

# Facilities and Technologists

## SULSA's infrastructure investments fall in 4 broad areas:

- » Next Generation DNA Sequencing
- » Proteomics and Metabolomics
- » Biological and Biomedical imaging
- » Drug discovery

SULSA is providing researchers with the state-of-the-art technologies they need to remain at the forefront of their fields. More than 17 research facilities across Scotland are supported by SULSA and all are open to researchers based at any Scottish university (at local-user rates). SULSA has also expanded research capabilities by creating positions for 25 highly trained technologists, who are providing expert technical support, training facility users, and developing new tools and methodologies.



SULSA OMX Microscope Facility (See over page)

## Next Generation DNA Sequencing

» SULSA researchers benefit from a fast, low-cost next generation DNA sequencing and analysis service provided by The Gene Pool at the University of Edinburgh and the Sir Henry Wellcome Functional Genomics Facility at the University of Glasgow.

The Gene Pool offers gigabase-scale DNA sequencing using Illumina Solexa and Roche 454 platforms, with a range of data-analysis services provided by a dedicated SULSA bioinformatician.

The Gene Pool also offers a low-cost Illumina digital transcriptomics (Illumina-DT) service that is supported by a SULSA technologist. A SULSA bioinformatics specialist based at the Sir Henry Wellcome Functional Genomics Facility is available to assist SULSA users with their Illumina-DT data analysis.

### Contact:

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## Proteomics and Metabolomics

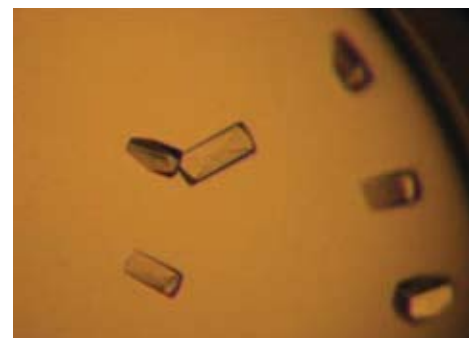
### Scottish Structural Proteomics Facility

» The Scottish Structural Proteomics Facility (SSPF) is a collaborative high throughput structural genomics project involving the Universities of St. Andrews, Dundee, Glasgow and Warwick.

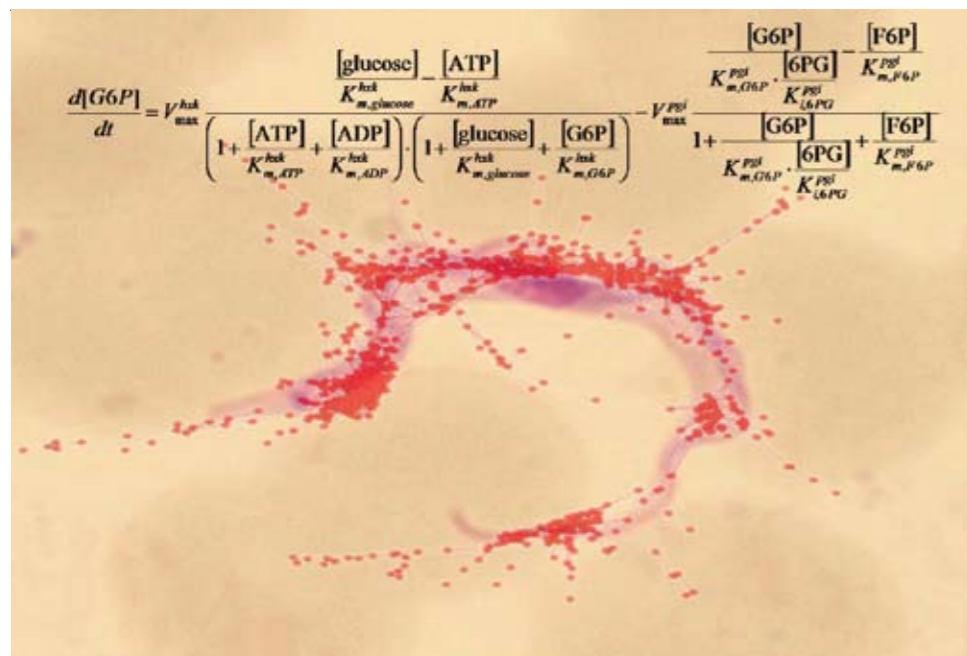
The facility, which is run on a collaborative basis, has an excellent track record of converting gene sequences into structural data, and has experience with both membrane and soluble proteins. SSPF staff have expertise in cloning, expression, purification and crystallisation, and new subjects for analysis can enter the pipeline with anything from a gene through to pure protein or even a crystal.

