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### **Chasing Extreme Polymer Morphologies with Ed**

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I was privileged to have a seventeen year friendship and scientific collaboration with Edward J. Kramer that produced 55 papers and countless student and postdoc co-advisements. This talk will discuss our last project together; an ongoing research program to achieve thermoplastic polymer materials that are uniquely hard, tough, and elastic, with moduli greater than 100 MPa and elastic recovery greater than 0.9 at strains of 1 or more. The targeted materials are based on an A(BA')<sub>n</sub> mikto-arm block copolymer architecture, and alloys of these molecules with A homopolymer. The molecular design of the miktopolymer was optimized using self-consistent field theory and the materials realized in a polystyrene (A)-polyisoprene (B) system. TEM, SAXS, and tensile mechanical tests were used to validate the designs and probe microstructure/mechanics relationships. An unexpected discovery was the emergence of a new structured disordered phase – the bricks and mortar phase –in which the A domains remain discrete at up to a volume fraction of 0.7. Field-theoretic simulations have been used to understand the origins of this new fluctuation-stabilized equilibrium phase, which has no precedent in the polymer physics literature.