DRAFT Call for Outline Proposals

Analysis of Complex Systems in the Information Society (EuroACSIS)

Following agreement with XX funding organisations in Country A, Country B, Country C, Country D, Country E, Country F, Country G, Country H, Country I, Country J, Country K, Country L, Country M, Country N, Country O and Country P the European Science Foundation is launching a Call for Outline Proposals for Collaborative Research Projects (CRPs) to be undertaken within the EUROCORES Programme XXXX. The Programme aims to support high quality multidisciplinary collaborative research in Europe, with involvement of leading scientists from outside Europe, when appropriate.

The research phase of EuroACSIS will run for three years [1] and includes national research funding as well as support for networking and dissemination activities. The research grants are provided directly to the eligible and successful Principal Investigators by their respective national funding organisations. The networking and dissemination support, also financed by the national organisations, is centrally managed by the ESF.

Outline Proposals are to be submitted by xth February 2011. It is expected that Full Proposals will be invited by xth March 2011 with xx May 2011 as expected deadline for submission.

A Programme-specific website can be consulted for the latest updates at
http://www.esf.org/euroacsis

Background and objectives

The development of huge computational power and the ability to record and model enormous amounts of data have been crucial for the recent impressive advancements in complexity science research in fields such as genetics and climatology. By contrast, the social sciences have not yet profited to the same extent from the enormous potential of digital information and communication technologies (ICTs) and complexity science approaches.

Complexity Sciences involve the study of systems composed of a multitude of individual parts (e.g. humans) interacting in a non-linear fashion. Such systems exhibit complex behaviours that emerge from the combined actions of the individual parts but cannot be interpreted as a simple superimposition of the discrete actions of the parts. Complexity thus provides an approach to the exploration of real-world phenomena and systems, the way they develop and organise, and the basic principles behind them. Complexity Sciences aim to provide us with methodologies and tools to help understand the mechanisms that govern such emergent behaviours and control their impact, while taking into account the role of uncertainty.

What is EUROCORES?

The ESF European Collaborative Research (EUROCORES) Programmes offer a flexible framework for researchers in Europe to work on questions which are best addressed in large-scale collaborative research programmes.

The EUROCORES Programmes allow excellent researchers in the various participating countries to collaborate in research projects 'at the bench'. They also allow, when appropriate, colleagues in non-European countries, for example the US, to participate. The Programmes encourage and anticipate networking and collaboration between researchers in order to achieve synthesis of scientific results across the programme, to connect with related programmes, and to disseminate findings.

The EUROCORES Programmes allow national research funding organisations in Europe and beyond to support top-class research in and across all scientific areas, by matching their strategic priorities with the needs articulated by the scientific community.

Final funding decisions on the projects and the research funding remain with the national funding organisations, based on a single international peer review process operated by ESF. Financed by the participating national Funding Organisations, ESF also provides support for networking between the researchers and for the scientific synthesis of research results and their dissemination. In this way, the EUROCORES Scheme complements the EC Framework Programme and other collaborative funding schemes at European level.

For further information see:
http://www.esf.org/eurocores

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[1] The formal duration of EUROCORES programmes is three years; however, individual researchers will apply to the national or other funding organisations under their respective rules, which may allow for more than three years' funding. No networking and coordination support will be available outside the formal duration of the programme.

Complexity sciences rely heavily on ICTs. Data mining and computational modelling provide the ICT infrastructure necessary to achieve a better understanding of massive amounts of data. From economic indicators to transport metrics, most of the analyses done today are heavily dependent on the identification of simple statistics that do not correspond to the real nature of the complex phenomena behind the socio-technical systems. The combination of ICT research with complex systems analysis represents a new area of research with potential impact in all sociotechnical systems.

The widespread use of digital information and communication technologies in all domains of society, and the concomitant accumulation of unprecedented amounts of data on human activity, has increase both the need and the possibilities for the social sciences to apply complexity approaches to the study of the Information Society.

Many European and world-wide socio-economic infrastructures rely on and evolve according to the way the underlying ICT systems and the huge amount of related data are handled. New technologies and their increasing interconnectivity are continuously adding more complexity to service infrastructures. The financial, health, transport, energy and education systems in Europe and beyond are just a few examples of systems which have recently displayed signs of fragility and failure. In the future, such crises may be alleviated by a more comprehensive understanding of these systems at all scales, from local to international, and structurally from organisational to multi-national.

