Higher structures in mathematics: buildings, C*-algebras and Drinfeld-Manin solutions of Yang-Baxter equations.

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The most interesting mathematical structures are usually sufficiently rich and appear in several fields of mathematics, physics and computer science. We give a brief introduction to one such topic, namely buildings. We will present geometric, algebraic and arithmetic aspects of buildings. In particular, we present explicit constructions of infinite families of quaternionic cube complexes, covered by buildings.

We will use these cube complexes to describe new infinite families of Drinfeld-Manin solutions of Yang-Baxter equations. Another application of our constructions are new infinite families of higher-rank graph C*-algebras and von Neumann algebras.