Guillaume Huber

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Research Interests

Astronomical instrumentation; UV-visible-NIR detector development; photon-counting and ultra-low-background detector systems; high-contrast imaging for exoplanets; optical and polarimetric instrumentation; precursor science and instrumentation for the Habitable Worlds Observatory.

Education

University of Hawai'i at Mānoa, Institute for Astronomy 2022–present
Ph.D. student in Astronomy, M.Sc. in Astronomy *Honolulu / Hilo, HI, USA*

- Thesis topic: near-infrared arrays and target selection for the Habitable Worlds Observatory.
- Advisor: Prof. Michael Bottom
- Research areas: infrared detector characterization, astronomical instrumentation, polarimetry, high-contrast imaging, and target selection for future space missions.
- Coursework in astronomical instrumentation, observational astronomy, stellar interiors, astrobiology, interstellar medium, radiative transfer, stars and planets, and solar astronomy.

Institut d'Optique Graduate School / Université Paris-Saclay 2019–2022
M.Eng. in Applied Physics, Optics and Photonics *Palaiseau, France*

- Coursework in optical instrumentation, Fourier optics, polarimetry, signal and image processing, quantum optics, radiometry, detection systems, lasers, optical fibers, and applied photonics.
- GPA: 4.36/4.5; graduated top 10%.

Panthéon-Sorbonne University 2021–2022
First-year B.A. coursework in Philosophy *Paris, France*

- Coursework in general philosophy, philosophy of science, history of philosophy, and practical philosophy.

Classes Préparatoires aux Grandes Écoles 2017–2019
B.Sc.-level intensive track in Mathematics and Physics *Sophia Antipolis, Nantes, Rennes, France*

- Highly selective preparatory program with intensive coursework in mathematics, physics, engineering, computer science, chemistry, and philosophy.

Research Experience

Detector Characterization for Low-Signal Astronomy Aug. 2022–present
Institute for Astronomy, University of Hawai'i - UC Berkeley *Advisor: Prof. Michael Bottom*

- Characterize large-format linear-mode avalanche photodiode (LmAPD) arrays for ultra-low-signal near-infrared astronomy and future astronomical observatories, including the Habitable Worlds Observatory.
- Develop laboratory experiments and analysis pipelines for detector characterization (gain, read noise, dark current, glow, persistence, and single-photon event detection).

- Analyze laboratory and telescope datasets; build simulations and statistical tools for detector performance assessment.
- Collaborate with academic partners (RIT, MIT, UC Berkeley), NASA, and industry partners (Leonardo UK, Hawaii Aerospace); presented related work at SPIE Astronomical Telescopes + Instrumentation, astronomy and HWO-related conferences, and detector workshops.

Target Selection for the Habitable Worlds Observatory Oct. 2024–present
Institute for Astronomy, University of Hawai'i *Advisors: Prof. Michael Bottom*

- Search for binary companions in potential HWO target systems using Robo-AO-2 observations from the UH 88-inch telescope on Mauna Kea.
- Contribute to the instrument commissioning and its infrared data-processing pipeline
- Contribute to the HWO target-selection working group.

Dual-Wavelength Spectropolarimeter for Solar Astronomy Summer 2021; Aug. 2022–2024
Institute for Astronomy, University of Hawai'i *Advisor: Prof. Haosheng Lin*

- Designed and demonstrated a single-channel dual-wavelength polarimetric concept using optical modeling, Mueller-matrix analysis, and laboratory validation.
- Built Python simulations and experimental performance tests for the polarimeter proof of concept.
- First-year project awarded the IfA Achievement Scholarship.

Starspots on Main-Sequence Superflaring Stars 2023-2024
Institute for Astronomy, University of Hawai'i *Advisor: Prof. Haosheng Lin*

- Measure stellar spot temperatures and magnetic-field diagnostics using TESS photometry and high-resolution infrared spectroscopy.
- Awarded observing time as Principal Investigator on NASA IRTF.

Optical Engineering for Greenhouse-Gas Earth Observation Mar.–June 2022
SRON Netherlands Institute for Space Research *Advisor: Dr. Ryan Cooney*

- Contributed to an ESA-funded project for characterization of near-infrared cameras for the TANGO mission.
- Installed and evaluated a cleanroom sensor-testing setup involving cryogenic cooling and ultra-low-pressure conditions.
- Modeled thermal background and optical performance for infrared detector testing.

Hypertelescope Optical Design and Simulation July–Nov. 2021
Hypertelescope LISE *Advisors: Prof. Antoine Labeyrie; Prof. Thierry Lépine*

- Studied coma-aberration correction in a multi-pupil hypertelescope optical design.
- Developed Fourier-optics simulations in Python to model hypertelescope image formation.

Junior Engineer Consulting 2021–2022
Valeo; Somfy *France*

- Characterized polymer automotive lenses, including focal length, surface geometry, thickness, and aberration measurements.
- Performed 3D photometric characterization and environmental performance tests of an embedded infrared detector system for home automation.