The aim of the EuroACSIS programme is to develop methodologies, tools and technologies to help analyse the mechanisms governing the behaviours of complex sociotechnical systems. The EuroACSIS programme will facilitate the establishment of a closely interacting research community dedicated to enhancing our understanding of complex phenomena in the Information Society.

Scientific Goals

The EuroACSIS programme will stimulate the development of interactive, multi-purpose modelling, exploration and design tools, with the ultimate goal of contributing to the improvement of the quality of interaction between society and ICT systems. Integrated, large-scale modelling and simulation of complex sociotechnical systems will promote interdisciplinary research and innovation in various interconnected domains of the Information Society.

The EuroACSIS programme will deal with "interface" research. It is focused on a socio-

theoretical "meta-objective", namely the ideal of systematically and comprehensively understanding the interconnected networks within which flow the data relating to many problems faced by society.

Collaborative Research Projects will complement each other, yielding deeper scientific knowledge and understanding of how complex system perspectives could help sociotechnical infrastructures to operate more efficiently. Collaborative Research Projects will share a set of common methodologies to extract information from the highly complex, dispersed and incomplete sets of data collected by the heterogeneous ICT systems.

Research Areas

The EuroACSIS programme will bring together research communities from the engineering, natural and social sciences to combine and integrate the best of their knowledge. Proposals should have a clear emphasis on the development of methodologies, tools and techniques for application to real-world societal challenges.

To address the goals indicated above, the Collaborative Research Projects will focus on applying complex systems perspectives to one of the areas (or sub-areas thereof) listed below:

(i)   Information, Innovation and Education Services
(ii)   Urban Services: Transport, Traffic, Energy
(iii)   Economic and Financial Systems
(iv)   Safety, Security, Risk Management
(v)   Reasoning ICT Systems
(vi)   Massive Real-World Data Mining
(vii)   Realistic Models of Complex Systems
(viii) Design of Resilient and Sustainable Systems

(i) Complex Systems applied to Information, Innovation and Education Services
This research area will promote the development of new concepts and tools to support:

- Evaluation of information, projects, knowledge products, etc.
- Investigation of the link between innovation and each of the following: the working environment, energy/environmental crisis, globalisation
- Scientific co-creation and collaboration through new ICT tools and concepts ("Science2.0").
- ICT platforms to enhance individual and collective learning.
- Elaboration of ICT-based methods based on data stemming in order to help understand knowledge production and

circulation (e.g. in science, wiki platforms, blog networks).

(ii) Complex Systems applied to Urban Services: Transport, Traffic, Energy

Specific areas of application would be:

- Investigating real-time travel activities and their environmental impacts in a privacy-respecting way; supporting the development of more flexible, efficient and scalable control approaches for transport and logistical systems; improving user- and environmental friendliness of multi-modal transport.
- Understanding the interconnections between traffic and land use in the context of urban and regional planning.
- Supporting the development of coordination schemes for distributed energy production and consumption in smart grids with large numbers of generators and loads.
- Elaborating optimisation methods for energy generation, delivery and power grid structure in view of the radical changes in energy policies expected due to scarcity of fossil fuels in the future.
- Understanding data relevant to supply and demand in energy markets and underlying mechanisms.

(iii) Complex Systems applied to Economic and Financial Systems

This research area comprehends:

- Contributing to the development of economic theory and models.
- Building models consistent with empirical and experimental data.
- Exploring mechanisms and institutional settings which could help to create more robust, but adaptive economic systems.
- Comparing properties like efficiency, predictability, reliability, robustness, signs of failure, etc., of alternative banking, pricing, auctioning and market systems, through extensive computer simulations.
- Investigating different value transfer systems, distributed and open kinds of credit and exchange systems (e.g. P2P banking), considering mechanisms like trust, reputation, and norms.
- Exploring financial policies and new institutional or regulatory settings by computer simulation.

(iv) Complex Systems applied to Safety, Security and Risk Management

Relevant issues in this topical area are:

- Modelling data on corruption, crime, conflict and war.

- Exploring integration problems resulting from migration and independence/ liberation movements and conflicts.
- Testing and applying theories related to crime and corruption.
- Crisis prediction and containment.

