

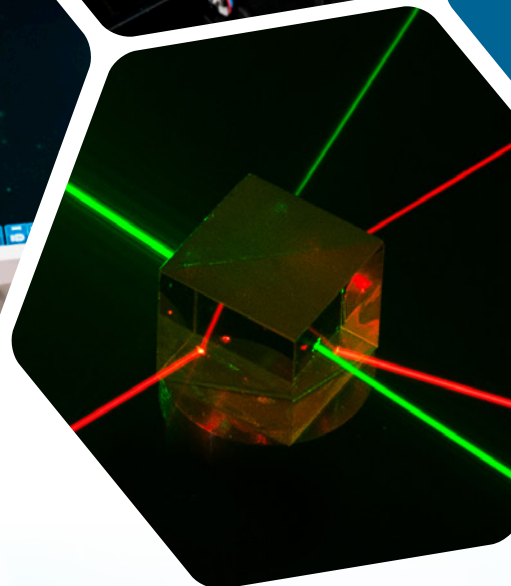


BF

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Supporting
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Research



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OF OULU



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ABOUT BIOCENTER FINLAND

The mission of Biocenter Finland is to offer open-access services to cutting-edge technologies and support ground-breaking life science and biomedical research, innovation and industry-academia collaboration throughout Finland. Biocenter Finland promotes collaboration among stakeholders by combining the local expertise within universities into a nation-wide knowledge base, and coordinates investments from competitive sources, while the personnel costs are financed by host universities.

The infrastructure services are organized into 15 Technology Platforms based on assessment by the international Scientific Advisory Board. The current platforms are BioImaging, Biobank technologies, Bioinformatics, Drug discovery & Chemical biology, Genome-wide methods, FinGMice, Metabolomics, National plant phenotyping, Non-mammalian model organisms, Proteomics, Real-time imaging, Single-cell omics, Stem cells & Genome editing, Structural biology and Viral gene transfer & Cell therapy, that are composed of nationally distributed nodes with complementary expertise.

The role and importance of life sciences in the society have significantly increased and the technological developments are providing direct implications in health care, environment, agriculture, innovations and industry. Annually the Biocenter Finland services are used by more than 2000 research groups from universities, research institutes, hospitals and industry in Finland and abroad. The quality of Biocenter Finland supported research is attested by high numbers of awardees of the most competitive programs such as ERCs, Academy Finland Professors and Centers of Excellence, and appr 1300 publications annually. These services have also been critical for numerous innovations and their translation into companies and products as well as dozens of collaborations with major international companies.

Biocenter Finland was selected again for the Finland's Strategy and Roadmap for Research Infrastructures 2021-2024 with excellent evaluation. The major national coordination role on life science infrastructures forms strong basis for close interaction with the Finnish nodes of the European research infrastructure projects (ESFRI) BBMRI, EATRIS, ELIXIR, EU-OpenScreen, EuroBioImaging, Infrafrontier, Instruct.

For the past 15 years Biocenter Finland has systematically developed the life science infrastructure services and is well positioned to support and facilitate science tackling the current and emerging questions and challenges.



Olli Silvennoinen
Director of Biocenter Finland

CONTENTS

- 2** About Biocenter Finland
- 4** Biobank technologies
- 5** BF Biolmaging
- 6** Drug discovery & chemical biology
- 7** Genome-wide methods
- 8** Metabolomics
- Mouse models – FinGMice
- 9** Non-mammalian model organisms
- 10** Plant biological imaging
- 11** Protein-proteome network
- 12** Real-time imaging
- 13** Single-cell –omics
- 14** Stem cells & Genome editing
- Structural biology
- 15** Viral gene transfer & cell therapy

Technology Platform	Host universities and Nodes				
	T A U	U H	U E F	U O	U T U Å A U
BF Biolmaging	●	○	●	●	●
Biobank technologies		○		●	
Bioinformatics	●	●	●	●	○
Drug discovery & Chemical biology		○	●		●
Genome-wide methods	●	○			●
FinGMice		●	●	○	●
Metabolomics		○	●		●
Plant phenotyping		○	●		
Non-mammalian model organisms	○	●			●
Proteomics	○	●		●	●
Real-time imaging		○			
Single-cell omics		○	●		●
Stem cells & Genome editing	●	○	●		●
Structural biology		○	●	●	●
Viral gene transfer & Cell therapy	●	●	○	●	●

