How do you describe materials that aren’t quite liquids, gases or solids? More importantly, how do you model these materials?

That’s a big question for scientists and engineers who toil in the world of complex fluids, which include surfactant solutions, polymers and colloid/polymer gels. Ronald Larson, George Granger Brown Professor and A.H. White Distinguished University Professor of chemical engineering at the University of Michigan, delivered a talk titled “Multi-scale modeling of complex fluids: Surfactants, colloids and polymers, and their applications,” to a packed room at the UH Cullen College of Engineering’s Rockwell Lecture on Nov. 17.

Larson’s talk covered surfactant solutions, polymers and latex colloidal solutions containing telechelic HEUR polymers that self-assemble in water into a variety of structures, including long, entangled micelles as well as polymer gels and colloid/polymer gels that are important for consumer products, paints and drug release formulations.

The complex structures of these solutions require complex modeling techniques, Larson explained—an area in which he happens to be an expert. His lecture showcased examples of such modeling, including the use of accelerated sampling methods, such as Umbrella Sampling, Forward Flux Sampling and Metadynamics.

Click here to view photos from Larson’s talk