University of Helsinki
Research Infrastructure Programme
2013 - 2016

Approved by the Rector on 19 April 2012

UNIVERSITY OF HELSINKI RESEARCH INFRASTRUCTURE PROGRAMME 2013 - 2016

Contents

1 Introduction

The University of Helsinki is Finland's largest and leading multidisciplinary research university. It enjoys a strong position in European and global research arenas, as demonstrated by its high placement in international university rankings, and aims to rank among the 50 leading research universities in the world. To achieve this objective, the University must focus on research infrastructures and their requirements, as research excellence requires first-rate infrastructures. State-of-the-art research infrastructures and a considered policy towards their further development also provide better opportunities for recruiting internationally recognised researchers in various disciplines.

The University of Helsinki Research Infrastructure Programme outlines the principles for the management and development of research infrastructures in the strategy period 2013–2016. The purpose is to support decision making by providing both campus-level players and Central Administration with information about the principles governing development, selection and resource allocation as well as by communicating these principles to the University's partners. The programme also describes communication and information within the University as well as between the University and its interest groups and the wider community. The appendices offer further information about the basic concepts and classification of research infrastructures (Appendices 1 and 2) and their scope at the University (Appendix 3).

Finnish and European research infrastructures have previously been surveyed in roadmaps published by the European Strategic Forum on Research Infrastructures (ESFRI 2006, 2008 and 2011) and the Finnish Ministry of Education and Culture (2009). The present programme continues in a similar vein, but focuses solely on the University. The programme will be revised regularly by taking into account updates to the above roadmaps.

The University of Helsinki is extensively involved in both national and international research infrastructures as well as its own internal infrastructures (Appendix 3). This is evident in the dozens of University projects included in Ministry and ESFRI roadmaps, which attests to the high quality of research and the University's broad, genuinely multidisciplinary research profile. The high number of projects must also be taken into account when setting targets for the development of research infrastructures: top-level research projects require top-level infrastructures. One of the measures defined in the implementation programme for the University of Helsinki Strategic Plan 2013–2016 relates to research infrastructures and involves increasing the ratio of depreciations in the University budget from 2.7% in 2010 to 4% by 2015. In practice, this means that if annual investments are increased by some five million euro over a period of five years, depreciations will amount to 4% of core funding by the sixth year. The level of investment must also remain elevated (adjusted for inflation) after this date to ensure that the rate of depreciation does not fall.

Vision for the University's research infrastructure policy in the strategy period 2013 - 2016:

Up-to-date research infrastructures and skilled support staff enable high-quality research.

Regular investments at the University level allow the University to respond swiftly to technical and technological developments.

Major research infrastructures are created and used through collaboration within and between campuses.

2 The University of Helsinki research infrastructure policy

2.1 Current state and development challenges

This programme cannot feasibly consider all of the University of Helsinki research infrastructures down to the smallest details, but rather the programme concentrates on the general status of research infrastructures and their development. The most significant national and international level facilities are discussed separately in Appendix 3.

The multidisciplinary nature of the University of Helsinki also characterises its research infrastructures. Of the University's 1,500 principal investigators and research groups, most use University research infrastructures on a daily basis. While traditional infrastructures focus on tools and equipment, virtual infrastructures are now increasingly used in all disciplines. The University's research is highly networked both nationally and internationally, and all campuses feature infrastructures at both these levels.

In future, the short- and long-term handling and preservation of research data will be increasingly important for research infrastructures. The University of Helsinki follows technical developments actively, establishes new practices and procedures, and contributes to the national and international development of research data infrastructures.

Major challenges for the development of research infrastructures:

Ageing equipment and technological development
- First-rate research cannot be produced with outdated tools

Swiftly increasing amount of research data
- An established policy is needed for the preservation and use of data

Insufficient coordination of purchases
- Leads to duplicate purchases and maintenance needs as well as poor cost effectiveness

Poor availability of information about research infrastructures and their use
- Hinders research collaboration and contributes to increasing duplicate purchases

Terminological inconsistency in classification
- Impedes the assessment of current circumstances and development needs as well as communication about research infrastructures

Recruitment of skilled staff and maintenance of human resources
- Specialists are needed to derive the full value from state-of-the-art equipment

Scarcity of available resources
- Establishing new research infrastructures and ensuring that existing ones remain competitive becomes considerably more difficult

2.2 Development of research infrastructures at the University of Helsinki

The University of Helsinki allocates considerable annual funding to research infrastructures. Operations are also funded from other sources, both national and international. To derive the greatest possible benefit from such funding, we need a policy coordinated at the University level as well as clear development guidelines. Action is therefore needed by research units, departments, campuses and Central Administration.

2.2.1 Strategic planning and responsibilities

Central Administration

The University's Central Administration is responsible for preparing a research infrastructure policy and monitoring its implementation at the University level. This requires that Central Administration and the University's research infrastructure committee use the information available from campuses and cooperate closely with campus-based working groups and researchers. Central Administration plays an important role in ensuring inter-campus cooperation and in prioritising projects at the University level. Central Administration also promotes the spread of good campus practices across the University and develops information practices for the whole University.

In accordance with the University of Helsinki strategic plan, key research infrastructures and technology services should be defined, and the University should participate in national and international projects within this framework. The purpose is to ensure a high research profile and standards and to further develop research in the long term. The clear classification of resources (Appendix 2) supports the distribution of information about research infrastructures and their use both within the University and to partners and interest groups as well as promotes the harmonisation of practices for various research infrastructures.

The most important players in Central Administration are the Research Sector and Finance. The former coordinates activities at the University level, supports the University's research infrastructure committee and communicates with campus-based working groups. The Research Sector cooperates actively with Finance on the funding of research infrastructures.

Campuses, independent institutes and faculties

Faculties and independent institutes are responsible for the purchase, use and maintenance of their research infrastructures on campuses. University-level guidelines must be taken into account in selecting projects and classifying infrastructures. At the campus level, purchases are to be coordinated and research infrastructures developed by research infrastructure working groups, which may include representatives from both faculties and campus-based independent institutes. Faculties and independent institutes may also establish separate bodies responsible for developing research infrastructures.

Campuses, faculties and independent institutes draw up their own research infrastructure programmes, defining in detail development goals, principles and responsibilities. Faculties and independent institutes on each campus as well as campus-based interest groups (e.g., government research institutes) are encouraged to collaborate with each other when drawing up the programmes, which should include information about at least the following issues:

- Impact of research focus areas on the selection of research infrastructures as well as investments
- The means necessary for taking new research initiatives
- Maintenance and upgrading of equipment and research infrastructures as part of investment policy
- A plan for the necessary support staff
- Faculty/campus collaboration
- Consistent classification criteria (see Appendix 2)
- Providing information and keeping it up-to-date
- Duties and responsibilities of the working groups that manage research infrastructures

Research infrastructures must be developed systematically on a long-term basis, and duplicate investments should be eliminated. The long-term approach should also be reflected in life-cycle thinking, which requires consideration of all stages of research infrastructure use, from planning to phasing out. Before undertaking a major project, the needs of other University campuses as well as opportunities for shared use must be considered. The leaders of campus working groups need to keep in contact with each other to explore possible synergy benefits when prioritising projects for University-level application processes for funding.

2.2.2 Target programmes as planning tools

Faculties and independent institutes draw up target programmes describing the development of their research infrastructures during the strategy period. The focus areas of research specified in the target programmes are important for allocating investments and developing research infrastructures.

Most of the research infrastructures specified in various roadmaps (ESFRI, Ministry of Education and Culture) and in Appendix 3 of this programme are large scale and require long-term investments. A central feature in new calls for funding is the requirement of sufficient resources not only for the initial investments, but also for the maintenance of research infrastructures, including both personnel and equipment. Thus, it is important that the target programmes take support services into account both at the initial stages and in the following years.

2.3 Investments and the allocation of funding

The basic principles of investment in research infrastructures are the optimal use of resources and the transparent selection of projects. The available resources are targeted via an assessment procedure to eliminate unnecessary duplicate purchases. The projects to be funded are selected at the University level by the research infrastructure committee and at the campus and faculty levels by the respective working groups and committees. Faculties must discuss all department proposals for projects that require a total investment of more than EUR 100,000. Before making a decision, the working group that discusses project proposals also informs similar groups in other faculties to determine whether shared use is possible.

When targeting funds, criteria for evaluating the project proposals include the scientific level, the projects' applicability to the University's and the host unit's research profile as well as the timeliness of the investment needs. In addition, major University-level investments (EUR 300,000 or above) require that the research infrastructure in question also serves user groups outside the host unit. To promote the successful selection of projects and expedite the process, campus-based working groups and committees maintain an annually updated review on research infrastructures, their status and development needs as well as the focus areas for investment.

When funding research infrastructures, faculties, departments and independent institutes take into account depreciations related to purchases. This means that the full purchase price is not amortised in a single payment, but rather a rate based on the depreciation period is deducted annually in accounting. As a rule, the depreciation period for research equipment is five years, in which case the annual rate of depreciation is 20% of the purchase price. Sufficient resources must be provided in funding plans to cover the depreciation rates of investments for the entire depreciation period. Further instructions for depreciations are available in Finnish from Finance (see https://alma.helsinki.fi/doclink/212880).

2.3.1 Central funding for research infrastructures

The University offers separate central funding to major research infrastructure projects. All University disciplines can apply equally for such funding. The projects funded are selected on the basis of criteria specified in the above section.

The University strives to allocate most of the central funding through annual or biennial application processes. By doing so, it can compare several applications at the same time rather than assessing individual projects (Figure 1). The regular application processes also contribute to the continuity and predictability of the investment procedure as a whole.

If it is difficult to assign a project proposal to a specific campus (e.g., due to the multidisciplinary nature of the project or the location of the host unit on several campuses), the proposal can be submitted to several working groups for consideration. The working groups must discuss all the applications they receive. Nevertheless, this should not lead to unnecessary multiplication of applications in the application process.

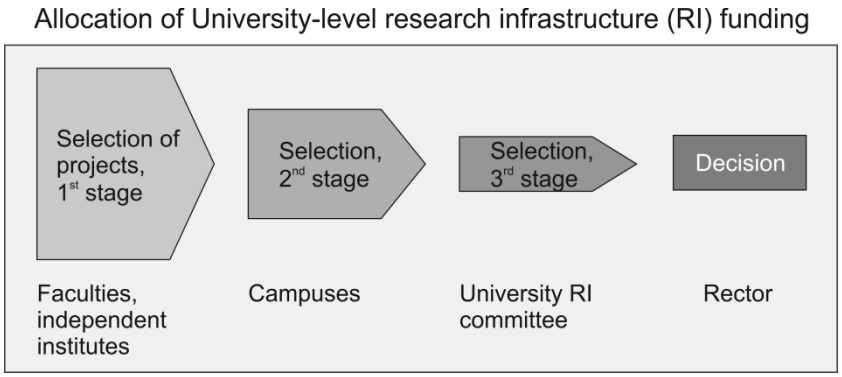

Figure 1. The selection and funding of research infrastructure projects in University-wide application processes. The height of the arrows depicts the number of projects proceeding to the following stage. The figure also illustrates the University's approach to selecting projects for national application processes for funding.

