

**2pm, May 8<sup>th</sup>, Room 1201**

**Generalized Symmetries and Topological Orders**

**Professor Zohar Nussinov**

**Washington University in St. Louis**

In recent years, a new paradigm of "topological quantum order" (TQO) has emerged. These orders cannot be characterized by local quantities and have led to a wealth of ideas and results motivated, in part, by the prospect of fault tolerant quantum computing.

We will show that known examples of topological quantum order harbor a symmetry which generally lies midway between local symmetries (that of gauge theories) and global symmetries (as in most condensed matter systems). Apart from the prominent examples of TQO, these symmetries also appear in orbital models, some frustrated magnets, cold atoms systems and Josephson junction systems. We will show how these symmetries can mandate TQO. These symmetries mandate, via a generalized version of Elitzur's theorem, an effective dimensional reduction which accounts for some of the peculiar properties of these systems. We will further show that by duality transformations, many of these systems can be mapped onto systems with global symmetries (and orders). These mappings allow us to assess the effect of finite temperatures.

Time permitting, we will present exact solutions to a nearest neighbor pyrochlore antiferromagnet and to a doped system with a new "orbital order driven quantum critical point" in which some of these notions are fleshed out.

**Host: Sankar Das Sarma**