

# ■ Summary

One of the aims of Plant Synthetic Biology is the engineering of entire biosynthetic or signaling pathways using plant crops as “chassis”. A major technological challenge for achieving this involves transferring large amounts of genetic information to the plant genome in the form of multigene constructs. To facilitate multigene engineering in plants we have developed a DNA assembly platform that we named GoldenBraid (GB). GB is a standardized DNA assembly system for Plant Synthetic Biology based on the use of Type IIS restriction enzymes that allows the indefinite growth of reusable gene modules made of standardized DNA parts. The GB toolbox includes eight destination vectors and a universal domesticator plasmid designed to incorporate multipartite assemblies made of standard DNA parts and to combine them binarily in increasingly complex multigene constructs. The use of the GoldenBraid framework is facilitated by a number of web resources, which include a publicly available database, tutorials and a software package that provides *in silico* simulations and tailored laboratory protocols for part domestication and multigene assembly. The GB toolkit is completed with a repository of standard DNA parts, the GBcollection. This collection contains more than 300 basic GBparts, more than 500 intermediate modules and pre-made transcriptional units, including a set of basic logic gates that will be the basis of future digitally-regulated gene networks. The most basic one-input operations and an initial set of two-input Boolean gates were developed. Finally a NOT logic gate, the first inducible basic inverter in plants, was also implemented.