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**Saturation in coupled oscillators** AHMED ROMAN, JAMES HANNA, Virginia Polytechnic Institute and State University — We consider a weakly nonlinear system consisting of a resonantly forced oscillator coupled to an unforced oscillator. It has long been known that, for quadratic nonlinearities and a 2:1 resonance between the oscillators, a perturbative solution of the dynamics exhibits a phenomenon known as saturation. At low forcing, the forced oscillator responds, while the unforced oscillator is quiescent. Above a critical value of the forcing, the forced oscillator's steady-state amplitude reaches a plateau, while that of the unforced oscillator increases without bound. We show that, contrary to established folklore, saturation is not unique to quadratically nonlinear systems. We present conditions on the form of the nonlinear couplings and resonance that lead to saturation. Our results elucidate a mechanism for localization or diversion of energy in systems of coupled oscillators, and suggest new approaches for the control or suppression of vibrations in engineered systems.

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