Physics AT QUEENS COLLEGE

Colloquium Notice

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Transforming Our Understanding of the Universe's Infancy with Novel Radio Telescopes

A crucial chapter in our cosmic history remains almost entirely unobserved. During the first several hundred million years after the big bang, known as the "Cosmic Dawn", our Universe was transformed from a cold, dark, and uniform expanse of hydrogen and helium into the vibrant, chemically enriched realm of stars and galaxies that we observe today. The drivers of this transformation were the first stars, galaxies, and black holes which chemically enriched, heated and ionizing material from which future generations of stars and galaxies like our own Sun and Milky Way would eventually form. These first sources set the stage for the cosmos we live in today.

While infrared telescopes like the James Webb promise to observe the very brightest of these early galaxies, the vast majority are too faint to ever detect directly. To get around this, radio astronomers are attempting to constrain the properties of these first sources by observing their statistical impact on 21cm emission from intergalactic hydrogen gas during the Cosmic Dawn. By the time these radio waves reach earth, they are redshifted to two meter wavelengths. Using similar techniques, we can also use measurements of large-scale Hydrogen emission to better understand the nature of Dark Energy and fundamental physics.

Unfortunately, foreground radio emission from nearby galaxies and our own is five orders of magnitude brighter. I will describe recent advances in our understanding of how to design close packed radio interferometers and data analysis that will allow us to distinguish the faint cosmological signal from the vastly brighter foregrounds; focusing on the Hydrogen Epoch of Reionization Array, a next generation 21cm experiment being commissioned in South Africa. I will finish by discussing areas where I expect significant improvements can be made in the coming years.

Note: NON-ZOOM EVENT

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