



LUND
UNIVERSITY

Quantum materials

Future trends

User needs

Community interactions

ELIZABETH BLACKBURN, LUND UNIVERSITY, ICNS 2025, 2025-07-08



From the abstracts:



From the abstracts:



Frustrated magnetism



From the abstracts:



Frustrated magnetism



Altermagnetism

Entanglement witnesses



LUND
UNIVERSITY

Frustrated magnetism

- Samples
- Data analysis
- Instruments and Days



Frustrated magnetism

- Samples

Difficult to grow large crystals



Frustrated magnetism

- Samples

Difficult to grow large crystals

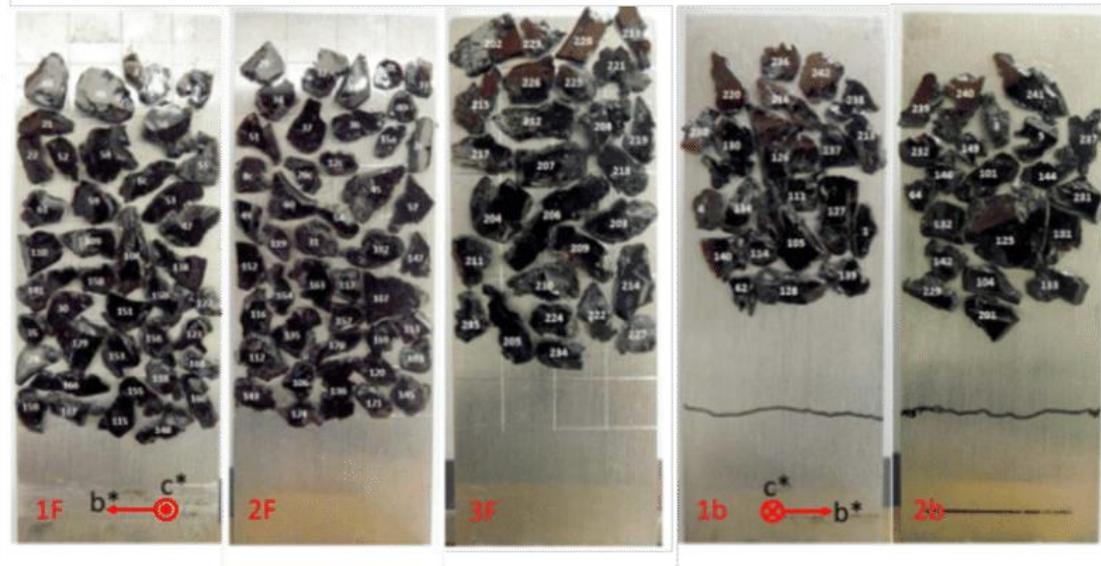
Deuteration and Macromolecular
Crystallisation (DEMAX)



