Erica Flapan* (ericaflapan@gmail.com) and Song Yu (syu@math.columbia.edu).  
Symmetries of Spatial Graphs in 3-manifolds. Preliminary report.

We consider when automorphisms of a graph can be induced by homeomorphisms of embeddings of the graph in a 3-manifold. In particular, we prove that every automorphism of a graph is induced by a homeomorphism of some embedding of the graph in a connected sum of one or more copies of $S^2 \times S^1$, yet there exist automorphisms which are not induced by a homeomorphism of any embedding of the graph in any orientable, closed, connected, irreducible 3-manifold. We also prove that for any 3-connected graph $G$, if an automorphism $\sigma$ is induced by a homeomorphism of an embedding of $G$ in an irreducible 3-manifold $M$, then $G$ can be embedded in an orientable, closed, connected 3-manifold $M'$ such that $\sigma$ is induced by a finite order homeomorphism of $M'$, though this is not true for graphs which are not 3-connected. Finally, we show that many symmetry properties of graphs in $S^3$ hold for graphs in homology spheres, yet we give an example of an automorphism of a graph $G$ that is induced by a homeomorphism of some embedding of $G$ in the Poincaré homology sphere, but is not induced by a homeomorphism of any embedding of $G$ in $S^3$. (Received August 19, 2020)