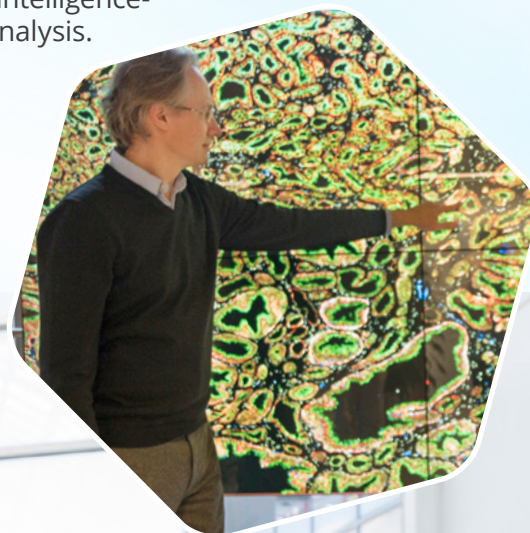
The Biocenter Finland technology platforms and local nodes providing the open access services at the host universities. The white dots indicate platform coordination. TAU Tampere University, UH University of Helsinki, UEF University of Eastern Finland, UO University of Oulu, UTU University of Turku, and ÅAU Åbo Akademi University.

Biobank technologies

The main goal of the technology platform is to support incorporation of digital microscopy in medical projects related to biobanks, tissue analytics and studies of cell and tissue biomarkers. High-resolution, high-throughput microscopy scanners are available for digitization of histological and cytological samples

Both brightfield and fluorescent scanning can be performed and scanned whole-slide images can be delivered through online cloud-based microscopy platforms or on disk.

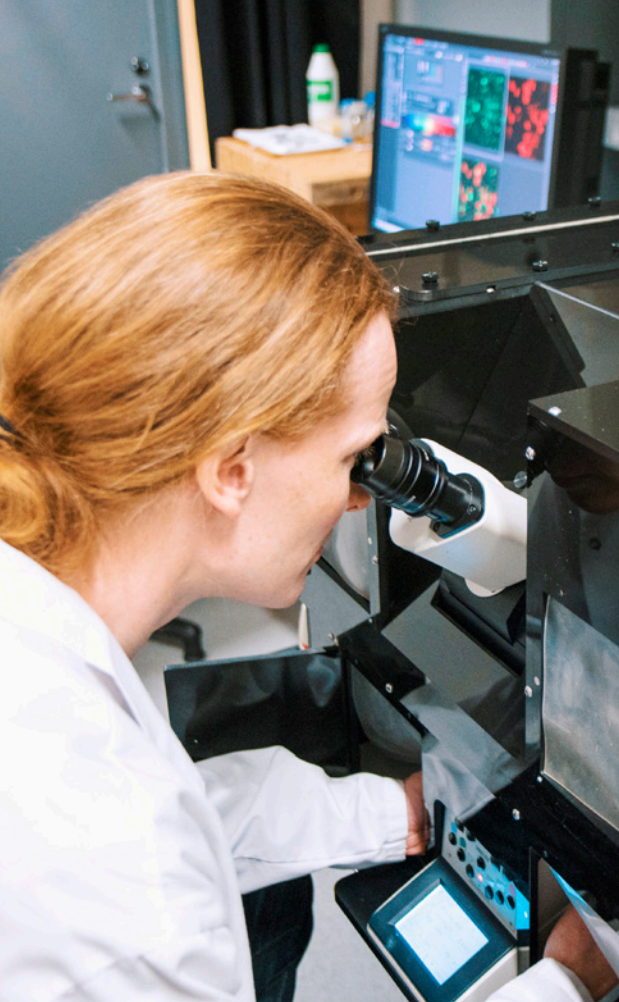
The consortium also provides know-how regarding phenotypic characterization of tissue samples and for automated computer-vision analysis. The platform has been improved further to enable seamless integration of whole-slide images with biobank samples, clinical databases and computational environments for artificial intelligence-supported analysis.



