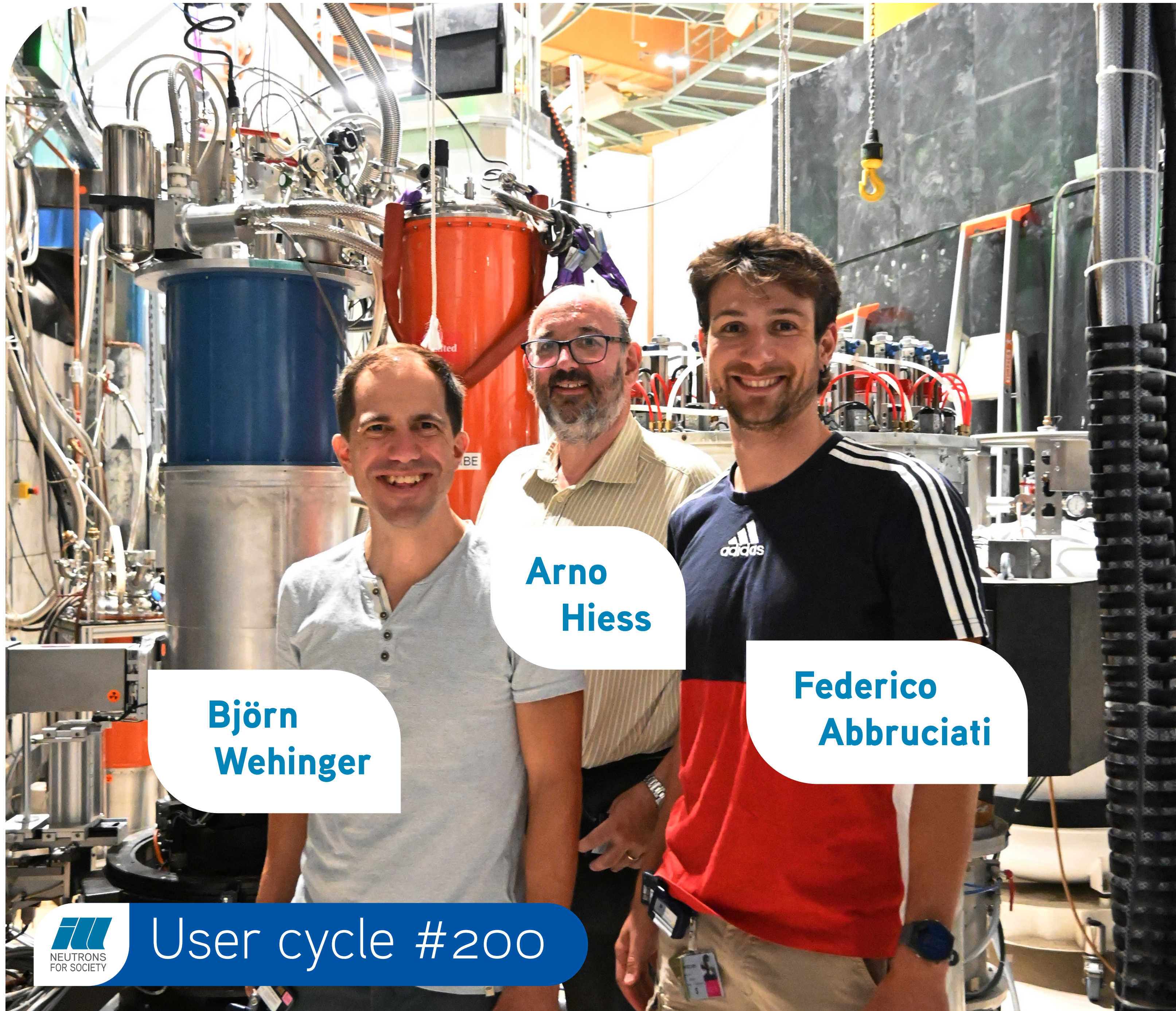




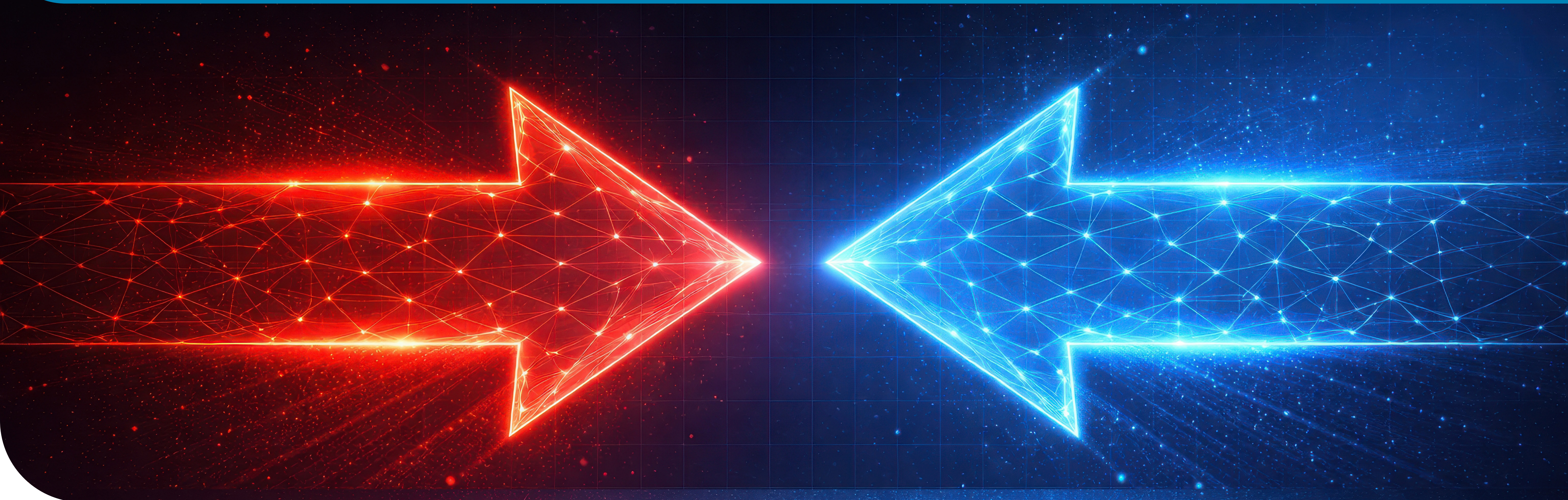
**Björn
Wehinger**

**Arno
Hiess**

**Federico
Abbruciati**

Meet the scientists
pushing a quantum
