

# JAKOB T. FABER

## *Curriculum Vitae*

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## EDUCATION

### California Institute of Technology

*Ph.D. Astrophysics*

Pasadena, CA

*Aug. 2022 – May 2028 (exp.)*

### Oberlin College

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

Oberlin, OH

*Aug. 2017 – May 2021*

*B.A. Philosophy*

*Aug. 2017 – May 2021*

### King's College London

*Coursework in Electrodynamics and the Philosophy of Mathematics*

London, U.K.

*Jan. – Jun. 2020*

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## 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*

Supervisor : Dr. Vicky Kaspi (MSI)

### 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 (MSI), Dr. Emmanuel Fonseca (West Virginia Univ.), Dr. Ziggy Pleunis (MSI), Dr. Daniele Michilli (MSI)

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 (Univ. of 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 Univ.), Dr. Shami Chatterjee (Cornell Univ.)

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 (Univ. of 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**

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**Instructor** | General Relativity

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

Feb. 2019 – Jan. 2020

**Teaching Assistant** | Differential Equations, Elementary Physics I

Aug. 2019 – Jan. 2020

**HONORS AND AWARDS**

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**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

**Lew Levy Scholarship** | Research and Travel Support | *UC Berkeley Astro. Dept. & Breakthrough Listen*

2020

**TECHNICAL SKILLS**

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**Languages**: Python, C/C++, SQL**Systems**: Unix, Mathematica, L<sup>A</sup>T<sub>E</sub>X**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

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

## PUBLICATIONS

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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) [in preparation]

## CONFERENCES \* - PRESENTER

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**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** Jun. 2018  
*NRAO | New Mexico Tech* *Socorro, NM*

**NANOGrav Fall Meeting** Dec. 2017  
*NRAO | University of Virginia* *Charlottesville, VA*

## EXTRACURRICULAR ACTIVITIES

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**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

<b>KCL Philosophy Society</b>	Jan – Mar. 2020
<b>Maxwell Physics Society</b>	Jan – Mar. 2020
<b>KCL Space Science Rocketry Society</b>   Rocket & CubeSat Engineer	Jan – Mar. 2020
<b>KCL Machine Learning and Data Science Society</b>	Jan – Mar. 2020
<b>KCL Chess Society</b>	Jan – Mar. 2020
<b>Oberlin Cycling Team</b>	Aug. 2019 – Jan. 2020
<b>Oberlin Club Soccer Team</b>	Aug. 2019 – Jan. 2020
<b>Oberlin Finance and Investment Club</b>	Aug. 2019 – Jan. 2020
<b>The Synapse</b> Intercollegiate Science Magazine   Content Editor	Aug. 2017 – May 2019
<b>Oberlin College Orchestra of Arts &amp; Sciences</b>   Assistant Principal First Violin	Aug. 2017 – May 2019