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Arrow Diagrams Arising from a Synthetic Biology Investigation

We are working with biology students on our campus and collaborating with mathematicians and biologists at Davidson College as part of an NSF-funded synthetic biology research team. One project undertaken by the team is the design and construction of a method to optimize a metabolic pathway in *E. coli*. In our initial study of how to search a space for an optimal result, we developed the concept of *arrow diagrams*, a directed graph subject to multiple constraints, and have investigated if such diagrams can be labeled under certain conditions. In addition to their potential impact on the order of our lab experiments, these graphs have interesting combinatorial properties.