1056-05-287 **Joanna Anthony Ellis-Monaghan*** (jellis-monaghan@smcvt.edu), Saint Michael's College, One Winooski Park, Colchester, VT 05439, and **Greta Pangborn** (gpangborn@smcvt.edu), Saint Michael's College, One Winooski Park, Colchester, VT 05439. *Graph invariants from self-assembling nanostructures.*

Recent advances in DNA self-assembly have resulted in nanoscale graphs: cubes, octahedrons, truncated octahedra, and even buckyballs, as well as ultra-fine meshes. These constructs serve emergent applications in biomolecular computing, nanoelectronics, biosensors, drug delivery systems, and organic synthesis. One construction method uses k-armed branched junction molecules, called tiles, whose arms are double strands of DNA with one strand extending beyond the other, forming a 'sticky end' at the end of the arm that can bond to any other sticky end with complementary Watson-Crick bases. A vertex of degree k in the target graph is formed from a k-armed tile, and joined sticky ends form the edges. We use graph theory to determine optimal design strategies for biologists producing these nanostructures. We define two new numerical graph invariants, the minimum number of tiles and minimum number of edge types necessary to create a given graph under three different laboratory scenarios. We determine these values for common graph classes (complete, bipartite, trees, regular, Platonic and Archimedean, etc.). For these classes of graphs, we provide either explicit descriptions of the set of tiles achieving the minimums or efficient algorithms for generating the desired set. (Received August 25, 2009)