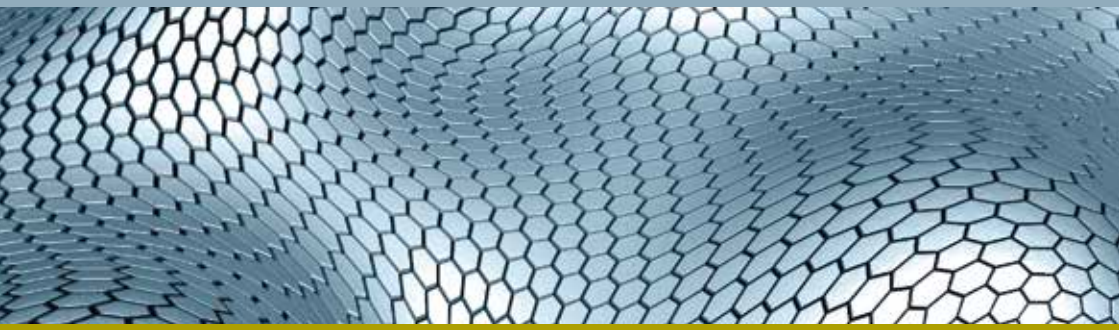
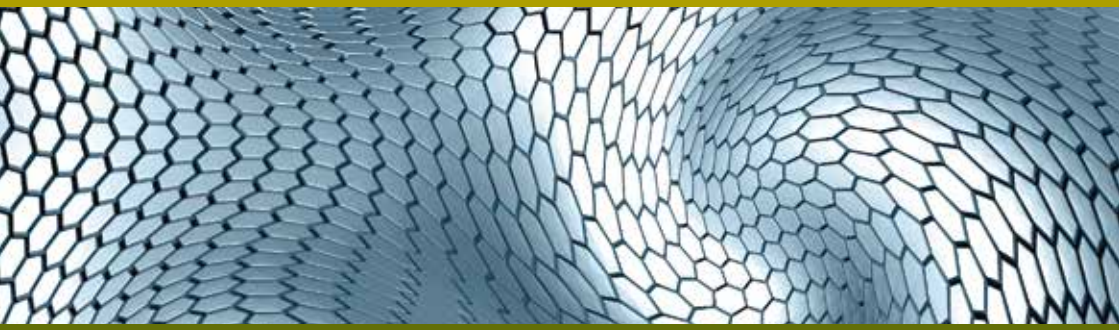
SWEDISH FOUNDATION FOR STRATEGIC RESEARCH



Research Strategy 2017 – 2021



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Research Strategy 2017 – 2021

SUMMARY

The Swedish Foundation for Strategic Research is an independent funder of research in the fields of natural science, engineering, and medicine aimed at strengthening Sweden's competitiveness. The research shall exhibit high excellence and relevance to meet the challenges facing Swedish industry and society. The Foundation acts strategically in its choice of research areas and types of grants, with for the most part open calls for proposals. Examples are framework programmes within strategically vital fields of research, career grants, and other targeted initiatives. The aim is to encourage interdisciplinary collaboration, exploitation of research results, use of research infrastructure, and mobility between academia and industry as well as between different countries.

The Foundation selects projects based on two main criteria:

- **Relevance and expected societal impact**
- **Scientific quality.**

In addition, different subcriteria are applied from case to case:

- **Interdisciplinarity**
- **Internationalization**
- **Mobility between sectors**
- **Leadership.**

ABOUT THE FOUNDATION

The Swedish Foundation for Strategic Research is an independent research funding body. The Foundation's objective, expressed in Article 1 of its statutes, is to:

- **support research in the natural sciences, engineering, and medicine**
- **promote the development of strong research settings of the highest international standard and of importance for the development of Sweden's long-term competitiveness.**

The section on Activities states that the research funded by the Foundation may include both basic and applied research, as well as areas falling in between these two. The Foundation's activities shall be distinguished by:

- **efforts to establish internationally competitive research centres**
- **programmes entailing cross-boundary collaboration between disciplines**
- **establishment of national and international forms of collaboration**
- **promotion of postgraduate studies and recruitment of researchers**
- **collaboration between academia and industry**
- **mobility of researchers.**

The Foundation has chosen to work as a funding body with targeted (thematic) calls for proposals for funding of individuals and projects, selected primarily by peer review of applications.

The research supported by the foundation shall meet the dual criteria of high scientific quality and societal relevance. Here, proven intradisciplinary success is desirable, but not sufficient, to meet the relevance requirement. Grantees shall demonstrate a commitment to exploitation of the research already at the time of application. The Foundation's investments in research shall yield measurable return in the form of scientific results as a basis for technological or medical advances with an impact in industry and society on a timescale of 5-15 years.

