BDR SEMINAR (Kobe & online hybrid)

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Monday, November 18, 2024

16:00-17:00

1F Auditorium, DB Building C, Kobe / Broadcast online via Zoom

Zoom meeting URL will be announced on the event day by e-mail.

※Non-BDR members: Please register from the following link.

https://krs2.riken.jp/m/bdrseminarregistration (Registration deadline: November 14)

Biomimicry of Living and Dead Color-producing Materials

Summary

Colors in organisms can be produced either chemically by pigments or physically by the constructive interference of light scattered by biophotonic nanostructures and sometimes as a combination of both. Fade-proof, saturated structural colors that have evolved over millions of years of selective optimization are an ideal source to look for natural solutions to our current technological challenges. However, given that the underlying nanostructures are overwhelmingly diverse in form and function, their characterization has suffered for over a century. I have pioneered the use of synchrotron Small Angle X-ray Scattering (SAXS) as a high throughput technique to structurally and optically characterize integumentary photonic nanostructures from hundreds of species across diverse animal orders in a comparative fashion. This led to the discovery of the first single gyroid crystals in biology within the iridescent green wing scales of certain butterflies whose self-assembly beautifully pre-empts our current engineering approaches but at the hard to achieve visible optical length scales. But broadly, this wealth of structural knowledge has led to the realization that these diverse, mesoscale nanostructures share a unifying theme – they appear to be self-assembled within cells by bottom-up and directed processes. I will broadly summarize our current state of knowledge about the structure, function, development and evolution of organismal structural colors in birds, butterflies and beetles, as well as discuss some future directions on how understanding the intracellular development of biophotonic nanostructures can lead to novel, facile biomimetic routes to sustainable mesoscale synthesis for next-generation functional applications from sensors, photonics, energy harvesting to catalysis.