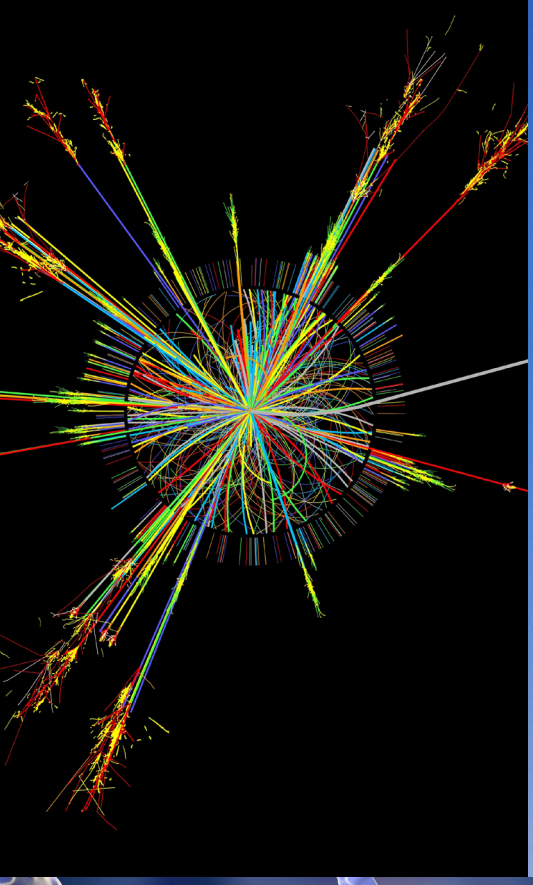
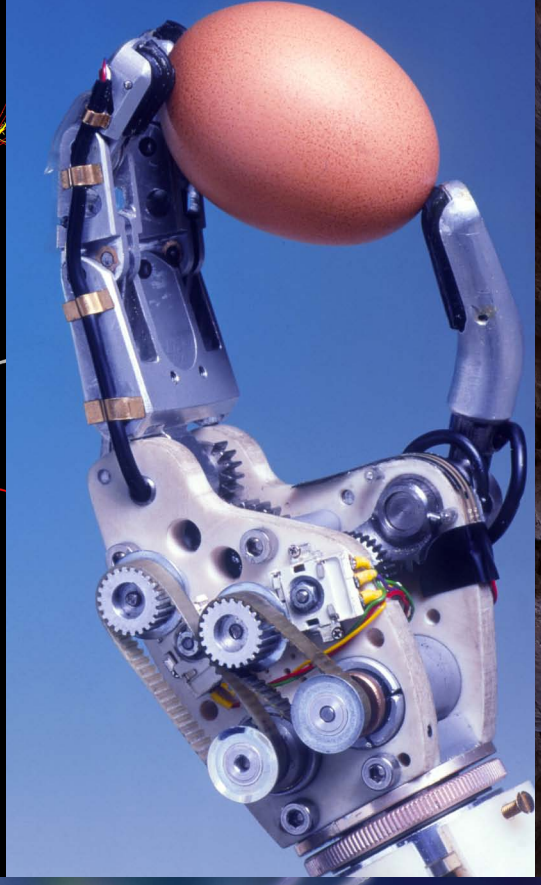




RESEARCH AND INNOVATION

A summary of Government Bill 2012/13:30

REGERINGSKANSLIET
Government Offices of Sweden

RESEARCH AND INNOVATION – SUMMARY

The Government's research policy objective is for Sweden to be a prominent research nation in which research and innovation are conducted with high quality, contributing to the development of society and the competitiveness of industry.

Starting points

More than most other countries, Sweden bases its economy on a high level of knowledge in society and business. This is one of the reasons Sweden has been able to develop into one of the world's leading welfare nations. Continued research and education at an internationally competitive level and the utilisation of Swedish research findings are therefore very important to Swedish society and business. To strengthen the international competitiveness of Swedish research, the Government has used the following starting points for the assessments made in the bill:

- freedom, long-term approach and greater opportunities for risk-taking;
- greater possibilities to achieve high quality;
- good conditions for researchers;
- initiatives for society and business; and
- increased utilisation of research-based knowledge.

