ABSTRACT. We introduce a symplectic surgery in six dimensions which collapses Lagrangian three-spheres and replaces them by symplectic two-spheres. Under mirror symmetry it corresponds to an operation on complex 3-folds studied by Clemens, Friedman and Tian. We describe several examples which show that there are either many more Calabi-Yau manifolds (e.g., rigid ones) than previously thought or there exist "symplectic Calabi-Yaus" — non-Kähler symplectic 6-folds with $c_1 = 0$. The analogous surgery in four dimensions, with a generalisation to ADE-trees of Lagrangians, implies that the canonical class of a minimal complex surface contains symplectic forms if and only if it has positive square.