Access to carbon nanotube samples enriched in single chiralities allows the observation of new photophysical behaviors obscured or difficult to demonstrate in mixed-chirality ensembles. Recent examples include the observation of strongly asymmetric G-band resonance Raman excitation profiles resulting from non-Condon effects [1] and the unambiguous demonstration of Raman interference effects [2]. A summary of our results illustrating the asymmetric profile behavior observed for a wide range of semiconducting species with excitation in E22 will be given, along with a demonstration of Raman interference between E33 and E44 for select chiralities. We also present here our most recent results demonstrating the generality of the non-Condon behavior to include metallic species (specifically armchair chiralities). Additionally, the E_{ii} dependence in non-Condon behavior with excitations from E11 thru E44 for both RBM and G modes will be discussed. Additionally, the complex response expected for the CNT 2-D mode has not yet been clearly defined. We present results on the dispersive and resonance behaviors of the 2-D mode. The response will be discussed in the context of the interplay of dispersive effects and resonance with the E_{ii} and E_{jj} transitions. The results will be compared to simulations that include all relevant electronic and phonon bands tied to the double-resonance process.