If research infrastructures are allocated national funding (e.g., from the Academy of Finland), the projects are selected for such application processes through a similar mechanism as for the University's own application process. Due to the various stages involved, special attention must be paid to the timetables of the application processes both within Central Administration and on campuses (Figure 1). Where necessary, information about timetables should also be provided to external project partners.

2.3.2 Monitoring project implementation

The use of funds provided for research infrastructures is monitored on campuses and in Central Administration. As a rule, investments should be carried out following the original plans as closely as possible, taking into account the overall procurement situation and related tendering processes. This requires that a realistic project plan and budget are drawn up at the application stage. Those who prepare project proposals should take into account the costs of maintenance and upgrades when planning funding. These costs, incurred through use and ageing, should also be included in the pricing of research activities.

Investments in research infrastructures and their ratio to depreciations are to be monitored actively to ensure that the total sum of annual investments exceeds or equals the level of depreciations.

2.4 Practices for the provision of information about research infrastructures

At present, information about research infrastructures is disorganised and spread across unit websites and various web resources. This makes it difficult to find suitable partners and increases the risk of unnecessary duplication in the selection and implementation of projects. Community relations are also adversely affected. It is in the University's interest that research infrastructures can be easily located in various fields and that up-to-date information about them can be found.

During the current strategy period, a portal will be created within the University's TUHAT research database to contain key information about the research infrastructures on various campuses. The University's Central Administration will be responsible for updating the core structure of this portal. Responsibility for submitting information to the portal will be delegated to the host units and, ultimately, to those maintaining research infrastructures. This will ensure that the portal always contains the latest information and current contact details. In future, the submission of information to the portal and the updating of information will be included in the terms of funding.

Unit home pages should include descriptions of research infrastructures and the services offered both within the University and to external partners. If a research infrastructure is used for commercial purposes, service descriptions and price lists must be available on the infrastructure's website and in the future portal.

3 Appendices

Appendix 1. Basic concepts and principles concerning research infrastructures

Appendix 2. Classification of research infrastructures at the University of Helsinki

Appendix 3. The scope of research infrastructures and their position at the University of Helsinki

4 References

ESFRI. (2006). *European Roadmap for Research Infrastructures, Report 2006.* Luxembourg: Office for Official Publications of the European Communities.

ESFRI. (2008). *European Roadmap for Research Infrastructures, Roadmap 2008.* Luxembourg: Office for Official Publications of the European Communities.

ESFRI. (2011). *Strategy Report on Research Infrastructures, Roadmap 2010.* Luxembourg: Publications Office of the European Union.

Ministry of Education. (2009). *Kansallisen tason tutkimusinfrastruktuurit: Nykytila ja tiekartta.* Helsinki: Ministry of Education.

Appendix 1. Basic concepts and principles concerning research infrastructures

What is a research infrastructure?

According to the definition of the Finnish Ministry of Education and Culture, research infrastructures are resources of research facilities, equipment, materials and services permitting research and development at different stages of innovation, supporting organised research, and maintaining and developing research capacity (Ministry of Education, 2009).

A **single-sited** research infrastructure is appropriate in fields requiring major investments in expensive research equipment. Typical examples include CERN, the European Organisation for Nuclear Research, and ESRF, the European Synchrotron Radiation Facility; the University of Helsinki is an active participant in both. A single-sited infrastructure may include satellite units, and it may also permit remote use.

A **distributed** research infrastructure is suited to fields in which the available resources are geographically dispersed. A distributed infrastructure may also produce shared central services. Examples at the University of Helsinki include ICOS (Integrated Carbon Observation System), CLARIN (Common Language Resources and Technology Infrastructure) and EATRIS (European Advanced Translational Research InfraStructure).

Virtual research infrastructures, or e-infrastructures, include databases and archives that can be used by researchers from their own workstations. At the University of Helsinki, such infrastructures include the Finnish National Electronic Library FinELib and the system architecture project for memory institutions, the purpose of which is to establish an efficient and competitive information and communication infrastructure for Finnish institutions of higher education, research institutes and memory institutions. Virtual infrastructures are also discussed in the publication entitled *Helsingin yliopiston eInfrastruktuuri 2010–2012* (University of Helsinki E-Infrastructure 2010-2012) (Publications by the University of Helsinki Administration 63, 2009).

Typical components of research infrastructures include the following:

- Research equipment, research and measuring stations, research vessels, specialised laboratories
- Research material collections and databases, archives and libraries
- Telecommunications networks used in research, centres for high-performance computing and other computing capacity

In developing research infrastructures at the University of Helsinki, it is important to consider how to define when an entity belongs to this framework. In this programme, such ensembles of components that offer services to a wide range of users in addition to the hosting research group are regarded as research infrastructures. A further condition is that long-term plans have been made for maintenance. Consequently, a service, equipment or resource used by a single laboratory or research group does not yet qualify as a research infrastructure, as wider connections within the University or with external partners are required. More detailed definitions of research infrastructures are presented in Appendix 2.

The scope of research infrastructures at the University of Helsinki

The University of Helsinki is extensively involved in national and international research infrastructures (see Appendix 3). These infrastructures are highly visible not only in research activities, but also in the other core duties of the University, namely teaching and community rela-

tions. The University's fundamental principle is that all researchers also teach and all teachers also do research. Modern, first-rate research infrastructures play a significant role in the fostering and development of research proficiency among the teaching staff. The importance of research infrastructures to students is emphasised when they are completing their theses for their undergraduate degrees and remains decisive all through their education up to the post-doctoral level.

Even if the impact of research infrastructures on community relations is not as straightforward as it is on research and teaching, it is still considerable. In order for the University's research to be relevant to society and deserve public attention, it must be outstanding and contribute to new knowledge. Such research requires state-of-the-art research infrastructures, especially now that research continuously extends its scope globally and competition at the top is tightening.

The University's research infrastructures may be roughly divided into three levels according to their scope and degree of international engagement (Figure A1). The levels are internal, national and international.

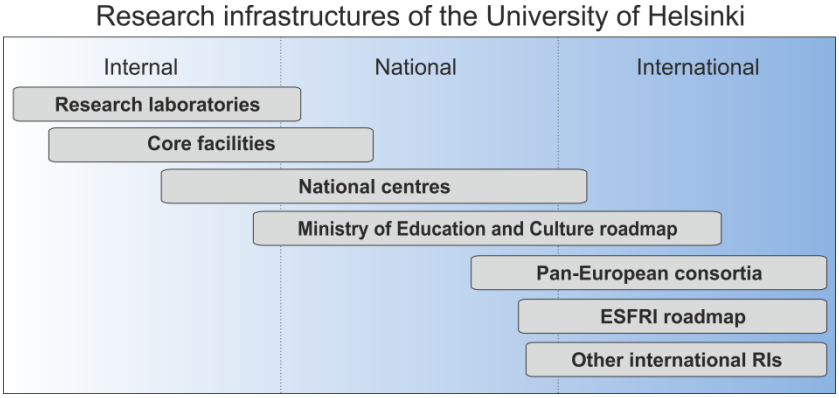

Figure A1. Classification of the research infrastructures (RIs) of the University on the internal, national and international levels. The horizontal width of each bar is indicative only.

The internal level at the University of Helsinki

The University of Helsinki boasts a great number of internal research infrastructures. From the perspective of the entire University, the most important ones are classified as core facilities. Core facilities produce high-quality research services not only for their own unit, but also for wider internal use as well as for external partners. They have great significance in reducing overlapping and often costly investments, both within and between campuses. It must be noted that because most of the research conducted at core facilities is commissioned, service descriptions and price lists need to be kept up-to-date and readily available.

Research laboratories are smaller University research infrastructures than core facilities. The most important distinction between a research laboratory and a core facility is the volume of research and research services directed at external partners. At research laboratories, such activities are more limited than at core facilities. At research laboratories, the major part of research is conducted by the laboratory's own staff or in scientific collaboration with other parties. However, for a research laboratory to be defined as an actual research infrastructure, its activities must be open to partners outside the laboratory (see Appendix 2).

The national level

The Ministry of Education and Culture has published a survey equivalent to the ESFRI (European Strategy Forum on Research Infrastructures) roadmap (Ministry of Education, 2009). The University of Helsinki participates in over 40 infrastructures listed in the Ministry's roadmap

(see Appendix 3). The number of national-level research infrastructures at the University of Helsinki is largest among the Finnish universities, which reflects the multidisciplinarity, wide scope and high standard of research at the University.

It must be pointed out, however, that there are important research infrastructures outside the roadmap which also play a distinct national role. The development of these infrastructures along with the ones included in the roadmaps is an integral part of the activities of the University of Helsinki. All national research infrastructures at the University are not only significant in top-level research and national research cooperation, but also play an important role in undergraduate and doctoral studies.

The international level

The roadmaps published by ESFRI in 2006, 2008 and 2011 feature spearhead projects of European research infrastructures. The University of Helsinki is among the most active universities in Europe in the ESFRI projects. The University is a member of 15 ESFRI roadmap projects (see Appendix 3), which include CLARIN, EATRIS, ESRF and ICOS mentioned on page 1 of this Appendix. These projects cover a wide spectrum of ensembles from single-sited to virtual infrastructures. A large proportion of international research infrastructures in the natural sciences are single-sited large research laboratories or centres. Among distributed European infrastructures, the administrative model of ERIC (European Research Infrastructure Consortium), of which ICOS is a good example, is gaining ground. In the strategy period 2010-2012, the establishment of the ICOS headquarters in Finland, at the University of Helsinki and the Finnish Meteorological Institute, will be confirmed.

ESFRI projects and international research infrastructures in general require massive investments, especially at the initial stages. No single university, including the University of Helsinki, has the required resources. Consequently, most projects are undertaken as consortia of several universities or research institutes. Even so, full participation in ESFRI projects requires external funding from sources such as the EU, ministries, the Academy of Finland and the Finnish Funding Agency for Technology and Innovation TEKES to supplement the University's core funding.

