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*Generating Graph Dualities from Chord Diagrams*

In joint work with Lowell Abrams (George Washington University) on twisted duality, we develop tools to identify and generate new surface embeddings of graphs with various forms of self-duality including geometric duality, Petrie duality, Wilson duality, and both forms of triality (which is like duality, but of order three instead of two). Previous work typically focused on regular maps (special, highly symmetric, embedded graphs), but the methods presented here apply to general embedded graphs. In contrast to Wilson's very large self-trial map of type  $\{9, 9\}_9$  we show that there are self-trial graphs on as few as three edges. We reduce the search for graphs with some form of self-duality or self-triality to the study of orientable one-vertex ribbon graphs, i.e. chord diagrams. We use the chord diagrams as the basis a fast algorithm that will find all graphs with any of the various forms of self-duality or self-triality in the orbit of a graph that is isomorphic to any twisted dual of itself.