magnet into a new
state of matter

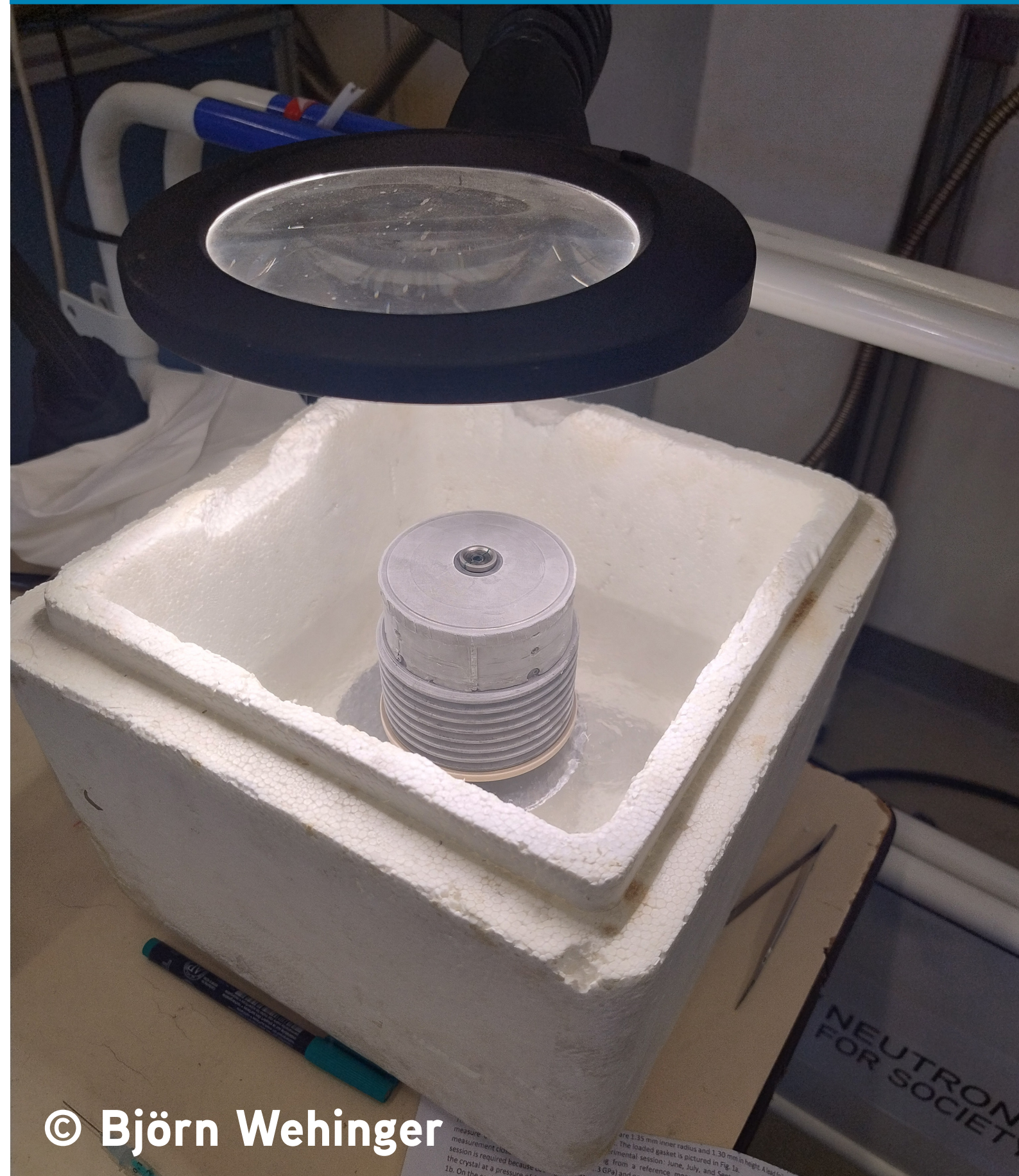
In some magnetic materials, the atoms cannot agree on how their magnetic moments should align. This creates a kind of quantum tug-of-war, where competing interactions and enhanced quantum fluctuations prevent the spins from ordering even at extremely low temperatures.

