Annual Report 2007

ACADEMY OF FINLAND

RESEARCH FUNDING AND EXPERTISE

Contents

Growing recognition of the importance of science

In 2007 there were signs that the importance of science and research to our future welfare and well-being is more and more widely recognised. It is understood that answers are urgently needed to the tough questions and challenges faced by humankind: the state of the environment, climate change, clean water, energy production and globalisation. None of these questions can be properly addressed without the knowledge, know-how and understanding that come with scientific research. At the same time, research is used to an increasing extent to inform decision-making in business and industry and other sectors of society as well. The growing importance of science and research further underscores the Academy's key role in the Finnish research system. Increasing effort must be devoted to promoting, facilitating and funding high-level research and international scientific cooperation.

The new Government that took office in spring 2007 clearly acknowledges the value of research, knowledge and innovation. As expressed in the Government Programme, the Government will "provide financial and structural prerequisites for high-standard and diverse basic and applied research".

The Government's ambitious target is to increase national R&D investment from 3.4 to 4 per cent of GDP. Furthermore, the Government's policy plans for higher education mean that the university and research systems in Finland are set to undergo a major overhaul that will change the legal status of universities and pool resources into larger units.

The Academy's newly-appointed Board and Research Councils got down to business in 2007.

The Academy is now better placed than ever before to meet its challenges. Operations are largely driven by the Academy's new strategy, which is geared towards strengthening the resources available to science and research, creating strategic partnerships with universities and industry in particular, increasing the impact of research funding, fostering research career development, and highlighting the importance of science. For many years now, the Academy has shown a strong commitment to internationalisation, including cooperation with emerging scientific powers such as China and Latin American countries.

Strategy:
The prime funding agency for competitive basic research

The European Union's science and research policy was realigned and refocused. The European Research Council (ERC) was launched, underlining the growing significance of high-level scientific research in EU research funding. The European Institute of Innovation and Technology (EIT) was set up by the EU to create new avenues of collaboration between scientific research, disseminators of research results and business and industry.

Finnish researchers had excellent success with their proposals for the first ERC Starting Independent Researcher Grants. From the Academy's point of view, it is noteworthy that virtually all the Finnish researchers who were successful with their ERC proposals had at some stage enjoyed Academy funding in completing their research qualifications.

The Academy is prepared to assume ever greater responsibility for overall research career development and for the promotion of national and international researcher mobility. The decision by the Ministry of Education to delegate the administration of graduate schools to the Academy provides important new impetus to this end.

In terms of research policy, 2007 saw an exceptionally large number of significant development projects. In the areas of innovation strategy, sectoral research, Strategic Centres for Science, Technology and Innovation as well as in national and international infrastructure policy, the Academy continued to emphasise the key importance of maintaining the highest possible standards of scientific research. As we see it, only the best research has the greatest impact.

Markku Mattila
President

Our operating environment

Strategic policy lines translated into practice

A major focus for the Academy in 2007 was to put into practice its newly adopted strategy. Running through to 2015, the strategy emphasises that social development and welfare depend crucially on scientific research and the ability to make good use of its results. The Academy is committed to further strengthening its role as the country's prime funding agency for scientific research and as a leading force in our research system.

Success requires the ability to identify the most promising and highest-quality research projects and the most talented researchers, to raise the quality standards of research and to improve the application of its results, and to support and promote internationalisation in research.

Strategy: The Academy works to provide opportunities to raise the scientific standards of research and to generate new knowledge

In 2007, Academy funding for research totalled 264 million euros. This accounts for 16 per cent of Government R&D funding. In keeping with its strategic plan, this investment has allowed the Academy to raise the standard of scientific research and to strengthen its ability to generate new knowledge.

The increases in Government research funding were concentrated in administrative sectors with the biggest R&D budgets. The injection of 36 million euros that came via the Ministry of Education was more or less evenly divided between university operating expenses and Academy research funding.

Government spending on R&D amounted to 1.73 billion euros, a nominal increase of 3.6 per cent and a real increase of 1.2 per cent. R&D accounted for 4.5 per cent of total Government expenditure. Public R&D funding as a proportion of GDP was slightly less than one per cent.

Preliminary estimates put the value of Finnish R&D spending in 2007 in excess of 6 billion euros, compared to 5.8 billion euros in 2006. The bulk of this funding (72%) was through the private business sector.

R&D expenditure was 3.36 per cent of GDP, down slightly from 3.45 per cent in 2006. In an international comparison, however, this is still a very high figure: Finland ranks third after Israel (4.5%) and Sweden (3.8%).

The Programme of Prime Minister Matti Vanhanen's second Cabinet reaffirms the Government's commitment to increase public R&D funding so that combined public and private R&D investment will rise to 4 per cent of GDP. The decision in principle taken by the Government in 2005 on the structural development of the public research system set in motion a profound transformation in the Finnish university and research sector. Its effects were keenly felt in 2007 as the new Government set about the task of restructuring universities and so to raise the quality of education and research.

In 2007, the Government took a decision in principle on the development of government sectoral research. The main areas of focus were identified as regional and community structures and infrastructures, knowledge and know-how, work and well-being, sustainable development, and safety and security. A Sectoral Research Advisory Committee was established under the auspices of the Ministry of Education, with divisions set up for the respective thematic areas to assess research needs and to create research agendas. Academy representatives were involved in the work of the Advisory Committee and of four of its divisions, contributing their views on how to focus sectoral research and how to apply its results.

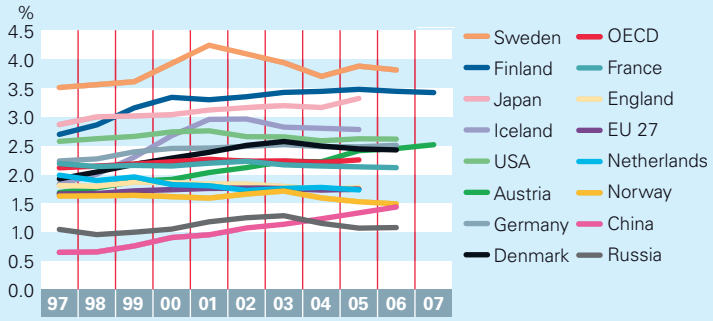
The Academy began to prepare for the projected changes in the university sector and in sectoral research, for the service centre project, the productivity programme, and the proposals put forward in the education and research development plan.

