

# Sydney Summer School in Pathogen Genomics and Global Health

## Program

**11-15 February 2019**

Venue: Nanoscience Hub, The University of Sydney (Camperdown Campus)

### Monday, 11 February 2019

**12.00-13.00** Registration – (Learning Studio 4003)

**13.00-13.10** Welcome and introduction to the course

#### Module One Introduction to microbial genomics

**13.10-15.00** Masterclass 1: Microbial genomes and genome sequencing  
*Dr Rebecca Rockett and Dr Verlaine Timms (CIDM-PH, MBI, University of Sydney)*

**15.00-15.15** Afternoon Tea

**15.15-16.00** Informatics Review 1: CLC Genomics Workbench  
*Dr Rebecca Rockett, Dr Elena Martinez (CIDM-PH, MBI, University of Sydney)*

**16.00-17.00** Exercise 1: Identification of the taxonomic position of viruses and bacteria from genomic data  
*Dr Rebecca Rockett (CIDM-PH, MBI, University of Sydney)*

### Tuesday, 12 February 2019

#### Module Two Genomics and evolution of drug resistance

**9.00-10.00** Masterclass 2: Prediction of drug resistance and its clinical relevance  
*Prof Jon Iredell (CIDM-PH, WIMR, University of Sydney)*

**10.00-11.00** Masterclass 3: Plasmid-mediated antibiotic resistance and tolerance  
*Dr Nouri Ben Zakour (WIMR, University of Sydney)*

**11.00-11.30** Morning Coffee

**11.30-12.30** Informatics Review 2: ABC of high performance computing  
*Dr Ranjeeta Menon and Dr Nathan Bachmann (CIDM-PH, MBI, University of Sydney)*

**12.30-13.30** Lunch

**13.30-15.30** Exercise 2: Inference of drug resistance in bacteria  
*Dr Elena Martinez (CIDM-PH, MBI, University of Sydney)*

**15.00-15.30** Afternoon Tea

**15.30-17.00** Exercise 3: Transcriptional profiling  
*Dr Elena Martinez (CIDM-PH, MBI, University of Sydney)*

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## Wednesday, 13 February 2019

### Module Three Genomics-guided public health surveillance

<b>9.00-10.30</b>	Masterclass 4: Phylogenomics of emerging pathogens <i>Prof Simon Ho (School of Life &amp; Environmental Sciences, University of Sydney)</i> <i>Dr Sebastián Duchêne (Bio21 Institute, University of Melbourne)</i>
<b>10.30-11.15</b>	Masterclass 5: Interpretation and integration of genomic and clinical data <i>Prof Vitali Sintchenko (CIDM-PH, MBI, University of Sydney)</i>
<b>11.15-11.40</b>	Morning Coffee
<b>11.40-12.30</b>	Masterclass 6: International, national and regional surveillance networks <i>Dr Matthew O'Sullivan (NSW Health Pathology, University of Sydney)</i>
<b>12.30-13.30</b>	Lunch
<b>13.30-14.30</b>	Informatics Review 3: Visualisation of multi-dimensional clinical and genomics data <i>Dr Alicia Arnott (MBI, University of Sydney)</i>
<b>14.30-15.30</b>	Exercise 4: Deciphering transmission pathways (Galaxy pangenome pipeline) <i>Dr Rosie Sadsad (Sydney Informatics Hub, University of Sydney)</i>
<b>15.30-16.00</b>	Afternoon Tea
<b>16.00-17.00</b>	Exercise 5: Detection of point source outbreaks <i>Dr Qinning Wang (CIDM-PH, NSW Health Pathology)</i>

## Thursday, 14 February 2019

### Module Four Genomic data in clinical and public health context

<b>9.00-9.45</b>	Masterclass 7: Evolution of genomes under vaccine pressure <i>Prof Ruiting Lan (University of New South Wales)</i>
<b>9.45-10.30</b>	Seminar: Quality management in the genomics laboratory <i>Dr Rebecca Rockett (CIDM-PH, MBI, University of Sydney)</i>
<b>10.30-11.00</b>	Morning Coffee
<b>11.00-12.00</b>	Informatics Review 4: Analysis of core and accessory genomes <i>Dr Verlaine Timms (CIDM-PH, MBI, University of Sydney)</i>
<b>12.00-13.00</b>	Exercise 6: Genome mapping, assembly and characterisations (in small groups) <i>Dr Verlaine Timms and Dr Rajat Dhakal (CIDM-PH, MBI, University of Sydney)</i>
<b>13.00-14.00</b>	Lunch
<b>14.00-15.00</b>	Transfer to Westmead

**15.00-17.00**

**Visit to NSW Public Health Pathogen Genomics Unit at the Centre for Infectious Diseases and Microbiology, NSW Health Pathology and Westmead Hospital**  
Station 1: DNA Extraction and Quantification (Anup Patel and Winkie Fong), Station 2: Library Preparation (Rajat Dhakal and Verlaine Timms), Station 3: Sequencing (Chayanika Biswas and Rebecca Rockett), Station 4: FastQ files' handling and QC procedures (Elena Martinez and Ranjeeta Menon), Station 5: Synthesis with epidemiological data (Daneeta Hennessy and Qinning Wang)

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**Friday, 15 February 2019**

**Module Five Metagenomics and culture-independent sequencing**

<b>9.00-10.00</b>	Masterclass 8: Metagenomics <i>A/Prof Aaron Darling (The iThree Institute, University of Technology Sydney)</i>
<b>10.00-11.00</b>	Masterclass 9: Pathogen discovery from meta-transcriptomics data <i>Dr John-Sebastian Eden (WIMR, University of Sydney)</i>
<b>11.00-11.30</b>	Morning coffee
<b>11.30-12.15</b>	Exercise 7: Analysis of culture-independent metagenomic data <i>Dr Nathan Bachmann and Dr Rebecca Rockett (CIDM-PH, MBI, University of Sydney)</i>
<b>12.15-13.00</b>	Informatics Review 5: Genome-wide association studies <i>Dr Ranjeeta Menon (CIDM-PH, MBI, University of Sydney)</i>
<b>13.00-13.45</b>	Lunch
<b>13.45-16.00</b>	Presentations from participants (Exercise 6 cont.)
<b>16.00-16.30</b>	Closing remarks and evaluation
<b>17.00</b>	<b>Reception and networking</b>

### Learning Outcomes

An advanced understanding of the theoretical bases of pathogen genomics, including the application of population genomics to public health and clinical microbiology;

After completing this course, participants should be able to:

- Understand the different file formats related to genome sequencing data
- Map sequencing reads to a reference genome
- Identify genomic differences between pathogens
- Construct phylogenetic trees to understand the recent evolution of pathogens
- Identify antibiotic resistance conferring mutations
- Identify changes in pathogen gene expression
- Understand clinical and public health relevance of genomic changes in bacteria and viruses.