Wider, Deeper, Faster: Probing Fundamental Cosmology with Surveys by ACT and CHIME

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Many important advances in observational cosmology today come from observatories designed with a specific measurement in mind—WMAP, *Planck* and BICEP being prime examples. I will describe two other such experiments, beginning with the Atacama Cosmology Telescope (ACT/ACTpol), a six-metre instrument in Chile for making high-resolution, polarisation-sensitive maps of the CMB. I will summarise some of our key contributions to the field so far, such as our measurement of the CMB power spectrum and our pioneering work in observing gravitational lensing of the CMB and detecting the kinetic Sunyaev-Zeldovich effect. I will also speak about how Advanced ACTpol, our planned upgrade to ACTpol, will be capable of probing fundamental physics like the scale of inflation, the number and masses of neutrinos and the parameters of dark energy. The second project I will describe is the Canadian Hydrogen Intensity Mapping Experiment (CHIME), an ambitious new 100m x 100m radio telescope that will measure the density variation of neutral hydrogen over more than half the sky between z = 0.8 and 2.5. By detecting the baryon acoustic oscillations in the resulting 3D map, we will make a very precise measurement of the expansion rate of the universe and thus provide important data for understanding dark energy. CHIME is fully funded, and a 'pathfinder' with one-seventh the collecting area already exists. I will describe both the CHIME instrument and the science that is motivating us to build it.