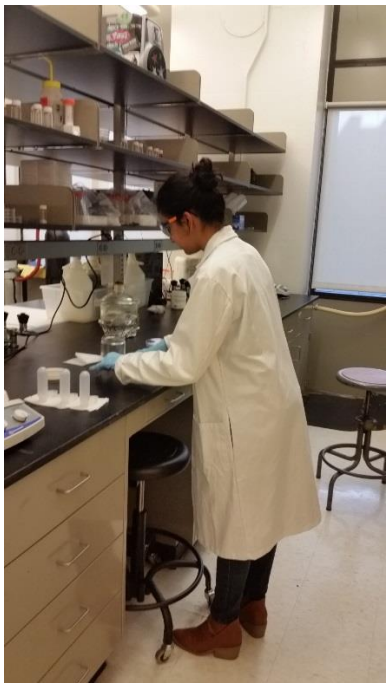

Solvent Annealing of Polymer Nanocomposites
Sona Dadhania (EAS 2019)
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My project was based on the dispersion and aggregation of nanoparticles in a film of two different molecular weights of a polymer. Nanoparticles in polymer films can either disperse evenly throughout the film or aggregate in clumps of nanoparticles throughout the film. A simulation study by Arthi Jayaraman and Tyler B. Martin found that in a polymer matrix of short and long chains, nanoparticles grafted with polymer chains chemically identical to the matrix chains will either disperse or aggregate, depending on the relative amounts of long and short chains. They suggested that nanoparticles are driven more towards aggregation as more long chains compose the polymer matrix. We decided to create a system using poly(methyl methacrylate) (PMMA) for the matrix and PMMA-grafted gold nanospheres for the nanoparticles. The goal is to determine at what fraction of long polymer chains in the polymer matrix the transition from dispersion to aggregation of the AuNS occurs. However, because the nanospheres only dispersed in the molecular weights of PMMA that were tested, we were unable to do further experiments on the subject, as further experiments require aggregation of nanoparticles at a higher molecular weight of polymer. Throughout the project, the experiments' results continued to surprise me, as things never turned out quite as expected. This taught me that one should not expect certain results from research and should always be prepared to deal with the twists and turns of research. Doing lab work and learning about different experimental methods is something that is not really encountered in the classroom, so this experience has really taught me about things that I wouldn't have been exposed to in class.