The Government and the Science and Technology Policy Council of Finland have set the objective of creating a network of Strategic Centres for Science, Technology and Innovation, which will be developed closely with the private business sector. Key partners in this preparation are Tekes, the Finnish Funding Agency for Technology and Innovation, and the Academy. The first new strategic centre to start was the forest cluster.

Strategy: The Academy is actively involved in promoting science and research and uses its resources to flexibly respond to changes

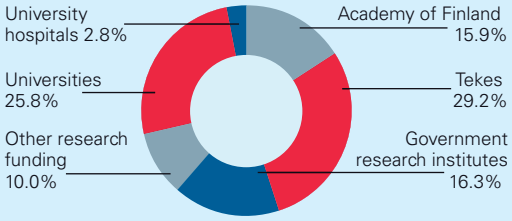
The Academy was involved in drafting a national innovation strategy. This strategy will help lay the groundwork for a broadly-based innovation policy, create an internationally competitive innovation environment and promote the development and adoption of innovations.

Figure 1. R&D investment in selected OECD countries and in China and Russia (R&D spending as a proportion of GDP)



Source: Main Science and Technology Indicators/OECD, 2008
R&D in 2007, Statistics Finland, 2008

Figure 2. Segmentation of the Government R&D funding in 2007



Source: Statistics Finland, 2007

Research infrastructures

attracted debate and discussion both at home and in Europe. The Academy contributed to the Ministry of Education Steering Group charged with drafting a national policy on research infrastructure.

Academy representatives were members of the work of the European Strategy Forum on Research Infrastructures (ESFRI). The ESFRI Roadmap Working Group in the environmental field is chaired by an Academy representative. Finnish experts also actively contributed to other ESFRI Roadmap working groups and project preparation.

NordForsk, a Nordic research board, announced a special call to promote the joint use of Nordic research infrastructures and participation in the preparation of ESFRI projects. An Academy representative was involved in preparing this special call.

Infrastructures are a priority area of concern among others for the Academy's Research Council for Natural Sciences and Engineering (see page 27). Finland has been successfully involved in the European Synchrotron Radiation Facility (ESRF) since its establishment in 1989 through the Nordic Nordsync consortium. The Research Council approved the new agreement negotiated in 2007 according to which Finland's membership contribution to Nordsync in 2008–2010 shall be 16 per cent of the total. The ESRF Science and Technology programme for 2008–2017 that covers various different disciplines, including physics, biosciences and medicine,

***Strategy:** The Academy selectively takes part in funding scientifically high-level research infrastructures in Finland and abroad in order to facilitate high-quality Finnish research*

is incorporated in the ESFRI Roadmap.

A new European Incoherent Scatter Radar (EISCAT) agreement came into force on 1 January 2007. The organisation now has seven members: Finland, Sweden, Norway, Japan, China, the UK and Germany. One of the EISCAT radars is hosted on Finnish soil, in Sodankylä. Finnish space research in particular has greatly benefited from EISCAT, as comparative measurements conducted in tandem with other terrestrial equipment have guaranteed access to international satellite programmes without the need for initial capital outlays on building satellites.

EISCAT has involved a considerable amount of science and technology development, and has generated numerous business ventures, development projects and patents. A matter that must be addressed with some urgency is the replacement of EISCAT's outdated ground-based radars, as their current transponder frequency range will be allocated to Finland's mobile phone network. In autumn 2007, Sweden proposed the inclusion of the planned EISCAT3D radar system into the new ESFRI Roadmap. The Academy's Research Council for Natural Sciences and Engineering and the Research Council of Norway pledged their support to EISCAT's efforts to install a new radar system.

The Academy is keen to emphasise the importance of cooperation with its partners. In the context of research programmes, the most important partners are Tekes and various ministries. In 2007, no less than ten national funding bodies contributed to Academy research programmes. Tekes was involved in five programmes, contributing around 6.2 million euros. The Sustainable Energy Research Programme marked a new departure in that, for the first time, funding also came directly from business companies.

Collaboration with international funding partners was further reinforced. The Academy had four ongoing research programmes that are jointly funded with four foreign funding agencies from three different countries (page 8). International cooperation figured prominently in all research programmes under preparation.

The Academy also had cooperation with Nordic partners in financing Nordic Centres of Excellence in research (page 11) and with European partners in the context of ERA-NETs (page 16).

Table 1. Government R&D funding in 2007

	R&D funding million	Percentage of research funding	Nominal change on previous year, %	Real change on previous year, %
R&D funding total	1,730.0		3.6	1.2
Major administrative branches				
Ministry of Education	751.7	43.4	5.1	2.6
Ministry of Trade and Industry	609.6	35.2	5.7	3.2
Ministry of Social Affairs and Health	125.6	7.3	0.0	-2.4
Ministry of Agriculture and Forestry	99.9	5.8	0.6	-1.8
By organisation				
Universities	446.4	25.8	4.4	2.0
University hospitals	48.7	2.8	0.0	-2.3
Academy of Finland	275.8	15.9	7.2	4.6
Tekes	504.3	29.2	5.5	3.0
Government research institutes	282.0	16.3	3.4	1.0
Other research funding	172.7	10.0	-7.0	-9.1

Source: Government R&D funding in the State Budget 2007, Statistics Finland

Table 2. R&D expenditure by sector and proportion of GDP in 2000–2006 and estimate for 2007