(v) Complex Systems applied to the Design of Reasoning ICT Systems

Specific areas of application would be:

- Evaluation and ranking of models according to individual criteria; supporting multi-dimensional evaluation of reputation-relevant aspects; complementing, enhancing and fusing data mining algorithms with models and expert knowledge to create interpretation devices.
- Development of methods for the self-validation of algorithms and models; running potentially relevant scenarios; identification of causality chains; exploration of feedback and cascading effects; determination of the reliability of implications, given the validity of the underlying models.
- Computation, analysis and use of independent information to address the impact of model assumptions and unmask hidden constraints; supporting the identification of open points and crucial questions regarding data analyses, algorithms, and models; developing and testing hypothesis generators.
- Use of evolutionary computing; development of ICT methods to test alternative interaction mechanisms and integrative systems designs.
- Supporting the creation of propositions, brain-storming, and decision-making.
- Development of data-driven models of emotion transfer in e-communities in ICT-mediated communities; new tools for improving human contact and human-computer interactions.

(vi) Complex Systems applied to Massive Real-World Data-Mining

Relevant issues in this topical area are:

- Development of concepts for large-scale, long-term, real-time data gathering and sensing; measuring systems and behaviour in real time using mobile phones, GPS, accelerometers, RFID tags, search engine requests, web and email use.
- Contributing to the development of sensor networks/smart grids; employing opportunistic sensing; learning how to collect data from users and to generate surrogate data having the same statistical properties as the original data, while protecting privacy.

- Contributing to the improvement of data collection, fusion, filtering, and categorisation; reducing database and information system pollution; improving accessibility and data extraction; supporting massive techno-social-economic-environmental data mining; managing data deluge; improving handling of inconsistent data; performing model calibration, identifying and filling data gaps (e.g. in case of incomplete or non-representative data).

(vii) Development of Realistic Models of Complex Systems

Relevant issues in this topical area are:
- Complex network research.
- Multi-agent simulations of large systems, including human cognitive and psychological processes.
- Realistic computer simulations with parameter-rich models of large techno-social-economic systems; calibration of parameter-rich models with massive datasets.
- Scanning of multi-dimensional parameter spaces; parallel social scenario analyses to test alternative policies; visualisation of multi-dimensional data and models of complex systems.
- Real-time management of complex systems, self-organisation.

(viii) Complex Systems applied to the Design of Resilient and Sustainable Systems

Applications in this area should aim to help to:
- Develop new concepts for managing complexity as well as for the design of institutional and integrated systems; enhance the resilience, adaptability, flexibility and sustainability of complex systems, while reducing undesirable systemic risks, feedback and side effects.
- Create techniques, tools, and concepts allowing for the integration of system components into global-scale systemic models of society.
- Verify results of large-scale, integrated, systemic models to capture emergent phenomena while avoiding artefacts; improve visualisation of multi-dimensional dependencies in global models to strengthen intuition and decision and foster social awareness.
- Develop guidelines for model-based decision support; find ways to consider decision-making constraints in model scenarios; support communication and exchange between scientists and decision-makers.
- Address the problems and interests of developing countries, considering multi-scale (local and world-wide) socio-economic impacts.

Interconnections

The EuroACSIS programme will span the natural, computational, engineering and social sciences, as well as humanities disciplines. Proposed projects may be grounded in the mathematical and physical sciences, but should incorporate meaningful collaboration with other social scientific or humanities disciplines. The following non-exhaustive list exemplifies subjects within these disciplines that might be relevant for the proposed theme:

- **Engineering and computer sciences** (energy and transport management, supercomputing, grid computing, distributed systems, human-computer interaction, semantic web, data mining, sensor networks, ambient intelligence, information systems, database design, information cleansing and pollution prevention, algorithm design, machine learning, automated deduction, visualisation, serious games, agent-based modelling, scenario modelling, cybernetics)
- **Mathematics** (statistics, modelling, catastrophe theory, non-linear dynamics, extreme events, sensitivity analysis, logic, axiomatic deduction)
- **Physics** (complex systems theory, self-organization, theory of critical phenomena, power laws, chaos theory, network analysis, experimental data, information theory, interference between noise and information in complex systems)
- **Cognitive sciences, psychology, anthropology** (subjectivity, individual preferences, attention, creativity, emotions and affective interactions)
- **Sociology** (social interaction, cooperation, reputation, norms, ICT-related social dynamics)
- **Political Sciences and Law** (governance, regulation)
- **Economics and Operations Research** (financial markets, mechanisms, institutional and systems design)
- **Biology** (neuroscience, perception, computational biology, epidemiology, evolution)
- **Geosciences** (global warming, prediction of natural hazards)
- **Ecology** (environmental change, sustainability, ecological modelling, structural stability)