Contacts with potential beneficiaries of the research in the private and public sectors are of vital importance for the Foundation.

The Foundation's evaluation panels typically include experts from academia, business, and government. We almost always use foreign evaluators and sometimes interview groups.

WORKING STRATEGICALLY

Our society is in the midst of the fastest and most vigorous phase of change in its history. Science and technology are offering us unparalleled opportunities to meet the great challenges we face. That is why we need targeted basic research that creates opportunities and is solution-driven at the same time as society is able to exploit the scientific findings.

Gender equality is also a strategic factor for research. The Foundation maintains a balanced acceptance between male and female applicants. At the same time, we strive for balance between the number of applicants from different research areas.

There is an international trend towards research that is increasingly strategic, accompanied by a search for new and effective modes of support. The intention is to create a

bridge between basic research and commercial exploitation, and to reduce the time it takes for a new product to reach the market.

The Swedish state does not have its own organizations for strategic research. In other countries there are often special government research councils. One of SSF's roles is therefore to try to bridge the gap in the funding chain between free basic research and innovation- or need-driven research.

After more than 20 years of activity, two studies[1] have found that the Foundation has acted as a system changer and renewer in the funding of research in Sweden. It has achieved this both by backing long-range ventures in collaboration with other funding bodies in business and academia and by responding quickly to changes and taking advantage of golden opportunities.

Since the pressure for change is increasing in society, the Foundation has chosen to work with a relatively short planning horizon of five years. The Foundation strives in particular to find new research funding forms that are important for Sweden's development, but cannot be offered by other funding bodies.

The Foundation's strategy is to prioritize research that contributes to Swedish productivity and competitiveness within a reasonable time horizon, while at the same time encouraging research breakthroughs.

Strategic research bridges the gap between basic research (where the future is not a defined concept) and product development (where the future is tomorrow). Collaboration and critical mass are other key concepts for projects supported by the Foundation.

WHAT IS STRATEGIC RESEARCH?

The Foundation is unique in encouraging the exploitation of high-quality research, often with an interdisciplinary approach and risk-taking in the problem formulation, and on a high potential for results that can be applied in business and in society.

The interpretation of the keywords strategic research and competitiveness is crucial for how the Foundation carries out its mission.

Strategic research is research that meets society's need for applicable knowledge, i.e. research of the highest quality that is relevant and has a good potential for exploitation. SSF wants to support researchers who work upward in the value chain towards new products and services. Benefit is typically judged based on the following aspects:

- the power and attraction of internationally brilliant integrative knowledge and innovation settings that deepen that relationship between education, research, and collaboration

- research whose results can spawn the development of existing or new enterprises, including ones launched by the researchers themselves

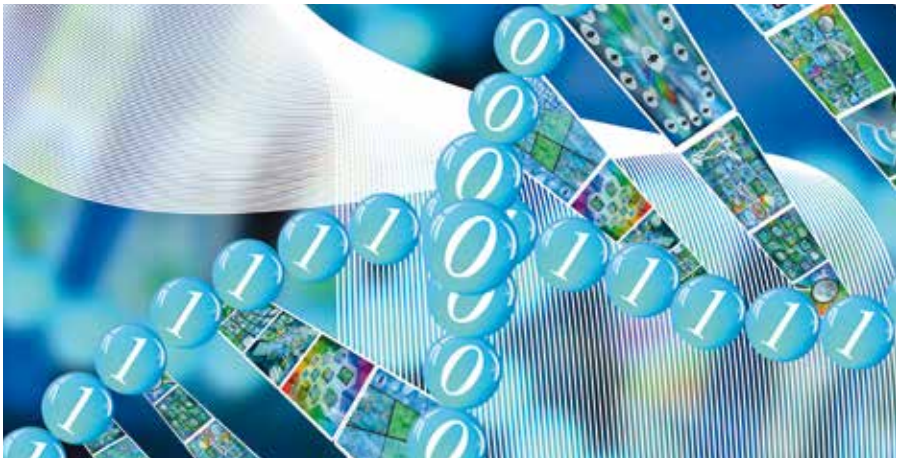
- researchers with postgraduate training who, based on their broad background and generic abilities, are attractive for employment in the private and public sectors

- research that serves as a focus for international cooperation, leading to investments in Sweden, for example when companies decide to locate R&D activities in Sweden

- new and improved medical therapies for treating illness and improving health

- techniques, goods, and services for higher productivity, lower emissions, phaseout of

1. Faugert Effektstudie 2014; Tillväxtanalys 2015.



hazardous substances, higher energy and resource efficiency, higher recyclability, and improved environmental performance.

