

JAKOB T. FABER

Curriculum Vitae

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EDUCATION

California Institute of Technology

Ph.D. Astrophysics

Pasadena, CA

Aug. 2023 – May 2029 (exp.)

Oberlin College

B.A. Physics (Astrophysics Concentration) with High Honors

B.A. Philosophy

Oberlin, OH

Aug. 2017 – May 2021

Aug. 2017 – May 2021

King's College London

Coursework in Electrodynamics and the Philosophy of Mathematics

London, U.K.

Jan. – Jun. 2020

RESEARCH EXPERIENCE

Fulbright Scholar

McGill Space Institute, McGill University | CHIME/FRB Collaboration

Aug. 2020 – Present

Montreal, QC, Canada

- **Project**: *Solving the Extragalactic Enigma: Hunting for Fast Radio Bursts with the CHIME Telescope*

Supervisors : Dr. Vicky Kaspi (McGill), Dr. Danielle Michilli (MIT)

Honors Candidate

Oberlin College Department of Physics & Astronomy

Aug. 2020 – May 2021

Oberlin, OH

- **Honors Thesis**: *Branched Flow in the Interstellar Medium*

Supervisors : Dr. Dan Stinebring (Oberlin), Dr. Rob Owen (Oberlin), Dr. Eric Heller (Harvard)

Aim : Investigating an emerging field in physics and universal wave behavior known as Branched Flow, as it relates to wave propagation in the interstellar medium (ISM)—i.e. multipath refractive scattering—as well as ISM turbulence dynamics and nanohertz-frequency gravitational wave astronomy with pulsar timing arrays. This research is being conducted in collaboration with Dr. Eric Heller's group in the Harvard Physics Department.

Research Assistant

Oberlin College | NANOGrav Collaboration

Aug. 2017 – May 2021

Oberlin, OH

- **Junior Member** — *North American Nanohertz Observatory for Gravitational Waves (NANOGrav Collaboration)*

Supervisor : Dr. Dan Stinebring (Oberlin)

Aim : Improving the sensitivity of pulsar timing arrays (PTAs) to low-frequency gravitational waves by formalizing new astrophysical models of time-variable propagation effects in the ISM to assist in their mitigation.

Research Assistant

UC Berkeley | Breakthrough Listen Initiative | NSF REU

Jun. 2020 – Present

Berkeley, CA

- **Project**: *Transient Signal Analysis with the Breakthrough Listen Digital Instrument*

Supervisor : Dr. Vishal Gajjar (UC Berkeley)

Aim : Constructed the semi-automated post-processing and analysis pipeline FLITS for the Breakthrough Listen digital backend at the Green Bank Telescope (GBT) to combine polarimetry, scintillation, and drift-rates in constraining FRB progenitors and emission mechanisms.

- Currently co-heading exclusive observing campaigns at the GBT between Breakthrough Listen and the CHIME/FRB collaboration to perform follow-up observations of repeating FRBs detected by the CHIME radio telescope.

Research Assistant*McGill Space Institute, McGill University | CHIME/FRB Collaboration*

Jun. – Dec. 2019

Montreal, QC, Canada

- **Project** : *Software and Algorithm Development for the CHIME/FRB Offline-Analysis Pipeline*

Supervisors : Dr. Vicky Kaspi (McGill), Dr. Emmanuel Fonseca (West Virginia), Dr. Ziggy Pleunis (Toronto), Dr. Daniele Michilli (MIT)

Aim: Assisted in developing an offline intensity analysis pipeline and software suite to characterize and localize morphologically complex repeating and one-off FRBs observed by the CHIME telescope.

Research Assistant*Anton Pannekoek Institute, University of Amsterdam | ASTRON*

Jan. – Jun. 2019

Amsterdam, Netherlands

- **Project**: *Dispersion Measure Variability and Scattering in Complex Fast Radio Burst Time-Frequency Structure*

Supervisors : Dr. Jason Hessels (Amsterdam), Dr. Dan Stinebring (Oberlin)

Aim : Devised analysis tools for characterizing propagation effects and dispersion measure variations in irregular time-frequency sub-structure for a series of detections of the first repeating Fast Radio Burst FRB 121102 made by the Arecibo Observatory.

Research Assistant*Cornell University | NANOGraw Collaboration*

Jun. – Nov. 2018

Ithaca, NY

- **Project** : *Simulating Interstellar Optics with Fresnel-Kirchhoff Diffraction Theory*

Supervisors : Dr. Jim Cordes (Cornell), Dr. Shami Chatterjee (Cornell)

Aim: Expanded a large-scale simulation of interstellar optics centered on the Fresnel-Kirchhoff theory of diffractive and refractive interstellar scintillation—soon to be featured in Dr. Cordes’ upcoming book on Interstellar Optics.

Research Assistant*Anton Pannekoek Institute, University of Amsterdam | ASTRON*

Jan. – Feb. 2018

Amsterdam, Netherlands

- **Project** : *Simulating Electron Density Distributions and Scattering Effects of PWNe and SNRs*

Supervisors : Dr. Joeri van Leeuwen (Amsterdam), Dr. Samayra Straal (NYU Abu Dhabi)

Aim: Simulated evolving electron densities and scattering effects of Pulsar Wind Nebulae and Supernova Remnants. Code was used in Dr. Straal’s dissertation in 2018.

TEACHING EXPERIENCE

Teaching Assistant | Astronomical Measurements and Instrumentation (Caltech)

Sept. 2023 – Dec. 2023

Instructor | General Relativity (Oberlin College)

Aug. 2020 – Jan 2021

- Taught a credit-bearing, full-semester course in the Oberlin Experimental College (sponsored by the Oberlin Physics Department) that I developed with a fellow student, which offered an undergraduate-level treatment of General Relativity.

