Sticky gooey liquids, often called complex fluids, are an integral part of our lives from the plastics in consumer products to the surfactant solutions in pharmaceuticals. Despite their use in everyday life, the physical and flow properties of complex fluids are not yet fully understood. A common method for exploring complex fluid flow properties, or rheology, is through measurement of a fluid’s response to shearing flows. From rheological measurements, we can learn how much memory (elasticity) a fluid has and how well it can dissipate energy (viscosity). The viscoelasticity of a fluid is a result of a material’s molecular structure and its interactions with other fluid components. Flow also imparts an orientation on fluid elements (molecules, micelles, etc.), and this orientation is an integral part of molecular models used to predict fluid behavior. Light, X-ray, and neutron scattering techniques can be leveraged to observe complex fluid orientation over several length scales (mm to nm) to inform our fluid viscoelasticity modelling. Specifically, we use the capability of neutron scattering to reveal the nanostructure and nanoscale orientation of materials to characterize wormlike micelle solutions and pharmaceutically relevant surfactant formulations. By exploring surfactant solutions organize themselves under different conditions, we can deepen our fundamental understanding of these important fluids and improve pharmaceutical product performance.