Participation in ESFRI projects and other major international infrastructures such as CERN constitutes an important part of University of Helsinki policy. International research infrastructures are European and global spearhead projects that enable state-of-the art research and maintain and enhance the University's high-level research profile. Their national and international visibility greatly boosts the recruitment of talented researchers to the University. International research infrastructures have a strong connection to the University's other core duties besides research; visibility offers good opportunities for societal interaction, and the high standard of the infrastructures supports top-level teaching from undergraduate to postdoctoral education.

Appendix 2. Classification of research infrastructures at the University of Helsinki

The University of Helsinki hosts numerous research-related infrastructures. The purpose of this Appendix is to clarify the concepts related to research infrastructures that are used in the University of Helsinki Research Infrastructure Programme. The starting point is the following definition: “Research infrastructures are resources of research facilities, equipment, materials and services permitting research and development at different stages of innovation, supporting organised research, and maintaining and developing research capacity.” (Ministry of Education, 2009)

Research infrastructures at the University of Helsinki are classified according to the scope of their operations either as core facilities (including libraries) or as research laboratories in line with the criteria below. It should be pointed out that an ensemble of equipment, materials or services constitutes a research infrastructure only if it has external users in addition to the researchers of its host unit.

Core facility

- Research facilities/equipment/material/services
- Ability to offer services on a large scale to partners outside the unit
- The service concepts and prices are clearly defined
- It is possible, and even routine practise, to offer paid services to partners outside the university
- The core facility’s goal may be (partial) self-sufficiency through paid services
- Support services of various levels are available to users (measurements, collection, analysis and storing of material)
- Maintenance is taken care of, including both human and technical resources
- The facility has a long-term development plan

Research laboratory

- Research facilities/equipment/material
- The laboratory is used by researchers from outside the host unit or a specified research group and has the ability to offer (paid) services to outsiders
- Maintenance is taken care of, including both human and technical resources
- The laboratory has a long-term development plan

Appendix 3. The scope of research infrastructures and their position at the University

This appendix briefly presents the national and international research infrastructures (RIs) in which the University of Helsinki participates, as well as the University's important internal research infrastructures (including core facilities and research stations). The sources of information include research infrastructure roadmaps (ESFRI, 2008, 2010; Ministry of Education and Culture, 2009) and a survey given to faculties and independent institutes in January 2012.

The introduction of each infrastructure contains a brief description of its tasks and an identification of its type based on the infrastructure classification adopted by the Ministry of Education and Culture (2009), which categorises infrastructures into single-sited, distributed and virtual RIs. For infrastructures that cannot be characterised by a single type, additional description is given. The core facilities and other significant research infrastructures listed at the end of this appendix have not been categorised by type. The infrastructures listed in the roadmap of the Ministry of Education and Culture are categorised by field of science using the Ministry's model.

Research infrastructures listed in roadmaps

ESFRI Roadmap, Updates 2008 & 2010:

ANAEE project (Infrastructure for Analysis and Experimentation on Ecosystems) / ExpeER (Distributed Infrastructure for Experimentation in Ecosystem Research)

The goal of the ANAEE project is to develop a network for analysing, observing and predicting the impact that changes in the environment and land use have on ecosystems. It also aims to produce environmental management tools that provide protection against such changes or enable adaptation to them. The network involves analytical and modelling tools as well as linkages to measurement station networks.

An EU project for experimental environmental research, ExpeER connects European highly instrumented observation stations for terrestrial ecosystems with experimental and analytical facilities and modelling approaches. Research on climate change, biodiversity loss and changes in land use require long time series, consistent measuring and monitoring protocols as well as experimental studies to determine the dynamic responses to changes exhibited by ecosystems shaped by nature and human beings. ExpeER is on the ESFRI roadmap (Preparatory Phase ESFRI ANAEE) in 2012. The University of Helsinki participates in the project through the SMEAR II station.

BBMRI (Biobanking and Biomolecular Resources Research Infrastructure)

Distributed infrastructure

BBMRI is a pan-European distributed infrastructure of existing and *de novo* biobanks and biomolecular resource centres providing access thereto. The infrastructure will include biological material from patients and healthy persons, typically DNA, tissues, cells, blood or other body fluids, with links to clinical and research data. The infrastructure also provides biomolecular research instruments and biocomputational tools for the optimal use of BBMRI's resources in global biomedical research. The Finnish BBMRI coordinator is the National Institute for Health and Welfare (THL), which cooperates with ESFRI infrastructures through the Biomedinfra consortium, jointly formed by THL, the Institute for Molecular Medicine Finland (FIMM) and the IT Centre for Science (CSC).

CLARIN (Common Language Resources and Technology Infrastructure)

Distributed/virtual infrastructure

CLARIN is a large-scale pan-European coordinated infrastructure that aims to make language resources and technology available and usable to researchers in all fields, especially in the humanities and social sciences. CLARIN aims to overcome the current fragmentation of language resources and technology by harmonising structures and concepts. It is based on a network of compatible CLARIN centres.

CLARIN ERIC is a European research infrastructure consortium established in 2012. Part of the pan-European project, FIN-CLARIN is a language resource consortium formed by Finnish universities, the Institute for the Languages of Finland, and the IT Centre for Science (CSC). It is coordinated and managed by the University of Helsinki. CLARIN ERIC's backbone consists of national language resource consortia similar to FIN-CLARIN, which operate in each member state, as well as of collaborative CLARIN centres maintained by the consortia. CLARIN benefits users by offering them an easy way to find the materials they need (with the help of metadata), helping them obtain permission to use the material (with the help of authorisation and authentication) and providing a way to use the materials found (with the help of compatible standards and tools). CLARIN also enables research of higher quality, as the results can be replicated and verified.

EATRIS (European Advanced Translational Research Infrastructure in Medicine)

Distributed infrastructure

EATRIS is a distributed infrastructure implemented through several biomedical research centres across Europe, with the task of translating basic discoveries into clinical practice. The centres will include cutting edge technologies for translational research and will cover the major disease fields: cancer, metabolic diseases, neurological disorders, cardiovascular diseases and infectious diseases. The EATRIS consortium is open to all countries which want to contribute to new European translational research infrastructure. The Finnish EATRIS coordinator is the Institute for Molecular Medicine Finland (FIMM), which cooperates with ESFRI infrastructures through the Biomedinfra consortium, jointly formed by FIMM, the National Institute for Health and Welfare (THL) and the IT Centre for Science (CSC).

E-ELT (European Extremely Large Telescope)

Single-sited infrastructure

ELTs are among the most highly prioritised projects worldwide in the field of ground-based astronomy. They promote astrophysical knowledge by enabling detailed studies in topics such as planets orbiting other stars, the first objects in the universe, supermassive black holes as well as the nature of dark matter and dark energy and their distribution in the universe. The 42-metre European ELT will maintain and reinforce Europe's position at the forefront of astrophysical research.

EISCAT (EISCAT _3D – The next generation European incoherent scatter radar system)

Single-sited infrastructure

EISCAT_3D is the upgrade of the existing EISCAT (European Incoherent SCATter) facility, which provides state-of-the-art radar facilities for studies of atmospheric processes. These studies can help understanding the formation and evolution of our own, and other, solar systems.

ELIXIR (European Life-Science Infrastructure for Biological Information)

Distributed infrastructure

ELIXIR is a secure but rapidly evolving platform for biological data collection, storage, annotation, validation, dissemination and utilisation, consistent with the unique requirements of

shared resources in the life sciences. ELIXIR will comprise a distributed but interlinked collection of core and specialized biological data resources and literature. The core, aiming for completeness and universal usage, will include a substantial upgrade to the existing molecular data resources at the European Bioinformatics Institute (EBI), as well as new resources as appropriate. The specialised resources, each serving more limited communities, will be distributed across Europe. The Finnish ELIXIR coordinator is the IT Centre for Science (CSC), which cooperates with ESFRI infrastructures through the Biomedinfra consortium, jointly formed by the CSC, the Institute for Molecular Medicine Finland (FIMM) and the National Institute for Health and Welfare (THL).

The Ministry of Education and Culture has funded the construction of Biomedinfra (involved in BBMRI, EATRIS and ELIXIR) in 2010–2013. Seeing as bioinformatics, the use of biobank samples and translational research are interdependent, coordinated inputs into the said research infrastructures generates synergies. All three ESFRI projects have submitted their letters of intent for the establishment of an ERIC-type administrative structure.

ESRF Upgrade

Single-sited infrastructure

The European Synchrotron Radiation Facility (ESRF), located in Grenoble, France, is a joint facility set up by international agreement, supported and shared by 18 European countries and Israel. It operates the most powerful high energy synchrotron light source in Europe and brings together a wide range of disciplines including physics, chemistry and materials science as well as biology, medicine, geophysics and archaeology. Research conducted in the facility also has many industrial applications, including pharmaceuticals, cosmetics, petrochemicals and microelectronics.

EU-OPENSCREEN (European Infrastructure of Open Screening Platforms for Chemical Biology)

Distributed infrastructure

EU-OPENSCREEN gives researchers in academia and SMEs access to resources for developing small bioactive molecules. The infrastructure is an association of high throughput screening (HTS) centres, which offer chemical resources for hit discovery and optimisation, support for bioinformatics and cheminformatics, as well as a publicly accessible database. The database combines screening results, assay protocols and chemical information. EU-OPENSCREEN has a central facility which offers a large collection of diverse compounds representing the chemical knowledge of Europe.

Euro-Bioimaging (European Research Infrastructure for biomedical imaging)

Distributed infrastructure

Euro-Bioimaging is a European research infrastructure for biomedical imaging, whose operations cover areas from basic research in biology to the medical imaging of humans and populations. It comprises many distributed yet coordinated infrastructures for biomedical imaging. Coordinated centres give European researchers access to advanced imaging technologies and training in their use, while research institutes and laboratories have the opportunity to participate in technological development and education. Euro-Bioimaging also offers a platform for the exchange of knowledge and expertise, enabling the mutual exchange of research methods and the joint use of data.

FAIR (Facility for Antiproton and Ion Research)

Single-sited infrastructure

FAIR is a particle accelerator laboratory in Darmstadt, Germany, which will produce high-energy and high-intensity particle beams, primary and secondary ion beams and antiproton beams. Ion beams enable advanced research in four different fields of physics. The

accelerator complex contains cooler and storage rings for particle beams and enables the use of internal targets for research purposes. Two superconducting synchrotrons generate high-intensity ion beams with a maximum energy of 35 GeV/u and enable primary heavy-ion beams as heavy as uranium, along with a wide range of radioactive ion beams.

