Photobioreactor enables systems biology studies of cyanobacteria

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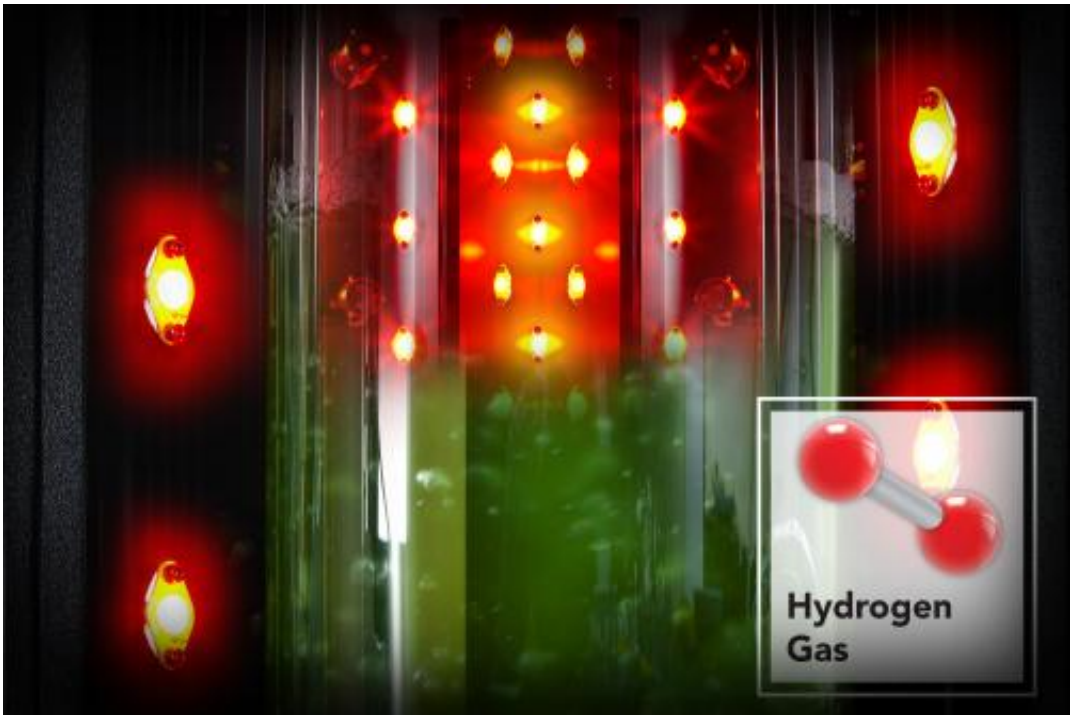

A novel photobioreactor designed and developed at Pacific Northwest National Laboratory is being used to identify growth limitations of cyanobacteria—important components of major ecosystems and potential catalysts for sustainable biofuel and chemical production.

A novel photobioreactor designed and developed at Pacific Northwest National Laboratory for cultivating photosynthetic bacteria and microalgae will be featured in the journal *Bioresource Technology*. PNNL researchers are using the photobioreactor to identify conditions

for achieving maximal growth and productivity of cyanobacteria, important components of major ecosystems and potential catalysts for sustainable biofuel and chemical production. Among its unique attributes, the bioreactor provides exquisite control over the intensity and spectrum of photosynthetically active wavelengths of light driving growth of the phototrophic cultures.

A bioreactor is a valuable tool for studying the structure of microbes, their behavior, and their metabolism. It provides continuous cultivation of microbes in a lab environment, giving scientists the opportunity to do a wide range of experiments. The new photobioreactor's capabilities allow more rigorous systems biology research on these photosynthetic microorganisms. It overcomes a major cultivation challenge by maintaining a defined light environment using a computer feedback loop to automatically adjust the light-emitting diodes (LEDs) to accommodate a culture's changing needs.

The ability to perform non-invasive rapid light measurements, real-time gas monitoring, and carry out programmable routines has transformed the standard chemostat, which is most commonly used for continuous cultivation, into an automated analytical device that avoids sampling bias. Large quantities of low-heterogeneity sample material for large-scale systems biology analyses can now be obtained using photosynthetic microorganisms grown under repeatable, defined conditions.

More information: Melnicki, M. et al. 2013. Feedback-Controlled LED Photobioreactor for Photophysiological Studies of Cyanobacteria. *Bioresource Technology* (In Press). DOI: 10.1016/j.biortech.2013.01.079

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