Freedom, long-term approach and greater opportunities for risk-taking

The Government safeguards the freedom of research. Research and education must have an independent role in society so that research issues can be formulated freely, even if this means calling norms into question and asking uncomfortable questions.

The direct appropriations for research and postgraduate education to higher education institutions are essential to create the conditions for free, independent research. These funds also give researchers the freedom to conduct long-term research, increasing their opportunities to try new approaches, thereby enhancing risk-taking, which is often a prerequisite for pioneering research.

Greater endeavours to achieve high quality

Research must be free, but government funding must be used for research that is of a high quality in various aspects. High quality in the form of scientific excellence, utilisation and relevance must therefore be sought throughout the research system. This relates to the allocation of funds at national level and, not least, of higher education institutions' strategies and priorities at all levels.

Good conditions for researchers

Research must be an attractive career option if Sweden is to be a prominent research nation, since the potential for success for Swedish research largely depends on our ability to attract, keep and develop the most suitable individuals from both Sweden and elsewhere in the world.

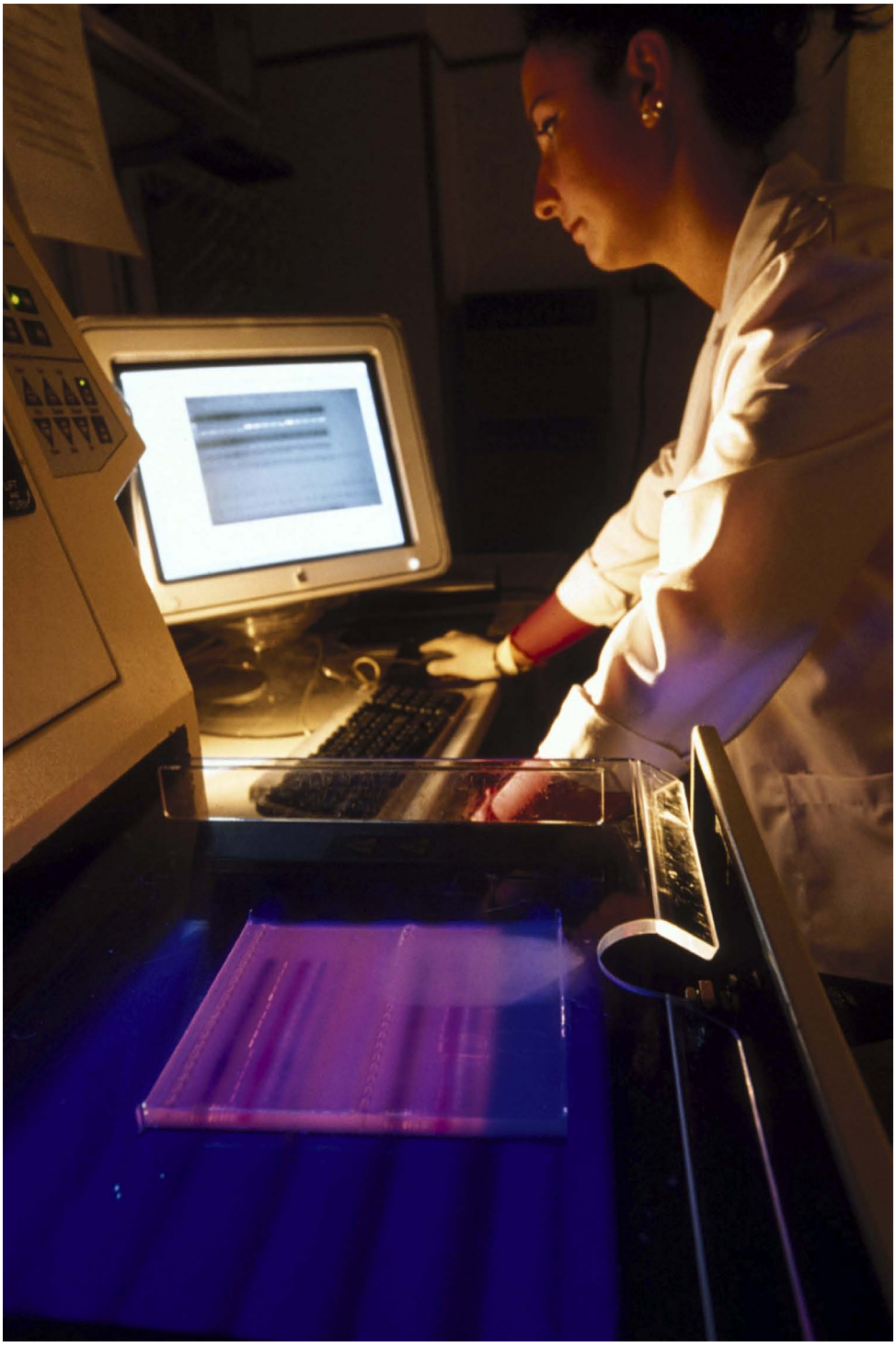
Good conditions for researchers also means having access to the tools needed to conduct research, i.e. research infrastructure. This can be anything from library resources and well-equipped laboratories to access to international research facilities.