ICOS (Integrated Carbon Observation System)

Distributed infrastructure

ICOS is an infrastructure for coordinated, integrated, long-term high quality observational data of the greenhouse balance of Europe and of adjacent key regions of Siberia and Africa. Consisting of a centre for coordination, calibration and data handling in conjunction with networks of atmospheric and ecosystem observations, ICOS is designed to create the scientific backbone for a better understanding and quantification of greenhouse gas sources and sinks and their feedback with climate change.

INFRAFRONTIER (The European infrastructure for the phenotyping and archiving of model mammalian genomes)

Distributed infrastructure

INFRAFRONTIER will organise two complementary and interlinked distributed infrastructures. (1) “Phenomefrontier” will provide a European platform equipped with the latest technologies, in particular in vivo imaging and data management tools, for the phenotyping of medically relevant mouse models; (2) “Archivefrontier” will provide a European resource for state of the art archiving and dissemination of those mouse models and will consist in a major upgrade of the European Mouse Mutant Archive (EMMA).

INSTRUCT (An Integrated Structural Biology Infrastructure for Europe)

Distributed infrastructure

INSTRUCT will consist of Core and Associate Centres for Integrated Structural Biology. All centres will maintain and further develop a set of core technologies such as protein production, NMR, crystallography, and different forms of microscopy. Each centre will have a specific biological focus that will shape its infrastructure development plan according to scientific need and improve the production and structural analysis of functional complexes. The network of centres will be organised in order to obtain multi-scale structural data and translate these data into functional knowledge.

LIFE WATCH (Science and Technology Infrastructure for Biodiversity Data and Observatories)

Distributed infrastructure

LIFE WATCH is a world leading e-infrastructure to support research on the protection, management and sustainable use of biodiversity. The infrastructure provides special services for scientists and policy users of biodiversity research, including training and research opportunities for young scientists. The core components are a network of observatories and biological collections for data generation and processing, together with facilities for data integration accessible through virtual laboratories offering a wide range of analytical and modeling tools. The infrastructure has the support of all major European biodiversity research networks.

Ministry of Education and Culture, national-level research infrastructures, roadmap 2009:

Social Sciences and Humanities

Finnish National Electronic Library (FinELib)

Virtual infrastructure

FinELib, the National Electronic Library, is a consortium of Finnish universities, polytechnics, research institutes and public libraries. FinELib acquires Finnish and foreign electronic resources to support teaching, study and research and to promote the availability and use of high-quality information in the community. The consortium boosts cooperation between Finnish libraries and enables first-rate expertise and international collaboration with other resource acquisition consortia.

National Library of Finland and its collections

Single-sited infrastructure

The research infrastructure is based on the National Collection, which contains all the written material published in Finland, as comprehensive a collection as possible of ephemera (e.g., advertisements, programme leaflets) as well as Finnish recordings. The Library's main task is to collect and preserve national materials published in Finland and make them available to current and future generations.

System Architecture for Memory Institutions

Distributed/virtual infrastructure

The goal of the System Architecture for Memory Institutions project is to construct an efficient and competitive information and communication infrastructure for Finnish universities, research institutes and memory institutions. System architecture development is divided into three interlinked subprojects, which focus on the 1) public interface, 2) national union catalogue and 3) long-term preservation system (PAS).

Environmental Sciences

FinLTSER (Finnish Long-Term Socio-Ecological Research Network)

Distributed infrastructure

The goal of the FinLTSER network is to provide a national research infrastructure for long-term Finnish investigation into ecosystems and biodiversity, including the impacts of climate change. The network provides the Finnish contribution to the recently established European LTER research network (www.lter-europe.ceh.ac.uk) and the international LTER network (ILTER, www.ilternet.edu) via access to Finnish observatories (for ground, surface water and marine environments) included in the LIFE WATCH initiative (www.lifewatch.eu).

GRIN (Geoinformatics Research Infrastructure Network)

Distributed infrastructure

The Geoinformatics Research Infrastructure Network serves a variety of basic and applied research where methods of geoinformatics (remote sensing, geographic information systems, geo-computing, spatio-temporal modelling, navigation and location-based services) are needed. GRIN is constituted by distributed laboratory and computing resources in the participating academic environments, supported by (1) coordinated infrastructure development, (2) jointly purchased spatial data with their direct access through download and interface technologies, (3) a permanent research data repository with metadata and delivery services supporting open access to scientific data, (4) shared software and analysis application resources (local and distributed) and (5) centralized high performance computing.

Finnish Museum of Natural History and its collections

Single-sited/distributed infrastructure

The Finnish Museum of Natural History is a research institute under the auspices of the University of Helsinki. It is one of Finland's three national museums and, as defined in the Universities Act, is entrusted with preserving, accumulating and exhibiting national collections in the field of natural sciences as well as with carrying out related research and education. The national collections include botanical, zoological, geological and paleontological samples and observation materials from around the world and are part of a global network of biodiversity data resources. The museum provides versatile services to international research, environmental administration, university programmes and lifelong learning. Furthermore, the Laboratory of Chronology is a nationally unique core facility -level research infrastructure, which applies methods from the natural sciences and has a wide operating environment. The laboratory is located on the Kumpula Campus. Plans are underway to expand the current infrastructure of the museum into a national distributed infrastructure.

SMEAR I, II and III (Stations for Measuring Forest Ecosystem-Atmosphere Relationships)

Distributed/single-sited infrastructure

To understand climate change, we need long-term, continuous and comprehensive field measurements. Three SMEAR stations are currently in operation, and all the measurement data, analysed results and infrastructures as such are generally available. All the field stations have comprehensive scientific programmes to investigate aerosol and trace gas concentrations, biosphere- atmosphere interactions, aerosol formation and growth, as well as biogenic background processes leading to aerosol formation.

Biomedical and Life Sciences

Biomedical Imaging Cluster

Distributed infrastructure

The biomedical imaging cluster includes the key imaging research centres in Finland: the Turku PET Centre (University of Turku, Åbo Akademi University and Turku University Hospital), the AMI Centre and MEG unit (Aalto University, University of Helsinki) and the Biomedical NMR group (University of Eastern Finland/Kuopio). The equipment and competence of these centres complement each other. The goal has been to create a community encompassing the whole chain from cell imaging to the *in vivo* imaging of humans.

EMBL (European Molecular Biology Laboratory)

Distributed infrastructure

EMBL (European Molecular Biology Laboratory) is an international research organisation formed by 20 member states and one associate member. Finland has been a member since 1984. EMBL conducts molecular biology research at its main laboratory in Heidelberg and its outstations in Hamburg (Germany), Grenoble (France), Hinxton (Great Britain) and Monterotondo (Italy). EMBL is an important European infrastructure in bioinformatics (EBI, Hinxton), structural biology (Grenoble and Hamburg) and fields related to research into genetically modified mice (Monterotondo). The Institute for Molecular Medicine Finland (FIMM), located on the Meilahti Campus, functions as a part of the Nordic EMBL Molecular Medicine Partnership.

FIMM-DNA (National Biobanks of Finland)

Single-sited infrastructure

In recent decades, the Public Health Unit at the National Institute for Health and Welfare has developed a centralised biobank for DNA extraction, quality control, storage and logistics. The

collection currently contains samples from over 200,000 individuals, mainly from Finland. The biobank is largely automated, the samples are barcoded, and the biobank is operated via a specialised database, SamWise. The biobank is an essential infrastructure for Finnish genome research and was used by the Institute for Molecular Medicine Finland (FIMM) and its international partners to create a notable data resource, the Finnish Gene Atlas, to assist Finnish health research. In 2011–2012, the biobank infrastructures of FIMM and the National Institute for Health and Welfare have been integrated to form a national node of the BBMRI.FI network and a joint biobank infrastructure on the Meilahti Campus.

FIMM Technology Centre (formerly FIMM-FGC, Finnish Genome Centre)

Single-sited infrastructure

FIMM performs services previously carried out under the name of the Finnish Genome Centre, established 13 years ago, and has since 2007 expanded its infrastructures into new fields through the FIMM Technology Centre, which employs some 40 people. The infrastructures contribute to the development of personalised medicine and the translation of research results into health care applications. National service provision will continue in fields such as genotyping, sequencing, bioinformatics, metabolomics and molecular pathology.

GWM (Genome-Wide Methods, Biocenter Finland infrastructure network)

Distributed infrastructure

Genome-wide technologies call for an infrastructure that contains both high-throughput screening equipment to analyse genetic variants, gene expression and cell signalling, as well as tools to perform gene silencing and activation genome-wide in living cells. Biocenter Finland's Genome-Wide Methods research infrastructure integrates the instrumentation, genome-scale reagent sets, and expertise into nationally provided services.

HFIC (Helsinki Functional Imaging Center)

Distributed/single-sited infrastructure

In Helsinki, imaging services have been integrated into the Helsinki Functional Imaging Center (HFIC, www.hfic.helsinki.fi), which is in charge of coordination and development. The HFIC offers a wide range of imaging services, including the wide-field and confocal imaging of cells (also live cells), high-throughput screening imaging, electron microscopy (EM, cryo-EM, scanning EM), laboratory animal imaging (based on luminance and fMRI technologies) and imaging techniques based on material technologies (nanomaterials, nanoimaging). The HFIC comprises 12 core units and a national centre for electron microscopy.

NEUROIMAGING (Center for Systems Neuroimaging)

Distributed infrastructure

NEUROIMAGING is an infrastructure network formed by three national neuroimaging laboratories: Aalto University's MEG and the AMI centres in Otaniemi, Espoo, and HUSLAB'S BioMag research laboratory at the Helsinki University Central Hospital. The NEUROIMAGING infrastructure offers both internal and external users equipment, analysis tools and expertise for the imaging of the human brain, including the applications in studies of healthy and diseased brains.

NSB, FinnStruct (Finnish Infrastructure Network in Structural Biology)

Distributed infrastructure

The Finnish Infrastructure Network in Structural Biology supports and serves structural biology research in all of Finland. FinnStruct maintains equipment and competence centres as well as the sample preparation facilities (virus production, protein research and crystallisation, etc.) required for the methods used in three major disciplines of structural biology: X-ray crystallography, NMR spectrometry and electron microscopy.

Materials Science and Analytics

MAX-IV (MAX IV synchrotron and free electron laser facility)

Single-sited infrastructure

Max IV is a new synchrotron radiation research facility to be constructed in Lund, Sweden. The project is led by MAX-lab, a synchrotron research laboratory operating under the auspices of the Lund University and specialised in the production of soft, low-energy synchrotron radiation. MAX IV will conduct both synchrotron and free electron laser (FEL) research. The new MAX IV synchrotron will feature innovative technology and an extremely efficient synchrotron radiation source for the production of high-energy X-rays required to studying the structure and properties of materials.

