Jonah T. **Hansen**

Researcher in Astronomical Instrumentation | ETH Zurich

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Summary

Current researcher in astronomical instrumentation in the Exoplanets and Habitability group at ETH Zurich. Particularly interested in optical/IR space interferometry, with involvement in the Large Interferometer For Exoplanets (LIFE) mission concept.

Education

Australian National University — *Canberra, ACT*

Doctor of Philosophy — *Feb. 2020 - Oct. 2023*

- Recipient of an RTP and Dean's Merit HDR Supplimentary Scholarship in Science
- Supervised by Prof. Michael Ireland, Dr. Tony Travouillon, Dr Tiphaine Lagadec and Prof. John Monnier

Australian National University — *Canberra, ACT*

Bachelor of Philosophy - Science, Honours in Astronomy and Astrophysics — *Feb. 2016 - Dec. 2019*

- Recipient of a Tuckwell Scholarship
- High Distinction Average and University Medal recipient

Employment History

ETH Zurich — *Zurich, Switzerland*

Postdoctoral Researcher — *Jan. 2024 - Present*

- Assisting the Nulling Interferometry Cryogenic Experiment (NICE), in particular with regards to optical testing under cryogenic conditions
- Continuing to work on architecture designs and configurations for the LIFE (Large Interferometer For Exoplanets) initiative

Australian National University — *Canberra, ACT*

Student Researcher — *Jul. 2016 - Oct. 2023*

- PhD project centred on developing a beam combiner for the Pyxis interferometer. Have also been involved with the LIFE (Large Interferometer For Exoplanets) initiative in simulating nulling interferometry compatible telescope configurations. Interested in the properties of Mira variables using high angular resolution measurements from the CHARA and VLTI interferometric facilities.
- Honours project with Prof. Michael Ireland in simulating a linear formation flying, space interferometer mission with the aim of detecting biosignatures on exoplanets.
- Undergraduate projects with Prof. Michael Ireland, Dr Brad Tucker, Dr Tony Travouillon and Dr Luca Casagrande. These varied from tracing back the positions of stars in order to determine cluster membership, to building an instrument designed to measure turbulence inside a telescope dome, to identifying relationships between exoplanets and their host star's properties.

Mount Stromlo Observatory — *Canberra, ACT*

Outreach Assistant — *Apr. 2018 - Oct. 2023*

- Assisted with the ANU Stargazing World Record Attempt.
- Regularly give tours and present to school and private groups at Mt Stromlo Observatory.
- Assisted in giving talks to schools around regional South Australia and local Canberran schools.
- Given many talks and written newspaper articles about astronomy (more details here)

HEO Robotics — *Sydney, NSW*

PhD Intern — *Oct. 2020 - Jan. 2021*

- Researched and designed an optical payload for a future space situational awareness (SSA) satellite.
- Purchased and tested a potential optical system, both for optical quality and for survivability in space.

Australian Astronomical Observatory — *Sydney, NSW*

Student Fellowship Holder — *Dec. 2017 - Feb. 2018*

- Conducted a research project with Dr. Barnaby Norris in Adaptive Optics Instrumentation.
- Designed and tested a photonic lantern based wavefront sensor, designed to increase the speed and accuracy at which atmospheric turbulence can be detected.

Australian National University *Canberra, ACT*

Student Ambassador *Jan. 2017 - Jan. 2020*

- Lead tours of the ANU campus on a fortnightly basis.
- Team leader for major events, such as ANU Commencement Address and ANU Open Day.
- Gave presentations to prospective ANU students.

Max Planck Institute for Astronomy *Heidelberg, Germany*

Student Researcher *Jul. - Aug. 2015*

- Conducted a research project into galaxy evolution and morphology with Dr Kai Noeske.