Year	Private business sector		Public sector**		Higher education sector		Total	R&D spending as % of GDP***
	€ million	%	€ million	%	€ million	%	€ million	%
2000	3,135.9	70.9	497.4	11.2	789.3	17.8	4,422.6	3.34
2001	3,284.0	71.1	500.9	10.8	834.1	18.1	4,619.0	3.30
2002	3,375.1	69.9	529.7	11.0	925.6	19.2	4,830.3	3.35
2003	3,527.9	70.5	515.4	10.3	961.7	19.2	5,005.0	3.43
2004	3,683.5	70.1	530.1	10.1	1,039.8	19.8	5,253.4	3.45
2005	3,876.9	70.8	554.7	10.1	1,042.1	19.0	5,473.8	3.48
2006	4,107.8	71.3	574.2	10.0	1,079.2	18.7	5,761.2	3.45
2007*	4,302.4	71.5	586.2	9.7	1,226.9	18.7	6,015.6	3.36

* Estimate based on questionnaire responses and other calculations.
** The figures include private non-profit activities.
*** GDP 2005 and 2006 preliminary data from Statistics Finland, GDP 2007 Ministry of Finance forecast.

Source: Statistics Finland, 2007

The impact of our funding

The state, quality and impact of Finnish science viewed from different angles

The Academy launched a major project (SIGHT 2009) to gain an international perspective on Finnish science and research. One facet of this project is to compare current science policy trends in OECD countries.

With respect to the structural development of the research system, a particular concern will be with the prerequisites for conducting research at Finnish universities, which are the Academy's most important strategic partners. In their assessments of the strengths and weaknesses of Finnish science, the Academy's Research Councils also consider the state and future of scientific infrastructures and their role in raising the standard of scientific research.

Strategy: The Academy works to promote the impact of basic research and to demonstrate its significance

The Academy together with Tekes are executing an evaluation project that will assess the impact of science, technology and innovation using an impact framework. In addition, the project will define and identify the most important indicators of impact to shed light on how knowledge and know-how are changing in Finland.

Foresight, evaluation and impact are gaining greater significance in the science and technology policies of all advanced countries. The importance of impact assessment is further underscored by the widespread adoption of knowledge-based strategies in OECD countries and by the subsequent growth in funding for science and R&D. The impact of research is one of the Academy's key strategic priorities. A statement by the Science and Technology Policy Council of Finland confers a special responsibility for the development of impact and foresight on the Academy, Tekes and Sitra, the Finnish Innovation Fund.

This Annual Report highlights four examples to illustrate the impact of research funded by the Academy (see pages 10, 13, 17 and 19).

The Academy continued to conduct international comparisons of Finnish science and research using bibliometric methods. This work was now undertaken in the Nordic framework of NORIA-Net (page 17).

The results of the FinnSight 2015 foresight project by the Academy and Tekes were used in 2007 both at the level of the research system (e.g. Strategic Centres for Science, Technology and Innovation) and in the Academy's own operation.

The Academy continues to invest considerable effort in evaluating research and in developing evaluation methods with a view to improving its own operation and the quality and impact of Finnish research. The results of the evaluations conducted, coordinated or commissioned by the Academy are widely used in various development efforts. In 1998–2007, the Academy completed evaluations of 25 research programmes it had funded.

Strategy: The Academy's quality-based, competitive research funding and its peer review system are recognised as highly effective and efficient

In 2007, the Academy undertook the final evaluation of the Research Programme for Future Electronics (TULE 2004–2006); launched the final evaluations of six other programmes; and published the final evaluation reports of the Baltic Sea Research Programme (BIREME 2003–2006), Microbes and Man (MICMAN 2003–2005) and Proactive Computing (PROACT 2002–2005).

The Academy has conducted assessments of individual disciplines and fields of research since 1983. During 1998–2007, a total of 14 such assessments have been completed, two of them in 2007. These two international evaluations concerned dental research (page 28) and computer science research (page 27). In addition, an evaluation was underway on water research (page 23).

Research programmes

Working to raise the scientific quality of research

A major focus in research programme activities was to expand international contact and cooperation with the Academy's many foreign partners. In 2007, the Academy had 14 ongoing research programmes (for a full list, see page 32).

The Academy invited applications to two new research programmes, reviewed those applications and made its funding decisions. One final research programme evaluation was completed, six were started and three final evaluation reports were published.

International strategy: The Academy works to develop research programmes in close collaboration with national and international funding bodies with a view to enhancing their impact and further reinforcing Finland's areas of scientific strength

All Academy research programmes share the common goals of raising the scientific standard of research in a field important in terms of science and society, developing the field of research or science, and creating new or reinforcing existing scientific traditions and know-how. Research programmes promote multidisciplinary and interdisciplinary research approaches as well as national and international cooperation between researchers, funding agencies and end-users.

Research programmes helped to give greater visibility to researchers both nationally and internationally. A wide range of exploratory workshops, seminars and press conferences were arranged on these programmes' themes to give them greater exposure in public debate and in the press. International cooperation through research programmes was promoted by means of international networking and by opening jointly funded international calls with foreign partners.

Strategy: The Academy is committed through its measures and active cooperation significantly to increase the availability of competitive research funding

Researchers and other stakeholders had the opportunity for the first time to submit programme initiatives directly to the Academy via an online service. By the end of February 2007, the Academy's Research Councils had received 27 initiatives that they then processed. Some of the initiatives were lumped together, and some of the ideas put forward were incorporated in the preparation of new research programmes. Many of the initiatives concerned research on children's health and well-being, lending important support to preparations for the Research Programme on Child Welfare and Health.

The Research Programme on Sustainable Production and Products (KETJU 2006–2010) kicked off with an opening seminar. This programme provides funding to 12 consortia and three individual research projects. Contacts with the French Agence Nationale de la Recherche (ANR) from the earliest stages of the programme began to have a concrete effect as preparations got underway for a joint Franco-Finnish call for joint project proposals in January 2008.

