

MAP kinase modules: Two kinases, not three

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Genetic and biochemical studies have revealed that the diversity of cell types and developmental patterns evident within the animal kingdom are generated by a handful of conserved, core processes. Core biological processes must be robust, able to maintain functionality despite perturbations, and yet adaptable enough to allow the expression of phenotypic variation required for evolution. Characterising the fundamental design principles underpinning robust, adaptable biological circuits will inform both evolutionary and synthetic biology. MAP Kinase modules are core pathways which are evolutionarily conserved from yeast to man, and are used across eukaryotic phyla to drive diverse biological functions that are crucial for life. Here we define the fundamental two-tiered circuit topology that allows MAP kinase modules to function as robust biological circuits that can be readily reconfigured by feedback loops to generate diverse signal outputs. This two-tiered core module is loosely connected to multiple inputs, providing eukaryotic cells with a simple yet powerful circuit design that we argue has enabled MAPK modules to facilitate evolution through the generation of phenotypic variation.

Biography

Angus Harding received his Ph.D. from the University of Queensland in 2004, and conducted his post-doctoral research at Washington University School of Medicine in St Louis. His research focus investigating cellular signal transduction has been recognized with 20 publications, including manuscripts in *Nature Cell Biology*, *Current Biology* and *Brain*. Harding has recently begun investigating tumor biological systems, with the aim of developing a systems-level understanding of brain tumor evolution and adaptation. Harding has an independent research group at The University of Queensland.

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