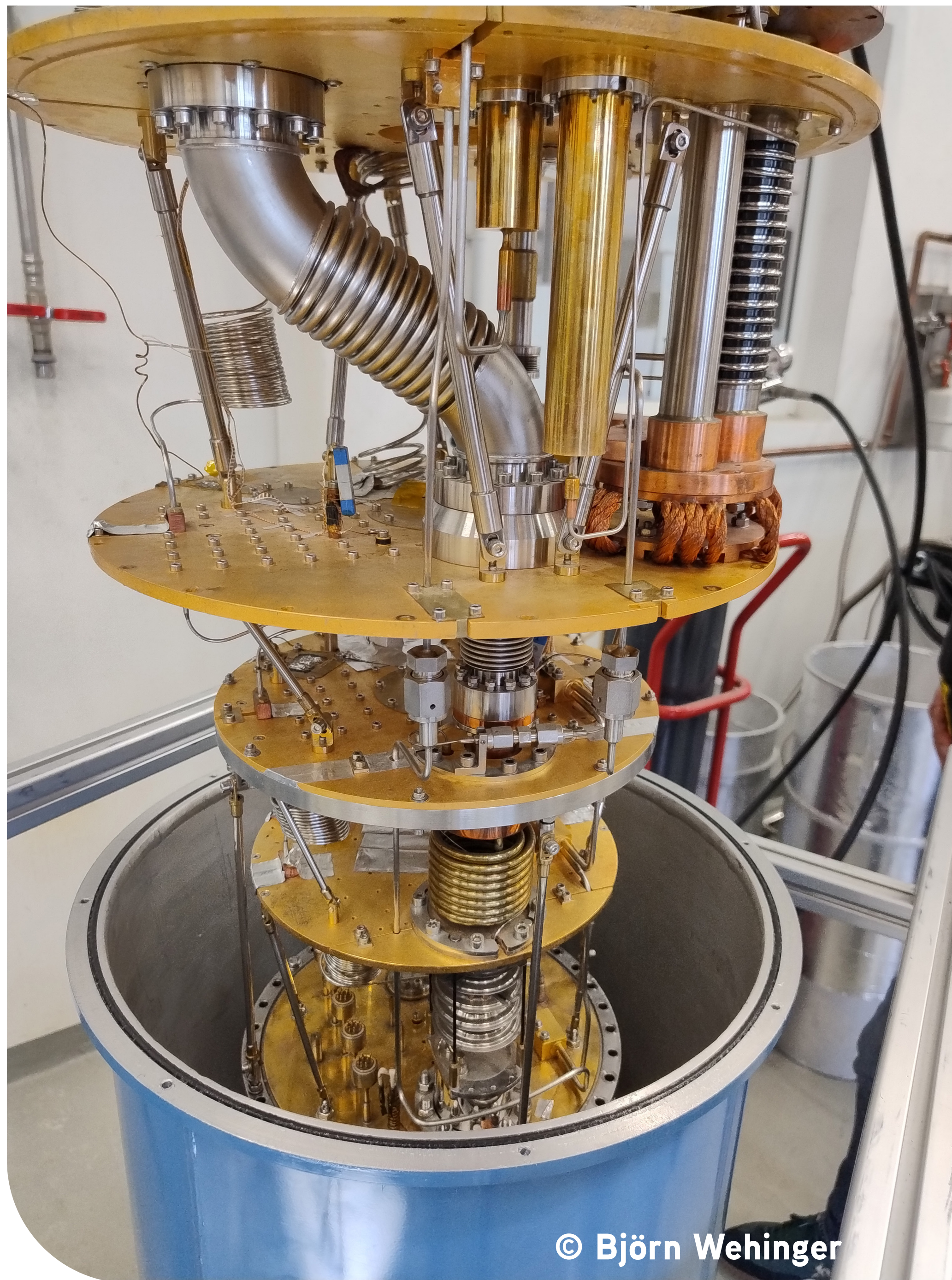


This “frustration” can prevent ordinary magnetic order and open the door to one of the most elusive states in quantum physics: a quantum spin liquid.



The material studied by the team, Y-kapellasite, is close to the boundary between magnetic order and a quantum spin liquid. This is due to the magnetic moments on the copper atoms forming a spin-1/2 kagome lattice of corner-sharing triangles.





On ThALES, the team uses **inelastic neutron scattering** to follow how the spins move as Y-kapellasite is put under very high pressures and cooled to **extremely low temperatures**.

