Astrophysics Roundtable, Nov. 10, 2016

Exploring the ‘Cosmic Dawn’ of our Universe, from the birth of the first stars and black holes about 100 million years after the Big Bang to the reionization of intergalactic gas 500 million years later, was one of the three “priority science objectives” highlighted by the US astronomy decadal survey committee for the 2012-2021 decade. Observations with new facilities in the next several years will transform our understanding of the first stars, galaxies, and black holes, and their role in driving reionization at the end of Cosmic Dawn. Among these are (1) the NSF-funded Hydrogen Epoch of Reionization Array (HERA; PI Aaron Parsons of UC Berkeley) which will directly observe 21cm emission from neutral hydrogen during the reionization epoch, (2) NASA’s James Webb Space Telescope (JWST, launching in 2018), which will directly observe the most distant galaxies and black holes, and the remnants of the first episodes of star formation in nearby low-mass galaxies that are predicted to have driven reionization, and (3) the Simons Observatory, a next generation Cosmic Microwave Background (CMB) experiment.

At this Astrophysics Roundtable, we will describe our early efforts toward understanding the complex interplay of astrophysics and cosmology during the Cosmic Dawn of our Universe. Realizing the full scientific potential of the world-class observing efforts led at UCB requires combining expertise across several observational domains. This territory is currently under-explored and unfunded because there is no existing framework for how to address the big questions; put simply, the field does not yet exist. This represents a compelling opportunity where external support would allow us to create a new scientific approach at the intersection of multiple existing sub-fields, with Quataert (theory/simulations of galaxy formation), Kriek (early galaxy observations), Weisz (stellar archeology), Seljak (CMB theory, large scale structure), Lee (CMB observation) and Parsons (intensity mapping of hydrogen during the reionization epoch) all providing critical expertise.