BERND SCHULZE, Fields Institute

Predicting flexibility in periodic frameworks with added symmetry

Recent work from authors across disciplines has made substantial contributions to counting rules (Maxwell type theorems) which predict when an infinite periodic framework would be rigid or flexible while preserving the periodic pattern. Other work has shown that for finite frameworks, introducing symmetry modifies the previous general counts, and under some circumstances this symmetrized Maxwell type count can predict added finite flexibility in the structure. In this talk we combine these approaches to present new Maxwell type counts for the columns and rows of a modified orbit rigidity matrix for frameworks that have both a periodic structure and additional symmetry within the periodic cells. In a number of cases, this count for the combined group of symmetry operations demonstrates that there is added finite flexibility in what would have been rigid when realized without the symmetry. Given that many crystal structures have these added symmetries, and that their flexibility may be key to their physical and chemical properties, these results are of both practical and theoretic interest. This talk is based on joint work with Elissa Ross and Walter Whiteley.