1106-18-2364 **Maissam Barkeshli*** (mbarkeshli@gmail.com), Microsoft Station Q, Santa Barbara, CA, **Parsa Bonderson**, Microsoft Station Q, Santa Barbara, CA, **Meng Cheng**, Microsoft Station Q, Santa Barbara, CA , and **Zhenghan Wang**, Microsoft Station Q, Santa Barbara, CA. *Symmetry, Defects, and Gauging of Topological Phases.*

The mathematical description of topological states of matter in two spatial dimensions is the theory of unitary braided tensor categories (UBTC). Here we examine the interplay of symmetry and topological order, developing a classification of symmetry-enriched topological phases with unitary symmetry $G$, for a topological phase described by a UBTC $\mathcal{C}$. Extrinsic defects associated with $g \in G$ exhibit a rich set of properties. We develop a general formalism, based on module categories, known as a $G$-crossed braided tensor category, to characterize the properties of such defects. We derive a set of data and consistency conditions, solutions of which define the defect theory $\mathcal{C}_G^\times$, which is referred to as a $G$-crossed extension of $\mathcal{C}$. This allows us to systematically compute many properties of the defects. We introduce the notion of $G$-crossed modular transformations for $\mathcal{C}_G^\times$, and derive a generalized Verlinde formula. We conjecture that distinct $\mathcal{C}_G^\times$ fully characterize all possible $G$-symmetric topological phases. Promoting $G$ to a gauge symmetry deconfines the extrinsic $G$-defects and results in a different topological order $\mathcal{C}/G$. (Received September 16, 2014)