

# Thayne Currie – Curriculum Vitae

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## Education

**Ph.D.** Astronomy - University of California-Los Angeles  
Completed at the Harvard-Smithsonian Center for Astrophysics, advisor: Scott Kenyon  
Thesis Title *Observational Constraints on Circumstellar Disk Evolution and Terrestrial Planet Formation*

**M.S.** Astronomy - University of California-Los Angeles

**B.S.** Physics, Magna Cum Laude, with Honors - Wichita State University

## Major Research Interests

- High-Contrast Imaging and Spectroscopy of Extrasolar Planets
- Wavefront Control, Post-Processing Algorithms, and Coronagraphy for High-Contrast Imaging

## Major Current Research Collaborations

- NASA Strategic Astrophysics Technology program on *Linear Wavefront Control* (P.I. Olivier Guyon) - Ames Coronagraph Experiment Testbed Lead
- Subaru Coronagraphic Extreme Adaptive Optics Project (SCEXAO; P.I. Olivier Guyon) - Core Team Member/Science Program Lead
- SCEXAO/CHARIS - Scientific Operations, Data Processing, and Survey Planning Lead
- *Protostars and Planets VII*, “Exoplanet Direct Imaging” Chapter - Lead Author
- James Webb Space Telescope, Early Release Science Program for High-Contrast Imaging (P.I. Sasha Hinkley)
- Member of the MICHI Thermal Infrared Coronagraphic Instrument Team for the *Thirty Meter Telescope*
- International Science Development Team, *Thirty Meter Telescope* (convener/leader for exoplanets program development)

## Major Published Research Results

- Discovery of AB Aur b: a directly-imaged protoplanet demonstrating planet formation by disk instability
- Discovery of the directly-imaged planets ROXs 42Bb and  $\kappa$  And b
- Laboratory demonstration of Spatial Linear Dark Field Control at contrasts needed to image planets in reflected light
- Discovery of the extrasolar Kuiper belt around HD 115600 (Best analogue to the young Kuiper belt; first object discovered with extreme adaptive optics) and the HD 36546 debris disk (youngest debris disk yet imaged)
- Discovery of a second candidate planet around HD 100546 (HD 100546 “c”)
- Confirmation of Fomalhaut b, HD 95086 b, and HD 100546 b as (likely) imaged exoplanets; Refutation of the LkCa 15 bcd protoplanets

- Identifying/characterizing the key physical properties shaping young exoplanet atmospheres, i.e. thick clouds
- Development of the *A-LOCI* image processing pipeline; originator of forward-modeling method for (A-)LOCI for integral field spectrograph data

## Recent Employment

- 2018-Present** Senior NASA Postdoctoral Fellow/Astrophysicist, NASA-Ames Research Center
- 2018-Present** Affiliated Researcher, National Astronomical Observatory of Japan, Subaru Telescope
- 2014-2018** Astronomer/Subaru Project Fellow, National Astronomical Observatory of Japan, Subaru Telescope
- 2012-2014** McLean Postdoctoral Fellow, University of Toronto

## Technical Experience and Skills

- High-Contrast Imaging/Spectroscopy Data Reduction Packages and Methods
  - \*Original pipeline development
    - Writer of SCExAO/CHARIS High-Contrast IFS Data Processing Pipeline
    - Writer of General High-Contrast Imaging Pipeline for Ground-Based Telescopes, HST
  - \*Advances in PSF Subtraction and Forward-Modeling/Spectral Extraction – A-LOCI
  - \*PSF Subtraction and Forward-Modeling/Spectral Extraction with KLIP
  - \*End-to-End Data Analysis
- Calibration and Instrument Integration, Optical System Alignment, Testing, and Data Analysis
  - \*SCExAO/CHARIS (computer modeling; on laboratory bench; on telescope)
  - \*Ames Coronagraph Experiment lab
- Survey Planning (SCExAO/CHARIS)
- Wavefront Control
  - \*Original code and research in Linear Dark Field Control; Speckle Nulling
- Coronagraph Characterization
  - \*Shaped-pupil, Vector Vortex, Lyot
- Programming Languages and Packages
  - \*IDL (expert), Python, C, IRAF

