Who Said Red and Dead? A Gas Menagerie in Local Early-type Galaxies

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Molecular gas in early-type galaxies (ETGs) has been shown to be far more common than previously expected. In fact, at least 22% (60/259) contain a significant reservoir of molecular gas. To gain insight into the presence and prevalence of this unexpected gas, it is important to understand its timeline, where it originated, how it is evolving, and how long it will remain. Imaging of the molecular gas is essential addressing these issues. We present the CO maps of 31 ETGs in the ATLAS3D survey, imaged with the Combined Array for Research for Millimeter Astronomy (CARMA), the largest systematic survey of the cold ISM in ETGs to date. ETGs feature a rich variety of gas configurations, including disks, extended molecular rings, spiral arms, and disrupted merger remnants. The menagerie observed by CARMA illustrates that the various paths molecular gas takes in ETGs is complex and nuanced, ranging from objects undergoing an interaction to those with purely quiescent origins. We also detail the rich molecular story of NGC1266, and how it plays host to an AGN-driven molecular outflow, quenching its star-forming material within the next 100 Myr. The ATLAS3D survey is a complete volume-limited survey of 259 massive ($M_{\rm gal} > 6 \times 10^9\ M_\odot$) ellipticals and lenticulars within 42 Mpc. It provides the best constraints on the formation and evolution of local early-type galaxies through multi-wavelength studies.

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