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Magnetization plateaus in the triangular-lattice antiferromagnet Cs_2CuBr_4

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Studies of antiferromagnets on a triangular lattice date back to the pioneering work of Wannier, Houtappel, and Husimi and Syoji from 1950. Despite the long history, this prototypical frustrated geometry harbors many unsolved problems. In small-spin Heisenberg antiferromagnets on a triangular lattice, the interplay between the geometric frustration and quantum fluctuations leads to non-trivial low-energy excitations and exotic high-field ground states, which are not yet fully understood. We have mapped out the phase diagram of Cs_2CuBr_4, one of the best laboratory models for the S=1/2 Heisenberg antiferromagnet on a triangular lattice, in high magnetic fields and have found a cascade of new ordered phases, three of which manifest themselves as magnetization plateaus. Possible spin structures of these phases are strongly limited by the requirement of commensurateness and the absence of Nambu-Goldstone modes for any ordered state that forms a magnetization plateau. This work was in collaboration with N.A. Fortune, S.T. Hannahs, Y. Yoshida, A.A. Wilson-Muenchow, O. Starykh, T. Ono, and H. Tanaka.