## Current Grants/Funding

- 2021** (PI, \$12 K) NASA/Keck Data Analysis – *Direct Imaging Survey with NIRC2*
- 2020** (PI, \$163 K) – NASA/Hubble Space Telescope, Cycle 28 (Mid-Cycle), Data Analysis – *Confirming a Wide-Separation Directly-Imaged Infant Planet around a Young, Dusty Star*
- 2020** (PI, \$37K) – NASA/Keck Data Analysis – *Direct Imaging Survey with NIRC2 and Subaru/SCExAO*
- 2020** (Co-I, \$610K) – NASA-XRP – *Extreme AO Imaging and Integral Field Spectroscopy of Planet-Forming Disks*
- 2020** (Co-I, \$960K) – NASA-Strategic Astrophysics Technology – *Laboratory Demonstration of Multi-Star Wavefront Control in Vacuum*
- 2019** (Co-I, \$500K) – NASA-Strategic Astrophysics Technology – *Linear Wavefront Control for Exoplanet Imaging*
- 2018** (PI, \$400K) – NASA Senior Postdoctoral Fellowship – *Developing and Demonstrating Linear Dark Field Control*

**2018** (Co-I, \$10K) NASA/JWST Early Release Science Program – *High Contrast Imaging of Exoplanets and Exoplanetary Systems with JWST*  
**2018** (PI - \$20K) – NASA/Keck Data Analysis – *Thermal Infrared Follow-up of Candidate Planets Identified from Subaru/SCEXAO*  
**2017** (PI - \$13K) – NASA/Keck Data Analysis – *Shedding Light on the Nature of Candidate Planets around LkCa 15*  
**2016** (Co-I, \$530K) – NASA-XRP – *Exploring the Final Stages of Planet Formation*

## Telescope Observing Time Awarded as Principal Investigator

10m Keck I/II (NIRC2, OSIRIS), Hawaii - 13 nights  
 8.2m Subaru Telescope (SCEXAO/CHARIS, SCEXAO/VAMPIRES, SCEXAO/HiCIAO, AO188/IRCS, HDS), Hawaii - 27+ nights (65+ nights through other collaborations)  
 8.2m Very Large Telescope (NaCo), Chile - 5 nights  
 8.1m Gemini-South (GPI, NICI), Chile - 12+ nights  
 6.5m MMT (Clio, Hectospec) & 1.5m Whipple Telescope (FAST), Arizona - 15 nights  
 3m Infrared Telescope Facility (CSHELL), Hawaii - 4 nights  
 2.4m Hubble Space Telescope - 12 orbits

