

Bioluminescent devices for zero-electricity lighting, Seville, Spain

Project data

Project group	Materials, products and construction technologies
Project background	Academic research
Estimated start of construction	December 2012

Main author

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Further author(s)

Not applicable

Comment of the Holcim Awards jury Europe

The jury was impressed by the visionary strength of the concept, with various criteria of sustainability applied and combined in a fascinating manner. Various employments of the technology prove the significance of the bioluminescent devices in terms of ambitious design, minimal energy consumption, minimal cost production, simple construction and numerous fields of application.

Project description by author

This project seeks to design and fabricate glowing devices that do not consume electricity through the manipulation of bioluminescent populations of micro-organisms.

To achieve this goal, two different species are tested. The first one is a kind of bacteria that naturally glows in the dark: *Vibrio Fischeri*. The second one, a sort of unicellular alga that also glows when it is excited by movement: *Pyrocystis Fusiformis*. Depending on the results obtained, different geometries are specifically designed to host these populations and get the best results both in terms of design and lighting.

The devices obtained can be used for public ambient lighting, natural park illumination, billboards and screens, highway posts and signs, and many other uses.

Relevance to target issues by author

Innovation and transferability – Progress

Manipulating populations of bioluminescent organisms to generate glowing devices able to emit light without consuming electricity is highly innovative. Nowadays the most relevant revolution that is redefining life and the way we live occurs in the field of biotechnology and synthetic biology. This proposal seeks to revisit the relationship between architecture and ecology going through this field. Sustainable architecture is not only about solar panels and windmills. If we want to really draw an alternative to current design and production means based on the consumption of natural resources and the production or waste, we have to go deeper. This proposal explores the path of synthetic biology in the realm of architectural design and takes advantage of living forms of intelligence. It does so from a very direct approach that does not require very sophisticated knowledge, but it is truly effective and innovative.

Ethical standards and social equity – People

This project is not meant to improve human social scenario but it considers other sort of societies. The glowing devices are designed using living entities, which means they do not hurt the environment or other communities like plants or animals. That helps to create a better overall scenario where humans are included. Regarding ethical issues, it is perfectly fine since no sentient beings are damaged and no pollution is emitted or waste released to the environment.

Environmental quality and resource efficiency – Planet

This proposal takes advantage of living intelligence and natural capital without transforming it into an artificial one. It reorganizes this living intelligence into a more sophisticated form of natural capital that performs the features demanded (lighting) without generating waste or consuming other forms of energy such as electricity. It is true though that these micro-organisms do not glow as much as some artificial lights, but they can be used in a wide range of scenarios.