SULSA has supported the development of the SSPF by contributing to the enhancement of equipment and by providing funding for four SULSA technologists within the facility.

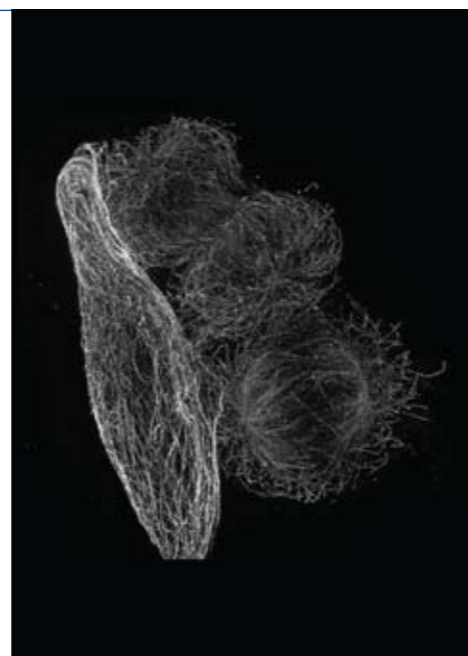
Contact Secretary@sspf.ac.uk



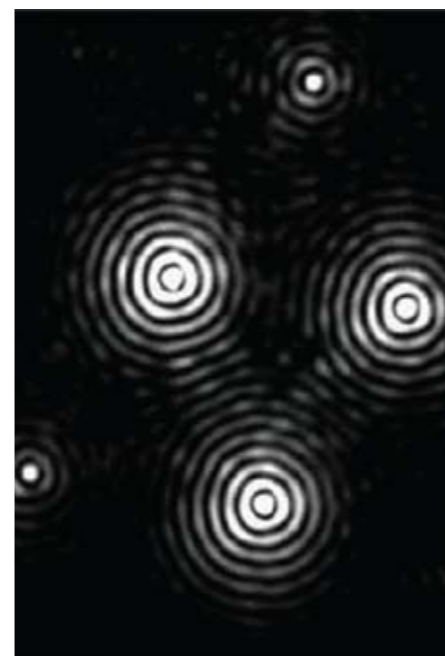
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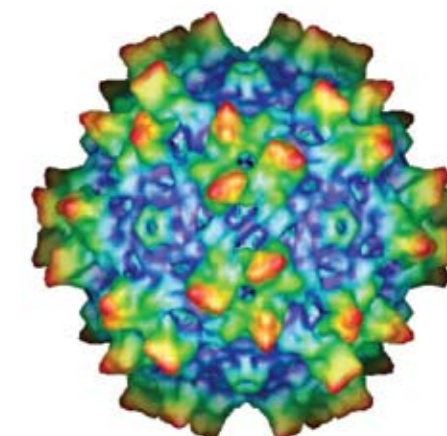
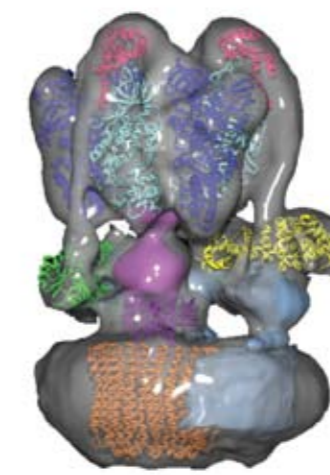
Scottish Metabolomics Facility



OMX Microscope



Bioworkstation



## Edinburgh Protein Production Facility

» The Edinburgh Protein Production Facility (EPPF) provides researchers with access to state-of-the-art equipment and expertise for rapid protein production.

The SULSA-supported EPPF labs, located at the University of Edinburgh, include a purification suite, an extensive core column and chromatography resin library, high throughput robotic cloning and screening facilities, incubation areas, a tissue culture suite, and a set of core wet labs with access to automated cell lysis, centrifugation, and analysis instrumentation.

Users of the EPPF benefit from the expertise of facility staff, including a SULSA technologist, who are highly trained in protein expression and purification.

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## Biophysical Characterisation Facility

» The SULSA-supported Biophysical Characterisation Facility (BCF) at the University of Edinburgh offers state-of-the-art equipment for crystallisation robotics, ITC, surface plasmon resonance, NMR, light scattering and fluorescent spectroscopy.

Technical support is provided by expert BCF facility staff, including two SULSA technologists.

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## Scottish Metabolomics Facility

» Metabolomics is a relatively new approach in biological and biomedical research, in which thousands of metabolites that represent the dynamic status of a living system are measured simultaneously. Environmental perturbations or genetic changes are reflected in changes in metabolite levels. Metabolomics is, therefore, a key tool in systems biology and systems medicine.

