

## Investigating the role of indirect genetic effects in the control of complex traits

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One of the major challenges of biology is to dissect the genetic control of the complex traits that underpin variation of medical, evolutionary and commercial relevance. Indeed, almost all traits of importance are complex and influenced by the action and interactions of many genes and environmental factors.

Although current analytical approaches have been successful in identifying genes involved in trait control, only a small proportion of the genetic variation in a trait is generally explained. Standard models investigating the source and control of genetic variation usually consider the direct effect of an individual's genes on his own performance. More complicated models include the indirect effect of, for example, the mother's genes on her offspring's performance. In general terms, however, the genotype of an individual or group of individuals can affect another's phenotype through social interaction. The availability of large human data sets, including related individuals, with dense SNP information, in principle, enables us to disentangle the various sources of variation and investigate the importance of indirect, social, genetic effects.

Using the large, human data sets currently available, containing SNP genotypes or sequence data along with phenotypic records, this project will investigate and develop analytical approaches for large populations to determine the importance of indirect genetic effects.

This project will provide training and experience in key areas of genomics combined with statistics and computation (relevant to all species) whilst tackling one of the most exciting scientific challenges of the 21<sup>st</sup> century. The project is relevant to students with a background in statistics, informatics or computational sciences as well as those with training in quantitative or population genetics and related subjects and would suit a student with strong mathematical and/or computational abilities and an interest in biological systems. Additional training in genetics and genomics is available through our MSc programme in Quantitative Genetics and Genome Analysis (<http://qgen.bio.ed.ac.uk>).

### Background references

- Bijma P. The quantitative genetics of indirect genetic effects: a selective review of modelling issues. *Heredity* (2014) **112**: 61-69 doi:10.1038/hdy.2013.15
- Muir W *et al.* Multilevel selection with kin and non-kin groups, experimental results with Japanese quail (*Coturnix japonica*). *Evolution* (2013); **67**(6): 1598-1606 doi:10.1111/evo.12062
- Powell JE *et al.* Reconciling the analysis of IBD and IBS in complex trait studies. *Nature reviews Genetics* (2010) **11** (11): 800-5 doi:10.1038/nrg2865