## SELECTED RECENT COLLOQUIA AND RESEARCH TALKS

**July 2022** Invited Talk: High-Contrast Imaging with SCEXAO, *Science workshop for synergy of Subaru/SCEXAO and ALMA*, Tokyo, Japan (online)  
**May 2022** Contributed Talk: The SCEXAO Direct Imaging Search for Planets Around Accelerating Stars, *Exoplanets IV*, Las Vegas, NV  
**August 2021** - Contributed Talk/Paper: A New Type of Exoplanet Direct Imaging Search: a SCEXAO/CHARIS survey of Accelerating Stars, *SPIE, Techniques and Instrumentation for Detection of Exoplanets X*, San Diego, CA  
**April 2021** - Contributed Talk: Direct Imaging and Astrometry Together: Imaging Extrasolar Planets Around Accelerating Stars from SCEXAO and Gaia, *Towards the Comprehensive Characterization of Exoplanets: Science at the Interface of Multiple Measurement Techniques*, (remote)  
**March 2021** - Contributed Talk: Ground-Based Exoplanet Direct Imaging in the Next Decade: The Path to Imaging Another Earth, *Habitable Worlds 2021*, STScI (remote)  
**March 2021** - Contributed Talk: Sciences Results from SCEXAO/CHARIS, *Subaru Users Meeting* (remote)  
**January 2021** - Contributed Talk: SCEXAO/CHARIS Discoveries, *American Astronomical Society Meeting*, Phoenix, Arizona (remote)  
**December 2020** - Contributed Talk: New Discoveries with SCEXAO/CHARIS, *Chesapeake Bay Area Exoplanet Meeting* (remote)  
**December 2020** - Contributed Talk: SCEXAO/CHARIS Direct Imaging of Protoplanet Candidates, *Five Years after HL Tau: A New Era in Planet Formation* (remote)  
**October 2020** - Contributed Talk: SCEXAO Science, *Ground-Based Thermal Infrared Astronomy - Past, Present, and Future*, Santiago, Chile (remote)  
**October 2020** - Star and Planet Formation Seminar: University of Michigan (remote)  
**September 2020** - Contributed Talk: SCEXAO Science, *Bay Area Exoplanets Meeting*, NASA-Ames Research Center, Mountain View, CA (remote)  
**May 2020** - Contributed Talk: SCEXAO Science, *American Astronomical Society Meeting*, Madison, Wisconsin (remote)  
**December 2019** - Contributed Talk: Linear Dark Field Control, *Bay Area Exoplanets Meeting*, NASA-Ames Research Center, Mountain View, CA  
**November 2019** - Contributed Talk: Exoplanet Characterization with Subaru, *Subaru 20th Anniversary Meeting*, Waikaloa, HI  
**October 2019** - Invited Talk: Exoplanet Direct Imaging Technology Development, *Lyot Conference*, Tokyo, Japan  
**October 2019** - Colloquium: Department of Astronomy, Indiana University, Bloomington, IN  
**September 2019** - Colloquium: Department of Physics and Astronomy, University of Texas-San Antonio, San Antonio, TX  
**August 2019** - Contributed Talk: Linear Dark Field Control, *SPIE*, San Diego, CA

**August 2019** - Contributed Talk: SCEExAO Instrument Performance, *SPIE*, San Diego, CA  
**January 2019** - Contributed Talk: SCEExAO Exoplanet Characterization, *American Astronomical Society Meeting*, Seattle, WA  
**December 2018** - Contributed Talk: Imaging Habitable Rocky Planets, *TMT Science Forum*, Pasadena, CA  
**November 2018** - Colloquium: Department of Physics and Astronomy, University of California-Riverside, Riverside, CA  
**October 2018** - Colloquium: Department of Physics and Astronomy, California State University-Northridge, Northridge, CA  
**September 2018** - Contributed Talk: Exoplanet Characterization with SCEExAO, *ExoSoCal*, California Institute of Technology, Pasadena, CA  
**June 2018** - Contributed Talk: SCEExAO Science, *Bay Area Exoplanets Meeting*, NASA-Ames Research Center, Mountain View, CA  
**December 2017** - Invited Talk: Science and PSF Subtraction with SCEExAO, *CHARIS International Workshop*, Tokyo, Japan  
**December 2017** - Invited Talk: Exoplanet Direct Imaging with SCEExAO, *Subaru Star and Planet Formation Workshop*, Taipei, Taiwan  
**May 2017** - Seminar: High-Contrast Imaging and Coronagraphy with SCEExAO, NExSCI/Caltech, Pasadena, CA  
**April 2017** - Seminar: SCEExAO Direct Imaging Science, Stanford University, Palo Alto, CA  
**January 2017** - Press Release: First-Light SCEExAO results, *American Astronomical Society Meeting*, Grapevine, TX  
**November 2016** - Contributed Talk: Exoplanet Direct Imaging Algorithms/PSF Subtraction, *High Contrast Imaging in Space*, STScI, Baltimore, MD (**demonstration of high-contrast imaging pipeline applied to simulated Roman-CGI data**)  
**October 2016** - Colloquium: Institute for Astronomy, University of Hawaii, Honolulu, HI

