

Environmental Omics Bioinformatics Facility

Background

Omics covers the complete make-up of the building blocks of life, at the genetic, protein and mRNA levels, and products of metabolism. It includes the assimilation, evaluation and interpretation of the data using bioinformatics. In recent years omics technologies have advanced markedly; many more samples are processed to high resolutions and produce vast amounts of data. By 2016 omics will include vast surveys of entire communities and up to the ecosystem scale. The emerging data challenge requires access to HPC and skilled technical support, for analyses, training, and the curation and management of omics data for the UK environmental sciences community.

Access to the latest omics technologies, including measurement and informatics, will enable the UK to retain its position at the cutting edge of environmental genomics, developed through earlier RCUK investments. These earlier investments have transformed the way in which many aspects of the ecology and evolution of life are understood, as well as providing regulatory tools. To tackle priorities in the areas of biodiversity and environment/health, major investment will be required in high-throughput analysis of key organisms and community genetic codes, high end computing services, data analysis, storage and management.

Existing capability

There is a national and global capacity for running samples and generating raw data. High-throughput molecular data generation is provided through the NERC Biomolecular Analysis Facility (NBAF), giving access to a range of omics analytical hardware including 'second generation' DNA sequencing technologies. However, without the ability to integrate individually generated data sets across habitats and time, these can provide only snapshots rather than integrated science of broader relevance.

New capability

The facility will provide the environmental science community with expertise and support via an internationally recognised centre of excellence for environmental omics. It will support the analysis and interpretation of bio-molecular data, linking with other data generation and analysis activities. It will be a focal point for innovations at the interface of environmental and molecular sciences, and will contribute extensively to the UK's ability to determine functional biological responses and their relevance in different environments. It will ensure that omics data are fully exploited via a dedicated 'hub' for data aggregation, inter-operation and analysis.

The facility will have a major impact on the UK's capability in Metagenomics - a means of defining the genetic make-up of communities in a given environment, applied to soil, deep earth, marine, freshwater or atmospheric environments. It will also help to identify characteristic and novel patterns of flora and fauna, which could evolve into 'indicators' of functional status and resilience. Such studies will help to explain how life evolved and detail at the biotic and abiotic levels the various nutrient cycles operate under different conditions. Subsequently advances process-understanding will help to parameterise climate models, hence reduce uncertainty and improve predictions of climate change. These will in turn contribute to improved insights into how changes in the water cycle will impact on societies, including the security of food supply, food production and the environmental dynamics of some pathogens.

The new facility will act as a UK node in an international network and will drive pioneering work in the field of data-sharing, data-standards and ontology development, and foster community working.

Funding & partnerships

The facility will work closely with the European Bioinformatics Institute and the proposed European Life-Science Infrastructure for Biological Information (ELIXIR), with the need for environmental scientists to work with heterogenous, natural systems often giving rise to quite different requirements. It will assist the research community to identify optimal service providers for data generation by building strong ties with the growing capability of Asia and the USA in sequencing and omics technologies.

Funding will be sought from the Large Facilities Capital Fund.

Potential cost	£30 million
Estimated operational date	2016

Information

www.nerc.ac.uk