Micronova (Centre for Micro and Nanotechnology)

Single-sited infrastructure

Micronova is a research centre jointly run by the VTT Technical Research Centre of Finland and Aalto University, which provides micro- and nanofabrication facilities for the development of microelectronic, photonic, microsystems and nanoelectronic components and devices. The biggest in the Nordic countries, Micronova's cleanroom facilities in Otaniemi, Espoo, cover 2,600 m^2. They are used by researchers from VTT, Aalto University and other universities as well as several companies. The cleanrooms are also used for educational purposes and researcher training.

Space Research and Astronomy

ESA (European Space Agency)

Single-sited/distributed infrastructure

ESA's mission is to elaborate and implement long-term European space policy. The Agency's projects have been designed to obtain further information about the Earth and the space around it, the solar system and the universe. Their goal is also to develop satellite-based technologies and services and promote European industry. ESA also works in close cooperation with non-European space organisations to globally share the opportunities offered by space.

ESO (European Southern Observatory)

Single-sited/distributed infrastructure

ESO is one of the most significant astronomical observatories on both European and global scales. Headquartered near Munich, Germany, its observation sites are located in Chile, up in the Andean highlands. ESO currently has 14 member states. Finland joined the organisation in 2004. The most important of ESO's existing observation instruments is the optical Very Large Telescope (VLT). ESO, the USA and Japan are currently building ALMA, a radiowave system in which the output of 50 radio telescopes is combined. There are also plans for ESO to head the construction of a next-generation 42-metre optical telescope (see the E-ELT ESFRI project).

NOT (Nordic Optical Telescope)

Single-sited infrastructure

The 2.5-metre Nordic Optical Telescope (NOT) is located on La Palma, in the Canary Islands. It has been operated by the five Nordic countries since 1989. NOT is an important observation device for Finnish astronomers and has considerably increased their scientific activity and productivity. It is also used to introduce students to the use of modern astronomical observation methods.

Energy

ITER (International Thermonuclear Experimental Reactor)

Single-sited infrastructure

The goal of ITER is to prove the technological and scientific feasibility of fusion energy production. The achievement of this goal would make fusion a feasible energy source in the future. The size of a power plant, ITER will integrate all the essential elements of fusion technology. After the international space station, ITER is the largest global research project, and its construction may be the most challenging technology project taken up by humankind. ITER partners include the European Union, India, Japan, China, South Korea, Russia and the US.

JET (Joint European Torus)

Single-sited infrastructure

Located in the United Kingdom, JET is a joint European experimental fusion facility and is currently the world's most highly performing fusion device, holding the world record peak fusion power of 16 MW. Finland is actively involved in the JET experimental programme, which coordinates scientific experiments, engages in modelling and carries out analyses.

Physics and Technology

CERN (European Organization for Nuclear Research)

Single-sited infrastructure

CERN is the world's leading, highly diverse research centre for particle and nuclear physics. The organisation's 20 member states collaborate in global research projects which are carried out on a larger scale than would be possible for a single European country and are focused on the basic structure of matter and fundamental interactions in nature. CERN's latest major project, the Large Hadron Collider (LHC), is the world's largest scientific instrument. It came online in 2010 and is expected to cast light on what may seem obvious in everyday life: the origins of mass. In addition to being a particle physics laboratory, CERN also functions as a major platform for technological development.

JYFL-ACCLAB (University of Jyväskylä Accelerator Laboratory)

Single-sited infrastructure

The JYFL-ACCLAB has been an EU large scale facility since 1996 and an Academy of Finland Centre of Excellence since 2001. It has a national mission as a centre of expertise and education in accelerator technology and use of radiation. The laboratory works in close cooperation with the Helsinki Institute of Physics and is responsible for a significant portion of Finland's contribution to CERN, FAIR and ESA projects. The laboratory is one of the large EU-funded infrastructures open to researchers. Several Finnish and international companies and research facilities conduct radiation hardness tests at the laboratory's RADEF facility, which is accredited by the European Space Agency. The RADEF facility is also used for applied research in materials physics focused on ion-material interactions.

Information Technology and e-Infrastructures

CSC-FUNET

Virtual infrastructure

The Finnish University and Research Network, Funet, provides superfast and reliable data links that connect universities, universities of applied sciences and public research institutes to one another, to international research networks (such as NORDUnet – the Nordic Infrastructure for Research and Education, GÉANT – the pan-European backbone for the

European research community and Internet2 in the US) and to the public Internet. Funet will be further developed by expanding the light path network to connect all of Finland's major research infrastructures and by making the network both faster and more efficient with new software and hardware and related R&D activities.

CSC-Services

Single-sited infrastructure

CSC (IT Center for Science Ltd) is a non-profit company administered by the Ministry of Education and Culture, which offers IT support and resources to universities, research institutes and companies. Its supercomputers run ultraefficient applications suitable for parallel computing. The computing power of a supercomputer may be thousands of times that of a single processor. Thanks to parallel computing, a problem that would take years to solve using a single processor, can now be computed in less than a week. The CSC's most efficient computer, Cray XT4/XT5 (Louhi), performs over 10,000 billion floating-point operations a second. In 2012 the CSC acquires a new supercomputer, which will be housed in the CSC's new data centre in Kajaani.

FGI (Finnish Grid Infrastructure)

Distributed infrastructure

The future of scientific computing is based on the enormous transfer capacity of research networks (e.g., CSC-Funet), which enables large data volumes to be transferred partly or entirely to distributed hardware for computation. This approach was first adopted by particle physicists, who developed grid computing technology, which enables both data and computation to be distributed worldwide, forming a seamless workflow. FGI will offer distributed computing capacity to an increasingly large group of researchers. The FGI consortium caters especially to computer sciences, materials sciences (including chemistry and physics), biosciences and computational drug research, but its resources are also available to other disciplines in need of supercomputing services.

Core facilities

City Centre Campus

ELE (Engaging Learning Environment) - New learning environments in teacher education

Faculty of Behavioural Sciences, Department of Teacher Education

The Faculty of Behavioural Sciences of the University of Helsinki, together with many University departments, educates future teachers. The various aspects that combine different new pedagogical approaches are crystallised in the 'engaging working methods' model. This project aims to constantly develop new engaging working methods, which will serve as a basis for the integration of virtual, social, physical and psychological aspects of the learning environment into a functional whole.

The activities focus on the Minerva building (Siltavuorenpenger 5A), where teacher training takes place. The learning environment applications can be used in both degree and continuing education. The ELE model developed at the Department of Teacher Education combines personal interaction with new technologies and learning platforms. The facilities will comprise a physical space of 300 sqm, six to seven interactive whiteboards, some 40 tablet computers, research equipment and versatile furnishings.

The Finnish Biodiversity Information Centre

The Finnish Museum of Natural History

The Finnish Biodiversity Information Centre is a national service infrastructure focusing specifically on biodiversity research, but also on decision making, teaching and lifelong learning. It collects, archives and distributes Finnish electronic biodiversity data as well as (especially in the future) provides tools for the visualisation and analysis of data through one portal.

The Finnish Biodiversity Information Centre functions as a centralised gateway to international joint portals for biodiversity data, such as the Global Biodiversity Information Facility (GBIF). The Finnish Biodiversity Information Centre promotes the openness of science, the expeditious availability and use of existing information in research and decision making, as well as quality assurance, metadata provision and the accumulation of research knowledge. The basis of the infrastructure, the data repository, will be used by the Finnish Museum of Natural History as well. In 2012 the centre will begin to operate on the national level.

RICON (Research Infrastructure for Cognitive Neuroscience)

Faculty of Behavioural Sciences, Institute of Behavioural Sciences

RICON provides comprehensive laboratory services for research in psychophysiology, cognitive neuroscience and other neighbouring fields of psychology. The infrastructure includes both full service measurement laboratories and the required IT services. The laboratory staff develops measurement technologies and methods in collaboration with researchers.

The Bank of Finnish Terminology in Arts and Sciences (BFT)

Faculty of Arts, Department of Finnish, Finno-Ugrian and Scandinavian Studies

The project entitled the Bank of Finnish Terminology in Arts and Sciences (BFT) is compiling a joint, open terminology database for individuals and the academic community in all fields of research represented in Finland. The database will be updated continuously. The project will be implemented on a voluntary basis in collaboration with researchers from all over the country.

The project is coordinated by the Department of Finnish, Finno-Ugrian and Scandinavian Studies of the University of Helsinki. Funding is provided by the Academy of Finland and the University of Helsinki; the project received funding from an Academy of Finland call for funding applications earmarked for research infrastructure projects. The key partners include the Federation of Finnish Learned Societies, the Institute for the Languages of Finland, the Finnish Terminology Centre TSK and the FIN-CLARIN infrastructure project.

The database will be constructed on the basis of terminology data acquired through three pilot projects (in botany, linguistics and jurisprudence) and hosted on a server administered by the Federation of Finnish Learned Societies' IT services. The project employees create a frame for the work of experts in different fields by charting terms and their definitions, relationships to the concept system, forms and equivalents in other languages. Expert teams will decide on the terms and their definitions used in individual fields.

Kumpula Campus

ACTRIS Finland

Faculty of Science, Department of Physics; Faculty of Agriculture and Forestry, Department of Forest Sciences

ACTRIS Finland is a research infrastructure project focusing on the observation and analysis of atmospheric aerosols, cloud-related variables such as water content (ice and liquid states) and short-lived trace gases. At the moment, ACTRIS Finland is part of the EU FP7 project ACTRIS (Aerosols, Clouds, and Trace Gases Research Infrastructure Network) coordinated by the CNRS (France) and the CNR (Italy), whose long-term goal is to establish a permanent, standardised pan-European measurement network. The Finnish stations included in the ACTRIS infrastructure (the SMEAR stations, the Sammaltunturi measuring station) are run by the University of Helsinki and the Finnish Meteorological Institute.

Laboratory of Chronology

Finnish Museum of Natural History, Laboratory of Chronology

The Laboratory of Chronology is a unique national resource in an extensive operating environment. It provides research knowledge derived from radiocarbon and stable isotope measurements and luminescence dating of both natural and man-made samples. Datings are carried out using internationally peer-reviewed procedures, both as paid services and through research collaboration. The process organisation enables accreditation, and one of the goals for the future is to bring operations to the next level through accreditations, LIMS and infrastructure upgrades, new websites (a unit website and the general ^{14}C portal) and business activities.

