

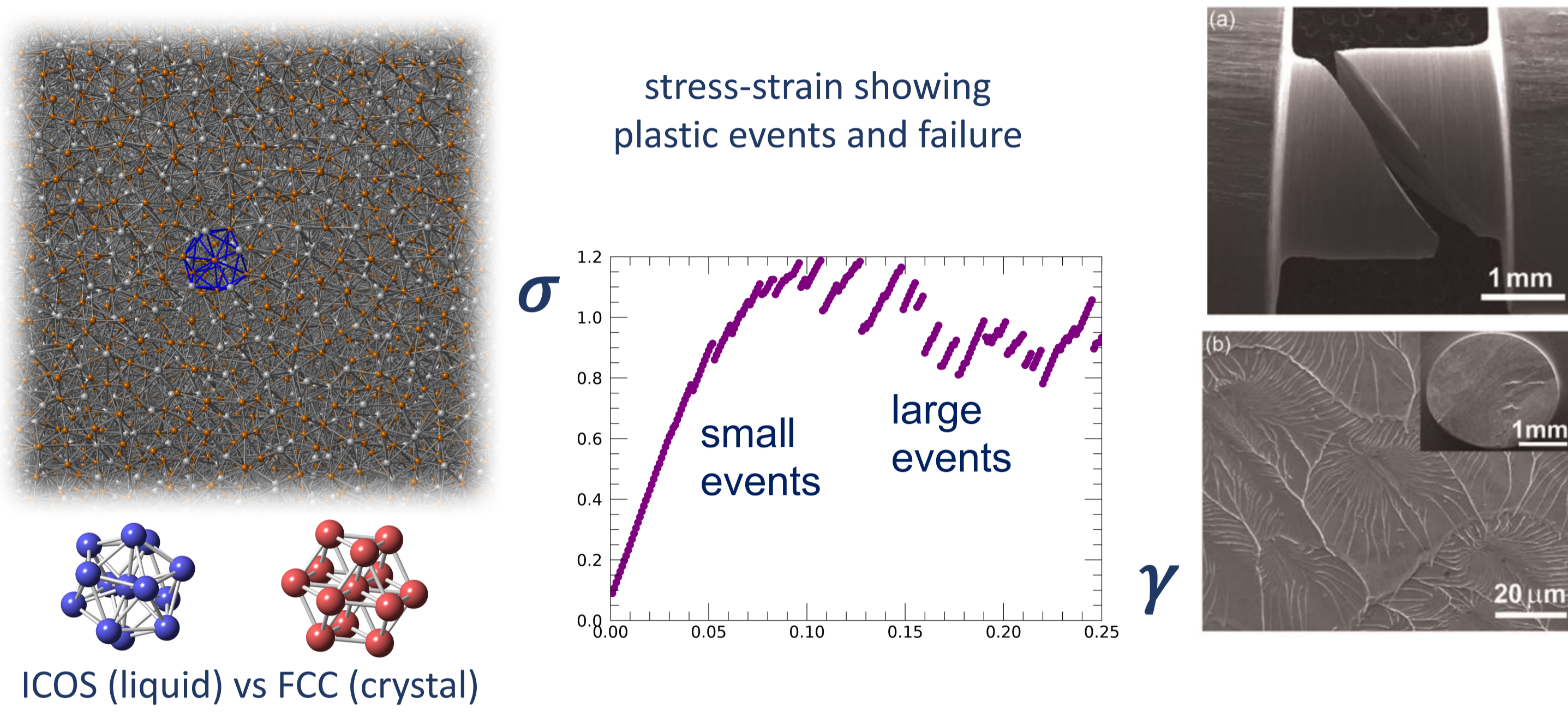
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The problem with glasses ...

