LINKING CHEMISTRY AND KINEMATICS IN THE MOLECULAR GAS OF PROTOPLANETARY NEBULA M1-92

KATHERINE R. GOLD, *Department of Chemistry and Biochemistry, The University of Arizona, Tucson, AZ, USA*; DEBORAH SCHMIDT, OMAR KHATTAB, *Department of Physics and Astronomy, Franklin and Marshall College, Lancaster, PA, USA*; LUCY M. ZIURYS, *Dept. of Astronomy, Dept. of Chemistry, Arizona Radio Observatory, The University of Arizona, Tucson, AZ, USA*.

Protoplanetary nebulae (PPNe) play a significant role in the evolution of low and intermediate mass stars, serving as the link between the asymptotic giant branch (AGB) and planetary nebulae phases. Previous observations have revealed that planetary nebulae are rich in molecular content that varies considerably from the AGB phase, suggesting that significant chemical transformations take place during the brief intermediate PPN stage. To further investigate this problem, we have conducted new molecular observations towards M1-92, an oxygen-rich, bipolar PPN. These measurements have been conducted using the using the Kitt Peak 12 m antenna and the Sub-Millimeter Telescope (SMT) of the Arizona Radio Observatory, as well as the IRAM 30 m telescope. These observations have extended the molecular identifications to include CN, HCO^+, $H^{13}CO^+$, HCN, HNC, H_2CO, H_2S, SO_2, SiO, $Si^{17}O$, and other isotopologues of these species. Further, some spectra, for example, CS, contain at least five velocity components, tracing the equatorial disk of the nebula, the bipolar lobes and the bipolar tips. The "tips" may track a high velocity wind that has punctured through the slower-moving material in the lobes, sweeping up the lobe gas. These observations will be discussed, with implications for the chemical evolution in this O-rich PPN and its relationship to the kinematic structure.