Astrophysics Laboratory

Faculty of Science, Department of Physics

The Laboratory of Astrophysics comprises the astronomical telescopes, the space instrument laboratory and the scattering research laboratory. The telescopes are housed on the Kumpula Campus, the observatory on Tähtitorninmäki in Southern Helsinki and in the Metsähovi Observatory in Kirkkonummi, and are mainly used for teaching. The space instrument laboratory carries out scientific and technological research in the construction, testing and characterisation of instrument electronics and sensors related to space equipment projects. The scattering laboratory conducts light backscattering measurements from fine particle media and spectroscopy of meteorite materials in the visible light and infrared wavelength range (350–2500 nm).

Detector Laboratory

Faculty of Science, Department of Physics; Helsinki Institute of Physics

The Detector Laboratory supports Finnish experimental research on detector development. The laboratory provides premises, equipment and extensive expertise to research projects developing gaseous or semiconductor radiation detectors. Presently, the laboratory hosts several active projects of the Helsinki Institute of Physics and the Department of Physics, concentrating on major international particle and nuclear physics experiments such as the CMS and TOTEM experiments at CERN and the NUSTAR experiment at FAIR. In addition, the laboratory offers support for projects of the Department of Physics, such as the international Electric Solar Wind Sail project. The laboratory facilities include a large main laboratory on the third floor of the Physicum building and clean rooms on the basement floor. The equipment enables the manufacture and diverse testing of gas and silicon detectors. The laboratory staff actively contributes to teaching and receives numerous external visitors each year.

Ion Beam Laboratory

Faculty of Science, Department of Physics

The laboratory equipment enables many forms of ion beam-based processing, characterisation and analysis of materials or samples. The research equipment is built around two different particle accelerators.

The 5 MV tandem accelerator enables

- Accelerator mass spectrometry measurements (AMS), including AMS analyses of gaseous samples, such as direct determination of the ^{14}C isotope content of atmospheric CO_2 and CH_4 gases
- Determination of solid sample composition and the vertical distribution of elements with time-of-flight elastic recoil detection analysis (TOF-ERDA)
- Ion irradiation of materials at different temperatures (room temperature – 10 K); *in situ* characterisation of irradiated materials with positron spectroscopy (PAS) and electrical measurement techniques (IV and CV)

The 500 kV ion implanter/particle accelerator enables

- Characterisation of material with Rutherford backscattering (RBS) combined with channeling (RBS/channeling)
- Ion implantation of elements

Laboratory for Nanomaterials

Faculty of Science, Department of Physics

The Laboratory provides facilities for constructing nanostructures using ion and cluster beams. The structure, composition and electrical properties of the samples and materials thus produced can be characterised with a variety of methods. The main equipment include

- Equipment for producing nanostructures with cluster ion beams
- A facility for nanostructuring and downsizing with dry etching using low energy ion beams
- Ion plating equipment
- An Atomic Force Microscope (AFM)/a Scanning Tunneling Microscope (STM)
- Low Energy Electron Diffraction (LEED)
- Auger Electron Spectroscopy (AES)
- An Ultra-High Vacuum (UHV) Variable Temperature Atomic Force Microscope (AFM)/A Scanning Tunneling Microscope (STM)
- A Cryogen-Free Dilution Refrigerator System (~10mK) for the determination of the electric properties of nanostructures

High performance cluster Ukko

Faculty of Science, Department of Computer Science

The Ukko cluster was purchased in late 2009 and has been in use since summer 2010. It has 240 Dell PowerEdge M610 nodes, each with 32GB of RAM and two 4-core Intel Xeon E5540 2.53GHz CPUs. There is a 10 Gbps Ethernet connection between the nodes.

The Ukko cluster is used in research projects for completing complex calculations and the practical assessment of the performance of data network algorithms and applications, using the cluster as a virtual network platform. Thanks to its large size, the Ukko cluster generates significant added value to the research conducted at the department by enabling the study of extensive computing and network problems, which in turn increases the value and significance of related academic publications. The cluster is maintained by an administration team from the Department of Computer Science.

Meilahti Campus

Biomedicum Flow Cytometry Core Facility

Faculty of Medicine, Institute of Biomedicine

The Biomedicum Flow Cytometry Core Facility enables research teams to carry out or order flow cytometry analyses or cell sorting. Currently, the unit has two instruments, FACSArray and FACSAria. FACSAria is the only flow cytometer with a cell sorting function on campus, and therefore the schedule for using the instrument is quite full. It is capable of multicolour analysis. The second instrument, FACSArray, is capable of analysing samples in 96 well plate format. All customers receive preliminary instruction, after which they can use the equipment independently. The unit also provides analysis and sorting services for a fee.

Biomedicum Functional Genomics Unit (FuGU)

Faculty of Medicine, Research Programs Unit

The Biomedicum Functional Genomics Unit is a core facility operating in the Biomedicum Helsinki 1 building. It develops and offers a wide range of services related to functional genomics. The unit operates under the auspices of Biocentrum Helsinki and is part of the Biocenter Finland infrastructure network. The unit provides various genome profiling services (gene expression, miRNA, copy number profiling, methylation, protein-DNA interaction) with its state-of-the-art microarrays and next generation sequencing instruments as well as a wide range of bioinformatics services related to the pre-processing and analysis of genome profiling data. The unit also provides recombinant virus services, including recombinant virus particles for gene silencing and expression, related quality testing, biosafety class 2 facilities for working with recombinant viruses, as well as genome-wide reagent libraries for studying gene function. The unit has a trained staff of experts well versed in providing paid services, a clear service concept and a broad customer base.

Biomedicum Imaging Unit

Faculty of Medicine, Institute of Biomedicine

The Biomedicum Imaging Unit (BIU) is a core infrastructure that provides equipment, training and consultation services in biomedical imaging as well as in the processing and analysis of visual data.

The equipment for the BIU is located on the Meilahti Campus in the Biomedicum 1 building and at the Haartman Institute. The instruments include confocal, wide-field, TIRF and super resolution microscopes suitable for live cell imaging; bioluminescence, fluorescence and MRI equipment for preclinical translational imaging; and software for deconvolution, volume reconstruction and image analysis. Users are provided with equipment-specific training and continuous support, assistance in the planning of research processes as well as training in

biological and preclinical imaging. The unit also maintains contact with other imaging centres both nationally and internationally.

BIU services: Services are available to students, researchers and company clients. In 2011, the customers included some 200 researchers from 88 research groups.

Scope of the research infrastructure: BIU is a core facility of the University of Helsinki and belongs to the national imaging infrastructure entitled Helsinki Functional Imaging Center (www.hfic.helsinki.fi; National research infrastructure roadmap of the Ministry of Education and Culture) as well as the ESFRI Euro-BioImaging infrastructure project (www.eurobioimaging.eu).

Tissue Preparation and Histochemistry Unit

Faculty of Medicine, Institute of Biomedicine

The services include tissue fixation, embedding samples in paraffin and creating preparations for microscopy. Frozen preparations of embedded tissue samples are prepared with cryostats. The antibody service provides characterised monoclonal mouse antibodies for research purposes according to a separate list.

Meilahti Clinical Proteomics Core Facility

Faculty of Medicine, Institute of Biomedicine

The Meilahti Clinical Proteomics Core Facility operates at the Faculty of Medicine on the Meilahti Campus of the University of Helsinki. The facility includes units operating on the premises of Biomedicum Helsinki and the Haartman Institute. The Biomedicum unit belongs to the Institute of Biomedicine and the Haartman unit to the Transplantation Laboratory. The facility is a member of the ProtMetNet community funded by Biocenter Finland. ProtMetNet's activities are coordinated to meet the national need for proteomic analysis, and some of its funding comes from the Ministry of Education and Culture.

The Meilahti unit specialises in analysis and research services in clinical proteomics for all Finnish institutes of higher education, other research communities and the industry. Even though the unit specialises in clinical proteomics, it also provides basic services in the field and serves international communities, mainly European institutes of higher education and research communities. It is largely responsible for local undergraduate and postgraduate education in proteomics. In addition, the unit organises international training and coordinates, for example, the study unit on proteomics and metabolomics in the international TransMed Master's programme of the Faculty of Medicine. In addition to the service functions, the staff is also involved in the regular teaching of medicine at the Faculty.

Zebrafish unit

Faculty of Medicine, Institute of Biomedicine; Neuroscience Centre

The zebrafish model has many benefits with regard to the study of physiological and pathophysiological gene functions in living animals, including rapid development, transparent developing embryos and the availability of mutants. The zebrafish unit uses protein translation inhibition with morpholino-oligonucleotides, the identification of new mutants through mutation screenings and targeted gene deletion (the TILLING method and the zinc finger method) to study gene functioning and to model pathological mechanisms. The mutant phenotype analysis is based on numerous modern imaging techniques, such as high-resolution confocal microscopy and two-photon microscopy, which yield detailed information on, for example, the development of neuronal networks and any changes to them due to genetic manipulation. Another method used at the unit for studying gene function and the effects of drugs in the animal model is automated quantitative behaviour analysis. In addition, the unit organises international courses in the use of zebrafish methods in biomedical research.

Sequencing Core Facility / Haartman Institute

Faculty of Medicine, Haartman Institute

The Sequencing Core Facility of the Haartman Institute provides sequencing services for both University and external clients. The sequencing is carried out from customer templates (clones, PCR fragments) using either the customers' own primers or commercial primers provided by the unit. The unit can also handle the enzymatic clean-up of PCR fragments to be sequenced, if necessary. "Ready" reactions can be run as well. The unit's main assets are its personalised services and prompt delivery.

Systems Biology Unit (SBU)

Faculty of Medicine, Research Programs Unit

The SBU offers services in experimental design, data analysis, result interpretation and visualization as listed at the web site (http://www.ltdk.helsinki.fi/sysbio/). In the data analysis side, the SBU offers a wide variety of bioinformatics and computational analysis services. These include high-throughput data analysis services (e.g., gene, exon, SNP, array-CGH, protein microarrays, mass spectrometry, ChIP-seq), data analysis infrastructure (Anduril; http://csbi.ltdk.helsinki.fi/anduril/) and next-generation sequencing data analysis. The Anduril infrastructure is freely available for the Finnish research community (with training) and it unifies the practices to analyze and manage the data within the Biocenter Finland bioinformatics network. The SBU also conducts customized projects such as identifying motifs, building web services and consultation in hiring bioinformaticians.

SBU coordinates the Biocenter Finland bioinformatics technology platform (http://www.biocenter.fi/index.php?page=bioinformatics), which offers bioinformatics services to scientific community in other Finnish research institutes and hospitals.

