



CDE international seminar (online)

4th: April 16th (Fri), 18:00-19:00 (Japan time) [Lang: English]

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Mycalesina in morphospace: How developmental bias shape evolutionary diversification in butterflies

Click this URL for registration (free event)

<https://forms.gle/SoNEmKFhvf9u8LJj6>

(Zoom URL will be sent to you based on the registered information)

- Abstract -

The developmental mechanisms that generate morphology can in theory bias the independent evolution of traits sharing ontogenetic pathways, making certain evolutionary changes more likely than others. The eyespots commonly found on butterfly wings each have concentric rings of differing colours and these classic examples of serially repeated pattern elements have been a focus for evo-devo research. Previous work on a model species of *Mycalesina* butterfly, *Bicyclus anynana*, has provided insights into the developmental control of individual eyespots. These studies showed that the relative size of a eyespots on the same wing surface is highly flexible, whereas they are resistant to diverging in colour-composition, presumably due to shared developmental process.

I will present a recent major survey of the diversity in eyespot colour composition, across a majority of *Mycalesina* butterflies. Results are largely consistent with those from *B. anynana*, with the notable exception of a diverse clade on Madagascar. Thus, whereas each species generally has eyespots of similar colour-composition, consistent with a major role for developmental bias in shaping evolutionary diversification, most Malagasy *Heteropsis* species have gained independent control of eyespot colour-composition enabling a wider exploration of morphospace. Further experimental work investigated the formation of this novel phenotype by manipulating eyespot development in early pupal wings and show that the bias has been broken through a novel difference in the response of different areas of wing tissue to a conserved eyespot patterning signal.

This study demonstrates how development can potentially constrain the evolutionary independence of traits, but that at a macro evolutionary level the constraint can be released by an innovative developmental change allowing rapid morphological change and facilitating evolutionary diversification. Future directions include more detailed studies of how the bias was broken in the early *Heteropsis* radiation, and whether the bias found in most *Mycalesina* might be adaptive.

進化にご興味のある全ての皆様へ

新学術領域「進化的制約方向性 (倉谷代表)」公開オンラインセミナーのお知らせです。表現型進化の方向性、拘束、進化可能性といった概念や問題について、考え、議論したり新たな考えや人の相互作用をもたらすための不定期で行う国際オンラインセミナーです (公開。参加費無料)。フランクなオンラインミーティングです。大学院生の方々も広くご参加いただけましたら幸いです。近くに興味を持たれそうな方がおられましたらお声がけいただけると幸いです。

For all of you who are interested in Evolutionary Biology

We are happy to announce open, online international seminar provided by the research project "Constrained and Directional Evolution" (led by Dr. Shigeru Kuratani).

The aim of this open seminar is to share and discuss over the challenging topics in evolutionary biology, such as Evolvability, Constraints, Directionality in phenotypic evolution etc., and to boost interactions between scientists interested in these topics. It's an open seminar with participation free of charge, and we welcome your participation (Students, Postdocs, PIs etc.)

[Greeting from the chair of this project]

How much has our understanding of biological evolution improved in the past half century? Not even the shape of the tiny insect in front of us now can be satisfactorily explained. My understanding of evolution has not changed much since then. I do not think it's the way it should be. It's good enough. At last, it's time we start doing something to solve the mystery.

Why should the shapes of plants and animals be the way they are? How does purposefulness explain the process of these refinement of shapes? This project aims to construct a new theoretical system of evolutionary biology by not only encompassing natural selection and neutral theories but also integrating essential elements that previous theories failed to address. We hope that this attempt will provide a place for gathering bold challengers, and further leads to a new trend in the field of evolutionary biology.

<http://constrained-evo.org/greeting.html>

[領域代表より、抜粋] (原文はHPをご覧ください)

過去半世紀の間、生物の進化についての私たちの理解はどれほど深まっただろうか。いま目の前にいるちっぽけな虫のかたちすら満足に説明してくれない。進化に関する私の理解はあの頃とあまり変わってはいない。さりとして、このままでよいとも思わない。いよいよ謎を解くべく、何かを始めなければならない。

動植物のかたちがなぜこのようなものでなければならないのか、そしてそれが洗練されて行く過程にどのように合目的性が入り込むのか、自然選択説や中立説を包含するのみならず、それらが扱うことのできなかった本質的要素を統合することを通じ、本領域は進化生物学の新たな理論体系の構築を目論む。この試み自体、進化生物学領域における梁山泊であり、自ら新たな潮流となり、進化研究を変える第一歩ならんと欲するものである。

<http://constrained-evo.org/greeting.html>