While the vast majority of stars in our galaxy will go through the Planetary Nebula (PN) stage near the end of their lives, these objects are not very well understood both physically and chemically. It has long been thought that nebular age is a major factor in determining the chemical content of PNe, but our recent studies have shown this is not likely the case. Millimeter-wave observations of planetary nebulae using the telescopes of the Arizona Radio Observatory have shown that the molecular content of these PNe appears to vary with the C to O ratio of the progenitor star. For example, SO, SO$_2$, and SiO, molecules that are typically seen in oxygen-rich AGB stars and supergiants, were all detected in the oxygen-rich M2-48. Previous studies of the young, carbon-rich object NGC 7027 show the presence of multiple carbon containing molecules like HC$_3$N, CCH, and C$_3$H$_2$. For NGC 6537, where C/O is close to 1, SO and CCH were identified, indicating an S-type progenitor star. The molecular content of PNe that are carbon-rich, oxygen-rich, and have a C/O ratio close to unity will be compared. The chemical relationship with respect to age will be discussed, as well as implications that the molecular content of the remnant circumstellar shell and its C/O ratio is the main contributing factor behind chemical variation in PNe.