Economic performance and compatibility – Prosperity

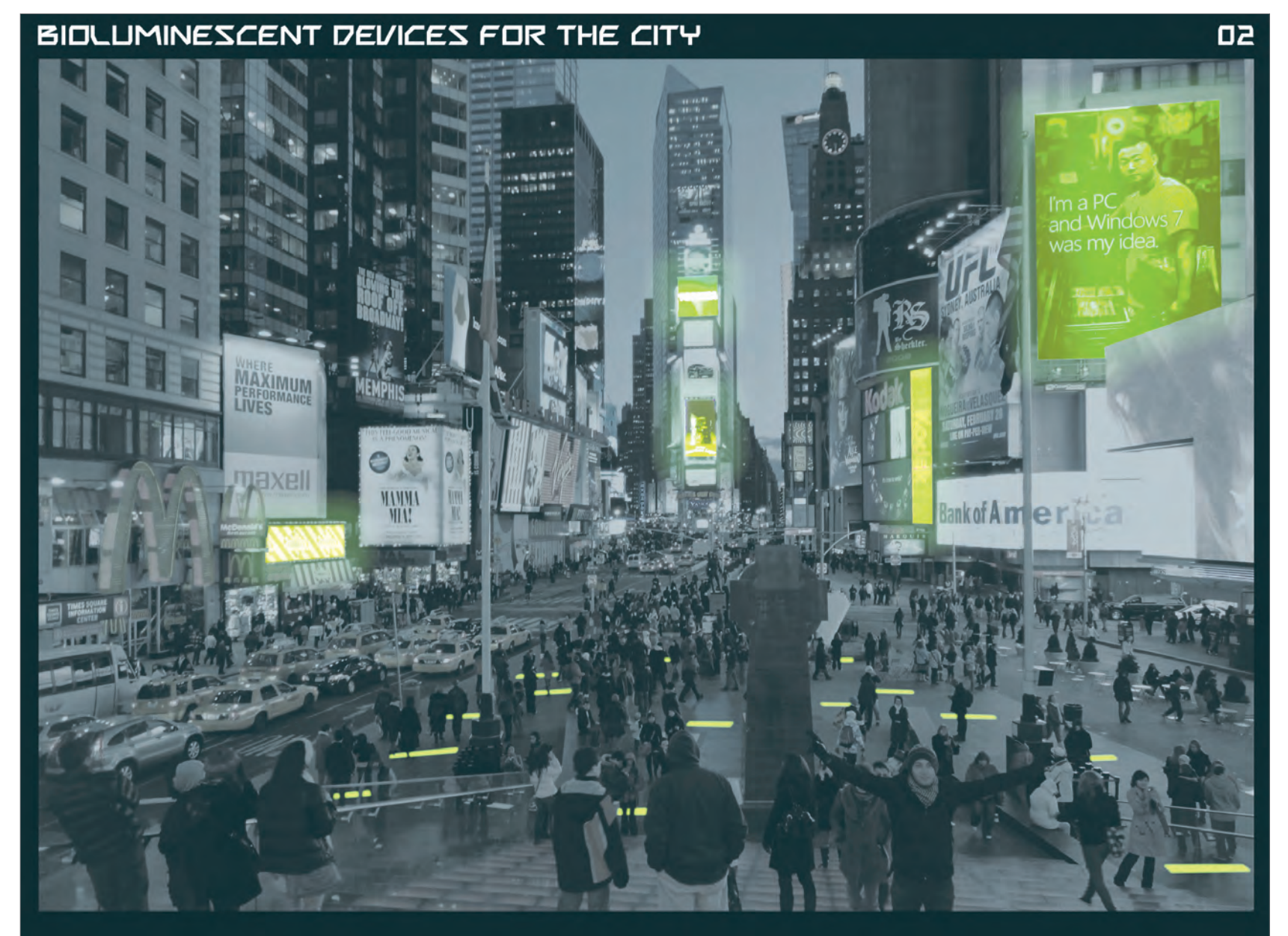
Right now the proposal is at a very basic level of development so it is not 100% efficient. However it is just a matter of time to get to know the best conditions for the bacteria and the algae to grow, and in which conditions do they glow better, to really achieve a very powerful economic lighting system. However it is absolutely compatible with the environment unless the ambient conditions are extreme, meaning very high or low temperatures. In that case, the micro-organisms would die.

Contextual and aesthetic impact – Proficiency

The aesthetics really depend on the device or the formal prototype designed. What I am really proposing is the use of these populations of micro-organisms to emit light without consuming electricity and generating artificial waste. This system is perfect to illuminate natural environments since there is no need for a substantial amount of light there and these micro-organisms are living systems that do not hurt other species and do not release any sort of pollution or generate waste. These organisms do not produce any visual impact besides the fact that they glow. When it comes to cities, it would be a significant advantage to illuminate certain spaces without consuming electricity because we would save energy. Regarding the aesthetic impact I think it could even be a positive one since these micro-organisms can live in symbiosis with natural elements like plants.



