



FURMAN

**Chemistry Department
2010 Summer Research Program**

John Wheeler's Research Group

The Wheeler group is interested in developing novel strategies for separating complex chiral transition metal (TM) mixtures using capillary electrophoresis that employs enantioselective tartrate and sulfonated cyclodextrin resolving agents (Chiral Capillary Electrophoresis, CCE). Such approaches are useful, for example, for studying the products and kinetics of photolytic TM reactions, facilitating the hypothesis of potential reaction mechanisms. When used in conjunction with circular dichroism, these chiral CE separations permit the determination of an absolute value D_e for optically pure complexes using samples that are only moderately optically active (i.e., not optically pure), and chiral CE has been shown to be a novel screening procedure for TM:DNA interaction. We are also active in developing novel applications of capillary gel electrophoresis (CGE), polyacrylamide gel electrophoresis (PAGE) and electrospray (ESI) LC-MS for studying transition metal interactions with DNA, including the formation of covalent adducts which can be determined based on observed changes in electrophoretic migration time, chromatographic retention time, or mass analysis. Finally, we are applying the techniques of isothermal titration calorimetry (ITC) for assessing the thermodynamics of DNA binding for transition metal systems. While ITC is well established in the area of conventional organic drug:DNA inter-actions, relatively little prior work has utilized ITC for examining TM:DNA interaction, and data obtained to date strongly suggests that these interactions are entropically driven with negative binding enthalpies.