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# DIY Biology and the Case of the Glowing Plants

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## Description

In 2013, the Glowing Plant Project raised money to fund amateur biologists attempting to insert a firefly gene into a small flowering plant called *Arabidopsis thaliana*. This historical case explores ethical concerns with synthetic biology and the DIY Biology movement.

## Body

In 2013, the Glowing Plant Project raised money to fund amateur biologists attempting to insert a firefly gene into a small flowering plant called *Arabidopsis thaliana*. The amateur scientists aimed to create a plant that would emit green light once its modified genome prompted it to produce bioluminescent enzymes, such as *Luciferase*. The project advertised on the popular crowd-sourcing website, Kickstarter, and raised close to \$500,000 (<https://www.kickstarter.com/projects/antonyevans/glowing-plants-natural-lighting-with-no-electricity>). The initiators of the campaign promised that, if successful, supporters would receive the seeds of the genetically modified plants to grow wherever they wanted. The distribution of these seeds would not be subject to any

institutional regulation, required for other bio-engineering companies, like Monsanto, that determines whether new GMOs are safe for humans and whether they pose any environmental risks (Grushkin 2013).

The initiators of the project believed that the Glowing Plant project would popularize new technologies in synthetic biology, such as gene-writing software and the creation of synthetic DNA, and perhaps also inspire and educate the broader public about these new biotechnologies. However, many scientists objected to the project's goals and Kickstarter eventually revised its guidelines to prohibit the distribution of GMOs as a reward for investment. Several critics of the project deemed it controversial.

On the one hand, some scientists argued that the project's aims were frivolous and did not contribute to the development of any beneficial applications. For that reason, they believed the risk of releasing GM plants to the general public, and thus into the wild, with potentially detrimental consequences, was too great. Others simply criticized the project for being biochemically unfeasible, claiming that the small plants would not be able to produce enough energy to glow for any extended period of time. The objections to the Glowing Plant Project led to other fund-raising campaigns, like Kickstarter, intending to stop all projects involved with GMOs.

On the other hand, supporters of the project emphasized the potential of DIY biology projects, such as the Glowing Plant Project, to democratize science and encourage creativity and innovation to help solve real-world problems. They also downplayed the risks involved in both the procedure of genetically modifying these plants and their potential release into the environment. The researchers behind the Glowing Plant Project explained that they would insert the genes using a ballistics-powered device, called a gene gun, rather than using a bacterial transfection vehicle, such as *Agrobacterium* (Callaway 2013). Because of the gene-gun method, the project lay beyond the jurisdiction of the US Department of Agriculture (USDA). Second, they claimed that both the plant species and the gene circuitry that the scientists proposed to use in the project are well-studied and well-understood systems and do not pose safety risks to humans or the environment.

### **Discussion Questions:**

- What are the ethical, social and legal issues in the case of the glowing plants in DIY biology, and in DIY biology more generally?

- Should DIY biology be subject to government oversight? Or should it be self-regulated by members of the DIY biology community? What are the potential trade-offs in governmental oversight compared to a system of self-regulation?
- What kinds of institutions, if any, should regulate DIY biology projects?
- Should Kickstarter have banned the distributions of GMOs as rewards for DIY biology project supporters?

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### **Links:**

Site for the Glowing Plant Project: <http://www.glowingplant.com/> (Accessed December 10, 2015)

A Blog for the "Do-It-Yourself Biologist": <http://diybio.org/> (Accessed December 10, 2015)

"Glowing Plant seeds expected to ship in December: Biohackers' genetically engineered glow-in-the-dark plant attracts fans and critics." *CBC New: Technology & Science*. October 9, 2014. Accessed December 10, 2015. <http://www.cbc.ca/news/technology/glowing-plant-seeds-expected-to-ship-in-december-1.2794138>

### **Notes**

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