## Teaching Experience

2013-2014 - Guest lecturer, Introductory Astronomy, University of Toronto  
 2004-2005 - Instructor, *Solar System Astronomy*, Glendale Community College, Glendale, California  
 2005 - Teaching Assistant, *Infrared Astronomy* (graduate course), UCLA

## Selected Press Coverage/Popular Science Writing

### Press Releases

*AB Aurigae b*, Subaru/HST/Nature Press Release, "Subaru Telescope Images Planet Just Starting to Form", "Hubble Finds a Planet Forming in an Unconventional Way", April 2022  
 covered by Reuters, USA Today, BBC, CBC, Science, Nature, Astronomy Magazine, Honolulu Star-Advertiser, Sky & Telescope, + many others

*HD 33632 Ab*, Subaru Press Release, "SCEExAO/CHARIS Nets Its First Discovery", December 2020

*LkCa 15/κ And b*, Subaru/Keck Press Releases, "Subaru Telescope Sheds New Light on an Obscured Infant Solar System", May 2019; covered by Subaru/Keck Observatories, Sky & Telescope, Nature

*First-Light SCEExAO Results*, Subaru Press Release/AAS Meeting, "New Exoplanet Imager Opens Its Eyes to Other Worlds", January 2017

*HD 100546*, Gemini/AAS Press Release, "Astronomers Spy Nursery of Baby Planets", December 2015

*HD 115600*, Gemini/Subaru/Nature/AAS/U.Cambridge Joint Press Release, "Discovery Shows What the Solar System Looked Like as a 'Toddler'", May 2015

*ROXs 42Bb*, AAS Press Release/U. Toronto, "Newly Discovered Celestial Object Defies Categories", January 2014

*Fomalhaut b*, NASA/STScI Announcement, "New Study Brings Doubtful Planet Back from the Dead", October 2012; ScienceNews, "Fomalhaut b Regains Planetary Status", October 2012  
also covered by NBC News, CNN, Sky & Telescope, Nature, New Scientist, CTV News, etc.

*Kappa And b*, Subaru/MPIA/U. Toronto/NASA Press Release, "Astrophysicists identify a 'super-Jupiter' around a massive star", November 2012; covered by CNN, MSNBC, Scientific American, Sky & Telescope, etc.

### Popular Writing

Sky and Telescope, "Baby Pictures of an Infant Solar System", August 2012 issue

## Professional Service

**2021** NASA/ROSES XRP Review Committee/Panelist

**2020-present** Hubble Space Telescope Time Allocation Committee/Reviewer

**2020-** NSPIRES/FINESST Astrophysics Program External Reviewer

**2020-** Swiss National Science Foundation, Proposal Reviewer

**2017-2020** – NSF OIR Lab/NOAO Time Allocation Committee

**2016** – SOFIA Airborne Observatory, Proposal Reviewer/Panelist, 2016

**2014** – Chandra X-Ray Observatory, Proposal Reviewer/Panelist

**2014-2015** – Canada France Hawaii Telescope Time Allocation Committee Proposal Reviewer

**2012-2015** – Gemini Time Allocation Committee Proposal Reviewer

**2012** – James Clerk Maxwell Telescope Time Allocation Committee Proposal Reviewer

**2011** – Local/Scientific Organizing Committee, *Signposts of Planets*, NASA-Goddard

**2011** – Graduate Women in Science, National Fellowship Competition Proposal Reviewer

**2010-2013** – NASA *Origins of Solar Systems* Proposal Reviewer

**Referee** - *Science*, *Nature*, *Nature Astronomy*, *The Astrophysical Journal*, *The Astrophysical Journal Letters*, *Astronomy and Astrophysics*, *MNRAS*, *New Astronomy*

