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Correlations between Elementary Relaxation Steps in a Model Glass Former DIETER BINGEMANN, NAI CHIEN YEAT, Williams College — Despite decades of research the dramatic slowdown of the dynamics in glasses upon cooling remains a mystery. We identify individual, sudden, local, structural relaxation events in a deeply supercooled binary Lennard-Jones system through statistical analysis of the particle trajectories. Correlations between these events in space and time show that (a) relaxation events often occur in clusters (cooperatively rearranging regions), (b) events follow each other in space and time (facilitation), (c) regions with the longest waiting times between events are encapsulated in layers with increasingly shorter waiting times (dynamic heterogeneity), (d) the length scales of these fast and slow regions show very little temperature dependence. Focusing on individual relaxation events we find that large-amplitude vibrations of atoms surrounding each event open a gateway for structural relaxation, hinting at a potential molecular mechanism for the dramatic slowdown of glass dynamics.

Dieter Bingemann
Williams College

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