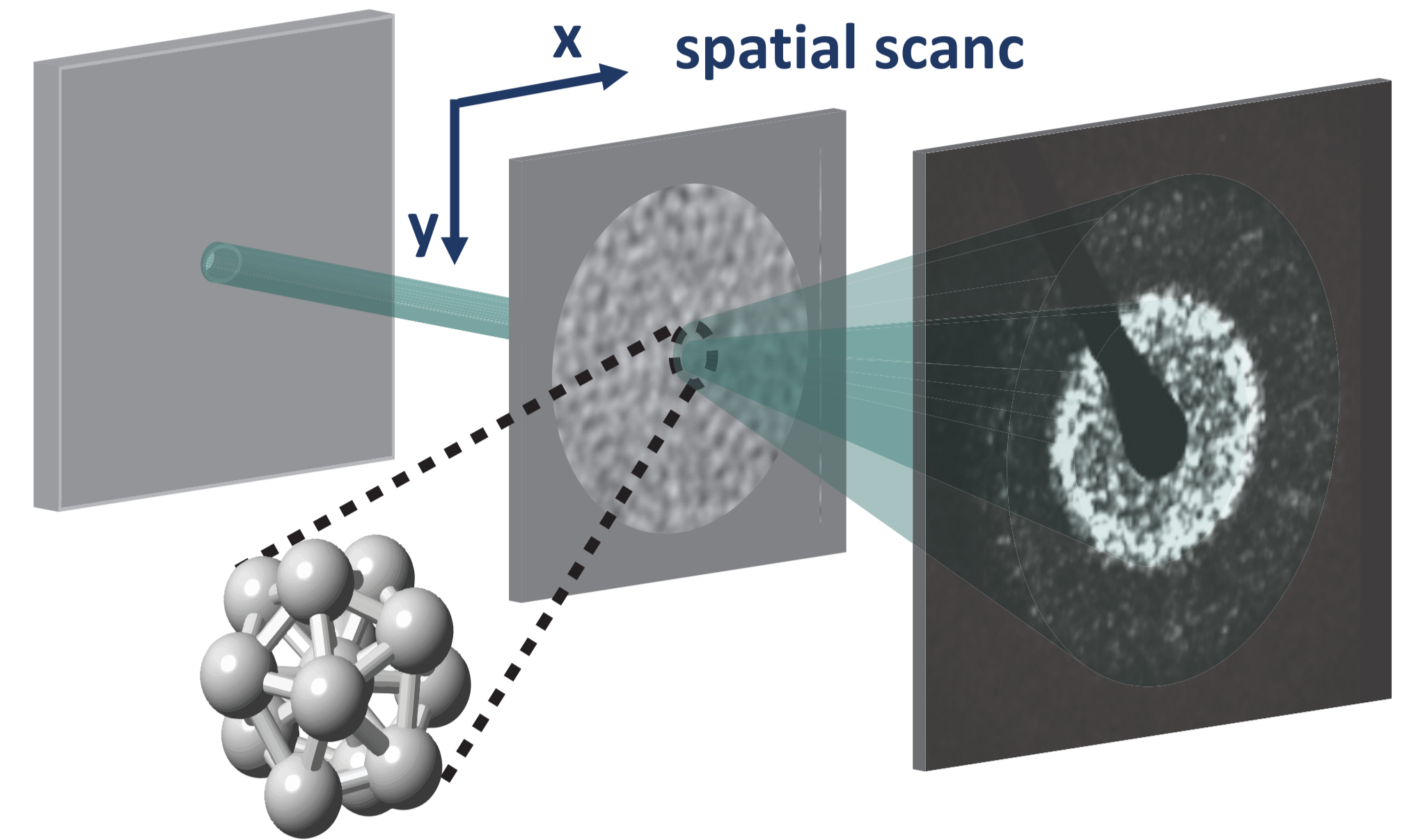
How is local structure related to stability in glasses? This question could be at the heart of why glasses solidify at the glass transition [1], and how they deform and the microscopic mechanism of shear-banding and brittle failure.

The problem of understanding the role of structure for glasses is twofold. The first is devising new methods to probe disordered structures, as structures lacking translational symmetry cannot be solved using conventional crystallographic techniques. The second, is figuring out what local structures are important for understanding glass properties and behaviours anyway.