Bioinformatics

Bioinformatics plays a central role in exploiting the high-quality Finnish biodata and novel measurement technologies. As the modern biotechnologies produce increasing amounts of multidimensional data, life sciences have become increasingly dependent on computational methodologies and software to translate the data to knowledge and medical benefits.

The Bioinformatics platform provides the expertise and tools needed for the analysis of various omics and imaging data and data integration. In addition, the platform provides support for bioinformatics tools and data management, as well as training and consultation.



BF BioImaging

Biological imaging ranges from the visualization of molecules, cells, and tissues to the in-vivo imaging of entire animals. Challenging biological questions are continuously being met by the development of new imaging methods and markers. Our Biological Imaging platform encloses this wide range using electron and light microscopy techniques.

The Biological imaging platform operates with nationally coordinated task division, where complementary state-of-the-art technologies are featured in its five nodes (Helsinki, Turku, Tampere, Oulu and Kuopio), with integrated collaboration and unified policies on user access, quality control, and best practice. A common aim is also to facilitate data management, image processing and analysis, and software production.

The units of Helsinki, Turku and Oulu also form the Finnish Advanced Light Microscopy Node of the Euro-BioImaging research infrastructure. This multimodal service node focuses on five advanced technologies that are in high demand in Europe: super-resolution imaging, correlative light and electron microscopy, high-throughput microscopy, label free imaging, and mesoscopic imaging.

www.eurobioimaging.fi

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We are the trusted national partner to deliver infrastructure solutions and services for life science researchers.

Our services are available for academic research, education and training purposes in Finnish higher education institutions and in state research institutes. Tailored also for life sciences, we provide

- comprehensive scientific computing for simulations and data-analysis
- secure data management solutions
- versatile customer training in use of our services, used methods and practical IT skills.
- expert support to help you get the most out of our services.

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LUMI

One of the world's fastest supercomputers enables fight against pandemics and helps to resolve unforeseen research questions. The flagship supercomputer is hosted by the LUMI consortium.



ELIXIR is an intergovernmental organisation that brings together life science resources from across Europe. Through the international ELIXIR network you can collaborate and find, analyse and share data, exchange expertise, and implement best practices. Read more: elixir-europe.org

Drug discovery & chemical biology

The DDCB platform provides access to state-of-the-art technologies and expertise for chemical biology and early-phase drug discovery. Our aim is to facilitate the discovery of inhibitors to interesting targets, support proof-of-concept testing and bridge the gap between academic research and industrial interests to drug discovery.

We provide coordinated services in assay development and chemical screening from low-to high throughput with a broad range of technologies including the DDCB-developed drug sensitivity and resistance testing platform, antibacterial screening, virtual screening, chemoinformatics, and open access to a large national chemical collection. The DDCB platform is linked to the European infrastructure EU-OPENSREEN.

www.eu-openscreen.eu



Genome-wide methods

BF Genome-Wide Methods (GWM) technology platform provides a wide range of research services in genomics, gene expression and regulation, metagenomics and de novo genome studies. GWM platform is responsible for national coordination of related activities and continuously tests new technologies and optimises methods to provide customised services. Through a recent merger with BF Liquid Biopsies, GWM platform also gives specialised support in cancer genomics.

GWM platform members run core units located at the Universities of Helsinki, Tampere, and Turku. All units share an open access policy and welcome both academic and commercial users.

GWM platform redirects users to the core unit best-suited to each user's needs and balances workload between units to minimise user waiting time.

GWM platform works closely with other BF technology platforms and has especially strong links with BF Bioinformatics and BF Single Cell Omics.





