
ASTR 115 - Statistical Mechanics & its Application to Astrophysics, UCLA

Laboratory section TA — *Fall 2014, Fall 2009–Spring 2010*
ASTR 3 - Nature of the Universe, UCLA

Member of committee revising ASTR 3 lab curriculum, UCLA — *2012–2013*

Instructor, Optics for AO Systems laboratory — *Aug 2011*
Adaptive Optics Summer School, Center for Adaptive Optics, UC Santa Cruz

Co-advisor for summer REU student, UCLA — *Summer 2011*

Lead TA — *Winter 2010*
ASTR 3, UCLA

Academic & Professional Experience

Co-founder & Director, Astronomy Live! Summer Workshop — *Jan–Aug 2014*
UCLA, Los Angeles, CA

Led team of graduate students in creation, administration, and instruction of observational astronomy workshop for high school juniors and seniors, focusing on underrepresented minorities. Students visited weekly for 8 weeks for lectures, telescope observing (including remotely with Lick Observatory 1-m), and individual data analysis projects.

Coordinator, UCLA Planetarium & Telescopes — *Sep 2011–present*
UCLA, Los Angeles, CA

Schedule public and private planetarium shows, select and create show content, maintain equipment, present shows, maintain website and social media presence. Maintain six telescopes (up to 24 in.) and associated equipment.

Institute for Scientist and Engineer Educators Professional Development Program — *Mar–Aug 2011*
University of California, Santa Cruz (UCSC), Santa Cruz, CA

Participant. Workshops on facilitating and designing inquiry-based learning activities. Redesigned and facilitated Fourier optics lab activity for Center for Adaptive Optics Summer School (Aug 2011).

Adaptive Optics Summer School — *Aug 2010*
Center for Adaptive Optics, UCSC, Santa Cruz, CA

Participant. Advanced instrumentation and techniques for adaptive optics.