Stellar population synthesis, the IMF, and stellar feedback across redshifts

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Understanding the properties of massive stars and how these influence their environments across cosmic time is crucial for constraining galaxy evolution and the initial mass function (IMF). Studies of resolved stellar populations in the nearby Universe claim to be able to provide key insights that can be applied to the distant Universe, but do true local analogs matching recent high redshift observations exist?

After an introduction the stellar population synthesis and the IMF, I will discuss how we can test the accuracy of the models, which are widely used to interpret integrated light from high-redshift galaxies by analyzing spatially resolved massive stars in local star-forming environments. These local benchmarks allow us to refine predictions of ionizing photon production, chemical enrichment, and feedback processes, ultimately improving our ability to infer the nature of massive stars and their role in early galaxy evolution. Thus, I will discuss how resolved stellar populations could bridge the gap between observations and models, shedding light on extreme stellar populations across redshift.