**Rethinking metallicity: how to measure galaxy abundances in the early universe**

Recent large near-infrared spectroscopic surveys (like KBSS, MOSDEF, and KMOS$^{3D}$) have confirmed that star-forming galaxies at cosmic noon ($z$~2-3) exhibit nebular spectra that are distinct from their local counterparts. These differences reflect important changes in the characteristic physical conditions and chemical enrichment patterns of galaxies at high redshift, likely correlated with differences in their star formation histories relative to most $z$~0 galaxies. I will present new results from the Keck Baryonic Structure Survey (KBSS) that support this hypothesis and illustrate how lessons learned from spectroscopic surveys of $z$~2-3 galaxies inform observations of galaxies at even earlier times. I have used photoionization models designed to reconcile the joint rest-UV-optical spectra of high-$z$ star-forming galaxies to self-consistently infer the gas chemistry (O/H and N/O) and nebular ionization and excitation conditions (including ionization parameter, $U$) in a sample of ~160 individual z~2-3 galaxies with good SNR measurements of many of the strong rest-optical emission lines. Based on these results, which show that the majority of $z$~2-3 KBSS galaxies have moderate oxygen enrichment but sub-solar iron enrichment, I will argue that we should be studying galaxies' abundance patterns rather than continuing to rely on a single "metallicity" measurement to describe their chemical enrichment. These results also offer new constraints on important scaling relations like the gas-phase stellar mass-metallicity (O/H) relation—without the biases introduced by relying on diagnostics tuned to $z$~0 galaxies. Further, because galaxies during the Epoch of Reionization have rising star formation histories much more similar to $z$~2-3 galaxies than galaxies today, my work has important implications for developing appropriate tools for determining the chemistry of galaxies at $z$~6 and beyond, which will be one of the main science drivers of observations with JWST.