Publications

Published / Accepted

[P1] Huber, G. et al. "Glow reduction of ultra-low noise LmAPDs: towards photon-counting infrared arrays." *Proceedings of SPIE*. 2024. ADS.

[P2] Huber, G. et al. "Recent characterization results of LmAPDs: towards photon-counting infrared arrays for HWO." *HWO 2025 Conference Proceedings*. 2026. ADS.

[P3] Huber, G., Lin, H. "Simultaneous multi-wavelength polarimetry without spectral splitting: proof of concept of a single-channel dual-wavelength polarimeter." *Proceedings of SPIE*. 2024. ADS.

[P4] Claveau, C.-A. et al. "Progress towards a megapixel linear-mode avalanche photodiode array for ultra-low-background shortwave infrared astronomy." *Proceedings of SPIE*. 2024. ADS.

[P5] Bottom, M. et al. "Fundamental Noise Limits of Infrared Detectors in the Presence of Readout Glow." *Proceedings of SPIE*. 2026. ADS.

[P6] Baranec, C. et al. "Robo-AO-2: entering the era of automated science operations, hybrid wavefront sensing, and adaptive secondary integration." *Proceedings of SPIE*. 2026. ADS.

[P7] Hartman Z. et al. "Paving the Road to the Habitable Worlds Observatory with High-resolution Imaging. I. New and Archival Speckle Observations of Potential HWO Target Stars." *The Astronomical Journal*. 2026. ADS.

[P8] Marcussen M. et al. "The μ Herculis system solved after nearly three centuries." *Astronomy and Astrophysics*. 2026. DOI.

Submitted

[S1] Huber, G. et al. "Near-noiseless single-photon detection in the infrared with a megapixel semiconductor array for low-background astronomy." *Nature Astronomy*. Submitted - In Review. ADS

[S2] Huber, G. et al. "Persistence in Linear-mode Avalanche Photodiodes." *Journal of Astronomical Telescopes, Instruments, and Systems (JATIS)*. Submitted - In Review.

[S3] Hartman Z. et al. "Here Be Binaries: Examining Our Current Understanding of the Multiplicity Status of Nearby Potential HWO Targets." *HWO 2025 Conference Proceedings*. Submitted, 2025.

In Preparation

[IP1] Huber, G. et al. "A Direct-Imaging Survey of $\sim$ 500 Potential HWO Targets." *The Astronomical Journal*. In preparation.

[IP2] Huber, G., Lin, H. "Proof of concept of a novel spectropolarimeter." *Publications of the Astronomical Society of the Pacific*. In preparation.

Conference Presentations and Workshops

- SPIE Astronomical Telescopes + Instrumentation, 2024, Yokohama, Japan
- Caltech Sagan Workshop, 2024, Pasadena, CA, USA
- NASA Habitable Worlds Observatory Face-to-Face Meeting, 2024, Rochester, NY, USA

- Habitable Worlds Observatory Conference, 2025, Washington, DC, USA
- Scientific Detector Workshop, 2025, Canberra, Australia
- Spirit of Lyot Conference, 2026, Pasadena, CA, USA

Observing and Proposal Experience

- Principal Investigator, Robo-AO-2 observations of candidate HWO targets with the UH 88-inch telescope, Mauna Kea. 12 observing nights, survey of 508 targets.
- Principal Investigator, NASA IRTF/iSHELL observing program on spectroscopy of stellar spots on Main Sequence stars. 5 observing half-nights, 8 targets.

Teaching and Mentoring

- Private tutor in mathematics, physics, and English, 2019–2020.
- Elementary school lecture on galactic and extra-galactic astronomy for the *Journey Through the Universe* outreach program in Hilo

Service and Outreach

- Volunteering at IfA Open House, Astroday Hilo and Kona, and other outreach events
- Help setting up a 50cm Planewave telescope at Waipahu high-school
- Co-organizing *Astronomy on Tap - Hawai'i.*
- Teaching at *Journey through the Universe* in Hilo.

Awards and Scholarships

- Achievement Scholarship, Institute for Astronomy, University of Hawai'i, 2023. Merit award for the best first-year research project.
- Paris-Saclay University Travel Scholarship, 2021. Merit scholarship supporting travel and research stay in Hawai'i.

Technical Skills

Programming and data analysis	Python, MATLAB; basic IDL and C; scientific computing, statistical analysis, image processing, detector-data reduction.
Optics and instrumentation	Optical alignment, cryogenic detector testing, polarimetry, Fourier optics, radiometry, laboratory automation, cleanroom sensor testing.
Software	Zemax OpticStudio, basic SolidWorks, LaTeX, DS9, astropy, photutils, emcee
Languages	French native; English fluent; German intermediate; Japanese beginner.

Selected Professional Experience

Co-founder and CTO, LensCare 2019–2020

- Led technical research, prototyping, and early production for a student startup developing ecological contact-lens cases using UV-visible diode illumination.

References

Available upon request.