The SULSA-funded Scottish Metabolomics Facility (ScotMet), is a state-of-the-art facility combining mass spectrometry, separations technology and bioinformatics. It is a collaboration between the Universities of Glasgow and Strathclyde that builds on relevant, long-standing expertise at these centres.

ScotMet aims to provide a world-class facility staffed by experts in metabolomics, working closely with leaders in the fields of genomics, proteomics and bioinformatics, who can provide training, sample analysis and collaboration on experimental design and data handling.

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## Biological and Biomedical imaging

### SULSA OMX microscope

» The SULSA OMX microscope at the University of Dundee is one of only seven OMX structured-illumination microscopes in the world.

The technology used by OMX can generate images with a resolution approximately twice

that which is normally possible - to 100nm in xy and 200nm in z. In real terms, this means that biological structures that were once indistinguishable from one another can now be identified as separate entities.

Two main imaging protocols are available: fast live 3D imaging and 3D structured illumination microscopy. These functions allow users to explore the spatial and temporal elements of biological processes with greater resolution than ever before. The SULSA OMX is open to users at any Scottish University and is supported by a dedicated SULSA technologist.

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### Electron Cryomicroscopy Facility

» Essential cell functions depend on the interplay of specific proteins, RNA and DNA in large complexes at defined locations within the cell. By their nature, many of these complexes are scarce, flexible, or of variable composition, which renders them difficult targets for structural studies by X-ray crystallography.

Electron cryomicroscopy is a high resolution, single molecule approach to determine the structure of macromolecular complexes. Specimens are imaged at cryogenic temperatures without fixing or staining, thus capturing macromolecular assemblies in their native state. The method can be used to study temporal changes in the structure and composition of complexes, and generates near-atomic resolution models to inform subsequent studies of molecular function.

The SULSA-supported Electron

Cryomicroscopy Facility at the University of Edinburgh will provide access to, and training and technical support for:

- » Sample preparation
- » Electron microscopy and cryomicroscopy on a field emission gun electron microscope equipped with a state-of-the-art detector
- » Basic techniques in single particle image reconstruction

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### Centre for Live Cell Imaging and Molecular Physiology

» SULSA is supporting the establishment of a multidisciplinary live-cell imaging and molecular physiology facility based at the University of Aberdeen. From 2010 the facility will provide Scottish researchers with the tools to study molecular dynamics, intermolecular interactions, and intracellular signalling mechanisms in live organisms.

The facility will be supported by a dedicated SULSA technologist and will offer the following capabilities:

- » electrophysiology recordings on a multi-cell, patch-clamp platform
- » single channel recordings
- » on-site cell culture capability and live-cell imaging using 2-photon microscopy
- » histochemical facility
- » expertise in correlated imaging and electrophysiology experiments
- » guidance and training in the

above technologies  
» specialized technical support for in vivo imaging

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### SULSA Imaging Technologist

» The SULSA Imaging Technologist at the University of Glasgow will support the biological imaging community within Scotland by:

- » providing technical advice and support on a range of imaging systems including two-photon confocal microscopy, whole organ/body fluorescence/luminescence imaging and structured light applications
- » writing customised open source software for image analysis for university laboratories across Scotland
- » coordinating and the teaching courses on computational techniques associated with imaging

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### Bioworkstation

» The Bioworkstation at the University of St Andrews is an interdisciplinary collaboration between physicists and biologists that has led to the development of novel cellular manipulation and imaging capabilities, including phototransfection of cells, optical sorting and tweezing of cells,

and single-molecule imaging techniques. The SULSA Biophysical Cell Technologist will contribute to the development of these cutting-edge technologies and make them available to researchers at SULSA universities.

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### Preclinical PET imaging facility

» The SULSA-supported preclinical positron emission tomography (PET) facility at the University of Aberdeen offers tracing of pharmaceuticals in small animal models and can be accessed by researchers based at SULSA institutions.

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### IVIS Spectrum Imager

» A system for non-invasive imaging of bioluminescent and fluorescent reporters in living animals is available at the University of Glasgow. The IVIS Spectrum imager can be used for in vivo monitoring of disease, cell migration and gene expression. This SULSA-supported facility is supported by a dedicated SULSA technologist and is open to users across SULSA.

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Image courtesy Caliper Life Sciences



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## Aberdeen Transgenic Facility

» Human diseases can be associated with genetic alterations including gene deletions, point mutations, polymorphisms and gene duplications. The Aberdeen Transgenic Facility can assist SULSA researchers to model human genetic diseases via gene targeting or transgenic approaches. Transgenes can be plasmid-based constructs or artificial chromosomes. A dedicated SULSA technologist is available to provide assistance at various levels including bioinformatics, construct design, micromanipulations, and phenotypic analyses.

