Public Abstract

Planetary nebulae, the near end stage for low to intermediate mass stars (like our Sun), are the short-lived, transitional states between AGB stars and white dwarfs that are pivotal to the redistribution of material to interstellar space, where new stars are formed. Embedded within the planetary nebula exist small scale structures which play host to dust and molecular gas. The possible survival of the small scale structures into the interstellar medium would have implications in the evolution of the universe. Two planetary nebulae were studied (Dumbbell nebula and NGC 2392) in order to determine the origin and survival of these small scale structures using the excitation of molecular hydrogen as a probe. The results indicate that both nebulae challenge current paradigms of knot formation and the role of molecular hydrogen in cometary knots. At the minimum, the differences of the Dumbbell nebula and NGC 2392 from previous studies of other nebulae indicate a need to expand our rather small sample of such objects so that we may begin to understand the processes behind molecular hydrogen formation, excitation, and its role in cometary knots and the planetary nebula as a whole.