Metabolomics

The Biocenter Finland Metabolomics Platform comprises of ViMU, FIMM-Meta, HiLIPID, TMC and BCK units, and offers complementary analytical services. ViMU offers plant metabolomics and metabolite profiling, targeted and non-targeted analysis of microbial metabolites, and analysis of drug metabolites and synthesis products. FIMM-Meta offers high-throughput targeted metabolomics and lipidomics analyses for various biological and clinical samples, with biostatistical analyses as an option, and customized tracer-based metabolic flux analyses. HiLIPID serves biosciences widely, from mechanistic biomedicine to ecology, and provides customized MS-based analysis of the composition or metabolism of lipids, fatty acids and lipid mediators.

The TMC offers a wide range of targeted and untargeted metabolomics/lipidomics assays as well as analysis of environmental chemicals, with focus on studies of human health and disease. Bioinformatics and integrative omics analysis is also available upon request. BCK focuses on LC-MS based metabolomics analysis with non-targeted metabolite profiling, as well as targeted, quantitative approaches for various sample types including biofluids, tissues and in vitro material.

Mouse models – FinGMice

Genetically modified (GM) mice are important study organisms to understand molecular basis of life and serve as precious models for human disease.

FinGMice integrates core facilities and service units involved in generation and analysis of GM mice in the universities of Oulu, Helsinki, Turku and Eastern Finland. Our aim is to provide services, enhance dissemination of knowledge in the field of GM mice and to strengthen the competitiveness of Finnish biomedical research.

National FinnDisMice research consortium established in 2020 focuses on modeling Finnish disease heritage in mouse. The goal is to facilitate understanding of molecular mechanisms that are causative for these rare diseases. Faithful recapitulation of disease-causing mutations and phenotypes in mice is essential for development of novel therapeutic strategies for these diseases.

Oulu unit serves as the Finnish node of the European Mouse Mutant Archive (EMMA), part of INFRAFRONTIER, the European Research Infrastructure for the generation, phenotyping, archiving and distribution of model mammalian genomes.

www.fingmice.fi, www.infrafrontier.eu



Non-mammalian model organisms

Based on conservation in cell physiology during evolution it is possible to use genetically tractable non-mammalian model organisms such as the fruit fly (*Drosophila melanogaster*) and zebrafish (*Danio rerio*) to study questions in life sciences. *Drosophila* is one of the most traditional genetic model organisms while the use of the zebrafish model has been growing steadily during the past decade.

Provided services include maintenance of the desired zebrafish and fly lines, hands-on guidance to create transgenic or mutant lines and annual training courses, for instance. Recently established or upgraded state-of-the-art facilities are located in Helsinki and Tampere.



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Plant biological imaging

The Biocenter Finland whole plant biological imaging facility, the National Plant Phenotyping Infrastructure,

NaPPI currently has two active nodes at the UH and at the UEF. They offer

complementing whole plant and organ, physiological and chemical imaging services. The UEF NaPPI node houses

five hyperspectral cameras covering the wavelength range from UV to midwave IR (250 – 5500 nm), liquid-cooled UV-optimized CCD (200 – 900 nm) and EMCCD cameras, light sources for fluorescence macroscopy, e.g. deep-UV LEDs, powerful and tunable narrowband light source, and three imaging PAMs.

The UH NaPPI offers non-invasive high-throughput morphological and physiological assessment of plant phenotypes with multiple visible light RGBs, thermal imaging set-up and two chlorophyll fluorescence imaging units (Imaging PAMs). The UH installation has

units for small model plant (Compact system) as well as for large crop plant (Modular system) analysis, with capacities for 1080 and 270 plants, respectively.



Protein-proteome network

The protein-proteome network (PPN) provides access to high-quality services in proteomics and protein characterization. All major universities in Finland are part of the network. The services provided include protein expression and purification, proteomics, glycoproteomics, protein arrays, protein quantification, MS imaging, PTM analyses, characterization of protein interactions and biophysical properties, membrane protein analysis, organelle proteomics, and spectroscopic techniques.

The services are organized by highly skilled personnel, which also contribute to the data analysis. Training for the use of the services and instrumentation are provided and the network

organizes teaching for students and researchers.

