Seminarium geometrów

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Crystallographic representations of finite Coxeter groups and applications to virology

Abstract: A (finite) *Coxeter group* can be viewed as a group of isometries of a Euclidean space generated by reflections and fixing the origin. Such a group is said to be *crystallographic* (also known as a *Weyl group*) if it fixes some lattice. Crystallographic and non-crystallographic Coxeter groups, while often studied together, each have their own merits – Weyl groups are related to Lie algebras, whereas non-crystallographic groups, such as the icosahedral group, are important in some applications. A particular instance of the latter is modelling the structure of viral capsids, which often admit icosahedral symmetry.

In this talk, I will outline how crystallographic higher-dimensional representations of non-crystallographic Coxeter groups can be used to produce nested structures with a particular symmetry. I will also mention some of the applications of this construction to virology and to arts. The talk is based on an interdisciplinary project joint with Briony Thomas (arts), Reidun Twarock (biology) and Emilio Zappa (mathematics).