The Research Programme on Substance Use and Addictions (ADDIKTIO 2007–2010) was launched with joint funding from Finland, Canada and Russia: funding is provided by the Canadian Institute of Neurosciences, Mental Health and Addiction (INMHA), the Russian Foundation for Basic Research (RFBR), the Russian Foundation for the Humanities (RFH) and the Finnish Ministry of Social Affairs and Health. The programme involves 13 research projects, five of which are joint international projects with the participation of Finnish, Canadian and Russian researchers. The opening seminar was held in April.

The Research Programme on Nutrition, Food and Health (ELVIRA 2006–2010) aims to produce high-quality research knowledge on food and nutrition that will allow consumers to make healthy and safe choices. The 15 multidisciplinary research projects in the programme cover virtually the whole food chain from the processing and products in food industry and food safety to consumer behaviour and the health effects of foods. A major emphasis in the research programme is to support the application of its results for the promotion of public health and for the development of the Finnish food industry.

The Research Programme on Power and Society in Finland (VALTA 2007–2010) started up with 21 participating projects. In addition to the opening seminar, the VALTA programme also joined forces with the research programmes on Social Capital and Networks of Trust

and Business Know-how 2 to host a seminar on corporate social responsibility. The general public event under the heading of Networks of Power, the first of its kind in the history of Academy research programmes, attracted great interest.

By the January deadline, the Academy had received 89 letters of intent to the Sustainable Energy Research Programme (SusEn 2008–2011). Funding was awarded to 14 applications. In addition to the 10.5 million euros granted by the Academy, national funding worth 0.9 million has been pledged by the Maj and Tor Nessling Foundation, Fortum, UPM-Kymmene and Neste Oil. The research programme is a genuinely multidisciplinary undertaking in that the Academy's all four Research Councils are involved. Perspectives range from those of bioenergy and nuclear power to medicine and business.

The SusEn programme involves 24 projects. Funding comes from the Academy, other national funding agencies plus ten international sources: the National Natural Science Foundation of China (NSFC) is contributing to two projects, one project is funded jointly with Luxembourg and Polish sources via MATERA ERA-NET, and in the context of N-INNER three projects are receiving funding from Sweden, Norway, Iceland, Denmark, Germany and a Nordic funding organisation. Four of the participating projects have secured funding through the joint call for applications with Chile's National Commission for Scientific and Technological Research (CONICYT). In 2008, the Academy plans to organise a joint call with the Brazilian National Council for Scientific and Technological Development (CNPq).

In all 103 letters of intent were submitted to the Research Programme on the Future of Work and Well-Being (WORK 2008–2011). The second round additionally involved a British-Finnish joint call, which attracted six applications. In October, the decision was announced that funding worth nine million euros was to be granted to 19 projects. The Academy has earmarked eight million euros, and additional funding will be received from the Ministry of Education (0.7 million euros) and the Finnish Work Environment Fund (0.34 million euros). Research topics range from the judicial restrains against exclusion and lifespan research through the grey zone between employment and unemployment to early exit from work force.

The Work and Well-being projects will be starting up at the beginning of 2008. The programme theme ties in closely with the Government's policy programmes on employment, entrepreneurship and worklife; health promotion; and the well-being of children, youth and families. Research on worklife is an area of much current interest also in the Advisory Committee on sectoral research.

Work was continued at the Academy in preparation of the research programmes on Ubiquitous Computing and Diversity of Communication (MOTIVE 2009–2012) and Responding to Public Health Challenges (SALVE 2009–2012). The Academy's Board decided to earmark nine million euros for MOTIVE and eight million euros for SALVE from the 2008 budget authority.

MOTIVE supports the collaboration of Finnish researchers with their Chinese and Russian colleagues. Two foreign funding agencies are involved in the international call for project proposals, i.e. the National Natural Science Foundation of China (NSFC) and the Russian Foundation for the Humanities (RFH). The Chinese Academy of Social Sciences (CASS) will also be opening a call, and its researchers will be able to apply for funding via the NSFC. In spring 2008, the Academy will be joining forces with the Japan Society for the Promotion of Science (JSPS) to organise a joint project call in the research fields covered by MOTIVE.

SALVE will integrate the approaches of public health research and behavioural, social and biosciences. The Academy has agreed on funding cooperation with the Research Council of Norway, the Canadian Institutes of Health Research and the British Medical Research Council.

The Academy's Board extended the authority to pursue negotiations on the Photonics and Modern Imaging Methods Research Programme and granted authority to start negotiations on two further programmes, i.e. Child Welfare and Health and Computational Sciences. Preparations will take place in 2008.

Gene discoveries lead to new treatments for cancer

How does a cancerous tumour get its nutrition? Why does a tumour sometimes spread very rapidly throughout the body? How can tumour growth be prevented? These are some of the questions that have been preoccupying Academy Professor Kari Alitalo and his team. It is expected that in the future, analysis of the cell genotype and the identification of genetic errors will pave the way to new and more effective cancer treatments.

People are well capable of destroying the genetic material they have inherited by smoking and other adverse lifestyle habits. Hereditary factors may also play a part in the process where cells become malignant. One area of interest for Alitalo and his team is the function of cancer stem cells and their differentiation. Ultimately the aim is to identify the genes where mutations lead to cancer and to find ways to prevent this from happening.

"The cell control system is like an integrated circuit. What we want to do is find out what goes wrong in that circuit when cancer happens. Our most recent important discovery is the identification of the gene that causes colon cancer," Alitalo explains.

As it grows, a cancerous tumour makes use of blood vessels that deliver nutrients and oxygen as well as lymph vessels that carry metastases. One way of treating malignant tumours is to prevent the growth of blood vessels. In animal tests researchers have already had success in preventing the active involvement of lymph vessels in the formation of metastases.

"Eventually, we hope to be able to prevent up to two-thirds of all metastasis spread via lymph vessels," Alitalo says.