Honours & Awards

Awards

2020-2023	**Dean's Merit HDR Supplimentary Scholarship in Science**, Australian National University	*Canberra, ACT*
2022	**Joan Duffield Research Award Scholarship**, Australian National University	*Canberra, ACT*
2020	**Peter McGregor Scholarship**, Australian National University	*Canberra, ACT*
2019	**University Medal**, Australian National University	*Canberra, ACT*
2016 - 2019	**Tuckwell Scholarship**, Australian National University	*Canberra, ACT*
2016, 2017, 2019	**Chancellor's Letter of Commendation**, Australian National University	*Canberra, ACT*
2017, 2018	**Brescia Award for Academic Achievement**, Ursula Hall, Australian National University	*Canberra, ACT*
2015	**Governor's Commendation Award for Outstanding Achievement**, South Australian Certificate of Education Merit Ceremony	*Adelaide, SA*
2015	**Kingston Estate Wines Chinner Memorial Prize (Valedictorian Award)**, Loxton High School	*Loxton, SA*

Opportunities

2015	**Participant**, International Summer Science School	*Heidelberg, Germany*
2015	**Participant**, National Youth Science Forum	*Canberra, ACT*

Publications

Birbacher, Thomas, Adrian M. Glauser, Mohanakrishna Ranganathan, **Jonah T. Hansen**, Suvrath Mahadevan, and Sascha P. Quanz (Aug. 2024). "Beam metrology and control for the Nulling Interferometry Cryogenic Experiment". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Ed. by Jens Kammerer, Stephanie Sallum, and Joel Sanchez-Bermudez. Vol. 13095. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 1309538, p. 1309538. DOI: 10.1117/12.3018652.

Glauser, Adrian M. et al. (Aug. 2024). "The Large Interferometer For Exoplanets (LIFE): a space mission for mid-infrared nulling interferometry". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Ed. by Jens Kammerer, Stephanie Sallum, and Joel Sanchez-Bermudez. Vol. 13095. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 130951D, p. 130951D. DOI: 10.1117/12.3019090.

Hansen, Jonah T., Michael J. Ireland, Olivia Anderson, Benjamin Courtney-Barrer, Nick Herrald, Joice Mathew, Grace McGinness, Julien Tom Bernard, Tony Travouillon, and Samuel Wade (Aug. 2024). "The Pyxis Interferometer: updates and future plans". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Ed. by Jens Kammerer, Stephanie Sallum, and Joel Sanchez-Bermudez. Vol. 13095. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 130951G, 130951G. DOI: 10.1117/12.3015959.

Huber, Philipp A., Felix A. Dannert, Romain Laugier, Thomas Birbacher, Adrian M. Glauser, **Jonah T. Hansen**, and Sascha P. Quanz (Aug. 2024). "Analytical and numerical instrumental noise simulations for the Large Interferometer For Exoplanets (LIFE)". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Ed. by Jens Kammerer, Stephanie Sallum, and Joel Sanchez-Bermudez. Vol. 13095. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 130951F, 130951F. DOI: 10.1117/12.3018644.

Ranganathan, Mohanakrishna, Thomas Birbacher, **Jonah T. Hansen**, Adrian Glauser, Suvrath Mahadevan, Sascha Quanz, Mathieu Bertrand, and Jérôme Faist (Aug. 2024). "The Nulling Interferometer Cryogenic Experiment: the warm phase". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Ed. by Jens Kammerer, Stephanie Sallum, and Joel Sanchez-Bermudez. Vol. 13095. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 130951H, 130951H. DOI: 10.1117/12.3018845.

Pogorelyuk, Leonid, Mason Black, Nicholas Belsten, Eleonora Polini, **Jonah T. Hansen**, Michael Ireland, John D. Monnier, and Kerri Cahoy (Apr. 2024). "Space interferometer imaging limitations due to Global Positioning System uncertainties and parasitic forces in Low Earth Orbit". In: *Journal of Astronomical Telescopes, Instruments, and Systems* 10, 025004, p. 025004. DOI: 10.1117/1.JATIS.10.2.025004.

Hansen, Jonah T., Samuel Wade, Michael J. Ireland, Tony D. Travouillon, Tiphaine Lagadec, Nicholas Herrald, Joice Mathew, Stephanie Monty, and Adam D. Rains (Oct. 2023). "Pyxis: A ground-based demonstrator for formation-flying optical interferometry". In: *Journal of Astronomical Telescopes, Instruments, and Systems* 9, 045001, p. 045001. DOI: 10.1117/1.JATIS.9.4.045001. arXiv: 2307.07211 [astro-ph.IM].

Pogorelyuk, Leonid, Mason Black, Nicholas Belsten, Eleonora Polini, **Jonah T. Hansen**, Michael Ireland, John D. Monnier, and Kerri Cahoy (Oct. 2023). "Space interferometer imaging limitations due to GPS uncertainties and parasitic forces in LEO". In: *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*. Ed. by Allison A. Barto, Fanny Keller, and H. Philip Stahl. Vol. 12676. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 1267606, p. 1267606. DOI: 10.1117/12.2677541.

