Investigating the beginning & expansion of the Universe

Laura Newburgh
Assistant Professor

Laura Newburgh studies the past 13 billion years of cosmic history through measurements of the Cosmic Microwave Background (CMB) and 21 cm hydrogen emission from faraway galaxies. Her work involves designing, building, and using instruments that go on radio telescopes around the world. The data from these instruments enable her to probe the nature of dark energy, dark matter, neutrinos, and cosmic inflation.

Newburgh received a National Science Foundation (NSF) CAREER award in 2018. She shared the 2022 Berkeley Prize with CHIME collaborators for breakthroughs in understanding Fast Radio Bursts (FRBs).

Newburgh frequently designs and carries out outreach programs for local schools in partnership with the Yale Pathways to Science program.

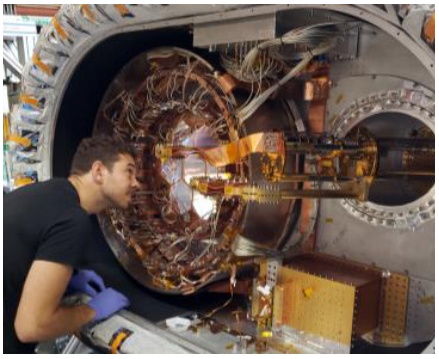
Canadian Hydrogen Intensity Mapping Experiment (CHIME)

CHIME is a radio interferometer telescope in Canada that is used to measure the expansion history of the Universe and discover insights about dark energy, a mysterious component that makes up approximately 72% of the energy density of the Universe and is causing the expansion of the Universe to accelerate. The Newburgh group uses a technique called holography to map the beam shape of CHIME. Understanding CHIME's standard beam shape is critical to be able to identify and remove emission from unintended sources.

Hydrogen Intensity and Real-Time Analysis eXperiment (HIRAX)

HIRAX is an interferometric array of 256 6-meter radio dishes in South Africa. HIRAX is designed to study high-redshift large-scale structure for a constraint on dark energy and transient science to understand the nature of Fast Radio Bursts (FRBs).

The Newburgh group is leading the development of techniques, hardware, and analysis to measure and map the HIRAX beam shape with a quadcopter drone.



Simons Observatory (SO)

SO is a new millimeter observatory that is designed to make the most sensitive measurements of the Cosmic Microwave Background (CMB)—light the Universe emitted when it was 400,000 years old. SO will consist of four new telescopes in the Atacama desert in Chile. The Newburgh group is part of the team commissioning SO. Newburgh leads the data acquisition and control group, mainly building software to control and acquire data.

Drone calibration

The Newburgh group is involved in R&D of techniques and equipment to map the beam shape of radio telescopes with a quadcopter drone. The Newburgh group has tested drone calibration in several U.S. locations; including Greenbank Observatory, Brookhaven National Laboratory, and Wright Lab.

The Newburgh Group has developed a radio telescope at Wright Lab that is used as a testbed for instruments, technologies, and measurement techniques they are developing to calibrate telescopes at observatories around the world.