Polycyclic aromatic hydrocarbons (PAHs) are environmental contaminants that are found in most estuarine sediments including those of Narragansett Bay, RI. There are two primary sources of PAHs to estuaries: pyrogenic PAHs derived from combustion sources and petrogenic PAHs derived from petroleum inputs. PAHs are an important class of environmental contaminants to study because some of these compounds are carcinogenic and/or mutagenic to mammals; in addition, they have both acute toxicity and sub-lethal effects on some aquatic organisms. PAHs may also bioaccumulate in edible shellfish, which gives them a pathway to humans. The EPA sediment quality criteria (SQC), based on current models of the sediment bioavailability of PAHs, use a partitioning coefficient between PAHs in pore water and on the total organic carbon in the sediments. However, recent work suggests that this partitioning in marine sediments does not agree with current models and that small soot particles in the sediment may be responsible for some pyrogenically derived PAHs being less available to partition into porewater than petrogenic PAHs [1]. This is important because only the dissolved PAHs in porewater are considered bioavailable; conversely, the soot PAHs are strongly associated with solid phases and may be less susceptible to degradation in the sediments, thereby lasting for longer periods of time.

The objectives of our research project are to assess the contribution of pyrogenic and petrogenic PAHs to the sediments of Narragansett Bay and to evaluate the biogeochemical fate of these compounds with respect to soot carbon and organic carbon. We looked at 45 individual PAH compounds, including alkyl homologs, in over 40 surface sediment samples collected throughout Narragansett Bay. Previous studies at other sites have found a stronger relationship between selected PAHs and soot carbon than with organic carbon [2]. Our analysis did not find this relationship for bulk PAHs or the PAHs used in these other studies. We then turned to principal component analysis (PCA) to try and categorize sediment PAHs as pyrogenically or petrogenically dominated. Several materials were included in the analysis to help distinguish the sources of the PAHs. These included urban dust (SRM1649a), marine sediment (SRM1941a), #6 fuel oil, coal tar (SRM1597), #2 fuel oil, used crankcase oil, airplane soot and fire place soot. Pyrogenically dominated sediments as determined from PCA, showed a stronger correlation of PAHs with soot carbon than organic carbon supporting the hypothesis that many of these PAHs are associated with soot particles. Petrogenically dominated sediments had a poor correlation of PAHs with both soot and organic carbon possibly because they contain weakly associated PAHs which are strongly influenced by sediment diagenesis.