Tim Rehm | PhD Student

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Current second year physics PhD student at Brown University focusing in space technology development and low-frequency observational cosmology. Previous research areas include extragalactic astronomy and physics education. I firmly believe that sustainable space technology benefits the succeeding generations in regards to climate regulation, interplanetary travel and understanding the nature of the Universe.

Education

Brown University GPA: –

Doctoral Student in **Physics** *2019-present*

- Experimental Astrophysics & Cosmology

Cornell University GPA: 3.7

Bachelor of Arts in **Physics** – Cum Laude *2015-2018*

- Astronomy Concentration
- Cornell Tradition Fellow

Research Experience

Tianlai 21cm Radio Dish/Cylinder Array

Advisor: Prof Gregory Tucker, Physics Dept, Brown University *2020-present*

- Updated entire data analysis pipeline `tlpipe` in Python 3. Pipeline features include RFI extraction, noise source calibration, point source calibration, and apply complex gain corrections.
- Generated 21cm Hydrogen maps from acquired data using an m-mode mapmaking formalism.
- Implementing a **mode amplitude Legendre decomposition** on observed visibilities to improve understanding of the RFI landscape.

EXoplanet Climate Infrared TElescope (EXCITE)

Advisor: Prof Gregory Tucker, Physics Dept, Brown University *2020-present*

- A proposed balloon-borne space telescope designed to observe the phase curves of hot Jupiters.
- Designing the telescope cryostat using **thermal and mechanical models** to stay within physical constraints.

Arecibo Pisces-Perseus Supercluster Survey

Advisor: Prof Martha Haynes, Astronomy Dept, Cornell University *Spring 2018-2019*

- Reduced Arecibo data in Pisces-Perseus using Python-written pipeline tasks and RFI mitigation techniques.
- Generated mock catalogs in Python using selection functions simulate galactic clustering environments.
- Implemented a **halo mass group assignment** algorithm to analyze ALFALFA data using SDSS & 2MRS.

Undergraduate ALFALFA Team

Advisor: Prof Martha Haynes, Astronomy Dept, Cornell University *Summer 2017-2019*

- Data reduction for L-Band wide ALFALFA observations in IDL
- Wrote Python scripts to assign distances to low-redshift galaxies in local volume.
- Computed estimates on galactic peculiar velocities using **local density perturbation** models.
- Participated in workshops held at the Green Bank Telescope which included active data reduction sessions.

Cornell Physics Education Research Lab

Advisor: Prof Natasha Holmes, Physics Dept, Cornell University *Summer 2017*

- Data analysis for the Physics Lab Inventory of Critical Thinking survey
- Piloted and redesigned Cornell's Introductory Physics Lab sequence
- Performed **chi-square analysis** on feedback from universities' introductory physics classes to determine inconsistencies in student understanding

Teaching Experience

- Certificate for Sheridan Teaching Seminar Program **Fall '19**
- Graduate TA for Physics 0220 "Astronomy" **Spring '20**
- Graduate TA for Physics 0270 "Astronomy & Astrophysics" **Fall '19**
- Undergraduate TA for Physics 2214 "Oscillations, Waves, and Quantum Physics" **Fall '18**

- Undergraduate TA for Physics 2213 "Electromagnetism" **Spring '17**
- Undergraduate TA for Physics 1112 "Mechanics & Heat" **Fall '16**

Talks & Presentations

Cornell Astronomy Undergraduate Research Forum
Ithaca, NY *May 2018*
- Rehm, T., Haynes, M. *Quantifying Clustering Environment of the 2MRS Galaxies in the Pisces-Perseus Supercluster.*

Annual Undergraduate ALFALFA Team Conference
Green Bank, WV *June 2018*
- Rehm, T. *Testing Measures of Environment in the Pisces-Perseus Region.*

Cornell Summer Astronomy REU Conference
Ithaca, NY *June-August 2018*
- Rehm, T. *Peculiar Velocities in the Local Universe & Arecibo Pisces- Perseus Supercluster Survey.*
- Rehm, T., Haynes, M. *Improving Distance Estimates in the Local Universe: Applications to ALFALFA.*

Awarded Grants

NASA Rhode Island Space Grant Consortium
Graduate Student Fellowship 2021 *Awarded February 2020*
- Funding for Spring and Summer 2021 to pursue mechanical and thermal modeling of EXCITE cryocooler technology

Recent Academic Projects

- Rehm, T. "Simulating Mean Motion Resonance around N-body Ring Structures." Graduate Classical Mechanics final project. (December 2019)
- Rehm, T. "Simulations of Ohmic Dissipation and Hall Drift of Magnetic Fields inside Ultra-Magnetized Neutron Star Crusts." Graduate Electromagnetism final project. (May 2020)

Technical Skills & Previous Positions

- **Proficiency** in Python, LaTeX , TOPCAT and IDL.
- **Familiarity** with MATLAB and Mathematica.
- **Telescope Operator** Fuertes Observatory & Barus and Holley
- **Member** Society for Physics Students (Cornell)
- **Member** Cornell Astronomical Society
- **President** Alpha Tau chapter of Phi Kappa Tau

Relevant Advanced Coursework (Cornell)

Galaxies Across Cosmic Time, Experimental Astronomy (Optical & Radio), General Relativity, Advanced Analytical Mechanics, Advanced Electromagnetism, Mathematical Physics, Teaching & Learning Physics, Intro Computing with Python

Relevant Advanced Coursework (Brown)

Techniques in Experimental Physics, Theoretical Physics I & II, Graduate Quantum Mechanics I & II, Advanced Quantum Mechanics, Graduate Statistical Mechanics, Solid State Physics I