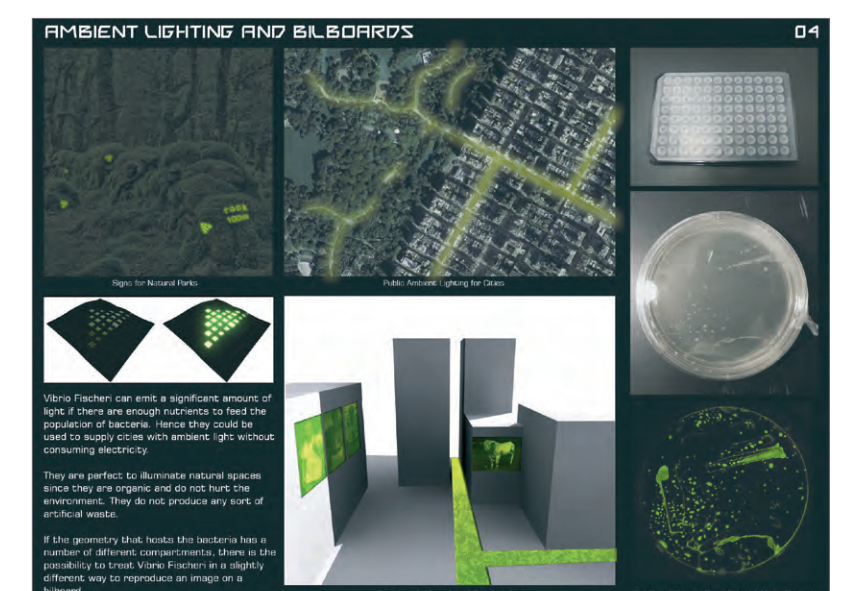
Natural environment illuminated with populations of bioluminescent bacteria, also used to generate signs to orient people in the woods.



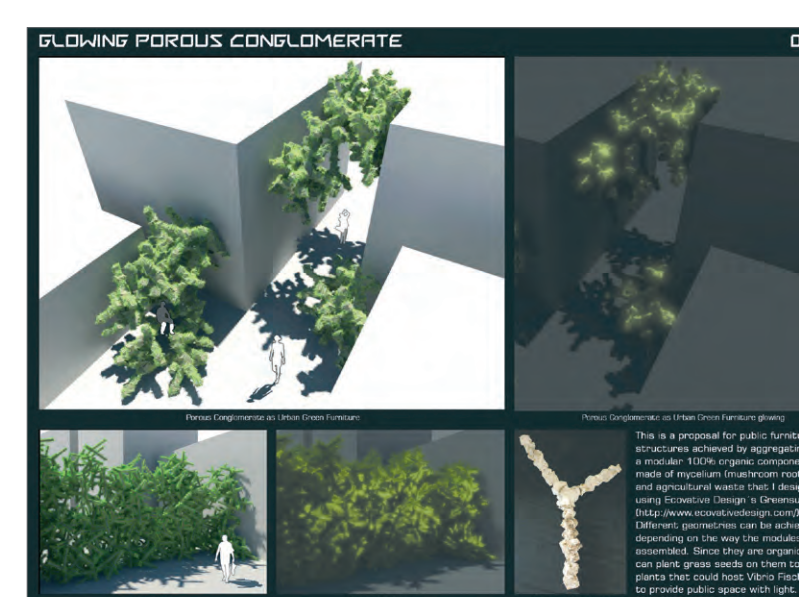
Lighting devices and billboards powered by bioluminescent bacteria to be used in cities.



