

Departmental Colloquium

Symmetry, invariance and the structure of matter

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Abstract: We begin with a general introduction to our work on “objective structures” with a focus on the relation between symmetry, invariance and structure, and applications to the periodic table, origami design and nanostructures. We then concentrate on Maxwell’s equations. We find solutions of Maxwell’s equations that are the precise analog of plane waves, but in the case that the translation group is replaced by the (largest) Abelian helical group. These waves display constructive/destructive interference with helical atomic structures, in the same way that plane waves interact with crystals. We show how the resulting far-field pattern can be used for structure determination, and we test the idea theoretically on the Pf1 virus from the Protein Data Bank. The underlying mathematical idea of this and our related work is: the structure of interest is the orbit of a group, and this group is an invariance group of the differential equations.

Friday, November 12 at 3:00 PM in 636 SEO