Frustrated magnetism

- Samples

Difficult to grow large crystals



Majorana fermions in the Kitaev quantum spin system $\alpha\text{-RuCl}_3$

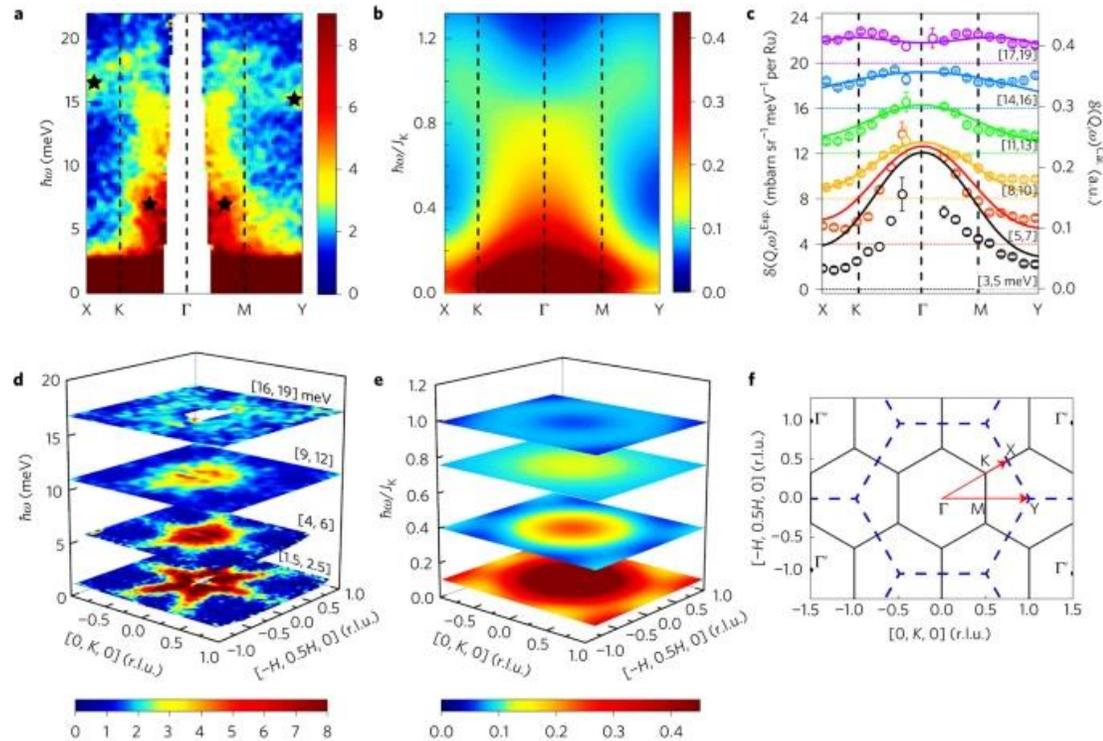
[Seung-Hwan Do](#), [Sang-Youn Park](#), [Junki Yoshitake](#), [Joji Nasu](#), [Yukitoshi Motome](#), [Yong Seung Kwon](#), [D. T. Adroja](#), [D. J. Voneshen](#), [Kyoo Kim](#), [T.-H. Jang](#), [J.-H. Park](#) & [Kwang-Yong Choi](#) & [Sungdae Ji](#)

[Nature Physics](#) **13**, 1079–1084 (2017) | [Cite this article](#)



Frustrated magnetism

- Data analysis



Majorana fermions in the Kitaev quantum spin system $\alpha\text{-RuCl}_3$

Seung-Hwan Do, Sang-Youn Park, Junki Yoshitake, Joji Nasu, Yukitoshi Motome, Yong Seung Kwon, D. T. Adroja, D. J. Voneshen, Kyoo Kim, T.-H. Jang, J.-H. Park & Kwang-Yong Choi & Sungdae Ji

Nature Physics **13**, 1079–1084 (2017) | [Cite this article](#)



Frustrated magnetism

- Instruments and Days

Region	No. Instruments
Europe	135
Asia/Oceania	125
United States	48

Source: NSSA Neutron Community Letter



Take advantage of existing schemes!



nepheWS

NEPHEWS in Detail

The project will deliver access to the world-class collective of Europe's premiere open advanced neutron (N), synchrotron (SR) and free-electron laser (FEL) complementary research infrastructures (RI), to promote curiosity driven excellence in research.

In NEPHEWS the RI institute in a novel approach jointly with their 40k+ user base of scientists through Users Organisations to provide a user-driven access program targeting new and non-expert communities, with a focus on Widening countries, Ukraine and Africa, a priority. The bottom-up User-to-User-oriented approach aims to build an integrated European RI landscape involving LEAPS and LENS consortia and their European scientific user communities.



Corner notes – quantum materials

- **Sample alignment** – Petr Cermak is proposing a robotic co-alignment service
- **Small samples** – for diffraction, learn from x-ray case where particular grains are selected out, and then information about individual small crystals can be extracted – can this be done with neutrons? For diffraction, probably yes, for inelastic scattering, probably harder.
- **Workflow** – try to improve workflow processes, establish a “quality label” with a focus on being confident about absolute intensities. Learn from engineering paradigms. For example, facilities should use common absorber types/sizes. Spurions for different instruments – better record-keeping and incorporation of machine learning to screen them out of the data.
- **Experiment length** – the limited number of days impacts: student experimental expertise, possibility of reproducing results, etc.
- **Powder neutron diffraction** access is really important!
- **Digital twin** use to prepare requires very good sample models – perhaps not so realistic at the moment.