We are experiencing that the quantitative proteome-wide analysis methods are gaining priority and thus our network has important role in method adaptation and development

– all of which requires sophisticated instrumentation as well as trained experts.





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Real-time imaging

The platform hosts a high-performance small animal SPECT/CT imaging for quantitative real-time tracking of tracers in 3D at high resolution, suitable for preclinical research in drug development, neuroscience, oncology, cardiovascular system and others.

We are able to perform drug delivery and biodistribution studies of drug molecules, both biologic and chemical compounds. Pharmacodynamics studies include imaging of drug-target interactions and imaging of drug effects in degenerative brain and heart diseases and visualization of anticancer effects among others.

We provide services for industry and academia offering integral services in liaison with the Radiopharmaceutical chemistry laboratory, which provides expert services in synthesis of imaging tracers and biological evaluation by radiotracer methods (e.g. in autoradiography).

Single-cell -omics

Single Cell -omics platform aims at bringing the latest single cell omics tools available for the research community. Services based on novel instruments are now available for single cell genomics and single cell proteomics to enable cutting-edge research in many areas of molecular biology and molecular medicine.

For single cell genomics Chromium™ instrument by 10X Genomics and InDrop™ and DropSeq™ systems enable thousands of individual cells to be transcriptionally profiled. Fluidigm Polaris™ system enables to select targeted single cells and hold them in environmentally controlled reaction chambers enabling perturbations with RNAseq readout.

For single cell proteomics we will provide services on Helios™ mass cytometry, which can differentiate up to 100 epitopes and obtain high content multiplexed protein data from single-cells. This enables the comprehensive understanding of cell phenotypes and function.

Annually, more than 2000 research groups and non-academic teams from universities, research institutes and companies in Finland and abroad use the services of Biocenter Finland.



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Stem cells & Genome editing

The combination of genome editing with patient derived induced pluripotent stem cells (iPS cells) provides endless possibilities for cellular modelling of disease mechanisms and a platform for drug discovery. Generation of human iPS cell lines requires special expertise, experience, and facilities.

At the same time, know-how and technology development for differentiating cells to true models of human cells and tissues is becoming a bottleneck for taking full advantage of human iPS cell methodology.

These approaches can be effectively applied to study not only monogenic diseases using cell types that are otherwise not available for research

and to study the functional effects of disease-associated genetic variants and the influence of environmental factors in defined cellular systems.

Genome editing toolbox is one of the most rapidly expanding set of ubiquitous research tools for life sciences based on CRISPR genome editing technology that was awarded Nobel prize in chemistry in 2020. FinGEEC will provide facility services, general services and develop beyond-the-state-of-art genome editing technologies with partners from Helsinki, Turku and Kuopio.



Structural biology

Structural biology and biophysics covers a wide range of topics, from high quality sample production to structure determination and biocomputational analysis. FINStruct is a national integrated structural cell biology research infrastructure that supports state-of-the-art research in biomolecular complex purification; cryo-electron microscopy; nuclear magnetic resonance; native mass spectrometry; structural bioinformatics; and X-ray crystallography.

FINStruct activities are distributed in five universities (Helsinki, Oulu, Turku, Eastern Finland, Åbo Akademi University), and the units are well-established as scientifically-driven core facilities with wide industrial and academic, international and domestic user networks. FINStruct is included on the Finnish Research Infrastructure 2021-2024 roadmap.

instruct-eric.eu




Viral gene transfer & cell therapy

Biocenter Finland Viral Gene Transfer and Cell Therapy Network (VGTCT) was established to guarantee that scientific community and biotech industry in Finland has access to the highest quality viral gene transfer vectors which are produced in a standardized manner with validated techniques at affordable prices.

VGTCT has been an excellent example of Biocenter Finland networks providing established vector services to a high number of domestic and international researchers and biotech companies. In addition to the production of high quality vectors, the mission of VGTCT network is to promote the use of viral gene transfer methods in Finland and to support development of novel gene delivery vectors and applications.

VGTCT is a joint, unified consortium of all Finnish Biocenters strengthening collaboration and building specific profiles of Finnish Biocenters.



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