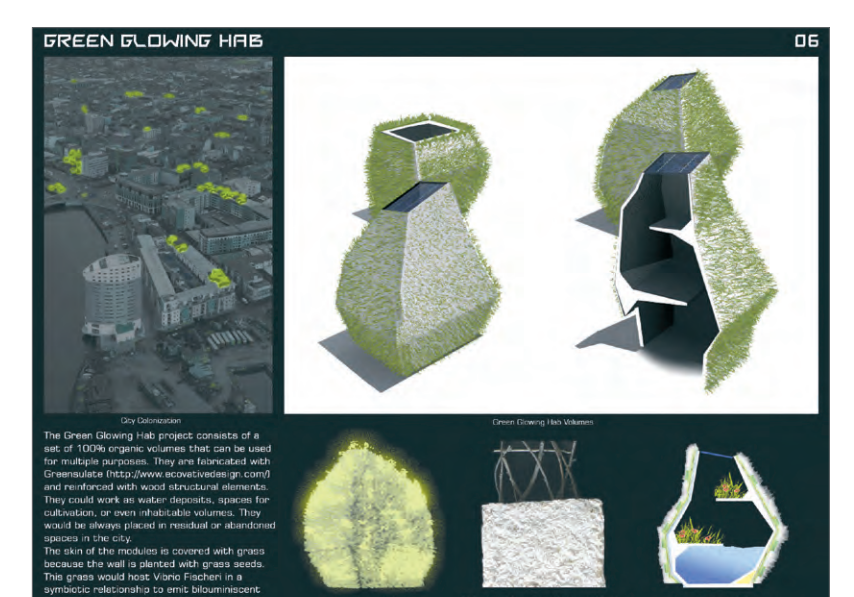
Vibrio Fischeri.



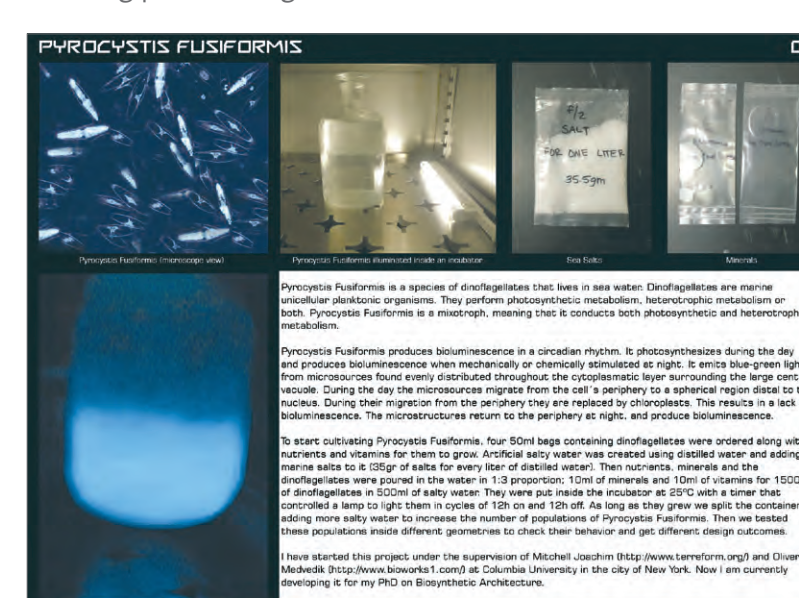
Ambient lighting and billboards.



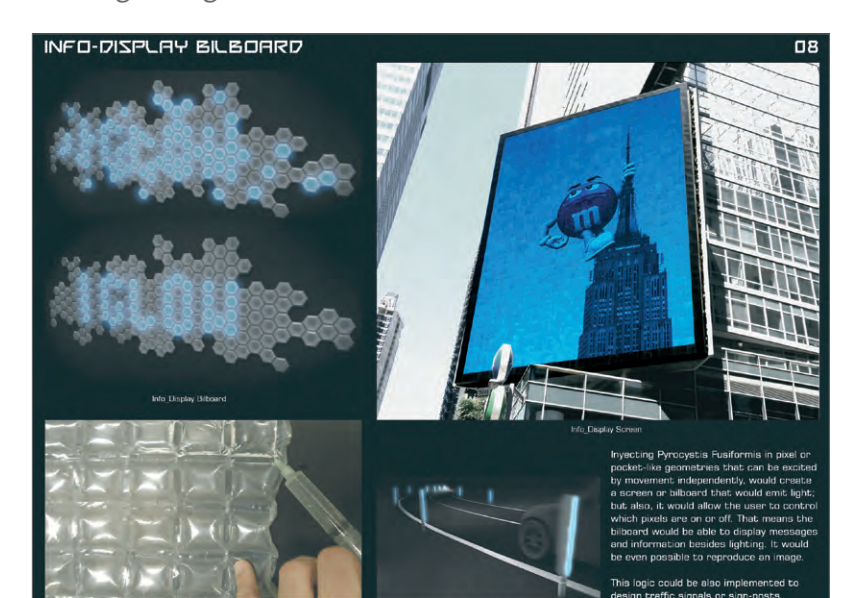
Glowing porous conglomerate.



