

Max-Planck-Institut für Ornithologie

Max Planck Institute for Ornithology



Seewiesen Colloquia

Speaker invited by: Baldwin Research Group

Thursday, March 23, 2017, 13h, in House 4, Lecture Room

“How evolution is like a global economy”¹
and
“On the Malleability of Protein Function”²

Prof. James O. McInerney¹ and Dr. Mary J. O’Connell²

¹The University of Manchester and ²The University of Leeds

The traditional view of evolution is that mutations create variation, natural selection and drift reduces variation either randomly or by selecting alleles that confer some fitness effect. However, genomes have taught us that a significant agent of change in evolutionary biology is the process of merging evolving objects with one another. In this talk, I will elaborate on how evolutionary history is like a global economy, where DNA sequences act as “public goods” and the creation of new products (genes, proteins, gene clusters, cell types, genomes) is very likely to occur by the merging of evolving objects. Obviously this is balanced by the loss of whole genes, parts of genes, large tracts of DNA and sometimes the majority of a genome. This “goods thinking” alternative to “tree-thinking” is necessary in order to fully explain evolutionary history.

Dr O’Connell’s research group combine computational biology and genome scale analyses with molecular/biochemical assays. She is interested in the tipping point that can occur between purifying selection which preserves function and positive selection that switches function. In essence, she is interested in understanding when protein function changes, where it changes, and how it changes. In this talk Dr O’Connell will summarise work her group have carried out to explore the emergence of novel function and the relationship between genotype and phenotype.

Who is Prof. James O. McInerney?

- 1995 PhD, The National University of Ireland, Galway.
- 1999 Tenured lecturer at the National University of Ireland Maynooth.
- 2005 Chair in Evolutionary Biology, The University of Manchester.
- 2006 Director of the “Evolution, Systems and Genomics” research domain, The University of Manchester.

Who is Dr. Mary J. O’Connell?

- 2005 PhD University of Ireland Maynooth, Ireland
- 2006 Tenured Academic at Dublin City University, Ireland
- 2012 Fulbright Scholar Harvard University, US
- 2014 Senior Lecturer and Deputy Head of Department, Dublin City University, Ireland
- 2015 250 Great Minds University Academic Fellow in Computational and Molecular Evolutionary Biology, The University of Leeds, UK

Selected publications: see next page

Selected publications:

- Professor McInerney:
- McInerney, J.O. and O'Connell, M.J. (2017) Minding the gaps in cellular evolution. *Nature* 541: 297-299. doi:10.1038/nature21113
- McInerney, J.O. (2016) Evolution: A four billion year old metabolism. *Nature Microbiology*. 1, Art. No. 16139.
- Ku, C., Nelson-Sathi, S., Roettger, M., Sousa, F.L., Lockhart, P., Bryant, D., Hazkani-Covo, E., McInerney, J.O., Landan, G., and Martin, W.F. (2015) Endosymbiotic origin and differential loss of eukaryotic genes *Nature*. 524, 427–432. doi:10.1038/nature14963
- Nelson-Sathi, et al., (2015). Origins of major archaeal clades correspond to gene acquisitions from bacteria. *Nature* 517, 77–80 doi:10.1038/nature13805.
- McInerney, et al., (2014). The hybrid nature of the Eukaryota and a consilient view of life on Earth. *Nature Reviews Microbiology* doi:10.1038/nrmicro3271.

Dr O'Connell:

- Webb AE, Walsh TAW and O'Connell MJ. 2017. VESPA: Very large-scale Evolutionary and Selective Pressure Analyses. *Peer J Computer Science* (in press).
- Webb AE, Gerek ZN, Morgan CC, Walsh AT, Loscher CE, Edwards SV, O'Connell MJ*. 2015. Adaptive Evolution as a predictor of species-specific innate immune response. *Molecular Biology and Evolution*. Jul;32(7):1717-29.
- Keane M*, Semeiks J*, Webb AE*, Li YI, Quesada V, Craig T, Bruhn Madsen L, van Dam S, Brawand D, Marques PI, Michalak P, Kang L, Bhak J, Yim HS, Grishin NV, Nielsen NH, Heide-Jørgensen MP, Oziolor EM, Matson CW, Church GM, Stuart GW, Patton JC, George JC, Suydam R, Larsen K, López-Otín C, O'Connell MJ, Bickham JW, Thomsen B, de Magalhães JP (2015) Insights into the evolution of longevity from the bowhead whale genome. *Cell Reports*. Volume 10, Issue 1, p112–122, 6 January.
- Liu S, Lorenzen ED, Fumagalli M, Li B, Harris K, Xiong Z, Zhou L, Korneliussen TS, Somel M, Babbitt C, Wray G, Li J, He W, Wang Z, Fu W, Xiang X, Morgan CC, Doherty A, O'Connell MJ, McInerney JO, Born EW, Dalén L, Dietz R, Orlando L, Sonne C, Zhang G, Nielsen R, Willerslev E and Wang J (2014) Population Genomics Reveal Recent Speciation and Rapid Evolutionary Adaptation in Polar Bears. *Cell* Volume 157, Issue 4, p785–794, 8 May
- Haggerty LS, Jachiet PA, Hanage WP, Fitzpatrick D, Lopez P, O'Connell MJ, Pisani D, Wilkinson M, Baptiste E and McInerney JO* (2014) A pluralistic account of homology: adapting the models to the data. *Molecular Biology and Evolution*. 31 (3): 501-516.