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## Drug discovery

### Scottish Hit Discovery Facility

» Researchers at SULSA universities can access industry-standard screening capabilities through collaboration with the SULSA-supported Scottish Hit Discovery Facility (SHDF) at the University of Dundee. The SHDF specialises in medium and high throughput screening of small molecule libraries against both molecular target and cell-based assays, and provides quality-controlled starting points for medicinal chemistry programmes.

The purpose-designed laboratories boast industry-standard equipment and software, with all standard screening technology outputs for isolated target and cell-based screening represented. The current screening capabilities of the unit are based around a series of compound sets amounting to a total of >90,000 compounds. These include known bioactive sets, gene family or biology focused sets and diversity sets. The large volume of data generated is managed within a secure, queryable database using purpose designed tools that link biological data to compound structure.

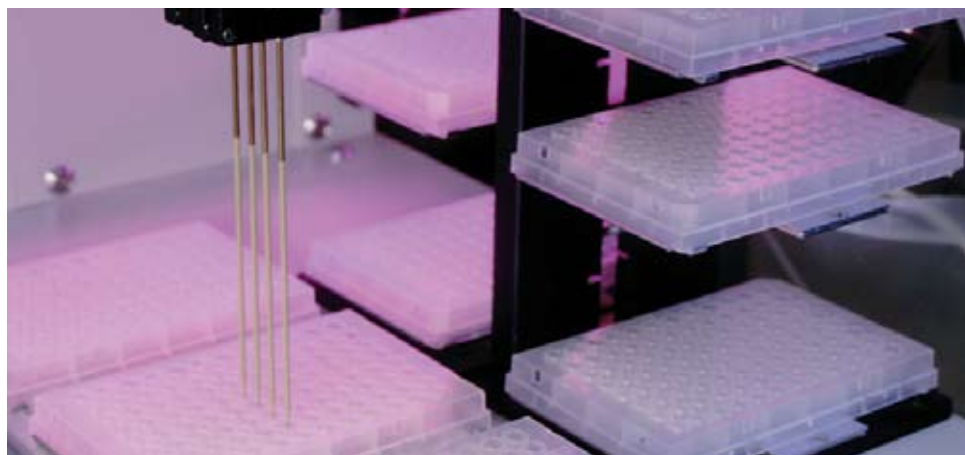
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### Drug Discovery Portal

» The Drug Discovery Portal (DPP), based at the University of Strathclyde, is a centralised resource for both chemists and biologists to work in tandem to enhance their drug discovery efforts.

The DPP matches structures provided by chemists to targets provided by biologists, and uses advanced in silico screening for hit identification. The DPP also offers database



creation and secure storage of proprietary molecules, virtual screening, druggability filtering and molecular docking analysis.

DPP users can also access a proprietary collection of compounds synthesised by chemists, an extensive natural products collection, and a commercial collection from commercial suppliers.

SULSA supports the DPP by funding an experienced researcher who works within the facility.

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### Compound libraries

» SULSA is supporting the development of unique compound libraries, which will be accessible to SULSA researchers for screening assays.

The Strathclyde Natural Products Library comprises 5120 extracts from around the world. With coverage of 90% of plant families, it is one of the most biodiverse (and hence chemically diverse) collections available for screening. The library can be accessed through collaboration with Strathclyde Innovations in Drug Research (University of Strathclyde), which offers facilities for high throughput screening, fractionation of hit extracts, isolation of active compounds, and determination of structures.

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» The Aberdeen Natural Products Library Facility will make compound libraries available for screening; these will include a purified extract library and a pure compound library. The compounds will be produced by the established Marine Biodiscovery Centre in Aberdeen, which has considerable expertise in obtaining extracts and pure compounds from marine biota. The libraries will be available to researchers at SULSA

institutions for testing of diverse biological targets using various high throughput screening platforms.

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### SULSA High Throughput Screening Fund

» Several Scottish universities offer excellent facilities and expertise for high throughput small molecule and biologics screening. But investigators can struggle to find sources of funding for screening, particularly when their research is at an early stage. The SULSA High Throughput Screening Fund was established to help bridge this gap.

The choice of facility or laboratory for running the proposed screen is at the discretion of the applicant. Successful 2008 projects – seven projects in total, from six different universities – tackled diverse biological targets for a wide range of diseases, including cancer, inflammatory disease, pain associated with nerve damage, trypanosomiasis (sleeping sickness) and pneumococcal infection.

The application form, guidelines and dates for the next round of applications are available on the SULSA website.

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