Hansen, Jonah T., Michael J. Ireland, Romain Laugier, and LIFE Collaboration (Feb. 2023). "Large Interferometer For Exoplanets (LIFE). VII. Practical implementation of a five-telescope kernel-nulling beam combiner with a discussion on instrumental uncertainties and redundancy benefits". In: *Astronomy and Astrophysics* 670, A57, A57. DOI: 10.1051/0004-6361/202243863. arXiv: 2204.12291 [astro-ph.IM].

Munro, Josephine, **Jonah Hansen**, Tony Travouillon, Doris Grosse, and Andrei Tokovinin (Jan. 2023). "Dome seeing analysis of the Anglo-Australian Telescope". In: *Journal of Astronomical Telescopes, Instruments, and Systems* 9, 017004, p. 017004. DOI: 10.1117/1.JATIS.9.1.017004.

Hansen, Jonah T., Michael J. Ireland, and the LIFE Collaboration (Aug. 2022). "Large Interferometer For Exoplanets (LIFE). IV. Ideal kernel-nulling array architectures for a space-based mid-infrared nulling interferometer". In: *Astronomy and Astrophysics* 664, A52, A52. DOI: 10.1051/0004-6361/202243107. arXiv: 2201.04891 [astro-ph.IM].

Hansen, Jonah T., Michael J. Ireland, Tony Travouillon, Samuel Wade, Michael Ellis, Steven Ellis, Shanae King, Tiphaine Lagadec, Joice Mathew, Patrick Miller, Stephanie Monty, Adam Rains, Thomas Scott, and Hancheng Shao (Aug. 2022). "The Pyxis Interferometer (I): scientific context, metrology system, and optical design". In: *Optical and Infrared Interferometry and Imaging VIII*. Ed. by Antoine Mérand, Stephanie Sallum, and Joel Sanchez-Bermudez. Vol. 12183. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 121831B, 121831B. DOI: 10.1117/12.2627768.

Munro, Josephine, **Jonah Hansen**, Doris Grosse, Tony Travouillon, and Andrei Tokovinin (Aug. 2022). "Results of the dome turbulence sensor at the Anglo-Australian Telescope". In: *Observatory Operations: Strategies, Processes, and Systems IX*. Ed. by David S. Adler, Robert L. Seaman, and Chris R. Benn. Vol. 12186. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 121860A, 121860A. DOI: 10.1117/12.2629702.

Wade, Samuel, **Jonah T. Hansen**, Michael J. Ireland, Tony Travouillon, Nicholas Bohlsen, Logan Corry, Steven Ellis, Nicholas Herrald, Weihao Luo, Stephen Madden, Joseph Mangos, Michael Polkinghorne, and Kunlun Yan (Aug. 2022). "The Pyxis Interferometer (II): control system, telescope, and mechanical design". In: *Optical and Infrared Interferometry and Imaging VIII*. Ed. by Antoine Mérand, Stephanie Sallum, and Joel Sanchez-Bermudez. Vol. 12183. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 121831C, p. 121831C. DOI: 10.1117/12.2627772.

Hansen, Jonah T., Michael J. Ireland, Andrew Ross-Adams, Simon Gross, Tiphaine Lagadec, Tony Travouillon, and Joice Mathew (Apr. 2022). "Interferometric beam combination with a triangular tricoupler photonic chip". In: *Journal of Astronomical Telescopes, Instruments, and Systems* 8, 025002, p. 025002. DOI: 10.1117/1.JATIS.8.2.025002. arXiv: 2112.05017 [astro-ph.IM].

Hansen, Jonah T., Luca Casagrande, Michael J. Ireland, and Jane Lin (Mar. 2021). "Confirming known planetary trends using a photometrically selected Kepler sample". In: *Monthly Notices of the Royal Astronomical Society* 501.4, pp. 5309–5318. DOI: 10.1093/mnras/staa3921. arXiv: 2009.08154 [astro-ph.EP].

Hansen, Jonah T., Michael J. Ireland, Tony Travouillon, Tiphaine Lagadec, Joice Mathew, and Nicholas Herrald (Dec. 2020). "Linear formation-flying astronomical interferometry in low-Earth orbit: a feasibility study". In: *Space Telescopes and Instrumentation 2020: Optical, Infrared, and Millimeter Wave*. Ed. by Makenzie Lystrup, Marshall D. Perrin, Natalie Batalha, Nicholas Siegler, and Edward C. Tong. Vol. 11443. International Society for Optics and Photonics. SPIE, pp. 955–967. DOI: 10.1117/12.2560890.

