



Institutional Repository - Research Portal

Dépôt Institutionnel - Portail de la Recherche

researchportal.unamur.be

RESEARCH OUTPUTS / RÉSULTATS DE RECHERCHE

Living Light 2014 editorial: Photonics from living materials

Sarrazin, Michaël; Berthier, Serge; Lambin, Philippe

Published in:
Materials Today Proceedings

DOI:
[10.1016/j.matpr.2014.09.005](https://doi.org/10.1016/j.matpr.2014.09.005)

Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (HARVARD):
Sarrazin, M, Berthier, S & Lambin, P 2014, 'Living Light 2014 editorial: Photonics from living materials' Materials Today Proceedings, vol. 1S, pp. 107-108. <https://doi.org/10.1016/j.matpr.2014.09.005>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Living Light: Uniting biology and photonics – A memorial meeting in honour of Prof Jean-Pol Vigneron

Living Light 2014 editorial: Photonics from living materials

Michaël Sarrazin^a, Serge Berthier^b, Philippe Lambin^a

^aPMR, Department of Physics, University of Namur, 61 rue de Bruxelles, Namur, B-5000, Belgium

^bInstitut des NanoSciences de Paris, UMR 7588, 4 Place Jussieu, 75005 Paris, France.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

Selection and Peer-review under responsibility of Physics Department, University of Namur.

Keywords: Photonics ; Living beings

Light plays a fundamental role in biology. It allows living beings to see and to recognize themselves. Recognition between species often goes beyond simple shape recognition, for light can convey important additional information. Often of pigment origin, but then of little variety, the color of a bird feather, a butterfly wing or the shell of a beetle may be structural. The microscopic texture of beards, feathers or scales produce special coloration effects by multiple reflections or diffraction of light, most often characterized by iridescence and, more generally, goniochromism. The tour de force of nature is to have been able to produce dramatic lighting effects from biological materials whose refractive index varies in a narrow range only. More than in the composition, the color secret lies in the geometry, often multi-scale, of the structure involved.

In addition to static structural coloration, nature has led to animals that change color under the influence of stress and others that emit light. Whereas the source of the light emitted by a firefly is of biochemical origin, its propagation and its extraction out of this organism may resort to complex physics whose study can help us to improve the efficiency of existing opto-electronical devices. These few examples demonstrate that bio-photonics is more than a passion. It is a multi-disciplinary science whose outcome can be significant for technology. The scientists involved in this science, be they chemists, biologists or physicists, are able to explain natural phenomena on the basis of complicate reactions, detailed microscopic analysis or sophisticated calculations. In return, the studied structures may become a real source of inspiration for the optimization of optical devices, the making of new

materials and the design of multi-functional surfaces. This is the object of bio-inspiration.

The wings of the Morpho are a beautiful example of natural photonic structures that engineers manage to reproduce with artificial materials. By comparison, biological structures are less perfect, but still, the colorations they produce are robust against imperfections. In some cases, structural color light is circularly polarized in one way or the other, depending on wavelength. If one can explain why, a different issue is to understand for what biological purpose, if any, it is so. Other interesting topics are covered by the papers that follow. All together, they constitute a written, partial witness to the high-quality scientific content of the meeting "Living light 2014" that was organized in the University of Namur in April 2014. "Living light 2014" came after the "Workshop on Bio-Inspired Photonic Structures" in Donostia - San Sebastián, the Basque Country (July 2009) and the "International Symposium on Natural Photonic Structures" in Shanghai, China (June 2011). The Namur meeting was a tribute to the memory of Jean-Pol Vigneron whose great love of understanding the colors of light will be perpetuated by these proceedings.

Acknowledgements

The authors acknowledge the international scientific committee and the local organization committee of the conference Living Light 2014, most particularly I. Dericke and K. Derochette.

The organization of the conference was made possible thanks to partial funding from University of Namur, CERUNA, SPW (DGO6), F.R.S. – FNRS, PromOptica, Olympus Belgium, and Banque Degroof.