

School of Biological Sciences Research Themes Update – December 2020

Six major cross-cutting research themes have emerged from extensive consultations and have been agreed by the Council of the School of the Biological Sciences. They are designed to provide integration across the School, encourage new conversations and enhance interdisciplinary networking critical for major innovation.

Molecules and Cells: The Building Blocks of Life: Control of cell function from molecules to tissues including protein synthesis, signalling pathways, membrane and structural biology, cell-cell communication, drug interactions, cancer.

Infection and Immunity: The biology of infection and immunity at the individual and population levels across the plant and animal kingdoms including diagnosis, pathogenesis, vaccines, antimicrobials, antibiotic resistance using a one health approach to tackle zoonotic and vector borne communicable diseases.

Neuroscience, Psychology and Behaviour: The biology of the nervous system from the level of the individual cell through neural circuits and pathways to integrated function of the brain and nervous system including vision, hearing, cognition, pain, memory, addiction, and social and group behaviour in human and other animal species across the lifespan in health, disease, injury and neurodegenerative conditions.

Functional and Evolutionary Genomics: The study of genomes and gene function across scales, from molecules to populations, and relationship with phenotype, health and disease: including chromosomes, gene regulation, epigenetics, chromatin and RNA biology, mathematical and computational genetics.

Reproduction, Development and Lifelong Health: Biological processes governing lifespan from reproduction through development to integrated physiological function and anatomy of tissue and organ systems including morphogenesis, embryogenesis, maternal-foetal interactions, ageing and senescence together with the interplay of genetic, physical and environmental factors in programming outcomes across plant and animal kingdoms. Stem cell and regenerative biology in health and disease.

Organisms, Evolution and Ecology: The biology, ecology and evolution of individuals, groups, populations, communities and ecosystems, and their conservation. The study of the origins, drivers and conservation of biodiversity. Multi-scale animal, plant and microbial sciences spanning molecular, cellular, organismal and population biology, plant-microbe and animal-microbe interactions and photosynthetic microbes. Integration of theory, mathematical principles and engineering with biological systems. Applications and impact on sustainability, global change, the development of biological engineering and food security.

These Themes, which are designed to overlap partially, can evolve and be refined further over time. Each theme can be subdivided into a small number of agile and flexible sub-themes to allow a sense of community amongst smaller groups of researchers with similar research goals, aligned to specific global challenges and funder/philanthropy strategic priorities. It is also clear that there is and will continue to be much cross-Theme, and cross-School, activity that should be strongly recognised.

First steps towards embedding the Themes in the School will involve asking University Teaching Officers (UTOs) and other Research Group Leaders to choose Theme membership (“full membership” of 1-2 Themes, plus “affiliate membership” of additional Themes if appropriate; “associate membership” by Group Leaders from outside the School will also be possible). At the same time, we will seek expressions of interest for Theme leadership roles from across Departments and career stages. Elaborating theme titles, descriptions, and philanthropic and industrial engagement objectives (spring-summer 2021) will be followed by website launches and planning of events programmes (2021-22 academic year).