A major unit that now comprises several laboratories and more than 100 staff, the story of this research team began in the early 1980s when Alitalo returned from his postdoctoral studies in the United States and set up his own laboratory in molecular and cancer biology. The CoE in Cancer Biology forms part of a major cancer research programme that is based at Biomedicum Helsinki. The Academy-funded CoE has five research teams that in addition to cancer stem cells, blood vessels and lymph vessels are studying inhibitors of cell growth, enzymes used by cancer cells to break down tissue structures as well as mechanisms used by cells to protect themselves against DNA damage that causes cancer.

Over the years some 40 scientists have gained their PhD in Alitalo's research teams. The number of scientific articles published is counted in hundreds. The most important measure of the weight and significance of the CoE's research, however, lies in citation impact analyses: comparisons published by the Institute for Scientific Information put the CoE among the top performers in the world.

For Alitalo himself, the biggest reward is each new discovery. The sense of exhilaration that comes with a virgin discovery, Alitalo says, is hard to describe.

Working as they do at the cutting edge of their field, the multidisciplinary team has attracted scientists from virtually all continents. Their pioneering efforts and the international recognition they have received make it easier to get the funding they need.

Alitalo is particularly pleased with the long-term funding provided by the Academy. "Academy funding also serves as a signal to other agencies that our work has been thoroughly reviewed and that it enjoys credibility. The decision to grant us funding for a second term stands as a clear recognition of the hard work we've done."

Centres of Excellence

Key source of funding for major research teams

There were two ongoing Finnish programmes for Centres of Excellence (CoE) in research in which funding was provided to 39 CoEs: 16 units in the 2002–2007 programme and 23 units in the 2006–2011 programme. (For a full list of CoEs, see page 33.)

Agreements were signed in 2007 that detail the tasks and the funding of the 18 units selected to take part in the fourth Finnish CoE programme in 2008–2013. During their first three-year term in 2008–2010, these units will receive 26 million euros from the Academy, 420,000 euros from the research service company KCL and 150,000 euros from Nokia. Academy funding in 2008–2010 will average 1.4 million euros per unit, which is 19 per cent of their total funding. In addition to contractual funding, researchers at CoEs received some 12.5 million euros of other Academy funding in 2007.

Preparations were underway at the Academy for the final evaluation of the first two CoE programmes (2000–2005 and 2002–2007). These programmes will be evaluated simultaneously in 2008. The Academy continued to develop its CoE activities, hosted a science policy seminar on cutting-edge research and explored opportunities for international cooperation.

The Academy contributed to the funding of five Nordic Centre of Excellence (NCoE) programmes, two of which started up in 2007.

In the NCoE Food, Nutrition and Health programme (2007–2011), the Academy provided funding to three units, one of which is coordinated in Finland. Finnish researchers are also involved in the two other units in this programme. Total funding for the NCoE programme is around 11.5 million euros. The Academy's contribution in 2007 was approximately 225,000 euros.

International strategy: The Academy contributes to those ERA-NETs that benefit Finnish research, that support the Academy's strategic objectives and that promote the development and internationalisation of Finnish and European research

In the NCoE Welfare programme (2007–2011), the Academy funds two units, one of which is coordinated by the programme's Finnish partners and the other of which involves Finnish research teams. Total funding for NCoE Welfare is about 9.3 million euros, and the Academy's contribution in 2007 was around 287,000 euros.

In the NCoE Global Change programme (2003–2007, NOS-N) funding is provided to four units, one of which has a Finnish coordinator and two of which involve Finnish research teams. Total funding for the programme is around 7.2 million euros; the Academy's share in 2007 was 190,000 euros. Preparations were started for the final evaluation of the programme in 2008.

In the NCoE Molecular Medicine programme (2004–2009, NOS-M), the Academy provides funding to three units, one of which is coordinated by Finnish partners; the two others involve Finnish research teams. An international interim evaluation was completed in 2007. Total funding for the programme amounts to around six million euros, with the Academy accounting for some 120,000 euros in 2007.

International strategy: The Academy provides funding for national Centres of Excellence in research to support national and international networking and cooperation with top-tier groups

In the NCoE Humanities and Social Sciences (2005–2010, NOS-HS) programme, Academy funding is provided to four units, all of which involve Finnish researchers. An interim evaluation of the programme was launched and will be completed in 2008. Total funding for the programme is around 8.5 million euros, of which the Academy accounted for some 229,000 euros in 2007.

Funding for NCoE programmes that have started up earlier is organised via the Joint Committees of the Nordic Research Councils (NOS) and NordForsk.

Research career

International researcher mobility continues to gain increasing importance

Researcher mobility is continuing to gain increasing importance with the growing internationalisation of Finnish science and research, despite some problems and obstacles on the horizon. During the 2000s, statistics on international researcher mobility have shown a steady rate of decline, particularly in the case of long-term placements abroad. However, such placements at different stages of the research career are crucially important not only for the individual researcher concerned, but for society at large.

Strategy: Through its consistent funding the Academy provides incentives for researchers with a view to increasing the appeal and strengthening the continuity of research careers

The mobility of talented Finnish researchers serves to strengthen the quality of research and the education and research system as a whole. The importance of the free movement of researchers and knowledge within the European Research Area (ERA) is also highlighted in the Green Book prepared by the European Commission.

In 2007, the Academy published a report on the various forms of and obstacles to researcher mobility. According to the report, existing mechanisms for funding international mobility are not fully compatible with researchers' needs.

Virtually all forms of Academy research funding are geared to support international mobility. Information on the funding and mobility options available was provided through the Academy's calls for applications, at various events and on the Academy website.

The People specific programme under the EU 7th Framework Programme (FP7) is specifically designed to promote research career development. The Academy has a representative on the Marie Curie Programme Committee, which concentrates on different stages of the research career, as well as on the EU Steering Group for Human Resources and Mobility and the Member Organisation Forum on Research Careers, set up by the European Science Foundation to explore the best funding mechanisms for supporting research career development.

Research career development was also supported by Academy research grants for transfer of university researchers to work in business and industry for a fixed term, and vice versa.

