Viewed from a wider perspective, the mixture experiments[1,3,5] are complementary to the discovery of anisotropic dipolar droplets of Dy in Stuttgart[6,7] and Er in Innsbruck[8]. Those droplets are obtained from a single-component dipolar Bose gas by capitalizing on the interplay between the long-range dipolar tail and tunable contact part of the interatomic interaction potential. In spite of conspicuous differences, the mixture and dipolar droplets share the same quantum-mechanical stabilization mechanism — a weak residual mean-field attraction compensated by repulsive beyond-mean-field forces.

The general impact of these experiments is the observation of a peculiar dilute liquid state that does not fit into the canonical van der Waals finite-range description. Moreover, the underlying stabilization mechanism produces quite a paradigmatic shift in the way we understand the importance of beyond mean-field effects in the weakly interacting regime. Surely, the progress will not stop at this point. There are many open questions related to the dynamics of the droplets and their excitation spectra. A more detailed investigation is necessary into their response to external perturbations, their behaviour in different geometries, under coherent intercomponent driving and so on. The quantum stabilization mechanism may lead to the observation of predicted but so far elusive phases of matter, such as supersolid or superstripe. ❐

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References

1. Cabrera, C. R. et al. *Science* **359**, 301–304 (2018).
2. Petrov, D. S. *Phys. Rev. Lett.* **115**, 155302 (2015).
3. Semeghini, G. et al. Preprint at https://arxiv.org/abs/1710.10890 (2017).
4. Lee, T. D., Huang, K. & Yang, C. N. *Phys. Rev.* **106**, 1135–1145 (1957).
5. Cheiney, P. et al. Preprint at https://arxiv.org/abs/1710.11079 (2017).
6. Ferrier-Barbut, I., Kadau, H., Schmitt, M., Wenzel, M. & Pfau, T. *Phys. Rev. Lett.* **116**, 215301 (2016).
7. Schmitt, M., Wenzel, M., Böttcher, F., Ferrier-Barbut, I. & Pfau, T. *Nature* **539**, 259–262 (2016).
8. Chomaz, L. et al. *Phys. Rev. X* **6**, 041039 (2016).

MATERIALS PHYSICS

Looking for glass in silk

Take a trip to your local museum and you might well come across artefacts that have been subjected to silking: the process of coating paper with a translucent layer of silk. The practice has been used in China for millennia to protect precious documents (pictured) from the wiles of ageing. But silk itself can degrade, undergoing changes to its elasticity and extensibility. Now, Jianlan Wang and colleagues have brought new techniques to bear on the study of how this occurs — with the help of experts at the British Library, who supplied them with a set of silk-faced treasures (*J. R. Soc. Interface* **15**, 20170883; 2018).

Infrared spectroscopy has been used before as a non-destructive way of probing ageing in silk, but previous studies have failed to distinguish between fabrics woven at different times. Silks from the Ming (1368–1644 AD) and Qing (1644–1912 AD) dynasties of China have infrared spectra that are largely indistinguishable. Instead, Wang et al. combined spectroscopy with thermal and dynamic mechanical analysis to determine what the glass transition could reveal about the provenance and age of a number of different silks.

Credit: Science History Images/Alamy Stock Photo

Taking their library samples, estimated to be around 60–80 years old, the team compared them with modern raw silks from two different regions in China, both of which were locally grown and woven without any industrial processing. They also analysed commercially available silks that had been treated thermally and subjected to mechanical stretching.

The library silks were found to have lower glass transition temperatures than their newer counterparts. After ageing the modern silks artificially using ultraviolet radiation and thermal methods, the transition temperature was even higher. The authors surmised that simulated ageing effected this increase via molecular cross-linking — a fate avoided by the naturally aged silks due to their low-light surroundings.

The dynamic mechanical thermal analysis distinguished between silks of different provenance and identified typical relaxation events in all samples. The analysis also revealed a pronounced increase in storage modulus of the library silks near the glass transition, rendering them twice as stiff — a feature missing in the modern fabrics.

Supposing adhesive to be the cause, Wang et al. investigated candidate substances and deemed starch to be the most likely culprit. But mixing it with pearl glue had the effect of protecting the silk while avoiding the negative impact of stiffening, offering a possible new mechanism for preserving precious silks, together with robust method for probing ageing.

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