Competitiveness is evaluated on the basis of how well Swedish research and postgraduate studies stand up to international comparison. The country will benefit as Swedish industry increases its market share and Swedish researchers make important contributions to global research. At a time when global competition for capable researchers is increasing, Sweden wants to attract the best.

Other strategic factors are the Foundation's choice of research areas, types of grants, and research leaders. Some examples here are framework grants within digitalization, life science technology, and strategic materials development. As regards individual scientists, an important strategy is encouraging mobility and leadership among young researchers and key persons in the infrastructure.

The research setting's creative drive and alertness to relevant problems are factors that are often crucial for success, along with the competence of collaborating companies and hospitals in contracting research, and exploiting results. The Foundation selects projects based on two main criteria:

- Relevance and expected societal impact
- Scientific quality.

In addition, different subcriteria are applied from case to case:

- Interdisciplinarity
- Internationalization
- Mobility between sectors
- Leadership.

FOCUS OF ACTIVITIES

Thanks to its organisational form and unattached position, the Foundation can act independently.

The Foundation undertakes targeted initiatives and shifts it priorities over time between different areas and organizational forms based on current assessments of needs and

opportunities. We strive to be an action- and result-oriented catalyst for creating added value by supporting creativity and innovative thinking in research, postgraduate studies, and collaboration. Our resources are targeted on effective research settings and individual scientists within selected areas.

The Foundation supports research of vital importance for the development of Swedish industry and society, both in areas where Sweden is among the leading nations in the world today and in areas where Sweden has the potential to become a leader, in order to take advantage of the in-depth knowledge, expertise and structure in our country.

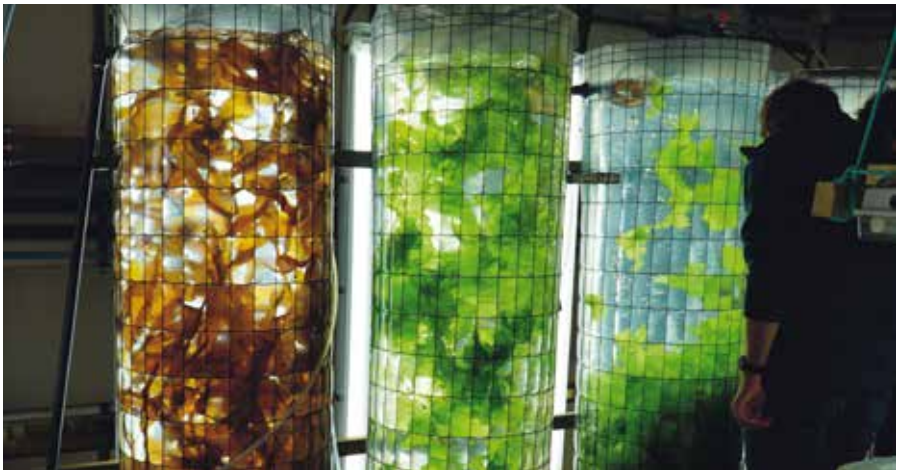
A standard that must be met by all research programmes funded by the Foundation is scientific excellence. To prove that this standard is met, the results must undergo peer review, which normally requires publication in international scientific journals. Another important factor is the assessment that Sweden should concentrate its forces within important areas.

Besides being of the highest scientific quality in an international perspective, the funded research must have the potential of yielding deeper knowledge and expertise that can, with concretely formulated plans, ultimately be expected to be applicable within knowledge-intensive and high-tech branches of industry or sectors of society in Sweden.

On the nine-grade scale of Technology Readiness Levels, the Foundation aims to locate its activities on the lower levels 2-6, spanning the spectrum from the formulation of technology concepts and applications after a discovery to their realization and verification in relevant systems.

The Foundation further stimulates interdisciplinary research between areas where there has not previously been collaboration. The purpose is to achieve transboundary synergies.

The timeframe for individual initiatives normally encompasses a grant period of 3 – 6 years. The programme should fit in with the long-term plan at the HEI (higher education institution) in question or have a potential to become a new competitive field for other funding bodies, to be further developed at research institutes or to be taken over by industry.

