

# Research in the biomedical sciences

## An overview of JISC activities

Briefing Paper

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The life sciences are experiencing a period of unprecedented change. The sequencing of the human and other genomes brings many new opportunities including personalised medicine, the identification of genetic factors in disease, rapid targeted drug discovery and the complete biological understanding of whole organisms and populations.

To achieve this vision, however, simple and manageable infrastructures are needed to provide completely secure access to vast, changeable, diverse and proliferating data sets. JISC is funding work to develop technologies underpinning such infrastructures.

### Network infrastructure

High throughput techniques now allow whole genomes to be sequenced, analysed and annotated at a previously unimaginable rate. The JISC-funded Joint Academic NETwork (**JANET**) supports the transfer of biomedical data at high and reliable rates. A high speed optical network for moving large amounts of data between source and computation has recently been incorporated into JANET.

### Data repositories

Biomedical research data must be curated and disseminated. JISC is funding the **Digital Curation Centre** which is working to secure the long-term preservation of digital material. JISC is also playing a role of international significance in the move towards making results of research freely available to readers (Open Access). It is one of nine funders of UK PubMed Central, an open access repository of UK biomedical research papers, and supports a **Repositories and Preservation** programme which is addressing the storage of data, as well as documents, in institutional and subject-based repositories. The **National Centre for Text Mining**, a part JISC-funded service, is developing text mining methods aimed specifically at extracting new information from the rapidly increasing biomedical research literature.

Other data resources are often required in biomedical research, such as census and geographical data for epidemiology. Here again JISC is directly supporting the needs of the community through the national Manchester Information and Associated Services (**MIMAS**) and Edinburgh Data and Information Access (**EDINA**) data centres.

### Computational infrastructures

Biomedical researchers need access to large scale computational infrastructures to compare protein or nucleotide sequences, for example, or discover potential drug binding sites. JISC is jointly funding the **National Grid Service** which enables researchers to access large scale computational clusters and databases held at different sites, including the UK's High Performance Computing facilities. Several JISC-funded projects have addressed the needs of biomedical researchers in accessing these resources with the

### Heart and cancer modelling

Integrative Biology (IB), a major e-science project funded by the Engineering and Physical Sciences Research Council, has developed a grid infrastructure to enable biomedical researchers all over the world to collaborate over the development and use of complex models of the electrophysiological function of the heart and of cancer tumour formation and growth. The infrastructure uses the JISC-funded National Grid Service to provide researchers with access to a wide variety of distributed resources including high-performance computers, databases and visualisation systems. During infrastructure development, we needed to understand how the IB scientific community works, collaborates and uses these resources. Barriers to faster progress had to be identified. The JISC-funded IB Virtual Research Environment project addressed these social aspects and resulted in the use of portal technologies to support the researchers' daily work. This facilitated their research enormously, allowing them to use advanced electrophysiological models of the heart to investigate new and challenging research questions, such as how cardiac arrhythmias arise and how to terminate them efficiently using electric shocks.

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[www.vre.ox.ac.uk/ibvre](http://www.vre.ox.ac.uk/ibvre)

aim of building a service-based computational infrastructure that is easy for them to use.

### Secure access

In biomedical research, data security is crucial. It is important to ensure that only the appropriate people can access and use the right data sets in the right context. JISC enables simple, secure, single sign-on to resources and data through the **UK Access Management Federation**. In this model, when attempting to access a protected resource, users are re-directed to their home sites to authenticate. Their authenticated credentials (roles in projects, licences they possess etc.) are then released to remote service providers and used to enforce site-specific security policies. This model fits well with post-genomic biomedical research where access is required to multiple independent resources of data, often through portals and targeted bioinformatics applications.

Such research involves collaboration across disciplines and organisations. The JISC-funded **Virtual Research Environments (VRE)** programme offers one model of user-oriented biomedical research with tailored e-research environments. The JISC-funded **Access Grid Support Centre** offers direct user collaboration through advanced video conferencing facilities and an associated support network.

See overleaf or go to [www.jisc.ac.uk](http://www.jisc.ac.uk) for more information on the programmes and projects mentioned above.

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## Information and Resources

### Services

JISC services provide facilities and advice to researchers and teachers in further and higher education. Some of these services are co-funded with the Higher Education Funding Council for England, the Biotechnology and Biological Sciences Research Council and other Research Councils.

