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The Impact of Liquid Structure and Long Range Diffusion on Glass Formation and Nanoscale Devitrification[1] K. F. KELTON, Department of Physics, Washington University, St. Louis, MO 63130 — Recently, synchrotron X-ray diffraction measurements of electrostatically levitated samples revealed a growing icosahedral order in many undercooled metallic liquids and alloys. In a TiZrNi liquid, this icosahedral order catalyzed the nucleation of a metastable icosahedral phase, instead of the stable C14 tetrahedral Laves phase, confirming a half-century-old hypothesis made by Frank that connects the crystal nucleation barrier with the local structure of the liquid. This is one example of a growing number of cases of multiple order parameter coupling in nucleation, which are not readily described within the framework of the commonly used classical theory of nucleation. The implications for glass formation, nanoscale devitrification and the role of microalloying of such coupled nucleation processes and of a new coupled flux kinetic model for nucleation are discussed.

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K. F. Kelton
Department of Physics, Washington University, St. Louis, MO 63130

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