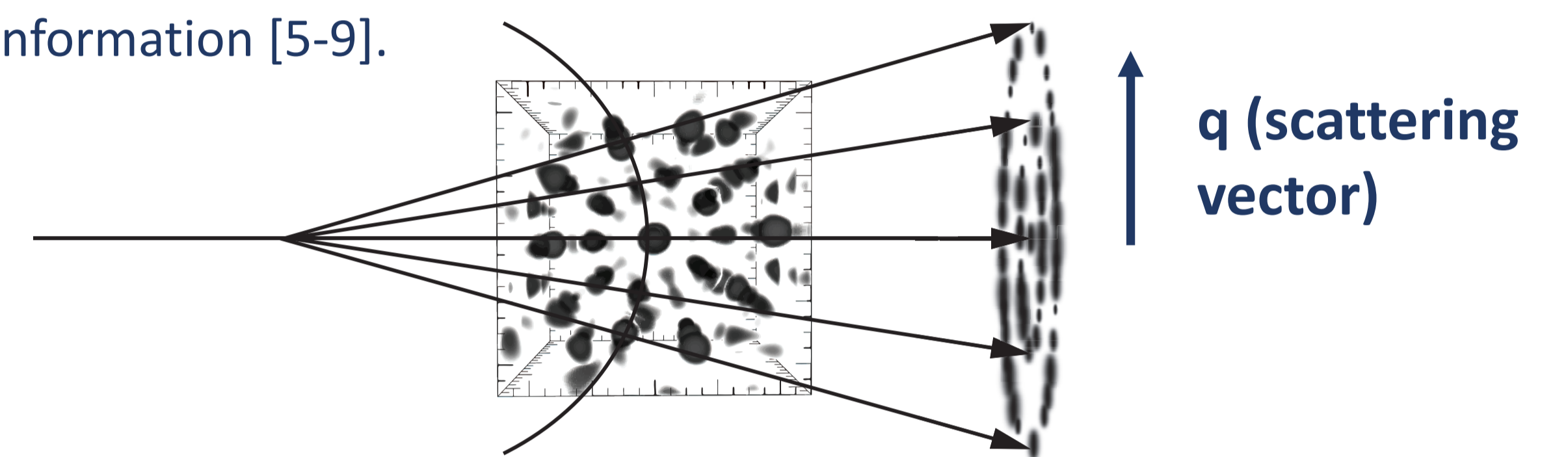


- [1] Schlegel, Brujic, Terentjev, Zaccone, *Sci. Rep.* **6**, 18724, (2016)
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Small, coherent, beam diffraction



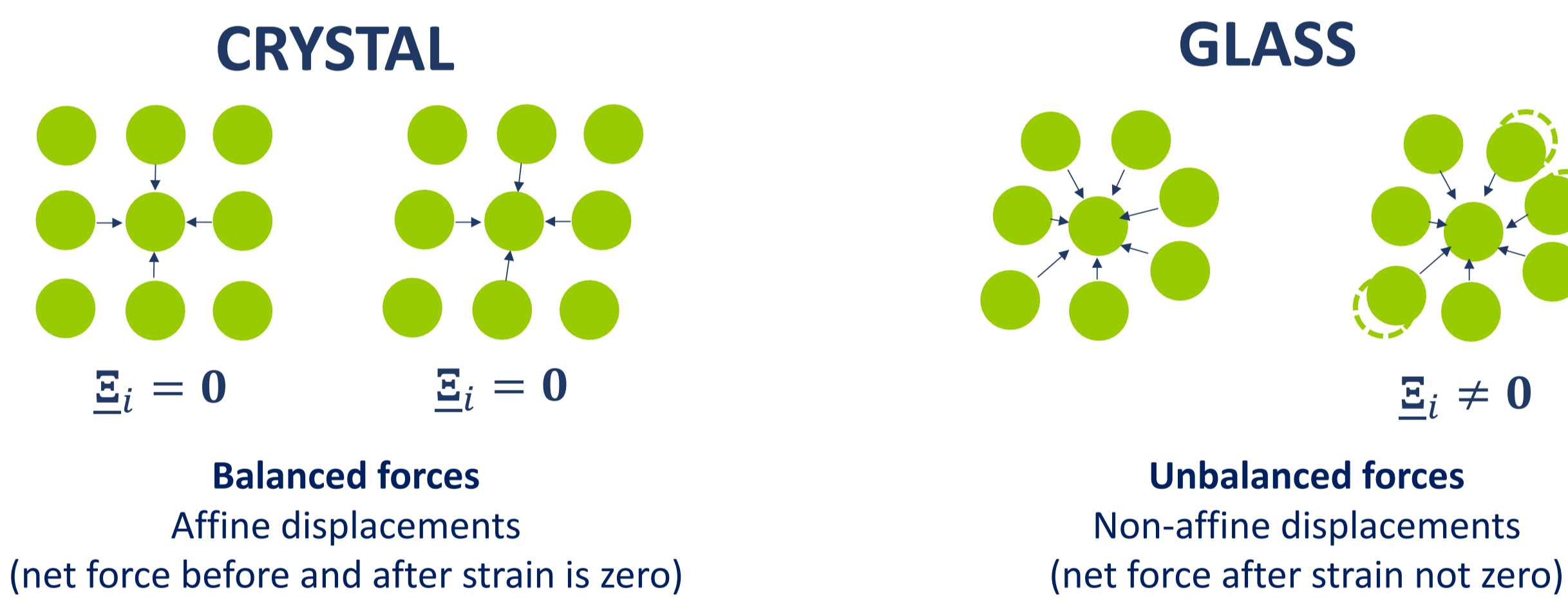
Small, coherent probe beams are uniquely promising to characterise amorphous structures, as the structure factor from a small volume breaks up into discrete intensities, giving rise to “speckle” diffraction patterns that are rich with local structural information [5-9].