The Ministry of Education announced an action programme for the development of researcher training and research careers in 2007–2011, and appointed a working group charged with finding ways to develop postdoctoral career paths. The working group has set the goal of creating a jointly funded, four-tiered research career system. The Academy was actively involved in the working group.

Administration of the graduate school system was transferred from the Ministry of Education to the Academy of Finland with effect the Academy will make decisions on graduate schools and graduate schools admissions. At the same time, the Academy also undertook responsibility for the development and monitoring of the graduate school system.

Working closely with the Ministry of Education, the Academy prepared a letter on good graduate school practices. In the autumn, a workshop was organised on this subject for the directors of German and Finnish graduate schools.

Together with the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG), the Academy provided funding to support the cooperation of German and Finnish graduate schools.

Academy research posts are important to the Academy. The Academy has 260 posts for Academy Research Fellows and 40 posts for Academy Professors.

The Academy awarded 169 three-year research grants for Postdoctoral Researcher's projects. Furthermore, to support the career independence of young scholars, 15 talented researchers who had received this funding were awarded a total of 1.25 million euros to pursue particularly promising research plans and to set up their own research teams.

Gender equality is an important objective with respect to research career development. The Academy's Equality Plan for 2005–2007 set the target of increasing the minority gender's share of all research posts to a minimum of 40 per cent. A comparison of the proportion of women funding recipients with the proportion of women applicants shows that good progress has been made in all disciplines. Among Academy Research Fellows and recipients of Postdoctoral Researcher's project funding, the proportion of women is close to the target level. Appointments to Academy Professorships, on

the other hand, continue to remain a critical stage with respect to the promotion of gender equality.

In 2007, no more than 15 per cent of Academy Professors were women, and this figure has slowly declined in recent years. As part of the bid to promote gender equality, the Research Councils were urged to pay special attention to the requirements of the Equality Plan when nominating their candidates. Competition for Academy Professorships, as indeed for other Academy research posts and grants, is extremely intense. There are not nearly enough posts for all the high-calibre researchers lining up.

Under the Finland Distinguished Professor (FiDiPro) programme, funding is provided to 28 top international researchers working at Finnish universities and research institutes (FiDiPro professors who are funded by the Academy are listed on page 32). The Academy and Tekes, who finance this programme together, hosted a networking event for FiDiPro professors and their Finnish partners.

The second FiDiPro call was organised in October. Again, there was a strong field of candidates: 53 plans of intent were submitted; 28 of them were shortlisted by the Academy Board for consideration in the second round. The final decisions on successful projects will be made in summer 2008.

The Academy's awards were presented for the fifth time at the Academy's annual Science Gala. The awards went to Hannes Lohi, Academy Research Fellow and Adjunct Professor in Molecular Biology; and to Jan Lundell, Academy Research Fellow and Adjunct Professor in Physical Chemistry.

The Academy's annual science competition (Viksu) for upper secondary students is primarily designed to stimulate interest among young people in science and the researcher's career. In 2007, the Academy received 150 entries from 176 participants.

The winners of the 2006 competition were awarded in spring 2007. Winner of the national category was Johannes Hirvelä from Helsingin normaalilyseo, and winner of the international category Klaara Kannisto from Helsingin Suomalainen Yhteiskoulu. All in all, awards were presented to 15 competition entries, four schools and one teacher. Eric Malmi from Valkeakoski Upper Secondary School/Päivölä Folk High School was awarded first prize for his entry in the 'Today in 2015' thematic competition.

EURYI funding opens the way to study of sacred texts

It is generally thought that over time, the writings of the Old Testament have only been added to, that nothing has been taken away. However, Juha Pakkala says that in all likelihood, there have been deletions and omissions – and it is on these that his exegetical research is focused.

Exegetics is the critical study of old religious texts. Pakkala and his international team at the University of Helsinki have received funding through the European Young Investigator Awards (EURYI) scheme to trace changes that have been made to the Old Testament. With a grant of more than one million euros, Pakkala and his team of seven are now in the position to work full-time on their research for the next five years.

In 2007, the European Science Foundation announced the last of its EURYI Awards, which were granted annually to some 20 merited young researchers. The scheme was funded by national research funding agencies from 16 European countries. Finland's contribution came from the Academy.

Pakkala is delighted to be able to concentrate on his research: "Long-term funding is hugely valuable and allows me to plan my work ahead. When you're on shorter grants you've to keep publishing all the time and filing new grant applications," he says.

"Our aim is to gain a better understanding of how the texts that we consider sacred were created. Our research may also have a bearing on current ecclesiastic debate if we can show that the tradition of the Old Testament has allowed for the freedom to remove outdated text."

Pakkala bases his research on a comparison of different translations of the Old Testament. His sources include other contemporary writings and history as well. "One approach is to compare the Hebrew original with the Greek translation. Since there may be several parallel texts of the same stories, we have at our disposal quite a considerable database," Pakkala explains.

"If the Greek translation is, say, 15 per cent shorter than the Hebrew original, then obviously something has been changed. A key research interest for me personally is whether the text has been abridged."

In addition to journal articles Pakkala, Adjunct Professor at the University of Helsinki, will be looking to publish a major literary study on revisions made to the Old Testament as well as a more accessible book.

Our international activities

Sights set on cooperation beyond Europe

The European Commission published a Green Book on the ERA (The European Research Area: New Perspectives). In the project to build the ERA, the Academy works to make sure that researchers in Finland are informed about funding opportunities available through the European Research Council (ERC) and the EU 7th Framework Programme (FP7) and about issues related to research career development and researcher mobility.

The Academy has national responsibility for two specific programmes and six sub-programmes under FP7:

- Cooperation (Health; Environment and climate change; Socio-economic sciences and humanities)
- Ideas (European Research Council, ERC)
- People (Marie Curie)
- Capacities (Research potential; Science in society; International cooperation).

One of the roles of the national responsible body is to canvass the views and opinions of the advisory group set up to support the committee members. A good example of an open and proactive work that contributed to the choice of themes for the work programme was the support group for the Health sub-programme, which convened regularly and invited experts of each theme to share their views. Finnish applicants have been actively involved in the Health sub-programme of 7FP.