Initiatives for society and business

The Government is highlighting research in several areas of particular benefit to society and business. These include areas where there are pressing social needs and where research can be a tool to tackle global social challenges and improve people's lives. One particular area that should be highlighted is research in the life sciences.

Increased utilisation of research-based knowledge

It is of decisive importance for growth and sustainable social development, both in Sweden and globally, that research-based knowledge benefits society because such knowledge is the key to a strong innovative capacity. This applies regardless of whether research is curiosity-driven or needs-driven. To achieve this aim, it is important that appropriate incentives, structures and tools for the utilisation of research are in place.



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Four billion kronor to research and innovation

Initiatives described in the bill entail an increase in the resources allocated to research and innovation of SEK 4 billion by 2016. Along with the increase of SEK 5 billion presented in the previous research and innovation bill, this means an increase of around SEK 9 billion over eight years.

Increase in appropriations compared with 2012 (SEK million)	**2013**	**2014**	**2015**	**2016**
Quality, efficiency and effectiveness				
Increased direct appropriations	-	600	600	900
Assessment of collaboration	30	50	60	60
Recruitment of top researchers				
International recruitment	150	150	200	250
Young researchers	25	50	50	50
Strategic innovation areas				
Strategic innovation areas	75	175	225	225
Business sector and society				
Research on mining, minerals and steel	25	30	50	100
Research on wood, forest products and biomass	-	40	50	100
Research on sustainable urban development	25	30	50	100
Life sciences				
Research on infection and antibiotics	40	75	75	75
Research on ageing and health	50	100	100	100
SciLifeLab	150	150	150	200
Pharmaceutical development	40	40	40	50
Clinical treatment research	20	50	75	75
Clinical studies	30	40	40	50
Institute for sustainable process development and catalysis (3 years)	100	40	10	-
Targeted investments				
Evidence-based schools, pre-schools	40	40	40	40
Research in the arts	20	40	40	40
Space research	75	75	75	100
Research in international economics (1 year)	10	-	-	-
Research infrastructure				
European Spallation Source (ESS)	75	150	200	200
MAX IV	-	20	30	50
Registers for research	25	50	50	50
Utilisation				
Innovation offices	20	20	20	20
Testing and demonstration facilities	50	50	50	50
RISE Holding industrial research institutes	25	85	115	125
Research funders				
Swedish Research Council	75	75	150	175
Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning *incl. SEK 25 million for strategic innovation areas*	50	75	100	100
Swedish Council for Working Life and Social Research	30	45	45	45
Swedish Energy Agency	250	250	270	470
European and international research cooperation				
Co-financing for EU projects	-	100	100	200
International Thermonuclear Experimental Reactor (ITER) (1 year)	230	-	-	-
Total	**1 735**	**2 695**	**3 060**	**4 000**