Teaching Assistant | Introductory Astronomy (Oberlin College)

Feb. 2019 – Jan. 2020

Teaching Assistant | Differential Equations, Elementary Physics I (Oberlin College)

Aug. 2019 – Jan. 2020

HONORS AND AWARDS

Fulbright Research Scholar Award | *Fulbright Program & McGill University*

2021

Dahl Philosophy Prize | Best Undergraduate Essay | *Oberlin College Philosophy Dept.*

2020

- **J. Faber**, “The Law of Excluded Middle: A Defense of Classical Mathematics Through Aristotelian Insights”

Robert Weinstock Prize | Outstanding Achievements in Physics | *Oberlin College Physics Dept.*

2020

SETI Forward Award | *UC Berkeley Astro. Dept., Breakthrough Listen & SETI Institute*

2020

TECHNICAL SKILLS

Languages: Python, C/C++, SQL**Systems**: Unix, Mathematica, L^AT_EX**Developer Tools**: Git, Docker**Libraries**: Numpy, Scipy, Scikit-learn, Astropy, Sympy, Matplotlib, Pandas, Seaborn**Other Software**: PSRCHIVE, DSPSR, TEMPO2, PINT, OpenCV, Adobe Premiere/After Effects/Photoshop, CAD, OpenRocket

LANGUAGES

English | *Native*
Dutch | *Native*
Spanish | *Intermediate*

PUBLICATIONS

1. **J. Faber** et al., “Re-Analysis of Breakthrough Listen Observations of FRB 121102: Polarization Properties of Eight New Spectrally-Narrow Bursts” (2021) [published in RNAAS]
2. K. Sand, **J. Faber**, V. Gajjar, D. Michilli and B. Andersen, “Multiband Detection of Repeating FRB 20180916B” (2021) [published in ApJ]
3. + (See Astrophysics Data System for latest publications.)

CONFERENCES * - PRESENTER

FRB 2022 May 2022
..... *Magog, QC*

- Talk: **J. Faber** “Compelling Morphologies of Fast Radio Bursts with CHIME/FRB Baseband Data”
- Received an honorable mention (third place) out of 52 talks from graduate students from 6 universities across Quebec

Center for Research in Astrophysics of Quebec* May 2022
..... *Magog, QC*

- Talk: **J. Faber** “Compelling Morphologies of Fast Radio Bursts with CHIME/FRB Baseband Data”
- Received an honorable mention (third place) out of 52 talks from graduate students from 6 universities across Quebec

American Astronomical Society* Jan. 2021
..... *Virtual Conference*

- Poster & Talk: **J. Faber**, K. Sand, V. Gajjar, D. Michilli, B. Andersen, “Multiband Detection of Repeating FRB 20180916B”

USNC-URSI National Radio Science Meeting Jan. 2021
..... *Virtual Conference*

Scintillometry* Jul. 2019
Max Planck Institute for Radio Astronomy *Bonn, Germany*

- Meeting Topic : Utilizing Very Long Baseline Interferometry (VLBI) and other radio astrometric techniques for interstellar scintillation studies, including the localization of plasma lenses and scattering screens.
- Co-led discussion session: *Applying Scintillometry Techniques to Fast Radio Bursts*

Scintillating Science Jul. 2019
South African National Space Agency (SANSA) *Hermanus, South Africa*

American Physical Society* Mar. 2019
..... *Denver, CO*

- Poster: **J. Faber**, D. Stinebring, J. Cordes, S. Chatterjee and A. Jussila, “Improving Gravitational Wave Detection: Interstellar Scattering Correction”
- Poster: S. Ocker, D. Stinebring, B. Rickett (**J. Faber** – stand-in presenter) “A Multi-Frequency Scintillation Arc Study of Pulsar B1133+16”

American Astronomical Society* Jan. 2019
..... *Seattle, WA*

- Poster: **J. Faber**, D. Stinebring, J. Cordes, S. Chatterjee and A. Jussila, “Simulating Pulsar Scintillation in the ISM: Wave Optics v. Ray Tracing”

International Pulsar Timing Array

NRAO | New Mexico Tech

Jun. 2018

Socorro, NM

NANOGrav Fall Meeting

NRAO | University of Virginia

Dec. 2017

Charlottesville, VA

EXTRACURRICULAR ACTIVITIES

Oberlin College Chamber Music Violinist in the Vatina String Trio	Aug. 2019 – Present
Oberlin College Chamber Music Violinist in the Margnité String Quartet	Aug. 2017 – Present
Gear Co-op Campus Music Studio Gear Wizard	Aug. 2017 – Present
OHACS Oberlin College Computer Science and Hackathon Club	Aug. 2019 – Present
Green Lab Food and AgriTech Innovation Lab & Makerspace Resident Researcher	Jan – Mar. 2020
South London Makerspace Resident Researcher	Jan – Mar. 2020
KCL Philosophy Society	Jan – Mar. 2020
Maxwell Physics Society	Jan – Mar. 2020
KCL Space Science Rocketry Society Rocket & CubeSat Engineer	Jan – Mar. 2020
KCL Machine Learning and Data Science Society	Jan – Mar. 2020
KCL Chess Society	Jan – Mar. 2020
Oberlin Cycling Team	Aug. 2019 – Jan. 2020
Oberlin Club Soccer Team	Aug. 2019 – Jan. 2020
Oberlin Finance and Investment Club	Aug. 2019 – Jan. 2020
The Synapse Intercollegiate Science Magazine Content Editor	Aug. 2017 – May 2019
Oberlin College Orchestra of Arts & Sciences Assistant Principal First Violin	Aug. 2017 – May 2019