THE NEAR, THE FAR, AND THE IN-BETWEEN: SYNERGY BETWEEN LOW AND HIGH REDSHIFT GALAXY EVOLUTION STUDIES IN THE ERA OF JWST AND EUCLID

Stellar metallicities and chemical abundance patterns of galaxies at z~1.4-2.1

Over the past 5 years, the advent of multi-object near-infrared spectrographs (e.g., Keck/MOSFIRE, VLT/KMOS) has enabled rest-frame optical spectroscopic studies of large samples of galaxies during cosmic noon (z~2). Though these studies have significantly advanced our understanding of galaxies during this critical epoch, they are almost exclusively based on emission line measurements. These measurements are insensitive to the formation histories of galaxies, and cannot be used to study galaxies without gas and ionizing sources. As a result, the knowledge about the stellar content of distant galaxies is still primarily based on photometric studies. Obtaining deep continuum spectroscopy for a large sample of distant galaxies is an essential next step toward understanding the build-up of galaxies. In particular, stellar metallicities and chemical abundance patterns open up a new window into galaxy evolution, as they provide strong and independent constraints on the chemical enrichment, star-formation, and assembly histories of quiescent galaxies. Using an ultradeep spectrum with Keck/MOSFIRE, we measured the first stellar abundance pattern of a massive quiescent galaxy beyond z=2, and found that this galaxy is 0.25 dex more alpha-enhanced than galaxies of similar mass today. This result has several important implications. I will discuss these results, as well as the results of an ongoing survey to obtain stellar abundance patterns of a much larger sample of distant massive galaxies. Finally, I will discuss how the JWST will be crucial to further advancing this field, and thus opening a new window into the chemical enrichment, star-formation, and assembly histories of quiescent galaxies.