Strategy: The Academy is a well-respected research funding agency and partner in the European research funding system

The European Research Council (ERC) was launched in connection with FP7. The first ERC call for proposals attracted huge interest, clearly demonstrating the need for funding. A total of 9,146 applications were submitted to the first ERC Starting Grant competition; 236 of them came from Finland. Just 559 applications went through to the second round. Fifteen of these had some connection to Finland. Roughly half of the short-listed applications received ERC funding. The final results of the competition will be published in early 2008.

The Academy has been actively involved in the ERC. It has overall national responsibility for implementation of the Ideas specific programme (Committee Member and National Contact Person). In this role the Academy has worked to increase awareness of the funding opportunities available by organising information events around the country and by providing advice on substantive issues relating to the application process. The Academy also contributed to the review process of the first ERC applications, commissioning four Academy officials to work in Brussels.

The European Science Foundation (ESF) had the meeting of its Governing Council in Helsinki. In this same connection, the Academy also hosted the EUROHORCs (Heads of European Research Councils) meeting, EURYI meetings (European Young Investigator Award) and the EURYI Awards Ceremony, where 20 young researchers were presented with prizes worth one million euros.

In 2007, a new CEO was appointed to head the ESF, and members were appointed to its newly established Science Advisory Board (SAB). The SAB is chaired by the Academy's former President, Professor Raimo Väyrynen, and the newly appointed ESF CEO is Professor Marja Makarow from the University of Helsinki.

The Academy took steps to strengthen its cooperation with the Delegation of the Finnish Academies of Science and Letters, which is the other of Finland's two ESF member organisations. According to the new ESF rules that took force at the beginning of 2007, it is essential for national member organisations to maintain close collaboration.

Members of the Academy's Research Councils and Academy officials attended ESF events and meetings. Important new forms of cooperation included project reviews and foresighting.

The Academy contributed to funding several EUROCORES programmes and Research Networking Programmes launched by the ESF. Academy funding for Finnish research teams involved in EUROCORES projects amounts to around one million euros a year. The impact of EUROCORES programmes was monitored by organising a seminar where researchers had the opportunity to share experiences and come forward with development proposals.

The Academy decided to join four new EUROCORES programmes:

- FANAS – Friction and Adhesion in Nanomechanical Systems (through the Research Council for Natural Sciences and Engineering)
- EuroSTRESS – Stress and Mental Health (Research Council for Health)

- LogiCCC – Logical Modelling in Interaction, Communication, Cognition and Computation (Research Council for Culture and Society)
- HumVIB – Cross-national and Multi-level Analysis of Human Values, Institutions and Behaviour (Research Council for Culture and Society).

The Academy's Research Councils have previously joined four EUROCORES programmes, financing the Finnish projects involved in their consortia:

- Research Council for Biosciences and Environment: EuroDIVERSITY – Challenges of Biodiversity Science; EuroSCOPE – Science of Protein Production for Functional and Structural Analysis (together with the Research Council for Health); and EuroCLIMATE – Climate Variability and the Carbon Cycle
- Research Council for Natural Sciences and Engineering: EuroQUAM – Quantum Cold Matter; S3T – Smart Structural Systems Technologies; and SONS – Self-organised Nanostructures
- Research Council for Culture and Society: Inventing Europe – Technology and the Making of Europe, 1850 to the Present; BOREAS – Histories from the North: Environments, Movements, Narratives; and ECRP – European Collaborative Research Projects
- Research Council for Health: EuroSTELLS – Development of a Stem Cell Tool Box; EuroSCOPE – Science of Protein Production for Functional and Structural Analysis (together with the Research Council for Biosciences and Environment); and ECT – Pan-European Clinical Trials EURAMOS.

Chile. Cooperation with Chile started with the Commission for Scientific and Technological Research (CONICYT) with a joint call for project proposals within the Sustainable Energy Research Programme. Funding was granted to four projects. The Academy and CONICYT organised two joint workshops on learning and education research and energy research.

Brazil. The Academy opened negotiations with the Brazilian National Council for Scientific and Technological Development (CNPq) on a call for joint project proposals. The Academy is a partner in the FP7 EULARINET project, which is aimed at increasing research collaboration between Latin American and European countries.

India. The Academy has memoranda of understanding (MoU) with three Indian organisations: the Department of Biotechnology (DBT) and the Department of Science and Technology (DST) under the Indian Ministry of Science and Technology, and Tooltech Ltd. In the framework of these MoUs, the Academy hosted a Finnish-Indian research seminar, conducted two calls for joint research projects and awarded mobility grants.

The Academy joined forces with the DBT to organise a joint call for project proposals in the field of plant and crop biotechnology. The Academy awarded funding worth a total of one million euros to the Finnish partners of five three-year projects in plant biotechnology. In October, joint calls were opened in the fields of environmental biotechnology and conservation biology of wild or endangered animal species. Funding decisions will be made in spring 2008.

Japan. The Academy and the Japan Society for the Promotion of Science (JSPS) organised a joint call for Core programme proposals in the field of biosciences and medicine. The next deadline for applications to the Core programme is February 2008. The themes of this call tie in closely with those covered in the Academy's Research Programme on Ubiquitous Computing and Diversity of Communication (MOTIVE 2009–2012).

In response to applications received in the January 2007 call, the Academy provided funding for 16 Finnish researchers working at Japanese universities. The duration of these grants ranged from a few weeks to two years.

The Academy opened talks on tripartite cooperation with the Japan Science and Technology Agency (JST) and Tekes. The aim is to organise a joint call for project proposals in a specified thematic area during 2008.

The Academy took part in events organised by the Finnish Institute in Japan to highlight the benefits of funding cooperation between the Academy and Japanese partners. The Academy contributed to the Japan-Finland science, technology and culture programme in 2007–2011.