Lagadec, T., M. Ireland, **J. Hansen**, J. Mathew, T. Travouillon, and S. Madden (Dec. 2020). "Compact unambiguous differential path-length metrology with dispersed Fabry-Perot laser diodes for a space interferometer array". In: *Optical and Infrared Interferometry and Imaging VII*. Ed. by Peter G. Tuthill, Antoine Mérand, and Stephanie Sallum. Vol. 11446. International Society for Optics and Photonics. SPIE, pp. 549–556. DOI: 10.1117/12.2561927.

Hansen, Jonah T. and Michael J. Ireland (May 2020). "A linear formation-flying astronomical interferometer in low Earth orbit". In: *Publications of the Astronomical Society of Australia* 37, e019, e019. DOI: 10.1017/pasa.2020.13. arXiv: 1912.02350 [astro-ph.IM].

Crundall, Timothy D., Michael J. Ireland, Mark R. Krumholz, Christoph Federrath, Maruša Žerjal, and **Jonah T. Hansen** (Nov. 2019). "Chronostar: a novel Bayesian method for kinematic age determination - I. Derivation and application to the β Pictoris moving group". In: *Monthly Notices of the Royal Astronomical Society* 489.3, pp. 3625–3642. DOI: 10.1093/mnras/stz2376. arXiv: 1902.07732 [astro-ph.SR].

Service Roles and Leadership

2022-2023	**Outreach Team Leader**, Mt Stromlo Outreach Program	*Canberra, ACT*
2022-2023	**HDR Student Representative**, Research School of Astronomy and Astrophysics Executive	*Canberra, ACT*
2021-2023	**Meeting Coordinator**, Planets Group Meeting, Instrumentation Journal Club	*Canberra, ACT*
2021-2022	**Member**, Research School of Astronomy and Astrophysics Telescope Time Allocation Committee	*Canberra, ACT*
2020, 2021	**Organiser and Advisor**, Mt Stromlo Student Seminars	*Canberra, ACT*
2016-2019	**Volunteer and Group Leader**, ConocoPhillips Science Experience	*Canberra, ACT*
2017-2018	**Secretary and Treasurer**, ANU Physics Society	*Canberra, ACT*
2018	**Organiser**, ANU National Science Week Program	*Canberra, ACT*

Presentations

LIFE All-hands meeting 2023 — *Online*
Presentation on LIFE architectures — *Nov. 2023*

9th Australian Exoplanet Workshop 2023 — *Sydney, Australia*
Presenter on the Pyxis Interferometer — *Sep. 2023*

Astronomical Society of Australia, Annual Science Meeting 2023 — *Sydney, Australia*
Presenter on the Pyxis Interferometer — *Jul. 2023*

Keck Institute For Space Studies Workshop: Exploring Exoplanets With Interferometry — *Pasadena, California, USA*
Presenter on the Pyxis Interferometer and Architectures for the Large Interferometer for Exoplanets — *Nov. 2022*

20th Australian Space Research Conference — *Sydney, Australia*
Presenter on the Pyxis Interferometer — *Sep. 2022*

Optical and Infrared Interferometry and Imaging VIII, SPIE Astronomical Telescopes and Instrumentation — *Montreal, Canada*
Presenter on the Pyxis Interferometer (Papers 12183-48 and 12183-49) — *Jul. 2022*

Astronomical Society of Australia, Annual Science Meeting 2022 — *Hybrid; Melbourne, Australia*
Poster presenter on the Pyxis Interferometer — *Jun. 2022*

Astronomical Society of Australia, Annual Science Meeting 2021 — *Hybrid; Hobart, Australia*
Poster presenter on the Pyxis Interferometer — *Jul. 2021*

43rd COSPAR Scientific Assembly — *Online; Sydney, Australia*
Presenter on formation-flying interferometry in low Earth orbit (Paper E1.20-0013-21) — *Jan. 2021*

Space Telescopes and Instrumentation 2020: Optical, Infrared, and Millimeter Wave, SPIE Astronomical Telescopes and Instrumentation — *Online*
Poster presenter on formation-flying interferometry in low Earth orbit (Paper 11443-177) — *Dec. 2020*