1135-68-2608 **Daniel Copeland*** (drcopela@ucsd.edu) and **Jamie Pommersheim**. *Quantum query complexity of symmetric problems.* Preliminary report.

Using state preparation and measurement to identify an unknown unitary operation is a crucial step in many quantum algorithms. We measure the difficulty of identifying this operation by the number of queries used by an optimal algorithm. When the unknown unitary is sampled from a finite group of unitaries, one can give a character-theoretic description of the query complexity. We apply this to explain several well-known quantum algorithms (notably the van Dam algorithm, PARITY, and the Bernstein-Vazirani problem) and introduce a new family of tasks which involve identifying an unknown permutation. This provides a large class of nonabelian problems, which may or may not allow quantum advantages. For instance, we provide an example of a $\Theta(1)$ vs $\Theta(n)$ speedup in query complexity coming from a finite Heisenberg group, but we also show a quantum computer requires $\Omega(n)$ queries to identify a random permutation given access to the defining representation of S_n. (Received September 26, 2017)