Quality, efficiency and effectiveness

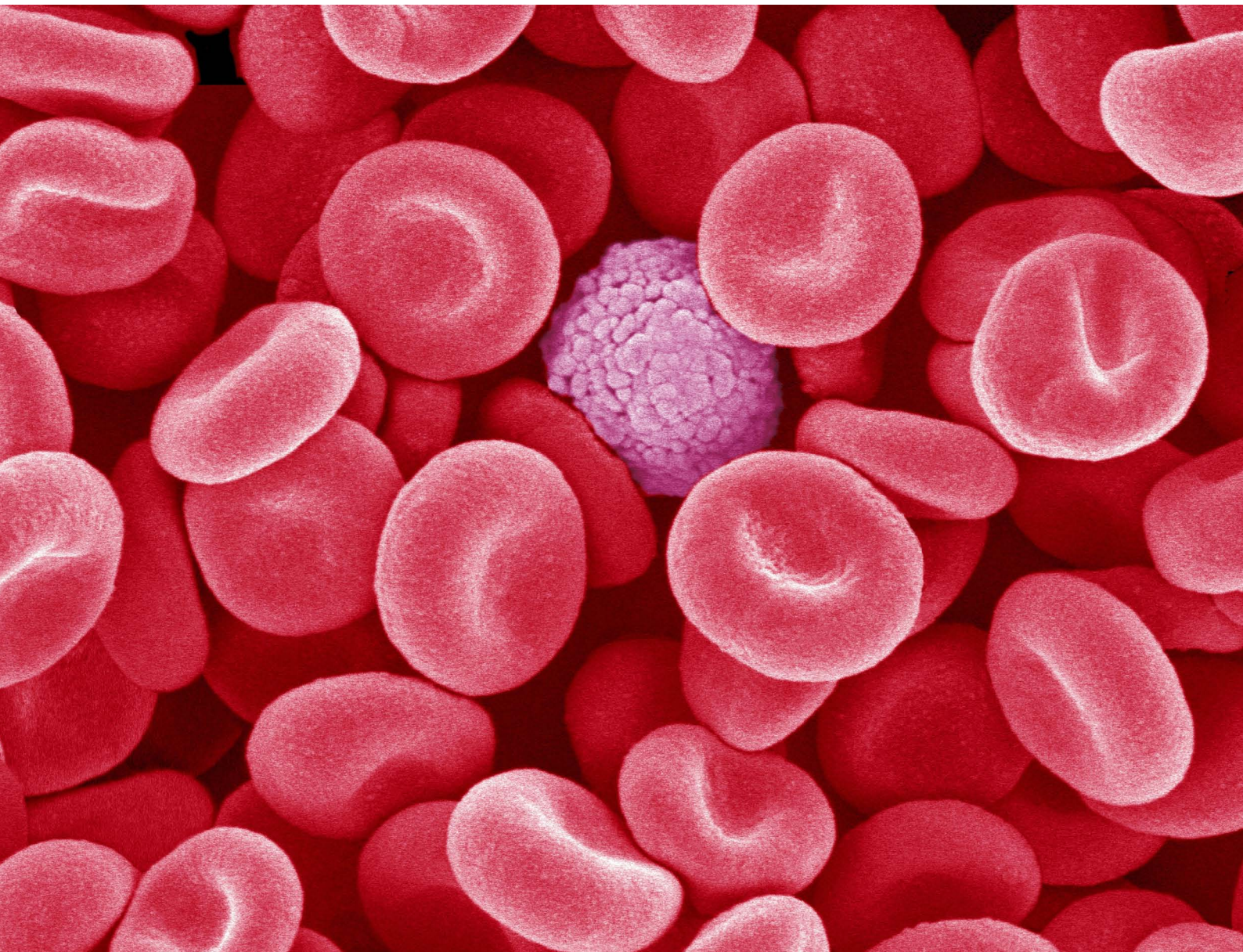
By international comparison, Swedish research is extensive. However, there are clear indications that Swedish research is losing ground in terms of quality compared with other countries. A number of measures should be taken to create the conditions for long-term positive development of the quality, efficiency and effectiveness of Swedish research.

Freedom and long-term approach

Higher education institutions should have wide discretionary authority to assess and prioritise what research should be undertaken and how it should be conducted. The institutional grants also offer potential to provide good conditions for researchers and enable greater risk-taking where a longer-term approach than that permitted by shorter project grants is necessary.

The major part of government research funding goes directly to higher education institutions in the form of appropriations for research and postgraduate education, and it is important that major investment continues. These appropriations, excluding targeted investments, should therefore increase by SEK 900 million by 2016.

The grants that research funders allocate to researchers are also important tools to reach high quality. The Swedish Research Council and other research councils, and the Swedish Agency for Innovation Systems (VINNOVA), have an important role to play in driving quality. Funding to research funders should therefore also increase to enable them to better support the highest-quality research.