Viikki Campus

BD FACSAria II cell sorter

Faculty of Veterinary Medicine

The BD FACSAria II cell sorter is a three-laser (blue 488 nm, red 633 nm, Near UV 375 nm) flow cytometer used for analysing particles (animal cells, bacteria, synthetic bacteria) labelled with fluorescent markers and sorting them according to up to nine parameters. It enables the retrieval of both individual cells and large quantities of particles. The laboratory also houses basic equipment for running the cytometer and an aseptic laminar flow cabinet. Registered users with appropriate training or experience may run the machine independently and manage their reservations on an online calendar. Support and training is available as resources allow.

BI-DNAGEN (DNA Sequencing and Genomics Laboratory)

Institute of Biotechnology

The laboratory's main activities include DNA sequencing, DNA microarrays and related bioinformatics. The unit provides DNA sequencing services using traditional capillary sequencing techniques as well as second (454, SOLiD, Illumina) and third (PacBio) generation instruments. We also carry out DNA purification in microtiter plate format, as well as other robotic support services. Our unit manufactures, grows and organises extensive clone libraries. SNP typing can be carried out using the Illumina bead array. Based on the Viikki Campus, BI-DNAGEN is a core service provider in genomics, functional genomics, metagenomics and integrative biology. The unit's instruments include two Sanger capillary sequencing instruments and three second-generation DNA sequencers (454FLX+ and SOLiD 5500XL, Illumina HiScanSQ). It also has several robots for handling liquid samples and a qPCR device.

Biocenter Finland Protein Crystallisation Facility

Institute of Biotechnology

We provide low volume crystallisation services and screen making. Our customers can also order custom-built, premixed crystallisation solutions. The full crystallisation service includes composition of the crystallisation setup and scheduled imaging of the experiment for up to four months. The crystallisation droplets are set up using our Mosquito LCP or Oryx nanodrop robots, which can use as little as 100 nl protein per experiment and are suitable for membrane proteins and for air-sensitive samples. Scientists can examine the maturation of the project over time and can pick up the crystallisation plate for X-ray experiments. In 2012, we will take delivery of a dedicated new imaging station for combined visible/UV epifluorescence imaging to detect very small protein (2µm) protein crystals.

Electron microscopy and cryo-electron microscopy

Institute of Biotechnology

The Electron Microscopy Unit provides imaging services related to biological and medical electron microscopy and prepares samples for over 60 projects and 80 users each year. About a third of the projects are carried out as scientific collaboration, the rest as paid services. The unit provides instruction on the use of the equipment free of charge, as well as consultation on the selection of appropriate methods. It also organises practical laboratory courses in different EM techniques each year. The unit has one 200 kV field emission and two 120 kV transmission electron microscopes (TEM) as well as a field emission scanning electron microscope (SEM) and a wide variety of sample preparation instruments (e.g., three microtomes for preparing thin sections, a high pressure freezing device, a freeze substitution unit, an automatic plunge freezer, and carbon and platinum coating equipment). The 200 kV TEM is mainly used for high resolution cryo-EM imaging and electron tomography, and the SEM also enables serial 3D imaging through a 3View attachment.

FBNMR (Finnish National Biological NMR Center)

Institute of Biotechnology

The Finnish National Biological NMR Center is one of the most significant research equipment clusters on the Viikki Campus. The Center has four high-grade 500–800 MHz 1H frequency NMR spectrometers. The 800 MHz NMR spectrometer is the only high field NMR instrument in Finland. In addition to the latest equipment, the Centre provides Finnish research groups with the best expertise in biomolecular NMR in the field. Its services include, for example, 1) the structure determination of proteins and protein-ligand complexes; 2) the characterisation of protein-ligand interaction on the amino acid level (epitope mapping, conformational changes, affinity determinations for also weak interactions); 3) dynamical characterization of proteins on different time scales (ps–h); and 4) protein production services for NMR analyses.

The unit will only increase in significance as the versatility of NMR spectroscopy and its rapid development in the observation of biological processes (naturally non-structural proteins, folding, enzymatic reactions, weak molecular interactions, non-native states, prions, amyloids, etc.) will increase its popularity as a biophysical tool that supplements traditional structure determination.

FCLAP (Finnish Centre for Laboratory Animal Pathology)

Faculty of Veterinary Medicine

The FCLAP provides expert services in laboratory animal pathology for the research community, including services provided by veterinary pathologists in the form of necropsies and/or the interpretation of tissue samples (including tem), the production and staining of histological tissue samples and microscopic preparations (histochemical and immunohistochemical staining). The FCLAP is led by a specialist veterinary pathologist (Dipl ECVP), who also contributes to statements issued by the centre together with veterinary

pathologists in training. The centre has access to a well-equipped histology laboratory (Faculty of Veterinary Medicine) equipped for handling cryogenic samples and tissue samples to be embedded in paraffin.

GBU (Genome Biology Unit)

Institute of Biotechnology

The GBU, which operates as part of Biocenter Finland's technology services (Genome-wide methods), primarily provides tools for the genome-wide study of human gene functioning. Its services include (i) the acquisition, maintenance and distribution of genome-wide reagents (e.g., gene expression and silencing libraries), (ii) the facilitation and expedition of genome-wide research (cloning, two-hybrid screening) through services, as well as (iii) consultation and (iv) training.

In current biomedical research, it is a central task to determine the functioning of gene coding proteins more extensively. Finland has long traditions in the field of disease genomics and shows increasing potential to play a key role in several genome-based approaches in, for example, bioinformatics, imaging and mass spectrometry. The validation of such research results is often hampered by the availability of additional tools and high costs, which GBU attempts to decrease on a national level − in addition to providing various types of screenings. In many specialities, the GBU is the only provider of services in Finland.

HAMBI Microbial Culture Collection

Faculty of Agriculture and Forestry, Department of Food and Environmental Sciences

The microbe collections housed at the Division of Microbiology of the Department of Food and Environmental Sciences contain some 3000 bacterial strains, some 2000 fungal strains and some 1000 cyanobacterial strains. A significant part of the samples represent unique Finnish biodiversity, which is not stored anywhere else. The collections, which have been compiled for research purposes during the past decades and are continuously appended, are an essential infrastructure for teaching and research in microbiology. The collections have been in a key role in numerous international research projects.

The services provided by HAMBI include microbe storage and distribution, species determination, and training. Available storage methods include freeze drying and cryogenic freezing, but also continuous culture, if other methods cannot be used. HAMBI is a member of extensive domestic and international partnership networks, including the Finnish MICCO, the European ECCO and the global WFCC.

Laboratory Animal Centre

The Viikki Campus houses one rodent unit, a large animal unit and part of the transgenic unit (GM) of the five core facilities of the Laboratory Animal Centre of the University of Helsinki.

Facilities: The core facilities are available to all researchers. The microbiological status of the rodent unit varies; the Ruskeasuo unit is the only completely "clean" (specific pathogen free, SPF) university laboratory animal facility in Finland. The GM mouse unit is housed at the Ruskeasuo and Viikki (Biokeskus 2) units. The Laboratory Animal Centre services will be centralised in the new laboratory animal centre under construction in Viikki (renovation of the F building) after its completion in 2013.

Core operations and services: (1) Housing various vertebrates and providing assistance in their use for research; (2) providing GM services; (3) immunising rabbits, mice, rats and guinea pigs; (4) providing a link to all forty laboratory animal centres of the University (various species of vertebrates) at, for example, zoological stations and farms in different locations in Finland; (5) organising training in laboratory animal use; and (6) collaborating with the laboratory animal pathology infrastructure.

LMU (Light Microscopy Unit)

Institute of Biotechnology

The LMU provides access to advanced light microscopes and training in their use on the Viikki Campus. The LMU is part of the Helsinki Functional Imaging Center (HFIC) and, through it, participates in the Euro-Bioimaging ESFRI project.

Molecular interaction analysis (Biacore)

Faculty of Biological and Environmental Sciences, Department of Biosciences

The molecular interaction analysis core facility of the biochemistry and biotechnology unit is equipped with a Biacore T100 device for measuring the binding of molecules (size >100 Da) to proteins or other macromolecules in real time using surface plasmon resonance. The measurement data enables the determination of binding kinetics and affinity. In addition, the core facility has a Horiba Jovin-Yvon Fluoromax-4 spectrofluorometer for carrying out fluorescence-based binding tests (balance measurements).

Mouse behavioural unit

Neuroscience Centre

Mouse genetic models play a key role in the investigation of molecular pathways underlying normal biological functions or pathological states. The mouse behavioural unit characterises the phenotypes of genetically altered mice, which is a key element of studying gene functioning in live animals. The tests conducted by the unit include various behavioural parameters that can be measured quantitatively, such as motor behaviour (coordination, spontaneous activity), sensory functions, muscle strength, sensorimotor gating, emotional and social behaviour as well as tests for measuring memory and learning. In addition, the unit has an automated system (CLAMS, comprehensive laboratory animal monitoring system) for measuring several physiological parameters (activity, food and water consumption, metabolic performance).

The unit has recently begun to use and develop an automatic monitoring system (IntelliCage) so that the researcher does not disturb the animals' normal behaviour. This behavioural "microlaboratory" allows researchers to measure several cognitive parameters in the animals' own social environment.

Plant growth facilities

Faculty of Agriculture and Forestry, Department of Agriculture and Department of Forest Sciences; Faculty of Biological and Environmental Sciences, Department of Biosciences; Institute of Biotechnology

Plant growth facilities offer services and facilities for the production and maintenance of plant material (often GMO), seed production and for experimental projects in plant biotechnology, breeding, ecology, genetics and genomics, molecular biology, pathology and physiology. Plant sciences are a research focus at both faculties, and plant growth facilities are among the central infrastructures of the Viikki Campus.

Current instruments and facilities: Plant growth cabinets (~15) and phytotrons for controlled experimentation, plant growth rooms (6) for production of experimental material (GMO), greenhouses and experimental fields (GMO approved). Growth cabinets will be upgraded during 2012 by a new phytotron with the capability to regulate the temperature down to below freezing point (with a full daylight illumination level) and to control the composition of the air. In addition, equipment to monitor both the plants and the air are installed, with special analytical instruments located outside of the phytotron.

Proteomics Unit

Institute of Biotechnology

The Proteomics Unit of the Institute of Biotechnology serves both academic research groups (nationally and internationally) and the industry (nationally). The paid services provided by the unit mainly encompass protein cleaning, identification and characterisation. In addition, since autumn 2011 the unit has sought to extensively develop mass spectrometry analyses for proteomics. Mass spectrometry has developed rapidly over the past few years, and the unit's goal for the near future is to further update its analytics equipment and software to better meet the continuously changing needs of its customers.

