PROJECT TITLE: Why are birds so colourful?
DTP Research Theme(s): Living World

Lead Institution: University of Bristol
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Image Caption: diversity of colouration in living birds, Photos: Daniel J. Field.

Project Background
The extraordinary colour gamut exhibited by birds is the product of a range of pigments and structural mechanisms unmatched by many other groups. But, how did birds evolve to become so colourful? As living descendants of theropod dinosaurs, the fossil record is necessary to provide an answer. Recent studies have shown that fossilised pigments can reveal numerous aspects of dinosaur colouration, and therefore provide critical clues to support our understanding of the origin of the avian colour palette. Most non-avian dinosaurs were primitively ground dwelling, but transitions to arboreality evolved multiple times. These changes in habitat occupation and ecology affected dinosaur behaviour and interspecific interactions. We will investigate associations between behavioural ecology and colouration in living birds to constrain inferences about such associations in the fossil record. This project will therefore help us understand the likely background that allowed birds to become some of the world’s most colourful organisms.
Project Aims and Methods
This project will investigate the range of colouration exhibited by living birds and its distribution across plumage types, and track the association between colouration patterns and modes of life. This quantitative framework will provide a basis to understand whether shifts in dinosaurian modes of life could be linked to predictable transitions in colouration, such as acquiring dramatic colouration coincident with decreases in predation pressure. We will therefore seek to use evidence from recently published reconstructions of dinosaur colouration and add more species to this framework to generate a higher resolution image of when and how birds became colourful.

We will use quantitative studies of bird colouration through surveys of birds from the literature and museum collections and combine these with published accounts of their ecology and other behaviours to investigate evolutionary associations among these parameters in a phylogenetic context. Hence, the core of this study will be based on database work.

The other aspect of this thesis will be to investigate mechanisms by which colour is generated by examining melanosome morphology from both living and fossil birds using Electron Microscopy (transmission and secondary electron) to understand the distribution of melanosomes within feathers, and develop mechanistic developmental models for melanosome morphology.

Candidate
The candidate needs to have a solid background in avian diversity. Furthermore, the candidate needs to have experience with electron microscopy methodology. Knowledge of statistics and use of R is preferred and the student needs to have a basic understanding of palaeontological thinking.

Training
The student will be trained in computational quantitative methods relevant to both phylogenetics and image processing, and electron microscopy. As a member of the Bristol Vision Institute (http://www.bristol.ac.uk/vision-institute/), which spans all aspects of vision from engineering to biological, the student will be in the ideal environment for such interdisciplinary training. Furthermore, this project is well suited to facilitating outreach and science communication, which the student would be encouraged to pursue. The project lends itself well to future career options in academia, teaching and science journalism.

References / Reading List

Links
School webpage: http://www.bristol.ac.uk/biology/courses/postgraduate/
NERC GW4+ DTP Website: http://nercgw4plus.ac.uk/
Bristol NERC GW4+ DTP Prospectus: http://www.bristol.ac.uk/study/postgraduate/2017/doctoral/phd-great-western-four-dtp/

Application deadline: 23.59 GMT, Sunday 7 January 2018
How to apply to the University of Bristol:
http://www.bristol.ac.uk/study/postgraduate/apply/

General Enquiries:
Bristol NERC GW4+ DTP Administrator - Email: bristol-nercgw4plusdtp-admin@bristol.ac.uk