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Greetings Anton Pannekoek Institute,

I am writing to express my strong interest in the PhD positions advertised by Dr. Ziggy Pleunis, Dr. Daniela Huppenkothen, and Dr. Benito Marcote that focus on Fast Radio Bursts (FRBs). My academic journey has prepared me to succeed as a PhD researcher. I am currently pursuing a master's degree in astrophysics at the University of Amsterdam. I hold an undergraduate degree in astrophysics from the University of Toronto, where I was awarded the John Pounder Prize twice for the highest grades in first- and second-year astronomy courses. As an undergraduate, I gained extensive experience in both teaching and research, culminating in a [first-author publication](#). I have a strong interest in FRBs, radio astronomy, multi-wavelength astronomy, cosmic magnetism, scintillation, observational cosmology, techniques, surveys, algorithms, and machine learning & data science for astronomy.

My master's thesis is on using scintillation to study the local environments of [CHIME/FRBs](#), particularly their emission size regions. Furthermore, I will investigate the time-variability of scintillation in repeating FRBs, which could reveal potential orbital periods of the FRB sources. My advisors are Dr. Ziggy Pleunis, and Professor Jason Hessels. This past summer, I worked as a summer research fellow at Astron in the Netherlands using the historic [25m Dwingeloo Radio Telescope \(DRT\)](#). The DRT was the largest radio telescope in the world when it was built in 1956 - today it is a museum and national monument in the Netherlands. The project was supervised by Professor Jason Hessels, and Dr. Tammo Jan Dijkema. I operated DRT, and developed a real-time detection pipeline in [Python](#) for repeating FRBs using [Presto](#), and [Fetch](#). The pipeline processes data at a rate of  $\sim 1$  Gb/s. The highlight of the project was [detecting a burst from FRB20240619D](#). The results will contribute to an upcoming paper, and the DRT will be used in future FRB observation campaigns.

During my undergraduate studies at the University of Toronto, I worked on four research projects and completed two theses by special request. I was awarded a competitive summer research fellowship three years in a row. My second thesis was searching for  $\gamma$ -ray counterparts to CHIME/FRBs using [Swift/BAT](#) data. My supervisors were Dr. Paul Schols, and Dr. Ziggy Pleunis. I developed a pipeline to analyze archival Swift/BAT data, generating lightcurves, and images. While some parts of the script utilized functions from [HEASoft](#) - the specialized software for Swift/BAT, I had to implement several components myself, as the software was not designed for my applications. My fluence limits agreed with the literature values. Additionally, I completed two fellowships that focused on rotation measure (RM) synthesis, a key technique for studying cosmic magnetism through Faraday Rotation. I was supervised by Dr. Cameron Van Eck, and Professor Bryan Gaensler. For one project, I developed a new RM synthesis algorithm for cases of extreme bandwidth depolarization - where the classical algorithm begins to break down. The results have been integrated into the [RM-Tools](#) package, and culminated in my [first-author publication](#) in the Monthly Notices of the Royal Astronomical Society.

Beyond academics, at the University of Toronto, I represented the physics department on the student union, managed a free physics tutoring center, and led facilitated study groups. I also organized outreach events including, a field trip for the Perseid meteor shower, and sidewalk telescope viewings.

Amsterdam stands out as a global leader in FRB research, and I am especially interested in the scintillation position due to my fascination in studying the intervening medium and its effects on light - like Faraday rotation. I am eager to continue exploring what scintillation can reveal about FRBs. Furthermore, the opportunity to work with my favorite telescopes CHIME, and [LOFAR](#) is most luminous. My interest in Dr. Huppenkothenin's project stems from its focus on data science, and observational methods applied to FRBs, as well as its multi-wavelength approach. Additionally, I am interested in the FlameS position because it involves radio imaging, a technique I am interested in trying.

Looking forward, I aspire to become a professional astronomer, either as a research professor or in a national lab. Pursuing a PhD is not just a means to an end but a worthwhile journey itself. I am eager to see where this path takes me, and I am confident that Amsterdam is the right place to continue this journey. Thank you for considering my application.

Astronomy is looking up!

Maxwell A. Fine

he/them

