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**Disorder-assisted melting and the glass transition in amorphous solids** ALESSIO ZACCONE, EUGENE TERENTJEV, Cavendish Laboratory, University of Cambridge — The mechanical response of solids depends on temperature because the way atoms and molecules respond collectively to deformation is affected at various levels by thermal motion. This is a fundamental problem of solid state science and plays a crucial role in metallurgy, aerospace engineering, energy. In disordered solids (glass, amorphous semiconductors, ceramics, metallic glass, polymers) the vanishing of rigidity as a function of temperature is not well understood because continuum elasticity is inapplicable due to the disorder leading to nontrivial (nonaffine) components in the atomic displacements. Our theory explains the basic mechanism of the melting transition of amorphous solids in terms of the lattice energy lost to nonaffine motion, compared to which thermal vibrations turn out to play a negligible role. The theory is in good agreement with data on melting of amorphous polymers (where no alternative theory can be found in the literature) and offers new opportunities in materials science.

Alessio Zaccone
Cavendish Laboratory, University of Cambridge

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