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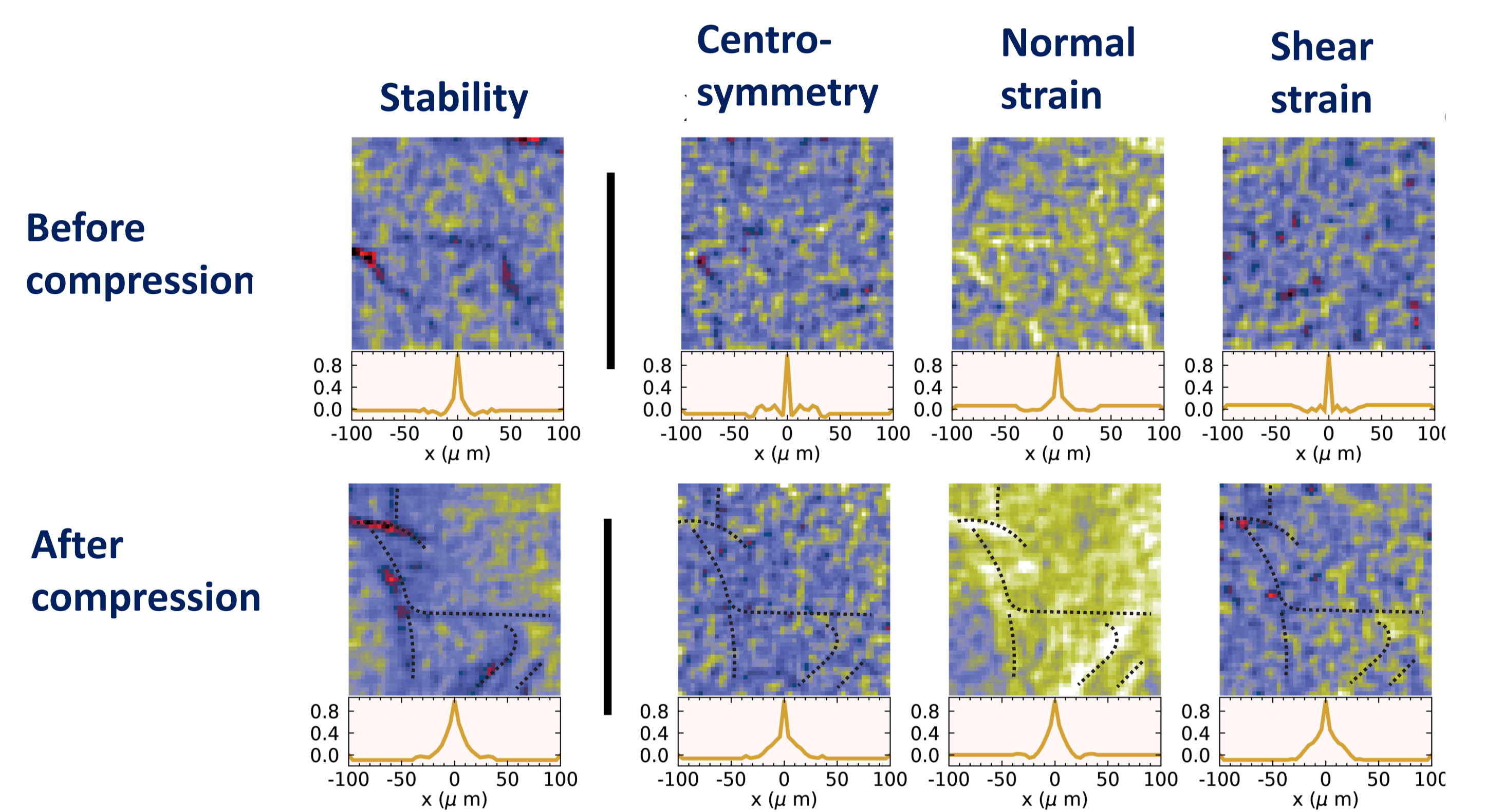
Structure and stability

