The mechanisms of crystallization and melting of polymers are richly different from those of small molecular systems. As examples, the path of crystallization is different from that of melting and these two are not reversible, as reflected in different crystallization and melting temperatures for the same polymer, and polymer recrystallizes while melting. Another example is the memory of a thoroughly homogenized melt undergoing crystallization that it was a crystal before forming the melt. The primary origin of the various enigmatic behaviors of polymer crystallization/melting phenomenon lies in the conformational entropy and entanglements resulting from intertwined chain connectivity. Based on our statistical mechanics theory and Langevin dynamics simulations, we will present recent conceptual advances in the fundamental understanding of polymer crystallization, melting, and melt memory.

**Biography:**
Murugappan Muthukumar received his Ph.D. in Chemical Physics at the University of Chicago. After his postdoctoral fellowship in the Cavendish Laboratory at the Cambridge University, he joined the faculty of Illinois Institute of Technology for a couple of years, and then moved to the University of Massachusetts at Amherst, where he is currently the Wilmer D. Barrett Distinguished Professor of Polymer Science and Engineering. His current research topics of interest include polymer crystallization, polyelectrolyte physics, and polymer translocation. Muthukumar is a Fellow of the American Physical Society, and has received the Dillon Medal and the Polymer Physics Prize of the American Physical Society, ACS Polymer Chemistry Award, Chancellor’s Medal of the University of Massachusetts, and the Gutenberg Lecture Award from the University of Mainz. He is an Associate Editor of the Journal of Chemical Physics, having served as an Adjunct Editor for the Physical Review Letters for almost a decade.