Introduction to Mammalian Genome special issue: Informatics and Integrative Genomics—Part 2

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In Part 1 of this special issue, we focused on the informatics developments from the Mouse Genome Informatics (MGI) resource at the Jackson Laboratory to celebrate their 25 year anniversary. As highlighted in Part 1, informatics and integrative genomics is a large field, driving forward new areas of insight in many aspects of mouse genetics and functional genomics. In this second issue, we are focusing on a breadth of work from genome annotation, platforms for data dissemination, and mouse resources, to methods for integrating mouse functional data with human disease.

The first group of papers in this issue by Mudge and Harrow, McGarvey et al. and de Hoon et al. review the current picture of annotating the mouse reference genome and the mouse transcriptome. The reviews of the Mouse Genomes Project by Adams et al. and the International Mouse Phenotyping Consortium portal by Ring et al. describe two large-scale resources of use to the biomedical and mouse genetics community. The following three papers review an ever-growing field of big data generation in mouse genetics, and the generation and analysis of 2D and 3D image data. The first paper by Hayamizu et al. gives an overview of the ontologies required for describing anatomy, with the next two papers by Armit et al. and Burel et al. describing two image resources: eMouseAtlas and OMERO.

Portals which enable users to gain access to mouse models are a key informatics resource for the community. Two papers by Eppig et al. and Rosen et al. describe the International Mouse Strain Resource (IMSR) and a review

on the International Knockout Mouse Consortium (IKMC). Underpinning many global resources are the worldwide mouse clinics who require 24/7 laboratory information management systems (LIMS) to ensure data accuracy and standardisation. The paper by Maier et al. gives a review of the current LIMS systems in use across the world. A key element of LIMS systems is the ability to acquire data on animal welfare, and the next review by Bussell and Wells describes efforts to implement a common language for mouse welfare.

Simon et al. and Wiles et al. describe the underpinning informatics approaches that are being developed for mutation detection and genome editing with CRISPR-Cas9. Two papers follow on the collaborative cross and diversity outbred projects by Bogue et al. and Morgan and Welsh. The final section of this special issue begins with a review by Gkoutos et al. on the current ontologies for describing mouse behaviour, a key ontology required for integration with human disease descriptors. This leads on to papers describing methods for cross-species comparisons and functional genomics by Haendel et al. and Bubier et al. functional analysis and comparative biology in the gene ontology (GO) by Richardson and Bult and Drabkin et al. and a concluding paper by Schriml and Mitraka on disease ontologies.

This special issue on Informatics and Integrative Genomics exhorts the importance of informatics in mouse genetics. The collection of articles in Parts 1 and 2 demonstrates the breadth and depth of extraordinary developments in data capture, dissemination, analysis and integration of mouse data. In addition, they highlight the anticipated growth in data, we can expect as mouse functional genomics contributes to the ‘big data’ era. This rapid growth in data provides numerous opportunities to seek novel and translational insights into the genome and gene function.

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