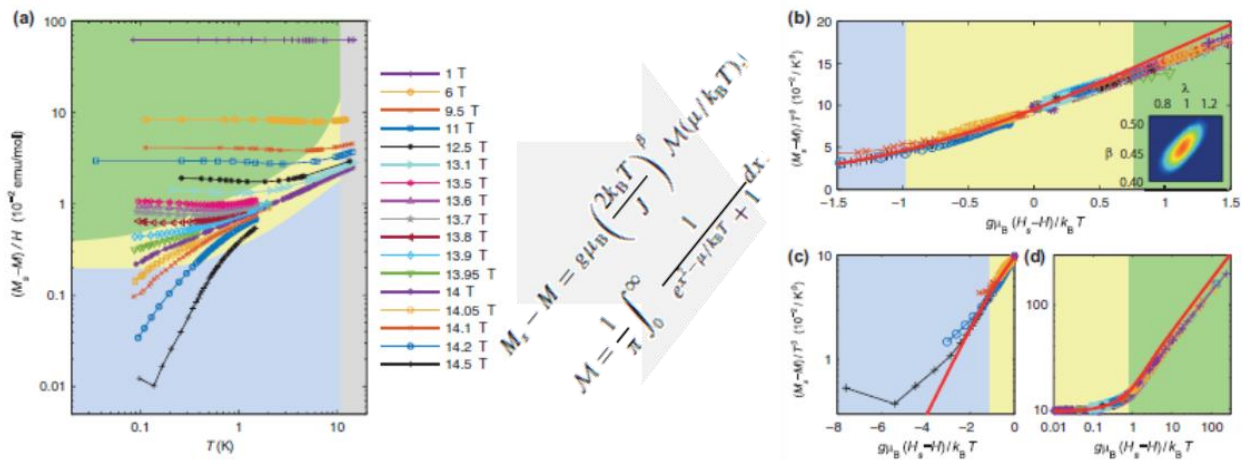


## Quantum Critical Scaling Analysis of Model Magnets

Quantum criticality refers to a set of universal behaviour observed in quantum materials at finite temperatures which originates from the intriguing interplay between quantum and thermal fluctuations. This is widely believed to underlie the emergence of many exotic phases such as an unconventional superconductivity, but our understanding is still quite limited. One dramatic manifestation is the so-called quantum critical scaling: the scattered physical quantities that have been observed over widely varying conditions (see the left figure below) fall onto a single curve (right figure) after a ‘very’ simple sequence of algebra. The parameters used in the algebra, and the resulting curve, depend only on the symmetry and dimension of the system, but nothing else of their other details: from diversity to universality.



The aim of this project is develop a software tool (using Matlab or others) for quantum critical scaling analysis, and perform actual analysis for the available dataset for a model dipolar magnet  $\text{LiErF}_4$  and others. Some basic knowledge on Matlab (or equivalent, e.g., Python) will be sufficient to finalise the tool development under the guidance. This is an opportunity to learn a cutting-edge theme in current condensed matter research as well as data analysis and visualisation.

Depending on the student’s interest, the contents and approach of the project is adjustable. This project is a part of our group’s research activities, and may grow into a Master project when combined with experimental work.

For those interested, feel free to contact Prof. Henrik M. Ronnow ([henrik.ronnow@epfl.ch](mailto:henrik.ronnow@epfl.ch)) for further information and discussion.

Reference: [P. Coleman and A. Schofield, Nature, 433, 226 \(2005\)](#) (access allowed at EPFL)