Small Animal SPECT/CT Imaging Unit

Faculty of Pharmacy, Centre for Drug Research

The unit provides equipment for the non-invasive imaging of small animals and is a Biocenter Finland service laboratory for the *in vivo* imaging of rodents. The unit's services can be utilised through research collaboration or commissioned research.

Equipment: SPECT/CT device for small animal imaging (NanoSPECT/CT, with four 4 heads, Bioscan Inc.); isotope laboratory with authorisation to carry out animal research including viral vectors (Biosafety level 2 laboratory); laminar flow hood; technetium generator (with ^{99m}Tc source); analytic HPLC device; gas anaesthesia units; data processing facilities (workstations and software).

Viikki Metabolomics Unit

Faculty of Biological and Environmental Sciences, Department of Biosciences; Faculty of Pharmacy

The Viikki Metabolomics Unit (http://www.helsinki.fi/bioscience/metabolomics), operated jointly by the Faculty of Biological and Environmental Sciences and the Faculty of Pharmacy, is a part of Biocenter Finland's infrastructure network in proteomics and metabolomics (www.ProtMet.net) and the related metabolomics consortium, both of which are part of our national infrastructure. The unit contributes to doctoral education in this rapidly developing field and provides metabolomics services nationally, and its special focus is on plant and microbe metabolomics as well as drug analysis.

Equipment: Waters UPLC, a Waters Synapt G2-S Q-TOF mass spectrometer (plant and microbe metabolomics and drug metabolites); an Agilent 7000A Triple Quadrupole GC/MS (directed plant metabolomics).

Zebrafish unit

Faculty of Medicine, Institute of Biomedicine; Neuroscience Centre

See presentation under Meilahti Campus.

Other important research infrastructures

Helsinki University Library

The Helsinki University Library is Finland's largest multidisciplinary university library. The library functions both virtually and locally. Four campus libraries provide services responding to the specific needs of each campus. Helsinki University Library has centrally organised administration, acquisition, metadata and online services. It acquires materials (journals, publication series, monographs, databases) and provides user services for the needs of research and learning at the University of Helsinki, as described in its collections policy. The library administers the financial process between publishers and the research community, and subscribes to the services of the national FinElib Consortium.

The library is in charge of maintaining the HELKA database of collections owned by the University and of adapting the national linking service and search portal for digital journals for the needs of the University of Helsinki. It also maintains the open digital repository containing full-text materials produced at the University (HELDA) and manages the database service for digital theses and dissertations (Ethesis). Furthermore, the library produces field-specific databases and acts as the information centre for international organisations, such as WHO, FAO's Agris and the European Documentation Centre.

The library offers diversified, specifically designed services to support research activities, such as field-specific searches, bibliometric analyses, publishing support, the TUHAT Research Information System and tailored services for research groups.

NDGF (Nordic Data Grid Facility)

Helsinki Institute of Physics

The main task of NDGF is to support the data analysis of CERN's LHC experiments using distributed high-performance computing conducted in the Nordic countries. NDGF is classified as a Nordic Tier-1 centre (NDGF-T1) and supports the national Tier-2 systems (T2) of the different Nordic countries. NDGF is part of NeiC (Nordic e-Infrastructure Collaboration), which takes care of the interdisciplinary e-infrastructure in the Nordic countries.

Research stations

Centre ValBio, Madagascar

Faculty of Biological and Environmental Sciences, Department of Biosciences

Centre ValBio is an international research station situated on the edge of the Ranomafana National Park in Madagascar. The University of Helsinki has participated in financing its construction. The research projects of the station focus mainly on biodiversity and on socio-economic questions related on its conservation, as well as on different medical applications. Thanks to its new well-equipped laboratory building, the Centre ValBio is emerging as one of the world's leading field stations adjacent to a tropical rainforest. In addition to conducting research, the station provides education for university students, researchers, civil servants and local citizens. The University of Helsinki has been involved in research projects in Ranomafana since 1996 and in field courses since 2008.

Hyytiälä Forestry Field Station

Faculty of Agriculture and Forestry, Department of Forest Sciences

The Hyytiälä Forestry Field Station is an active field centre of multidisciplinary research, where the aim is to promote the sustainable use of natural resources through research and teaching. The research infrastructure of the Forestry Field Station consists of the surrounding forests, accommodation and food services, technical support for research, IT services, laboratory services and the measurement station SMEAR II. A significant part of the surrounding forests is administered by the state enterprise Metsähallitus, which offers these state-owned forests

for teaching and research purposes. The history of the forests is particularly well known, partly due to the permanent network of sample plots.

The research infrastructure of the Hyytiälä Forestry Field Station supports several international projects, such as ICOS and LTSER. Hyytiälä is a state-of-the-art research centre, specialised in studying the interaction between forests, peatlands and climate, where forest ecologists and atmospheric scientists work together. Research activities are continuously expanding. The field courses held at the Hyytiälä station are a substantial part of basic and advanced studies in forestry, and are growing in importance in atmospheric sciences. Over the decades, the forestry station has provided a diversified environment and good facilities for international meetings and a variety of courses.

Kilpisjärvi Biological Station

Faculty of Biological and Environmental Studies

Situated in the subalpine birch forest zone, the Kilpisjärvi Biological Station is a top-level centre for university research and teaching with its own professorship. The station's activities, facilities and instruments meet the requirements of ecological and environmental research and teaching. It is known as a centre for long-term environmental research and follow-up studies of high international standards. It is a significant expert in environmental matters and a strong regional actor, collaborating with Finnish as well as international universities and research institutes. The Kilpisjärvi Biological Station is Lapland's most important location for the Long-term Socio-Ecological Research (LTSER) programme. The station also accommodates the science and art centre Ars Bioarctica, which cooperates with Finnish and international bioartists and with the bioart laboratory, planned to be launched in 2012 in Aalto University.

Lammi Biological Station

Faculty of Biological and Environmental Studies

The Lammi Biological Station is a research base supporting research in biology and related fields. The station provides a wide range of research instruments and the support of a professional staff. The station's well-equipped laboratory is specialised in aquatic research. The land area with its various habitats enables diverse experimental and follow-up research. In the research hall, experimental studies can be carried out in controlled conditions. Due to its location, the station focuses on boreal terrestrial and aquatic ecosystems. Varied physical, chemical and biological data is collected to support research within the LTSER and other networks.

Taita Research Station (Kenya)

Faculty of Biological and Environmental Sciences, Department of Biosciences; Faculty of Science, Department of Geosciences and Geography

The Taita Research Station is a multidisciplinary research centre situated in the in Kenyan Taita Hills and owned by the University of Helsinki. This station, opened in 2011, is administrated by the Department of Geosciences and Geography of the Faculty of Science of the University of Helsinki. The Taita Research Station serves as a natural laboratory, ideally suited for research projects in fields such as natural sciences, social sciences, ecology and evolutionary biology, plant and animal systematics, and microbial ecology. The Taita Hills are one of the world's biodiversity hotspots, and many endemic plant and animal species live in its surroundings. The area is particularly interesting due to changes in its natural conditions caused by topographic variation (500 m up to 2,200 m) affecting the climate, flora, land use and human activities.

The geodatabase created by geographers on land use, vegetation, infrastructure, hydrology and topography, including changes in them, is the most significant research infrastructure in addition to a meteorological observation network. The area provides good possibilities for studying the interactions between nature and human activities as well as for development

studies. The station's contact network in Kenya encompasses the private and public sector at both local and national levels. The cooperation agreements between the University of Helsinki, the University of Nairobi and the National Museums of Kenya provide a good basis for fruitful practical cooperation between researchers, teachers and students from the University of Helsinki and Kenyan experts in biological and environmental affairs.

Tvärminne Zoological Station

Faculty of Biological and Environmental Sciences

The Tvärminne Zoological Station, located in Hanko and established in 1902, is a research infrastructure in natural sciences. Its operations focus on the study of the Baltic Sea and evolutionary biology. The station's resources include an ample supply of boats, including the research vessel the R/V Saduria, an excellent laboratory with premises for experimental work and a wide range of field research equipment. The station is located in a marine nature reserve established for teaching and research purposes. The station has access to a wide variety of long-term measurement series through, for example, the LTSER network and its own geographic information system. Tvärminne is among the leading research infrastructures in the Baltic Sea area, which is reflected in the considerable number of international users at the station (approx. 25% of all users). The station also provides seminar and conference services with full room and board.

Viikki Research Farm, including resources in Muddusjärvi and Suitia

Faculty of Agriculture and Forestry, Department of Agricultural Sciences

The goal is to combine the research farm resources into a single unit. VALP (Viikki Agricultural Production Laboratory) is comprised of the agricultural field flux station for monitoring the environmental effects of crop production and a research barn used in domestic animal research. A number of research equipment investments have been proposed to improve the research infrastructure. The majority of the proposals are related to establishing a field measurement laboratory.

The research infrastructure consists of the following components:

- 167 ha of research fields (Viikki 153, Muddusjärvi 14)
- Approx. 900 ha of research forest (Viikki 42, Muddusjärvi 800 and Suitia 75)
- 1000 ha of waters with fishing rights in Muddusjärvi
- Research cattle: 60 heads of dairy cattle and 70 heads of young Ayrshire cattle whose genome testing is about to be launched
- A research barn with a milking robot as well as equipment for feeding, behavioural and other research, and a laboratory for handling samples
- Machinery and equipment for running the farm and experiments (tractors, harvesters and other machines)
- The necessary outbuildings (machine shelters, repair shops and warehouses)
- A support staff of 12 for maintaining operations

Värrio Subarctic Research Station

Faculty of Agriculture and Forestry, Department of Forest Sciences

The Värriö Subarctic Research Station, established by the University of Helsinki in 1967, is located in the northernmost part of the municipality of Salla and surrounded by the Värriö nature reserve founded for research purposes. The research mission of the station is to provide internationally pertinent information on the nature in the area and any changes taking place therein. The Värriö Subarctic Research Station represents the national University of Helsinki in its area of operation in eastern Lapland and Koillismaa.

The station includes a main building with accomodation and seminar rooms for 15−20 people, a sauna and utility sheds. The station provides ample facilities for research as well as for

undergraduate and doctoral education. The research is based on long-term observation series. The station has monitored nature systematically for over 40 years, and these chronological observation series form a pool of vital background information for studying the effects of climate change on the northern wilderness. The SMEAR I measuring station located on top of the Kotovaara hill automatically measures photosynthesis, environmental factors, atmospheric trace gases (NO_x, SO_2 and O_3) as well as the size distribution of aerosols throughout the year. These measurements have been conducted since 1991.