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Endeavours to achieve high quality

A new system for the allocation and redistribution of the appropriations for research and postgraduate education was presented in the previous research and innovation bill. The aim of the model is to reward quality in research and give higher education institution management the incentives to take measures to increase quality and competitiveness in the research undertaken at their institutions. This is to be achieved by allocating parts of the research appropriations on the basis of quality.

The system is based on two quality indicators: publications and citations and external funding of research. The proportion of the appropriations that is redistributed should be increased from 10 per cent to 20 per cent, and the SEK 900 million in new research appropriations should be allocated according to largely the same model.

Moreover, every higher education institution will be guaranteed a research appropriation of at least SEK 8 000 per full-time equivalent student, and in 2014 there will be a guaranteed increase of one per cent. The preliminary allocation to higher education institutions can be seen in this table.

Preliminary allocation to higher education institutions

Sum in SEK million	New funds 2014	New funds 2016	Redistri -bution 2014	Total contrib- utions
Uppsala University	71.0	38.0	-4.0	105.0
Lund University	79.0	42.5	17.0	138.5
University of Gothenburg	58.0	31.0	-1.0	88.0
Stockholm University	56.5	30.0	-6.0	80.5
Umeå University	37.0	19.0	-10.5	45.5
Linköping University	30.5	16.5	3.5	50.5
Karolinska Institutet	65.0	35.5	40.0	140.5
Royal Institute of Technology	37.0	19.5	-1.5	55.0
Luleå University of Technology	11.0	5.5	-6.0	10.5
Karlstad University	9.5	2.5	-7.5	4.5
Linnaeus University	13.0	4.0	-10.0	7.0
Örebro University	8.5	4.5	-2.0	11.0
Mid Sweden University	7.0	3.5	-3.5	7.0
Blekinge Institute of Technology	5.0	1.0	-4.0	2.0
Malmö University	4.5	1.5	-3.5	2.5
Mälardalen University	3.0	1.5	-1.0	3.5
Swedish School of Sport and Health Sciences	1.5	0.0	-1.0	0.5
Dalarna University	3.0	1.0	-2.5	1.5
University of Borås	2.5	1.0	-2.0	1.5
University of Gävle	5.5	1.0	-4.5	2.0
Halmstad University	2.5	1.0	0.0	3.5
University of Skövde	2.0	1.0	0.0	3.0
Kristianstad University	2.5	0.5	-2.0	1.0
University West	1.5	0.5	-0.5	1.5
Södertörn University	3.5	2.0	4.0	9.5
Swedish University of Agricultural Sciences	34.5	18.5	-1.0	52.0
Chalmers University of Technology	26.5	14.5	5.5	46.5
Jönköping University	5.0	3.0	4.0	12.0
Other	14.0			14.0
Total	**600**	**300**	**0**	**900**

In addition, the Swedish Agency for Innovation Systems should be tasked with designing methods to enable performance and quality in higher education and community partnerships to be assessed in terms of relevance and utilisation. Based on this, the Agency should be able to allocate funds to the higher education institutions.

A system for resource allocation involving peer review should be further investigated with a view to introduction in the longer term. This kind of system could offer a more complete assessment that can also take account of a research area's current potential, rather than basing resource allocation purely on historical data. This allows a more balanced assessment of an institution's research whereby different subject areas are evaluated based on their distinctive features.

Recruitment of top researchers

International recruitment of leading researchers is undertaken in many countries. As part of the work to enhance quality in Swedish research, a system should be created for international recruitment of researchers with the greatest potential for the future to higher education institutions. The Swedish Research Council should therefore create a recruitment programme for this.

Young researchers' careers are often impeded by short-term and insufficient funding of research projects, making it difficult for them to build independent research. The Swedish Research Council should obtain funding for positions and research projects for the best young researchers.

PHOTO: COLOURBOX

Business and society

Society and business have a great need for advanced knowledge and research competence in certain areas, which means that there can be grounds for the Government to make targeted investments. Research and innovation can play an important role in the development of society and business in several areas.

Strategic innovation areas

Collaboration between different actors, e.g. companies, higher education institutions and research institutes, is important in order to tackle various social challenges. The Government believes that a new instrument, strategic innovation areas, should be used to develop such collaboration.