Theoretical prediction: local symmetry = local stability [10,11]



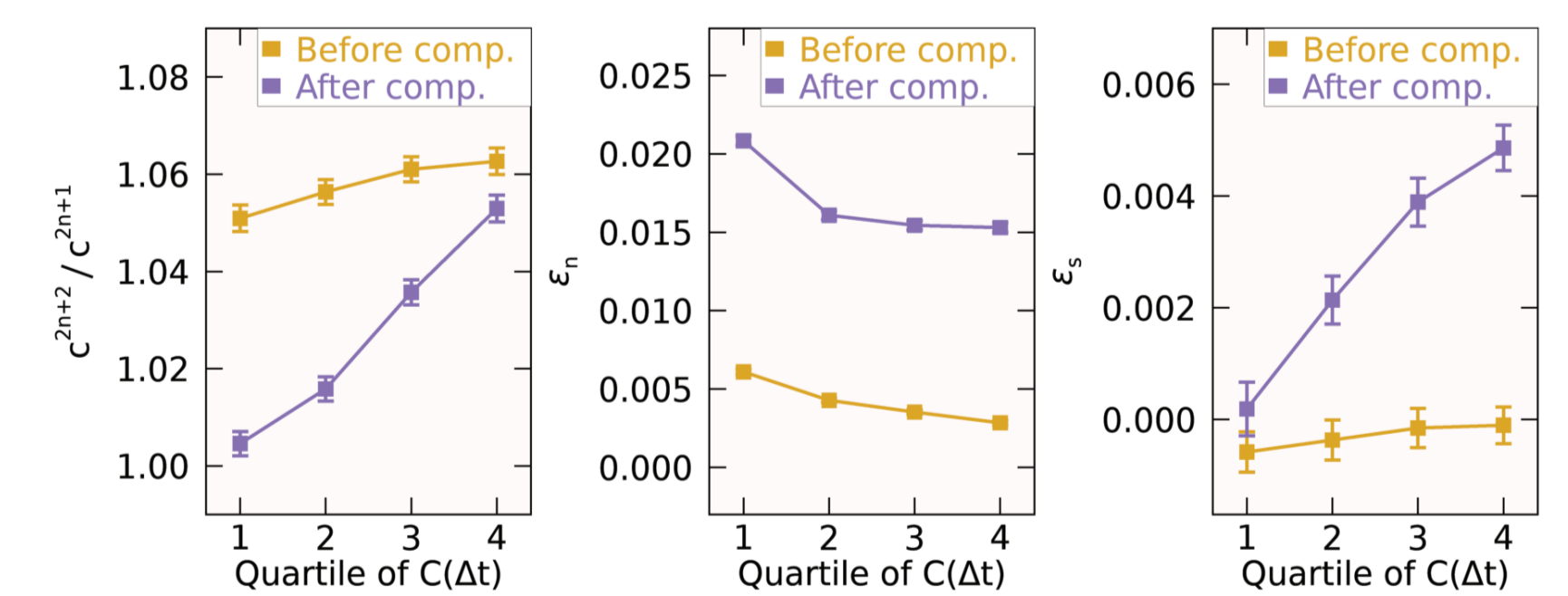
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Results and discussion



