Graphs are valuable because, being fundamentally simple, they have many developable properties. For instance, deletion-contraction invariants of graphs are classified by Tutte’s universal polynomial with one countable set of variables. Those with slight restrictions are classified by the well-known two-variable Tutte polynomial, which depends only on the graphic matroid.

One wants a generalization that shares much of the essential simplicity of graphs. Gain graphs, where each edge has an invertible labelling from a group $G$, are such a generalization. We have looked into describing a universal deletion-contraction invariant of gain graphs over $G$, not the 2-variable one that depends on the matroid, which is known, but a graphic one similar to Tutte’s countable-variables polynomial for ordinary graphs. Such a universal for gain graphs has relations among its variables that we have only slightly deciphered. I will explain the objective and the difficulties of this project. (Received June 27, 2017)