Systems Genetics

Linking Genotypes and Phenotypes

Whereas genetic studies have traditionally focused on explaining heritance of single traits and their phenotypes, recent technological advances have made it possible to comprehensively dissect the genetic architecture of complex traits and to quantify how genes interact to shape phenotypes. This exciting new area has been termed systems genetics and is born out of a synthesis of multiple fields, integrating a range of approaches and exploiting our increased ability to obtain quantitative and detailed measurements on a broad spectrum of phenotypes.

Gathering the contributions of leading scientists, both computational and experimental, this book shows how experimental perturbations can help us to understand the link between genotype and phenotype. A snapshot of current research activity and state-of-the-art approaches to systems genetics is provided, including work from model organisms such as *Saccharomices cerevisiae*, *Drosophila melanogaster*, as well as from human studies.

Researchers and graduate students in genetics, functional genomics, bioinformatics, computational biology, systems biology, and biotechnology will find this a valuable and timely resource.

Florian Markowetz is a Group Leader at Cancer Research UK's Cambridge Research Institute. His research is concerned with developing statistical and mathematical models of complex biological systems and analysing large-scale molecular data. His research interests range from the analysis of molecular clinical data to inference of cellular networks from high-throughput gene perturbation screens and integration of heterogeneous data sources using machines learning techniques and probabilistic graphic models.

Michael Boutros is a Group Leader at the German Cancer Research Centre (DKFZ) in Heidelberg, where he heads the Division of Signalling and Functional Genomics. He also holds a Professorship at the University of Heidelberg. His research focuses on the systematic dissection signalling pathways in *Drosophila* and mammalian cells, which are important during development and cancer. He attempts to define key components of signalling pathways, discovering interaction between pathways, and characterisation of signalling networks under normal and perturbed conditions.

CAMBRIDGE SERIES IN SYSTEMS GENETICS

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Systems Genetics is the study of DNA sequence variation and biological traits as a complex system characterised by spatial and temporal interactions. This includes phenomena such as epigenetics, epistasis, plastic reaction norms, and locus heterogeneity. The Cambridge Series in Systems Genetics covers all areas of genetics approached from a complex systems point of view. This series is of interest to researchers across several areas of the life sciences including bioinformatics, evolution, genomics, human genetics, molecular genetics, precision medicine, and systems biology.

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