### Network

- **JANET** [www.ja.net](http://www.ja.net)  
the UK's education and research network. JISC sets the strategy and provides funding for JANET. Associated services include JISCmail, JANET roaming and JANET video conferencing

### Collections

JISC negotiates on behalf of UK institutions to make collections of important material available at a reduced price. The collections can be accessed via JISC Collections or the JISC-funded data centres, MIMAS at Manchester University and EDINA at Edinburgh University.

- **JISC Collections** [www.jisc-collections.ac.uk](http://www.jisc-collections.ac.uk)  
eg BioMed Central; BIOSYS Reviews
- **EDINA** [www.edina.ac.uk](http://www.edina.ac.uk)  
eg Serial Union Catalogue (SUNCAT); Digimap Collections; CAB abstracts in agriculture, forestry and aspects of human health
- **MIMAS** [www.mimas.ac.uk](http://www.mimas.ac.uk)  
eg UK PubMed Central; Zetoc, the British Library's electronic table of contents; Intute Health and Life Sciences; Journal STORage (JSTOR) academic journals digital archives; Satellite Image Data Service

### Generic and e-science services

- **National Grid Service** [www.ngs.ac.uk](http://www.ngs.ac.uk)  
Provides access to grid computing facilities
- **Access Grid Support Centre** [www.agsc.ja.net](http://www.agsc.ja.net)  
Offers advice on using the Access Grid video conferencing facility for collaborative research
- **Digital Curation Centre** [www.dcc.ac.uk](http://www.dcc.ac.uk)  
Researches issues around data curation and promotes good practice
- **National Centre for Text Mining** [www.nactem.ac.uk](http://www.nactem.ac.uk)  
Provides text mining services for the academic community. The Representing Evidence For Interacting Network Elements (REFINE) project is developing text mining tools for systems biology
- **vizNET** [www.viznet.ac.uk](http://www.viznet.ac.uk)  
Supports researchers in the use of techniques for visualising data across a computing grid
- **OSS Watch** [www.oss-watch.ac.uk](http://www.oss-watch.ac.uk)  
Open Source Software Advisory Service

### Development

JISC funds research into and development of new ways of using Information and Communications Technology (ICT) in further and higher education and research.

- **Access management** [www.jisc.ac.uk/accessmanagement](http://www.jisc.ac.uk/accessmanagement)  
Projects under a number of programmes have developed new ways of providing controlled, secure access to digital resources based on Shibboleth technology. They include the GLASgow Implementation of Shibboleth (GLASS) and Dynamic Virtual Organisations in e-Science Education (DYVOSE) projects which showed how the technology can provide access to grids without compromising the fine-grained security needed for biomedical data
- **e-Infrastructure** [www.jisc.ac.uk/einfrastructure](http://www.jisc.ac.uk/einfrastructure)  
This programme is helping to develop the infrastructure needed for the use of advanced ICT methods in research, including grid security, services and tools and knowledge organisation and semantic services. Projects include: Shintau, enabling grid access via Shibboleth (see above)
- **Support for e-research** [www.jisc.ac.uk/eresearch](http://www.jisc.ac.uk/eresearch)  
Projects include: Collaborative Open Ontology Development Environment (CO-ODE) which is developing an integrated environment for ontology development for the life sciences
- **Virtual Research Environments** [www.jisc.ac.uk/vre](http://www.jisc.ac.uk/vre)  
This programme is developing frameworks to enable researchers to collaborate across boundaries in virtual organisations. Projects include: myExperiment to enable researchers to share and discuss scientific experiments; VRE to support the Integrative Biology Research Consortium
- **Repositories and Preservation** [www.jisc.ac.uk/reppres](http://www.jisc.ac.uk/reppres)  
This programme supports institutions to set up and run their own repositories. Projects include: Complex Archive Ingests for Repository Objects (CAIRO), developing a tool to ingest digital material into a preservation repository; Robot-generated Open Access Data (ROAD); Intute Repository Search Facility
- **Digitisation** [www.jisc.ac.uk/digitisation](http://www.jisc.ac.uk/digitisation)  
JISC is continuing a programme of digitising valuable scholarly resources which will enter the JISC Collections portfolio. Projects include: medical journal back files in collaboration with the Wellcome Trust
- **Portals** [www.jisc.ac.uk/portals](http://www.jisc.ac.uk/portals)  
JISC is developing the use of portals which provide a common point of access to widely distributed information on a topic. Projects include: Go-Geo! Geodata Portal

### The Information Environment

JISC has a large portfolio of development programmes and projects aimed at delivering an Information Environment which will enable seamless access to the information academics need for research, teaching and learning and the tools they need to process that information and collaborate with others.  
[www.jisc.ac.uk/informationenvironment](http://www.jisc.ac.uk/informationenvironment)