## Outreach/Diversity & Equity

**2012-present** – Co-Founder and Administrator for *Exoplanet Imaging* Discussion Group on Facebook (social media)

**2015-present** – Local outreach for support of the Maunakea observatories

**2016-2017** – *Career Day* Outreach at Hilo Intermediate Public School (50+% Hawaiian)

**2016-2017** – STEM jobs/educational opportunities outreach events hosted by *Perpetuating Unique Educational Opportunities* (P.U.E.O.) in Hawaiian homestead communities

**2015-2017** – *Astro Day*, A Celebration of Astronomy and Hawaiian Culture

**2015-2016** – Student internships/advising mostly for University of Hawaii students/underrepresented minority students

**2013-2016** – *DiskDetective* Citizen Science Project

## Student Advising/Collaborative Work

**Ranger Y. Liu** (Columbia, undergraduate) (2021-present) - Data Reduction Pipeline for Subaru/SCEXAO

**Edward Cashman** (University of Hawaii-Hilo, undergraduate) (2021-present) - Data Reduction Pipeline for Subaru/SCEXAO

**Amilcar Torres-Quijano** (University of Texas-San Antonio, graduate; thesis committee) (2021-present) - Exoplanet Spectroscopy with Subaru/SCEXAO

**Kellen Lawson** (University of Oklahoma, graduate; thesis committee) (2019-present) - Disk Direct Imaging with Subaru/SCEXAO

**Ruben Asensio-Torres** (Stockholm University, graduate) (2017-2018) - Brown Dwarf Direct Imaging/Spectroscopy with Subaru/SCEXAO

**Evan Rich** (University of Oklahoma, graduate) (2016-2018) - Exoplanet/Disk Direct Imaging with Subaru/IRCS and Subaru/SCEXAO

**Sean Goebel** (University of Hawaii-Manoa, graduate) (2017-2018) - Debris Disk Imaging with Subaru/SCEXAO

**Taichi Uyama** (University of Tokyo, graduate) (2017) - Exoplanet Direct Imaging with Subaru/SCEXAO  
**Eugenio Garcia** (Vanderbilt University, graduate) (2014-2015) - Exoplanet Direct Imaging and Spectroscopy with GPI, Keck, and Subaru/SCEXAO  
**Jasmin Silva** (University of Hawaii-Hilo, undergraduate) (2015) - Exoplanet Direct Imaging with Keck and Subaru/SCEXAO  
**Derek Hand** (University of Hawaii-Hilo, undergraduate) (2015) - Exoplanet Direct Imaging with Keck  
**Ryan Cloutier** (University of Toronto, undergraduate and graduate) (2013-2014) - Exoplanet Direct Imaging with GPI and Keck; Spitzer Photometry of  $\eta$  and  $\chi$  Persei

## References

Adam S. Burrows - Professor of Astrophysical Sciences, Princeton University,  
burrows@astro.princeton.edu

Olivier Guyon - Astrophysicist, Subaru Telescope/Professor of Astronomy,  
University of Arizona, guyon@naoj.org

Scott J. Kenyon - Senior Scientist, Smithsonian Astrophysical Observatory,  
skenyon@cfa.harvard.edu

Wladimir Lyra - Assistant Professor, New Mexico State University  
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John Wisniewski - Associate Professor, University of Oklahoma  
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Christian Marois - Astrophysicist, National Research Council, Herzberg Institute for Astrophysics,  
christian.marois@nrc-cnrc.gc.ca

## Bibliography

*37 First-Author Peer-Reviewed Journal Publications, 2 Submitted*

*99 Contributing Author Peer-Reviewed Journal Publications, 5 Submitted, 2 in Preparation*

*4 First-Author SPIE Proceedings Technical Papers*

*16 Contributing Author SPIE Proceedings Technical Papers*

*6 First-Author White Papers/Conference Proceedings/Other Publications*

*17 Contributing Author White Papers/Conference Proceedings/Other Publications*

Citations: Total - 5122, First Author - 1804; H-index: Total 41, First Author - 24