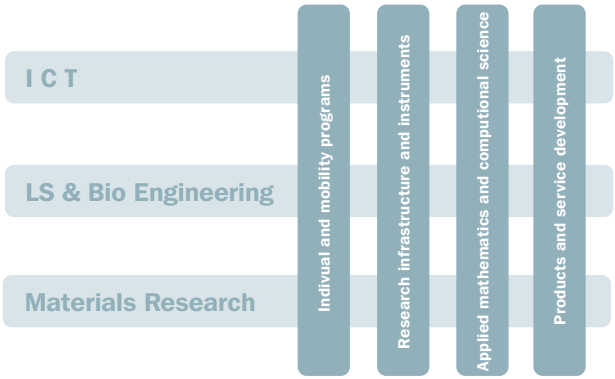


RESEARCH AREAS WITH TRANSVERSAL INITIATIVES

In all of its funding decisions, the Foundation aims to prioritize boldness with innovative thinking and risk-taking in the projects, link industry and healthcare to the projects right from the problem formulation phase, and in their execution work actively and systematically to hasten the exploitation of the research results.

The following main areas will be prioritized during the coming period:

- **Information, Communication, and Systems Technologies (ICT)**
- **Life Sciences with a focus on technologies and Bioengineering**
- **Materials Research with a focus on new and better functionality and production.**



The matrix shows main thematic areas together with transversal initiatives. Inter-disciplinary framework grants cut across the matrix and form nodes for possible calls for proposals.

The Foundation intends during the five-year period to allocate similar amounts to the three main areas, based on an assessment of their combined impact within research and exploitation, given their different potentials. At the same time we are keeping our options open to support research within other subareas within the Foundation's overall field of interest, which is engineering, medicine, and natural sciences.

The Foundation employs a dynamic grant structure based on strategic considerations. The research portfolio at the outset of the current five-year period mainly includes the following types of grants. These types of grants may be modified as needed and new types may be added.

MODES OF SUPPORT

Framework grants

The Foundation identifies strategic areas for Sweden where interdisciplinary projects meet a need from industry or contribute to solving a major societal challenge. Framework grant projects should preferably cut across the Foundation's three main research areas (for example framework grants within X/Y or Y/Z). They must be characterized by scientific

quality and relevance with a practical impact in application.

Framework grants target researchers and groups with complementary competence who employ scientific methods to solve advanced problems with high application potential and who work actively for practical exploitation of the results. The research need should preferably be formulated in collaboration with industry or healthcare. One of the researchers is also the research leader and main applicant. Participating researchers can be taken from different faculties and HEIs.

Framework grants also aim to develop dynamic research and innovation settings with extensive networks. The Foundation therefore allows relatively free usage of the research funds. This type of grant is characterized by both a top-down perspective from the funding body (as regards calls for proposals with problem formulation) and beneficiaries/stakeholders and a bottom-up perspective from the researchers (as regards approach and execution).

Individual grants

Individual Grants for the Advancement of Research Leaders (FFL)

The aim of the programme is to identify young, promising researchers with leadership potential and offer them grants to put together independent research groups distinguished by groundbreaking innovativeness, mobility, and international competitiveness. The programme is also characterized by leadership training for the grantees. Calls for proposals are normally issued every third year.

Ingvar Carlsson Award (ICA)

The aim of the programme is to give home-coming postdocs an opportunity to launch their own independent and creative research careers in Sweden. The programme includes leadership training. The Foundation gives priority to researchers who switch HEI on establishing themselves in Sweden. Calls for proposals are normally issued every other year.

Research Infrastructure Fellows (RIF)

These grants are targeted at individuals with unique expertise who choose a research staff-

oriented career rather than an faculty career, for example beam-line scientist or research engineer. The purpose is to develop scientific methods, instruments, labs, databases, registers, etc. and make them accessible for broader use, such as in industry, in the spirit of open access. A prerequisite for the grant is that the HEI in question prioritizes and allocates its own funds for such infrastructure.

Industry Doctoral Student (ID) and Research Institute Doctoral Student (FID)
The doctoral student must be primarily employed by a company or a research institute and be admitted to a postgraduate programme at a Swedish HEI. Calls for proposals are normally issued every year.

Strategic Mobility
A qualified individual from a university or a company applies for funds to pay his salary to conduct R&D via exchange with a company or university. Calls for proposals are normally issued every year.

Instrument and method development
A researcher at a university or research institute applies for funds to design a scientific instrument with associated measurement method for which there is a commercial potential and/or a need in a national research infrastructure. Calls for proposals are intended to be issued on a trial basis during this five-year period.

Innovation and exploitation
Researchers who participate in framework projects may use some funds to protect intellectual rights and pursue commercial exploitation of results. Particularly successful efforts for exploitation in SSF projects may be considered for a prize or scholarship.

