NUS National University of Singapore

Department of Biological Sciences
Faculty of Science

SEMINAR

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Hosted by A/P Li Daiqin

The music of evolution: Exploring the diversity of jumping spiders

By **Wayne Maddison**

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Biologists are acutely aware that chance plays a major role in how evolution unfolds, so much so that we might question how well we can understand the general mechanisms of evolution. In my own life, chance introduced me to a jumping spider when I was a teenager, which led to a lifelong fascination and a career. Different species of jumping spider (there are thousands) exhibit different colours, body forms, ecological interactions, and behaviours, each the unique product of its evolutionary history. And yet, when arrayed on the evolutionary tree, we can see that there are patterns: some behaviours or colours evolve repeatedly, and in similar ways, suggesting that there are general rules, and not simply chaos and chance. We can thus see two levels of beauty: the beauty of the individual spiders, and the beauty of the music of evolution — the melodies, harmonies and repetition across the grand scale of the Tree of Life. Scientists don't often speak of beauty, but we must. We know it best, through our explorations, and if we can communicate the beauty of biodiversity to the public and policy makers, we can help motivate a change in how we all care for our planet.

The Evolution of Color Vision in Jumping Spiders

By **Nathan Morehouse**

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Shifts from dichromacy to tri- or tetrachromacy offer major leaps in color vision through improvements to color discrimination and expansions in the range of perceivable wavelengths. However, the evolutionary causes and consequences of such transitions remain poorly understood. Here, we describe ongoing work to investigate the repeated evolution of transitions from ancestral UV-green dichromacy to tri- and tetrachromacy in jumping spiders. The transitions identified to date are not only phylogenetically distinct, they also involve divergent physiological mechanisms. For example, the transition from dichromacy to trichromacy in the jumping spider subtribe Harmochirina involved the evolution of an intra-retinal long-pass filter, whereas transitions from dichromacy to tetrachromacy in the tribe Euophryini and subtribe Aelurillina were accomplished through the addition of novel photoreceptor types with distinct spectral sensitivities. Such transitions should have important consequences for retinal development, visual function, and neural coding of visual information, all topics currently under investigation in our research group. In addition, by expanding the range of perceivable wavelengths, such transitions open up opportunities to use a broader palette of colors in foraging and communication. Consistent with this, we provide evidence that groups with expanded color sensitivities make more extensive use of color, particularly long-wavelength colors, during predation and courtship.

Artwork by Ann Nee, DBS, NUS