

## Instructor Background

### Gene Regulation with the pGLO Plasmid System

#### Bacterial Transformation

With the help of biotechnology techniques, it is possible to transfer genes from one organism to another through a process generally called genetic transformation. In this activity sequence, students learn about inserting genes from one organism into bacteria with the aid of a plasmid. In addition to one large chromosome, bacteria may naturally contain one or more small circular pieces of DNA called plasmids. Plasmid DNA usually contains genes for one or more traits beneficial to bacterial survival. In nature, bacteria can transfer plasmids between themselves, which may permit them to adapt to new environments. For example, the development of bacterial resistance to antibiotics is often due to such transmission of plasmids.

#### The pGLO Plasmid

In this activity sequence, students will genetically transform bacteria with a plasmid called pGLO that contains a gene encoding green fluorescent protein (GFP). The source of this gene is the bioluminescent jellyfish *Aequorea victoria*. When exposed to ultraviolet (UV) light, GFP fluoresces green.

Bio-Rad's pGLO plasmid contains genetic features essential to its function including:

**GFP** — a gene from *Aequorea victoria* encoding green fluorescent protein

**araC** — a gene from the arabinose operon that encodes the arabinose-dependent repressor protein AraC

**P<sub>BAD</sub>** — the promoter for *GFP*, which is repressed by AraC in the absence of arabinose and activated by AraC in the presence of arabinose

**Amp<sup>r</sup>** — a gene that encodes beta-lactamase (bla), an enzyme that degrades ampicillin and allows bacteria to survive in the presence of ampicillin

**ori** — the sequence where plasmid replication is initiated

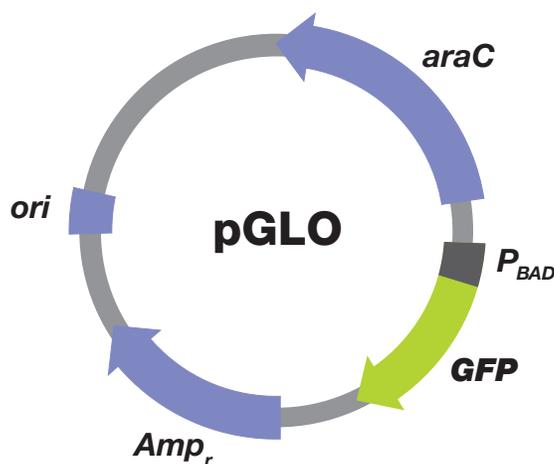


Fig. 1. pGLO plasmid map