Physics & Astronomy Colloquium – Spring 2020

Thursday, Jan 16th at 3:30 pm in CHEM 101

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How Massive Stars Shape Galactic and Cosmic Evolution

Massive stars are the engines that drive galaxy and cosmic evolution. High-energy photons, stellar winds, and supernovae from massive stars accelerate gas out of star-forming regions. These galaxy-scale outflows regulate star-formation rates and disperse metals into the intergalactic medium. The intense radiation fields of massive stars ionize and heat gas within galaxies. The resultant emission lines determine the physical conditions of galaxies. Perhaps most astonishingly, massive stars likely generated the largest phase change of neutral hydrogen in cosmic history: Cosmic Reionization. While massive stars truly shape cosmic history, their properties and impact are challenging to quantify. Here, I present observational results from the Hubble Space Telescope and the Keck Telescopes that determine the amount of gas and metals that massive stars remove from galaxies, how efficiently massive stars produce ionizing photons, and whether ionizing photons from the first massive stars can escape galaxies to reionize the entire Universe. While theory underscores the importance of massive stars, there are crucial empirical gaps in our understanding of them, such as the impact of binary star evolution and the astrophysics of low-metallicity stars. Upcoming programs will fill in these gaps and provide the requisite observational and theoretical basis to interpret the rich data from new observatories, like the James Webb Space Telescope, which will detail how the first massive stars shaped both galactic and cosmic evolution.

Refreshments at 3:00 pm in SC 103