The Swedish Agency for Innovation Systems should be tasked with designing the strategic innovation areas. The projects receiving funds for strategic innovation areas should use social challenges as a starting point, maintain high scientific standards, have a level of co-financing and be able to show new or interdisciplinary collaboration.

Strategic research for business and society

The Government has identified some areas where targeted research initiatives are needed. These initiatives should focus on research that maintains a high scientific standard and takes account of business and society's need for long-term competence-building, and funds should mainly be allocated to higher education institutions and research institutes.

The selected research areas are mining, minerals and steel, forest products and biomass, and sustainable urban management. There are also corresponding initiatives in two areas of the life sciences.

Evidence-based schools

Three measures are presented to develop a scientific approach in schools and promote knowledge of effective methods to boost learning outcomes. Research results that are relevant to school and pre-school activities should be taken into account and disseminated to be absorbed into teaching. More teachers and pre-school teachers should also have the opportunity to attend special research schools. Finally, subject-didactic research in the natural sciences and technology should be encouraged.

Research in the arts

Research in the arts has developed substantially in the last decade. Lund University, the University of Gothenburg and the University College of Borås are authorised to award arts degrees at doctoral level, and special initiatives should be implemented at these institutions. Three arts institutions of higher education in Stockholm are also discussing a merger. This will create a solid basis for a long-term strong research environment in the arts, and initiatives that may strengthen this research are presented.

Space research

Research in and about space provides new knowledge on questions such as the origin of life. Space technology is also used by government agencies, companies and private individuals in areas such as transport, climate and communications. Sweden is a world leader in research and technological development in some areas, and also has the unique Esrange Space Centre facility. The appropriations for space research and space exploration should increase, not least because Sweden should continue to contribute to European access to space.

Energy research

Support for energy research and innovation is an important and integral part of energy policy, and initiatives in this area contribute to achieving national and international energy and climate policy objectives. Current initiatives in this area are described in a separate energy research bill.

Temporary initiatives

Temporary initiatives are proposed to promote various types of research in several areas. This includes research that may contribute to development and progress for practical gender equality efforts in different sectors of society, and research in international economics.

PHOTO: COLOURBOX

Life sciences

Swedish research in the life sciences maintains a high standard, and companies in this area account for a large part of Swedish export success. Several initiatives are needed to maintain Sweden's position in the life sciences and entrepreneurship in biotechnology, medical technology and pharmaceuticals.

The term 'life sciences' here means scientific disciplines that study human beings and other living organisms, and the life science activities that aim to improve lives and health.

Research for business and society

Special investments should be made in several areas of the life sciences where Swedish research is of a high international standard and the research can contribute to resolving major challenges facing society. This applies to research on infections and antibiotics, and research on ageing and health.

SciLifeLab

SciLifeLab is a national centre for life science research where large-scale molecular biology research and method development are undertaken. This includes mapping the human genome and describing the structure of proteins. SciLifeLab should become a research centre and a national facility for national collaboration on large-scale molecular analysis in the life science field.

A national pharmaceuticals development initiative linked to SciLifeLab should also be undertaken to improve the transfer of basic research findings to the early development of pharmaceuticals.

Institutes

The processing industry is vital to the Swedish economy. In order for Sweden to maintain and develop the sector, national capacity to develop new industrial processes is needed. There is currently no effective national platform to industrialise ideas from higher education institutions and small companies in the life sciences and in general material development and the processing industry. The establishment of a new industrial research institute should therefore be facilitated – an institute for sustainable process development and catalysis.

Clinical studies

Clinical studies of pharmaceuticals, medical technology products and treatment methods have previously been a Swedish strength, but in recent years fewer and fewer clinical studies have been undertaken. There is therefore a need to design clearer collaboration to stimulate high-quality clinical studies, both those initiated and funded by business and those initiated by researchers themselves. National support is therefore needed for the coordination of clinical studies.

Clinical treatment research

Clinical treatment research findings can contribute to improved health and medical care and aim to both optimise existing treatment routines and develop and evaluate new treatment methods. Clinical treatment research can offer patients effective and safe treatment more quickly and contribute to business sector development and growth in Sweden. Investment in this area should be undertaken in close collaboration with the authorities responsible for medical care.

Health care research

Health care research often sees the individual from a social perspective, and is therefore an important complement to the traditional medical perspective in research. There is a need to strengthen both the scientific basis of health care research and its link to the needs of the health and medical care system.