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Infrastructure requirements

Collaborative Research Projects implemented within this programme should involve leading research institutions and infrastructures from all over the EU and other parts of the world. Many of these institutions will have super-computing centres, some of them among the fastest in Europe. Nevertheless, some of the topics listed above will require even more powerful or more versatile ICT systems. To this end, specific agreements should be sought with national and/or pan-European research infrastructures, to promote a paradigm shift towards high-performance, socio-eonomic data mining and supercomputing which promotes human well-being while protecting individual privacy. CRPs should be specific about how and where they will access data.

Ethics

Any Collaborative Research Project implemented within this programme, addressing topics such as reality mining and data collectors, can be potentially harmful for individual privacy and intimacy. The Scientific Committee will pay all due attention to potential problems related to data mining, privacy, intimacy and proprietary issues. CRP proposals should include concrete prevention mechanisms and explain clearly how the consortium will address ethical issues in each particular case.

The involved institutions and projects should rely on an Ethical Committee, which will be actively involved where appropriate. The Ethical Committee should give direction and supervise the activities.

Note that one relevant research topic addressed by the EuroACSIS Programme is the development of new methods to mine data that take privacy issues into account better than is currently done in science and business.

New ways of protecting privacy in data storage and mining might be developed and tested. The proposers may thus consider elaborating new policies and procedures to establish future standards and adequate protection of privacy within CRPs involving massive data mining.

Iinformation will be anonymised to satisfy the EU Directive 95/46/EC. Furthermore, established standards for information processing will be applied.

Guidelines for applications

(Outline and Full Proposals)

This Call for Proposals is for Outline Proposals for Collaborative Research Projects (CRP). Proposers should be individual scientists (or research groups represented by individual scientists) who are eligible for funding from a national funding organisation participating in the EUROCORES Programme EuroACSIS.

Scientists or groups not applying for or not eligible to apply for funding from such an organisation can be associated to a proposal when their scientific added value can be demonstrated. Participation of Associate Partners in a project must be fully self-supporting and will not be financially sponsored by the participating funding organisations.

Proposals are only eligible if they fulfil all of the following **criteria**:
- Proposals must involve, as a minimum, three eligible Principle Investigators (PIs) from **three different countries.**
- A maximum of 30% of the total number of Individual Projects (IPs) in a Collaborative Research Project (CRP) can come from one country.
- Proposals must involve more PIs than Associated Partners (APs).

Applications should envisage three years of research. Taking into account the two-stage proposal selection and approval process (described below), the successful projects are expected to begin their research phase activities during **March** - **June 2012**.

Online submission of applications

Outline and Full Proposals will be submitted online. Applicants should follow the proposal structure as indicated in the application template for Outline Proposals available on the Programme website at:
http://www.esf.org/euroacsis.

Links to information on national funding eligibility and requirements as well as to a EUROCORES Glossary and Frequently Asked Questions (FAQs) are available on the Programme website.

Prior to submitting Outline Proposals, all applicants must contact their national funding organisations in order to verify eligibility and

to ensure compliance with their national grant requirements and regulations. The list of participating organisations and their nominated contact persons is included on the last page of this document.

At the time of the online submission of the Outline Proposal, the Project Leader will be asked to confirm on behalf of the consortium that all the Principal Investigators in the CRP have consulted their national funding organisations and are eligible for funding from these organisations.

Outline Proposals

Outline Proposals are invited by <mark>xth February</mark> 2011.

Outline Proposals will be examined by the participating funding organisations for formal eligibility. Therefore, it is crucial that all applicants requesting funding contact their national funding organisation prior to submitting their proposals.
In compliance with the rules and regulations of the participating national funding organisations, the requested funds under the EUROCORES Programme EuroACSIS may include salaries for scientific and technical staff, equipment, travel costs and consumables within the project. The amounts requested from each funding organisation participating in the call must be clearly specified. National policies may also require the proposal to contain specific additional information. Applicants should be aware that the participating funding organisations can make adjustments to the requested funds in order to bring these in line with their normal grant regulations and standards.