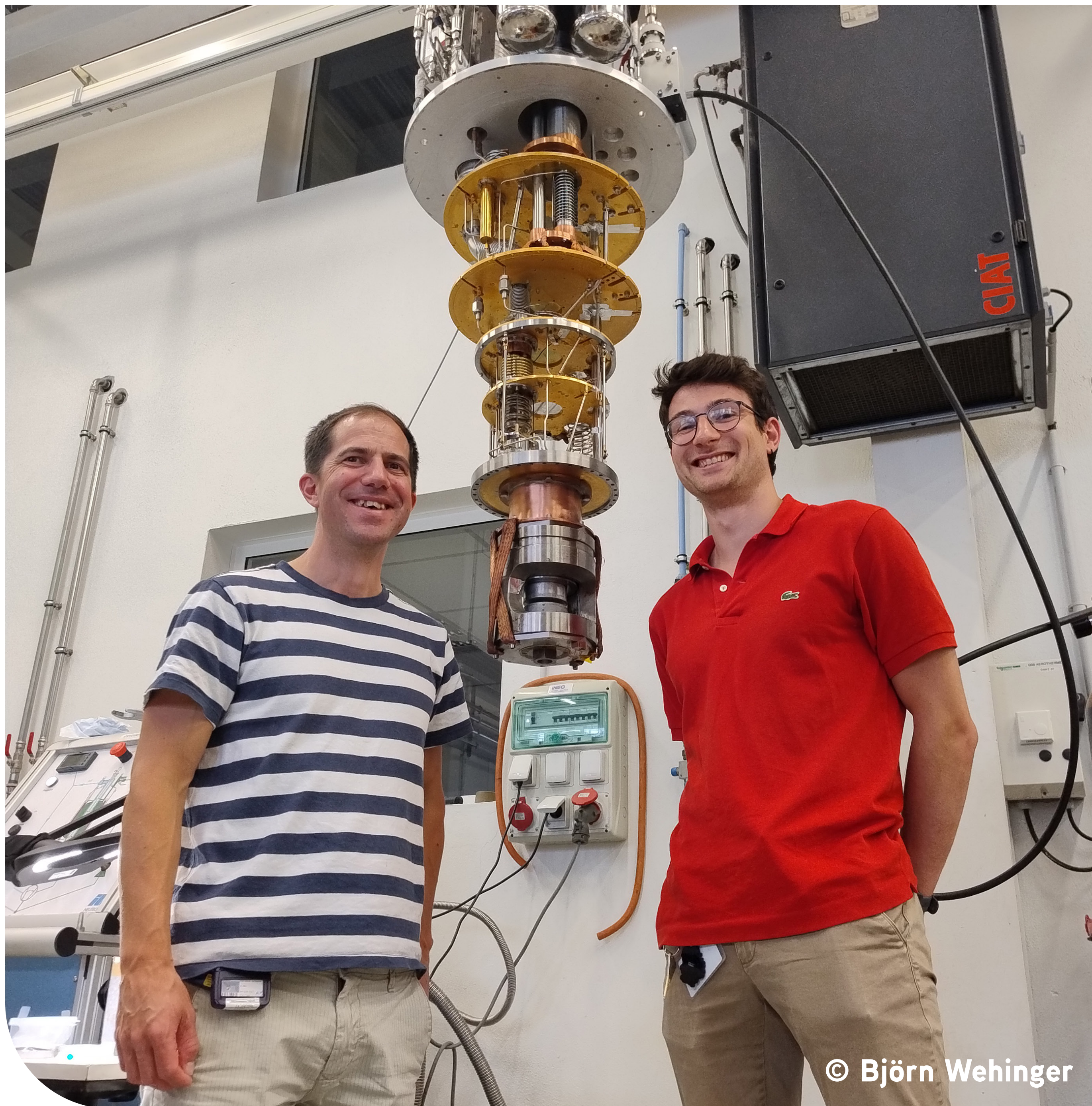
By tracking these magnetic excitations across the pressure-driven phase transition, they investigate how a quantum spin liquid emerges from an ordered state.

“To look for spin-liquid excitations, we have to combine high pressure, millikelvin temperatures and a very small crystal with an extremely weak magnetic signal. That makes the preparation as important as the measurement itself: the cell has to be loaded and tested in advance, pressure and cooling checked, and the experiment coordinated closely with the ThALES and sample-environment teams long before beamtime begins.”

Federico Abbruciati



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Quantum spin liquids are difficult to pin down. They are not captured by a single measurement, but by a set of unusual magnetic signatures.

With pressure as the control knob, this experiment explores the fragile frontier where conventional magnetism disappears and a quantum spin-liquid state may emerge.