Quantum magnets in high magnetic field

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The investigation of quantum magnets in high magnetic field is undergoing steady progress, with the recent measurement of the magnetization curve of $SrCu_2(BO_3)_2$ up to the record field value of 118 Tesla [1]. Beyond the experimental *tour de force*, the magnetic field turns out to be a very versatile parameter to induce quantum phase transitions, especially in the presence of geometrical frustration [2]. In this talk, after a brief experimental review, I will concentrate on the physics behind the formation of *magnetization plateaus* at rational values of the magnetization, which, depending on the system, are best seen as a consequence of *order by disorder* or as a *Wigner crystal* of triplets in a see of singlets. Other predictions such as the stabilization of *spin-supersolid* phases will be also briefly discussed.

[1] Y. H. Matsuda, N. Abe, S. Takeyama, H. Kageyama, P. Corboz, A. Honecker, S. R. Manmana, G. R. Foltin, K. P. Schmidt, and F. Mila, PRL **111**, 137204 (2013).

[2] For a review, see *Introduction to Frustrated Magnetism,* Eds. C. Lacroix, P. Mendels, and F. Mila (Springer, 2011).