Polyelectrolytes are long, chainlike macromolecules that become charged when dissolved in solution. Common examples are proteins, DNA, and starch, which are basic constituents of many soft materials. Practical applications range from water filtration membranes to consumer products to drug delivery. Understanding fundamental interactions between polyelectrolytes is key to predicting and controlling their unusual thermal and mechanical properties.

Among the materials explored in this research are solutions of star polyelectrolytes, comprising chains that have one end attached to a common core. Combining computer simulation and theoretical methods, we are modeling chain conformations and electrostatic interactions between these multiarmed star-branched macromolecules.
Theoretical and Computational Studies of Macromolecular Materials

Alan R. Denton, North Dakota State University, DMR-0204020

Education and Outreach

Currently involved in the research are one Ph.D. student (Ben Lu) and one postdoctoral fellow (Hao Wang). All are receiving training in modeling of macromolecular materials, ranging from polyelectrolyte solutions to charge-stabilized colloidal suspensions and colloid-polymer mixtures. Our group has presented research results at several conferences and has led outreach activities centered on the physics of materials with first-graders and high school students.

Students at Moorhead High School in Moorhead, MN, get hands-on experience in the unusual flow properties of colloidal suspensions – here a corn-starch-water mixture.