As described below, applications will be reviewed according to specific assessment criteria in a two-stage procedure. The goal is to select scientifically excellent proposals which fit well within the scope of the programme and have significant potential to add value to its achievements.

At the outline stage, the Review Panel will select proposals based on the following criteria:
- Relevance to the Call for Proposals
- Novelty and originality
- European added value (scientific)
- Qualifications of the applicants
An Outline Proposal must comprise:

- A summary of the CRP (max. 1200 words, including objectives, milestones, methodologies (e.g. experiments and fieldwork);
  - Short description of how (and why) the partners contributing to the CRP will work together and how their contributions will be integrated;
- Short CVs of Project Leader (PL), all PIs and Associate Partners, including the five most relevant publications (max. one page each);
- Estimated budget (consistent with the rules of the relevant national funding organisation), tabulated according to a provided template.

Associated Partners (APs) are also considered part of a CRP and will be assessed as such at both the Outline and Full Proposal stage.

It will be assumed that arrangements for the handling of Intellectual Property Rights (IPR) (e.g. the creation of open source codes) will be in place within projects, following the applicable national legislation and national funding organisation's regulations. Applicants are strongly urged to have such arrangements in place, covering all research groups (including any associated groups) *before* the start of the projects. It is expected that the results obtained by the projects supported under this EUROCORES Programme will be placed in the public domain, through standard scientific dissemination activities.

It is also expected that compliance with all other relevant national or international regulations on research (for example ethics) will have been affirmed before funding is granted. It is the responsibility of applicants to clarify any such matters (if applicable) with their national contact points.

Full Proposals

Full Proposals will be invited following the recommendations of the Review Panel. The deadline for Full Proposals will be announced later, but is expected to be around <mark>xxth May, 2011.</mark>

Please note that only applicants who have submitted an Outline Proposal can submit a Full Proposal.

For the Full Collaborative Research Project (CRP) Proposals, the most important selection criterion is "scientific quality". Other criteria include interdisciplinarity (according to the scope of the call), qualifications of the applicants, level of integration and collaboration, feasibility and appropriateness of methodologies, European added value, relation to other projects (complementarities versus risk of overlaps and double-funding) and suitability of the requested budget.

The Full Proposals will be assessed by at least three independent external expert referees selected by the ESF. The expert referees are selected from a pool of scientists suggested by the participating funding organisations, the Review Panel and the ESF office. The names of all referees used in the international peer review of EUROCORES programmes, together with the names of those who have contributed to the peer review process in other ESF instruments, will be published on the ESF website once in a given year.

The referee reports will be made available (anonymously) to the applicants for their information and if necessary for their comments and clarifications. The Review Panel will rank all Full Proposals based on the assessment of the Full Proposal, the anonymous referee reports and the applicant's responses to these.

The Review Panel will create a rank-ordered list of the strongest Full Proposals and will subsequently make recommendations to the Management Committee for the funding of these proposals. The Management Committee assigned to each programme comprises representatives of all the participating funding organisations.

The actual granting of the funds to the Individual Projects will be based on the Review Panel's ranked list. The funding cut-off will be determined based on the total amount of funds available in each participating Funding Organisation and how the Individual Projects figure on the list. The use of funds in a project will be subject to the national requirements and regulations of each participating Funding Organisation.

Full proposals must include sound and well-argued scientific cases both at the level of the consortium's collective objectives and in terms of the expected contributions of each of the Individual Projects in the consortium. Full Proposals must also include a list of all participants and their contact information and shorts CVs, detailed tabulated budgets for the

whole CRP and for each project within it. Full Proposals could include other necessary supporting information. A coherent and common scientific case must be made throughout the proposal to demonstrate a collective and collaborative aim and for scientific synergy and integration of multinational expertise. In addition, the amount requested from each national funding organisation has to be clearly and separately specified. Detailed instructions on requirements and how to complete the application forms will be made available when inviting Full Proposals.

The **Project Leader** (PL) will be the main point of contact between the ESF and the CRP for the whole duration of the project. He/she will be responsible for the flow of information and communication between the ESF and all the participants in the CRP. The PL will represent the Collaborative Research Project in relation to its participation in programme activities and for the fulfilment of reporting requirements for the CRP as a whole and for the contributions of the individual Principal Investigators in the CRP.

