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**Presentation Requested: oral**
**Category: Evolution of the Interstellar Medium and Star formation over Cosmic Time**
**Question:** How well do we understand the feedback from starbursts and outflows? What role can ALMA play in better constraining feedback?

## Discovery of Large Molecular Gas Reservoirs in Post-Starburst Galaxies

Post-starburst, or "E+A" galaxies are characterized by low H$\alpha$ emission and strong Balmer absorption, their A-star dominated stellar populations suggesting a recent starburst that has now ended, leaving little or no current star formation. The mechanism for ending the starburst is not yet understood. To study the fate of molecular gas in these galaxies, we present a study of CO (1–0) and (2–1) emission in a sample of 32 nearby ($0.01 < z < 0.12$) post-starburst galaxies drawn from the Sloan Digital Sky Survey (SDSS), measured with the IRAM 30m and SMT 10m telescopes, and detect molecular gas in 14 (44%) of the galaxies. Using CO as a tracer for molecular hydrogen, we obtain molecular gas masses of $10^{8.6}$–$10^{9.8} M_\odot$, and molecular gas mass to stellar mass fractions of $\sim 10^{-2}$–$10^{-0.5}$, comparable to those found in star-forming galaxies. The upper limits on molecular gas masses in the post-starburst sample range from $10^{7.4} M_\odot$ to $10^{9.0} M_\odot$, consistent with early-type galaxies, although some are not inconsistent with the star-forming comparison samples. The SFR limits from a variety of SFR indicators show an offset of the post-starburst sample from star-forming, starbursting, and early-type galaxies, with limits on the post-starburst SFRs lower than the comparison galaxies for the same molecular gas masses. We also compare the molecular gas surface densities ($\Sigma_{H_2}$) to limits on the star-formation rate surface densities ($\Sigma_{SFR}$), and find a lower $\Sigma_{SFR}$ for a given $\Sigma_{H_2}$ than is typical of star-forming galaxies. This offset from the Kennicutt-Schmidt relation suggests that the star formation efficiency is lower in the post-starburst sample, although there are significant uncertainties in the CO-to-H$_2$ conversion factor$\alpha_{CO}$, the current SFR, and the relative spatial distributions of gas and current SF. The large amounts of molecular gas rules out complete gas consumption, expulsion, or starvation as the SF cessation mechanism for many post-starbursts.