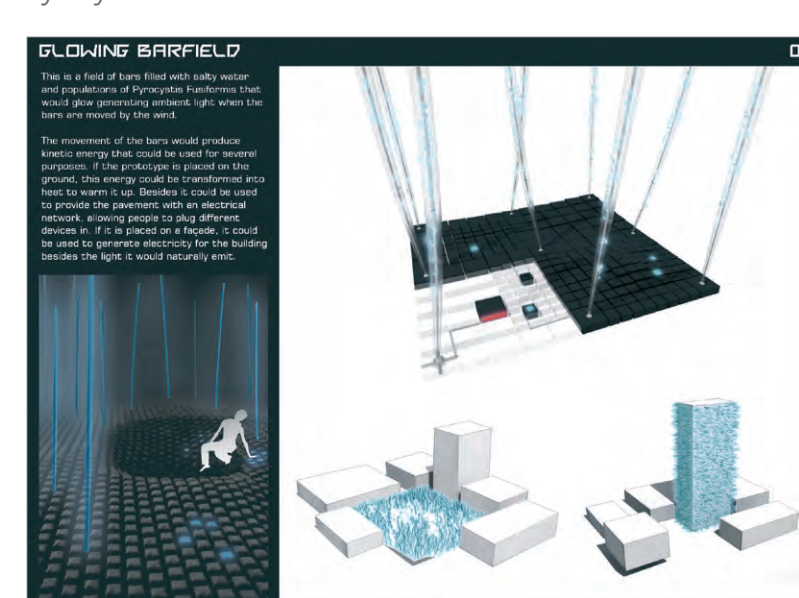
Green glowing hab.



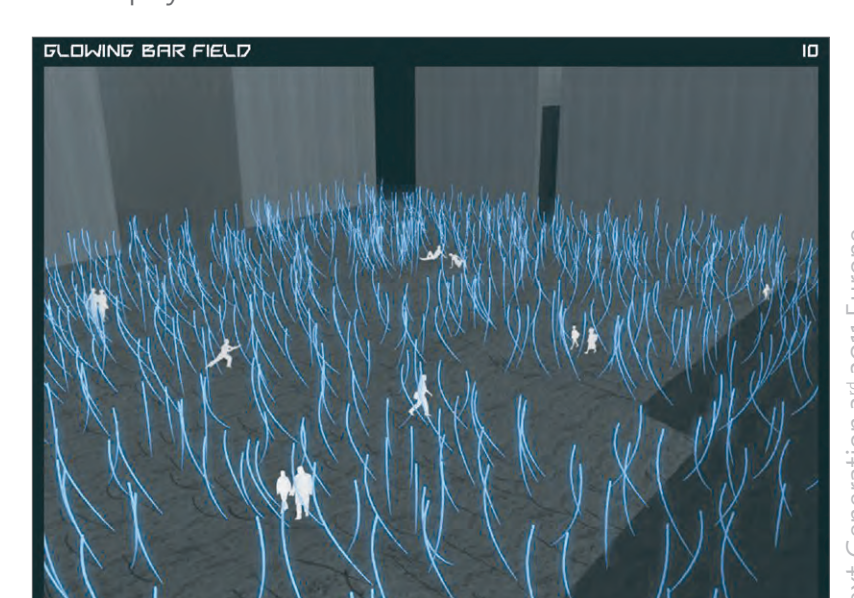
Pyrocystis Fusiformis.



Info-display billboard.



Glowing barfield.



Glowing barfield.