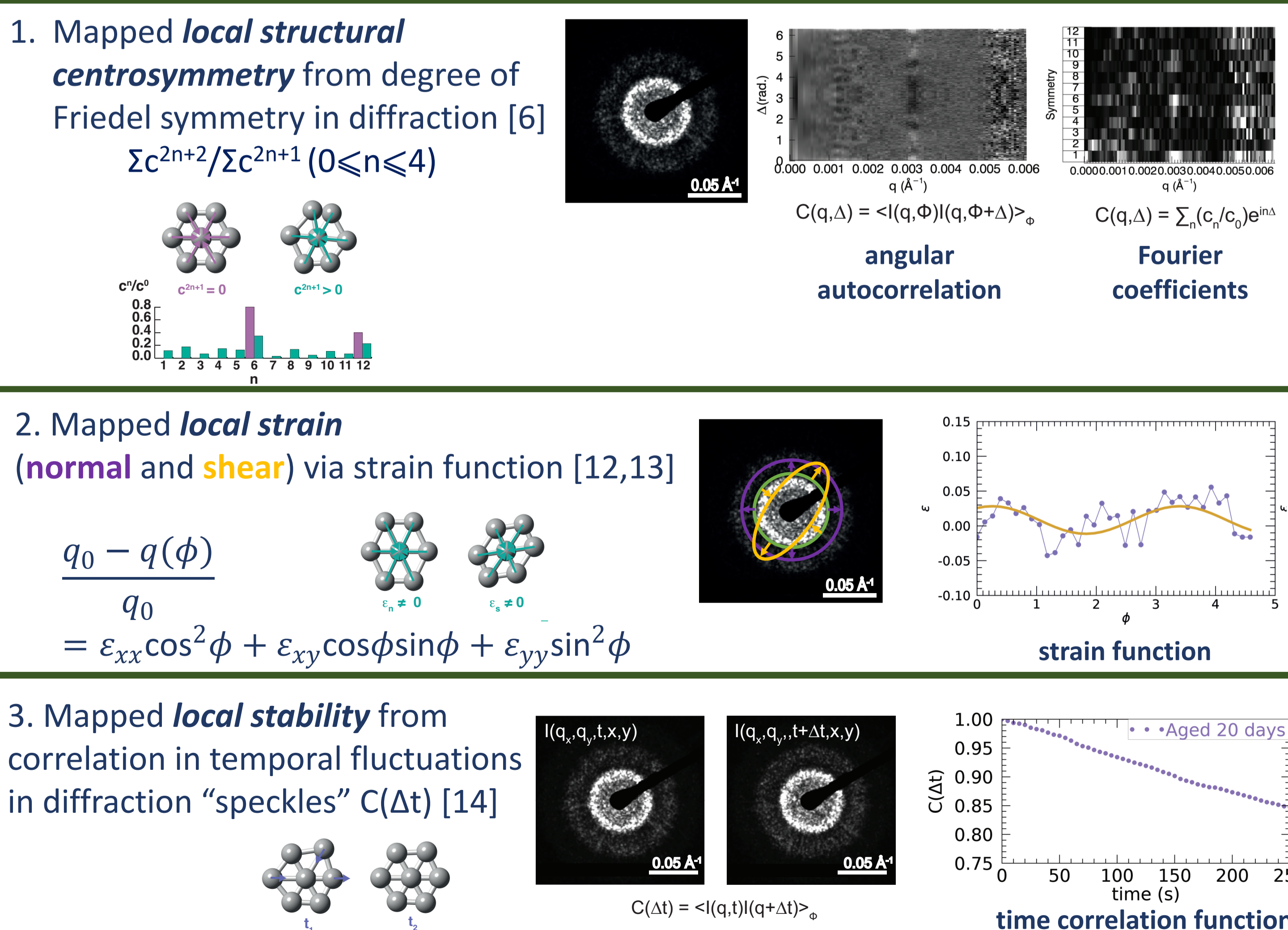
Shear bands are areas with **low stability**, **low centrosymmetry** and **localised strain**.

As predicted, **local symmetry = local stability!!!**



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Microbeam small-angle x-ray scattering of colloidal glasses



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- [13] Hufnagel, Ott, and Almer, *Phys. Rev. B* **73**, 064204, (2006)
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Conclusion and outlook

Scanning, coherent small-beam diffraction is a powerful new paradigm to study soft, disordered matter. Analogous measurements can be performed on atomic glasses with scanning electron nanodiffraction.

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