Register-based research

The Swedish use of registers and the personal identity number system offers unique opportunities to study important interdisciplinary issues in the life sciences and other areas. This includes the link between social conditions, housing and health, for example. An information and advisory function should be established at the Swedish Research Council to facilitate register-based research. At the same time, the information contained in registers must be handled in such a way as to protect the privacy of the individual.

Utilisation of research-based knowledge

The utilisation of research-based knowledge is valuable for both private and public activities. Innovation strengthens the competitiveness of the Swedish business sector and the utilisation of research-based knowledge contributes to development and efficiency in publicly financed activities. Increased cooperation between different actors, such as higher education institutions, companies and research funders, can help improve the effectiveness of this utilisation.

Industrial research institutes

Industrial research institutes operate at the intersection of research at higher education institutions and development in the business sector. They further develop knowledge and competence that help create value for business and society in the form of innovation. For large sections of the business sector, not least small and medium-sized enterprises, these institutes can play an important role as R&D resources, offering opportunities to gain access to and rapidly assimilate new knowledge and technology.

Industrial research institutes should be strengthened through increased appropriations to RISE Research Institutes of Sweden AB.

Higher education institutions

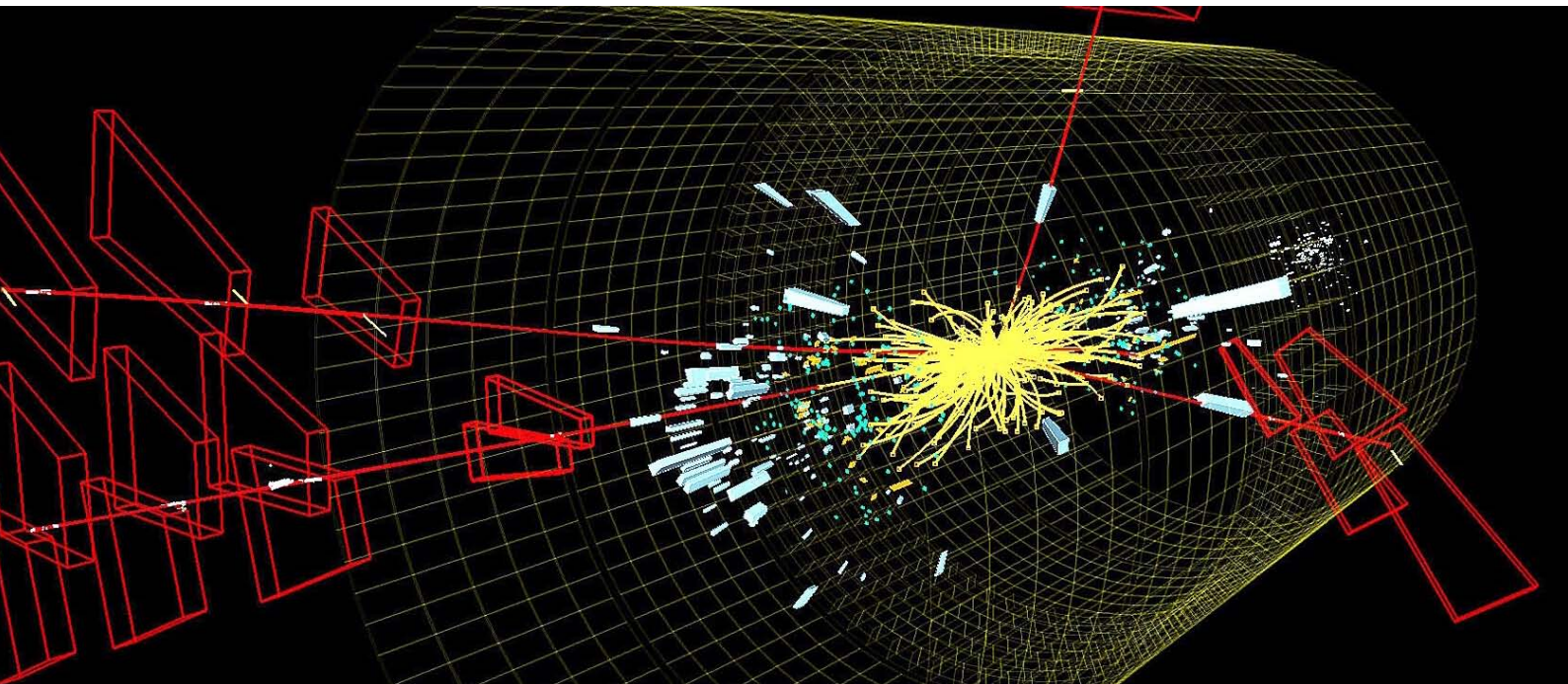
The task of higher education institutions includes collaborating with the community and providing information about their activities, as well as ensuring that their research findings are used in society. It is important that higher education institutions work strategically to facilitate collaboration and the utilisation of research-based knowledge. The Swedish Agency for Innovation Systems should support higher education institutions in this.

