1121-57-20 **Eric G. Samperton*** (egsamp@math.ucdavis.edu) and **Greg Kuperberg** (greg@math.ucdavis.edu). *A TQC-inspired proof of a classical complexity result for 3-manifolds.*

I will discuss the computational complexity of classical enumerative invariants of 3-manifolds. If G is a fixed, finite non-abelian simple group, then counting homomorphisms from the fundamental group of a triangulated 3-manifold M to G is #P-complete. As a corollary of the proof, determining whether $pi_1(M)$ admits a nontrivial homomorphism to G is NP-complete. Another corollary is that deciding when a 3-manifold admits an m-sheeted connected covering space is NP-complete, for fixed $mgeq5$. Our method is similar to certain constructions in topological quantum computing. We encode reversible classical logic gates by analyzing the action of the mapping class group of a surface S on the homomorphisms from $pi_1(S)$ to G. The hardness result follows by encoding reversible circuits into 3-manifolds using these gadgets. (Received July 16, 2016)