In addition to their normal scientific and collaborative activities within the CRP, all **Principal Investigators** will be responsible for dealing with the requirements concerning the contributions of their national funding organisation, and for supporting the Project Leader in the overall progress of the CRP, including organising and participating in networking activities and in the fulfilment of reporting requirements.

Programme Structure and Management

Programme Structure
The overall responsibility for the governance of each individual EUROCORES programme lies with a *Management Committee*, whose members include one representative from each participating funding organisation in the programme (usually a senior science manager), together with an ESF representative.

Proposal assessment and selection are the responsibility of an international, independent *Review Panel*. The members of this panel are leading scientists, appointed by the ESF following suggestions from participating Funding Organisations. The membership of the Review

Panel will be available on the Programme website for information. The Review Panel is also expected to monitor the overall scientific progress of the programme.

The Scientific Committee is formed by the Project Leaders of all funded CRPs and will be responsible for the overall scientific progress of the programme, including for the preparation of a work plan for the overall programme activities, including networking and dissemination. The Scientific Committee will also advise and support the EUROCORES Programme Coordinator in the coordination of the programme.

Programme Networking

Networking activities are designed to strengthen the scientific objectives of the EUROCORES Programme by promoting coherence and synergy in the activities of the scientific community involved. This will help to produce the European added value which is a main objective of all EUROCORES Programmes.

Networking and collaboration within EUROCORES Programmes take place at two levels:
1. Between the various Individual Projects within each Collaborative Research Project (CRP) (intra-CRP activities), and;
2. Between the funded CRPs in the programme (cross-CRP activities).

The intra-CRP activities must be supported through the individual research grants the participants receive from the national funding organisations in the given CRP.

The cross-CRP activities are centrally funded by the ESF through contributions from the participating organisations to the EUROCORES Programme.

The intra-CRP collaboration is motivated by the nature of the CRP's research objectives, i.e. by the scope and the complexity of the questions it deals with. In a CRP, the participating groups have the opportunity to gather the required critical mass to successfully address the objectives and challenges of their project.

The cross-CRP networking and collaboration is inspired by the aims and the nature of the EUROCORES Programme as a whole. The themes of EUROCORES Programmes are selected because they demonstrate a clear need for collaboration in the proposed field. The funded

CRPs will collectively establish and streamline this new collaboration. To this end, the CRPs will engage the programme participants and, when of clear benefit, colleagues from outside the programme in joint activities such as:

- Programme-wide meetings or conferences;
- Working group meetings for the exchange of information and results across the CRPs;
- Joint scientific meetings or summer schools;
- Short term visits;
- Development and delivery of joint training programmes;
- Seminars, workshops, symposia, invited sessions either stand-alone or as part of other larger events;
- Common web-facilities and publications.

Through active participation of scientists in the above mentioned activities, not only can existing collaborations be enhanced, but new and strategic partnership opportunities may also be identified.

Furthermore, these activities may provide opportunities to explore aspects of the programme which are not covered by the funded research projects.

The integrating activities between the CRPs should help to strengthen the field by building coherence within the existing and emerging research communities and will serve as platforms for the dissemination and outreach of the research conducted in the programme.

Project members are expected to participate annually in at least one cross-CRP activity.

When submitting your proposal, please note that the costs for networking within your CRP should be included in your proposal as part of the costs of meetings, travel and subsistence. Funds for networking between the CRPs will be centrally managed by the ESF through contributions from the participating funding organisations.

Programme Evaluation

A mid-term evaluation involving the Review Panel will assess the overall progress of the Programme. The Review Panel may also comment on the CRPs' work plan in relation to the objectives of the overall Programme. A final evaluation at the end of the Programme will assess the overall achievements of the whole EUROCORES Programme.

Contacts in the participating organisations

As it is currently not known which Funding Organisations will support this programme, please contact your National Funding Organisation or Research Council to inquire about this programme.

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[1] The European Science Foundation (ESF) provides a platform for its Member Organisations to advance European research and explore new directions for research at the European level.
Established in 1974 as an independent non-governmental organisation, the ESF currently serves 79 Member Organisations across 30 countries.