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Glowing trees could light up city streets

25 November 2010 by [Frank Swain](#)
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IMAGINE taking a midnight stroll, your route lit by row upon row of trees glowing a ghostly blue. If work by a team of undergraduates at the University of Cambridge pans out, bioluminescent trees could one day be giving our streets this dreamlike look. The students have taken the first step on this road by developing genetic tools that allow bioluminescence traits to be easily transferred into an organism.

Nature is full of glow-in-the-dark critters, but their shine is feeble - far too weak to read by, for example. To boost this light, the team, who were participating in the annual [International Genetically Engineered Machines competition \(iGEM\)](#), modified genetic material from fireflies and the luminescent marine bacterium *Vibrio fischeri* to boost the production and activity of light-yielding enzymes. They then made further modifications to create genetic components or "BioBricks" that can be inserted into a genome.

The team managed to produce a range of colours by putting these genes into the *Escherichia coli* bacterium. They found that a volume of bacterial culture about the size of a regular wine bottle gave off enough light to read by.

"We didn't end up making bioluminescent trees, which was the inspiration for the project," says team member Theo Sanderson, who is studying genetics. "But we decided to make a set of parts that would allow future researchers to use bioluminescence more effectively." The team presented its findings earlier this month at the iGEM Jamboree, held at the Massachusetts Institute of Technology.

One major obstacle to harnessing bioluminescence is that the process relies on a class of compounds called luciferins. They emit light and are then converted into oxyluciferin, which cannot produce light. To counter this, the Cambridge team found a way to engineer BioBricks that would enable organisms to produce enzymes to recycle oxyluciferin.

Bioluminescent plants could appeal especially to people whose homes are not wired up to the electricity grid. These living lights have no breakable parts, and new lights can be made simply by growing more of them. The team calculates that for a bioluminescent tree to compete with a street light, only 0.02 per cent of the energy absorbed for photosynthesis would need to be diverted into light production.



Street lamps with a difference (Image: Theo Sanderson)

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So are glowing trees coming soon to a street near you? It's unlikely, says [Alexandra Daisy Ginsberg](#), a designer and artist who advised the Cambridge team. "We already have light bulbs," she says. "We're not going to spend our money and time engineering a replacement for something that works very well."

However, she adds that "bio-light" has a distinctive allure. "There's something much more visceral about a living light. If you have to feed the light and look after it, then it becomes more precious."

Gold brings colour to water plants

Can a living thing give off light without being bioluminescent? It can - if it's full of gold nanoparticles.

A team headed by Yen Hsun Su of the Research Center for Applied Sciences at the Academia Sinica in Taipei, Taiwan, dipped *Bacopa caroliniana*, a plant often used in aquaria, into a solution of gold nanoparticles. The gold diffused into the plant's cells after a day or so. When the plant was exposed to ultraviolet light, it excited electrons in the gold, causing them to emit a violet-blue light. That light in turn made the plant's chlorophyll fluoresce red.

The nanoparticles remained in the leaves for between two weeks and two months.

Yuriko Nagano

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