Innovation offices are important for innovation support activities. The four higher education institutions that currently lack innovation offices should be allocated funds to create them.

Innovation infrastructure

When ideas from research findings are to be developed into products and processes they need to be tested in the development chain at an early stage, preferably in real conditions. This is the aim of testing and demonstration facilities, where ideas can be tested in collaboration with potential users and customers. Collective access to testing and demonstration facilities is of particular importance to small and medium-sized enterprises. This also stimulates collaboration between higher education institutions, research institutes and business.

Initiatives should be undertaken to increase access to the RISE testing and demonstration facilities. This will provide greater opportunities for both researchers in higher education institutions and small and medium-sized enterprises. It should also be possible to use funds to invest in existing testing and demonstration facilities or to start new ones.



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Infrastructure

All research requires infrastructure that is used by several researchers or research groups. Examples include large research facilities for experiments, biobanks or archives. As infrastructure becomes increasingly extensive and costly, it becomes necessary to develop it jointly at regional, national or international level.

Two initiatives mentioned under the life sciences heading, SciLifeLab and register-based research, concern infrastructure, and two further major initiatives are also presented.

European Spallation Source (ESS)

The European Spallation Source (ESS) uses neutron radiation to determine the three-dimensional structure of an object, thereby acting as a kind of giant microscope. Since 2009 there have been plans to build the ESS in Lund; this is one of the largest research infrastructure initiatives in Europe in recent decades.

Sweden has pledged to contribute 35 per cent of the construction costs (estimated at around EUR 1.5 billion at 2008 price levels), while Denmark has pledged 12.5 per cent and Norway 2.5 per cent. A further 15 countries have also signed a declaration of intent to participate in the construction and operation of the ESS.

The largest investments will come at the start of the construction phase, and the appropriation for the planning, construction and future operation and development costs of the ESS should increase.

MAX IV

Another research facility, the MAX IV synchrotron light source laboratory, is currently under construction in Lund and will offer opportunities for high-quality research in materials science, structural biology, life sciences, energy and environmental research. To enable MAX IV to be completed and developed into a world-leading, cost-effective facility with high technical performance, the Swedish Research Council should be given the opportunity to contribute additional funding to the facility.

Conditions for doctoral students

The recruitment of talented students and doctoral students to higher education institutions is a prerequisite for Sweden's position as a successful knowledge-based nation. Third level education is key to renewal and quality development within higher education and research, but can also provide society as a whole with competence to develop, assimilate, disseminate and utilise knowledge in all sectors of society.

The Government considers that it is important to strengthen the competitiveness of doctoral studies by improving student welfare conditions for doctoral students on training grants or scholarships, who have less of a welfare safety net than doctoral students who are employed. Doctoral students should be employed at an earlier stage, and those on scholarships should be covered by insurance.

EU co-financing

The importance of the EU in funding Swedish R&D has increased markedly. With the upcoming Horizon 2020 programme, which covers the period 2014–2020, it is expected that the framework programme's significance for Swedish R&D will increase further in both budgetary and strategic terms, and widen to include related innovation support measures.

In the Government's view, the ambition must be a continued high level of participation by Swedish researchers, companies, institutes and other actors under Horizon 2020.

If Sweden as a Member State does not participate in partnership programmes, Swedish actors will not be allowed to participate and they will be excluded from the partnerships established. Since the proportion of partnership programmes has increased, and is expected to continue to increase, resources are needed for Swedish participation. Additional funds should therefore be set aside to ensure Swedish participation in partnership programmes under Horizon 2020.