Targeted initiatives
The Foundation's research strategy also includes Industrial Research Centers, focused on long-term disruptive and enabling technologies, driven by industry in collaboration with universities and research institutes.

The Foundation participates in international bilateral collaborative programmes, currently with South Korea (projects) and Japan (postdoc nomination).

Furthermore, ad hoc initiatives will be adopted as necessary by the Foundation, for example when there is a risk that leading researchers will move away and similar initiatives by vice-chancellors.

MOBILITY
With its grants, the Foundation wishes to promote the mobility of researchers between HEIs in Sweden and abroad as well as to and from industry, research institutes, healthcare, and other sectors of society. Mobility has an inspirational effect on research problem formulation and strengthens creativity and technology transfer between the parties, while also making possible a career change for the individual. For this purpose, the Foundation offers above all the following types of grants: Strategic Mobility, Industrial Doctoral Students, Research Institute Doctoral Students, and the Ingvar Carlsson Award. The Foundation prioritizes a researcher's mobility when evaluating the person's application.

RESEARCH INFRASTRUCTURE
Research infrastructure is itself a strategic factor for advances in science and technology. Sweden needs to capitalize more on its big investments in, e.g. MAX-IV, ESS, and SciLifeLab. In the future, investments will be needed in the IT field, as well as in different types of testbeds.

The Foundation contributes to the social contract for research infrastructure by allocating funds to, e.g., key persons who act in their positions and careers to build labs, instruments, technology, methods, and databases, as well as to make them accessible for broader use, including by industry.

During the period 2017-2021, the Foundation will also fund a graduate school (40 projected doctorates) within applied neutron scattering for the purpose of greatly expanding Sweden's user base, research breadth, and industrial activity at ESS.

It is particularly important to simulate technology development in Sweden, for example of instruments and methods, for which there are not many types of government grants. One way to build future competence is to encourage young researchers to establish their research group at, or in connection with, an existing research infrastructure.

In these and other ways, the Foundation's targeted initiatives can contribute to the development of industry that operates in Sweden and thereby increase the country's long-term competitiveness.

EXPLOITATION OF RESEARCH

The Foundation believes that basic research and exploitation of its results need to go hand in hand in order to meet the challenges facing our society.

The Foundation therefore seeks to identify relevant research areas and prioritize projects that include innovation and exploitation of basic research. In their applications for research grants, the researchers describe how the results of the project will be of benefit, for example via technology transfer, industrialization, demonstrators (new functional or technological concepts) or intellectual property rights, as well as new treatment methods in healthcare. Some research grants are therefore typically reserved for the grantees to use for proof-of-principle research, patent applications, clinical trials, commercialization advice, and the like.

We also point out the value for researchers to interact directly with industry, healthcare, and other sectors, as well as with university innovation offices and research institutes, as a bridge between academia and industry.

THE FINANCIAL FRAMEWORK

The Governing Board determines the budget for new commitments over time and the Foundation is able to draw on the capital, not just the return. The Foundation's freedom to decide on the grant volume makes it possible to adjust the level of funding to the prevailing situation in Sweden and in the Swedish research and educational system.

From a well-managed initial capital endowment of SEK 6 billion obtained from the Swedish state in 1994, the Foundation had disbursed SEK 12 billion in research grants at the outset of 2016, leaving it with about SEK 10 billion in remaining capital. Based on current and projected capital growth and research needs viewed in the light of demands on long-term stability in the Foundation's funding, the Foundation judges that the annual grant budget should be at a level of SEK 1000 million. The Foundation can thereby continue to be an important actor in the Swedish research funding system up until such time as its capital has been depleted in 2030, assuming a constant disbursement level of SEK 1 billion per year. For new calls for proposals after 2025 and continued activities beyond 2030, a recapitalization of the Foundation is therefore required.

SSF

Research that shapes the future

THE SWEDISH FOUNDATION FOR STRATEGIC RESEARCH

- Supports research and postgraduate studies in science, engineering, and medicine for the purpose of strengthening Sweden's future competitiveness.
- Creates bridges between basic research and exploitation of research results.
- Funds several hundred research projects at Higher Education Institutions – many in collaboration with industry and research institutes.
- Awards grants to leading research leaders, with an emphasis on the talented young.
- Launches targeted initiatives aimed at such areas as information and communication technology, bioengineering, and materials development.
- Encourages interdisciplinary collaboration, exploitation of research results, use of research infrastructure, mobility between academia and industry as well as between different countries.
- Currently has an annual disbursement volume of about SEK 600 million, moving steadily upward to SEK 1 billion.

SWEDISH FOUNDATION *for* STRATEGIC RESEARCH

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