China. The Academy and the National Natural Science Foundation of China (NSFC) organised a joint call for project proposals in the fields of the environment and energy, and environmental ecology. It was agreed with the NSFC that in 2008, a corresponding joint call will be opened in the field of ubiquitous computing and diversity of communication. The Academy entered into talks with the Chinese Academy of Social Sciences (CASS) on funding decisions for the first joint call for project proposals on intercultural communication that was opened in October 2006. Furthermore, in connection with the LIIKE2

Research Programme, the Academy joined forces with the Shanghai Academy of Social Sciences (SASS) to organise a seminar in Shanghai on business know-how. The Academy also provided mobility funding for 14 Chinese researchers on the basis of the agreements with the NSFC, CASS and the Chinese Academy of Sciences (CAS) to allow them to spend time working in Finland, and to give the opportunity for Finnish researchers to work in China.

The United States. The Academy contributed to the work of the Finnish Innovation Center in Silicon Valley (FinNode) together with Tekes, the Finnish Funding Agency for Technology and Innovation; Sitra, the Finnish Innovation Fund; FinPro; and VTT Finland.

Strategy: The Academy works to promote the mobility of researchers and knowledge, to improve researcher training and to open up new career opportunities for researchers

Russia. The Academy carried out with the Russian Foundation for Basic Research (RFBR) a joint call in the field of materials technology and biosciences. In this call, funding worth over 2.2 million euros was granted to eleven research projects. The Academy worked closely with the Russian Foundation for the Humanities (RFH) to prepare a joint call in the field of linguistics, and as part of the MOTIVE research programme.

ERA-NETs have marked an important new departure in networking national research programmes and in launching joint calls for proposals. The Academy has the coordination of two ERA-NET projects and has contributed as a partner to 14 further ERA-NETs. Several ERA-NET networks had advanced to the stage where they were either planning or implementing European research programmes through joint calls or other forms of cooperation. (For a full list of ERA-NETs, see page 34.)

In keeping with Article 169 of the EU Treaty, work was continued in the Academy-coordinated ERA-NET BONUS for the Baltic Sea Science – Network of Funding Agencies, to prepare a joint research programme among the Baltic Sea states. The first call for joint Baltic proposals was opened in autumn 2007. Funding was made available through the ERA-NET Plus scheme, which is financed by the Baltic Sea states and the European Commission. A major focus of this call was on interactions between human activity and the Baltic Sea ecosystem and on economic and social issues underlying the sustainable development of the Baltic Sea.

The programme is coordinated by a European economic interest grouping called BONUS EEIG, established for this effort, which took over as coordinator from the Academy at the end of 2007. BONUS EEIG operates as an independent company in which the Academy remains a regular partner.

The Academy-coordinated NORFACE ERA-NET was preparing a research programme on migration in Europe. The programme involves 13 countries, and the funding made available amounts to 22 million euros.

The first joint call for the WoodWisdom-Net (Networking and Integration of National Programmes in the Area of Wood Material Science) took place in two stages and involved 15 funding organisations from seven countries. Separate calls were held for basic and applied research projects. The Academy was involved in the basic research component together with funding agencies from Sweden, Norway, France, Denmark and the UK. Each participating organisation allocated funding to projects from their own country. Overall, programme funding came to around 20 million euros, of which the Academy accounted for around one million.

ERA-NEURON (Network of European Funding for Neuroscience Research) was launched. The focus of the project is on disease-related neuroscience research and on the development of diagnostic and therapeutic applications. The project provides a forum for cooperation among the research and health ministries of EU member and candidate states and their funding organisations. Working closely with graduate schools in these fields, the Academy has responsibility for organising a joint call for this European research programme and for preparing measures to support the training and mobility of young researchers.

In the Nordic context the Academy contributed to funding NordForsk and to planning and implementing its operations. NordForsk organised three calls in which the Academy provided funding for joint Nordic projects in stem cell research; projects designed to promote the joint use of Nordic research infrastructures; and projects to support the collaboration of Nordic research funding agencies. Finnish partners are involved in all the funded projects. NordForsk also provided funding for the networking of researchers in different fields and for researcher mobility and researcher training.

Through NordForsk, the Academy contributed to

New toxic cyanobacteria genus discovered in the Baltic Sea

A new toxic genus of cyanobacteria (blue-green algae) has been discovered in the Baltic Sea. Formerly thought to be non-toxic, the *Anabaena* genus of cyanobacteria may have the ability to produce microcystin, which is a hepatotoxin. Earlier research had suggested that the nodularin produced by the cyanobacterial genus *Nodularia spumigena* was the only toxic cyanobacteria species in the Baltic Sea.

The discovery was made by Academy Professor Kaarina Sivonen and her team at the University of Helsinki.

Sivonen's earliest research ambition was to find out whether toxic cyanobacteria were present in Finland's water systems. Still driven by her curiosity, she is now heading a research effort to identify medicinal substances in cyanobacteria that could help to fight cancer and other diseases.

The mass blooms of cyanobacteria that are a common nuisance to swimmers along the Baltic coastline, are caused by discharges from human activity and the consequent eutrophication of water bodies. "Our studies have shown unequivocally that eutrophication further increases the abundance of toxic cyanobacteria," Sivonen explains. "Global warming is probably making the situation worse."

The cyanobacteria that live in the Baltic Sea contain hepatotoxins. In inland waterways, neurotoxins have also been found in cyanobacteria. The hepatotoxins that kill fish and other animals are not absorbed through the human skin, but if ingested they can be very harmful; therefore swimming should be avoided in water with cyanobacteria blooms. In fish, the toxins accumulate in the liver, so it is safe to eat fish as long as they are gutted.

"Hepatotoxins influence the function of enzymes, which are proteins that regulate crucial cell functions. In our studies of cyanobacteria what we are looking for is compounds that either enhance or inhibit enzyme function," Sivonen explains. "It's this characteristic, the influence of cyanobacteria on enzymes, that makes them so interesting. We're specifically interested in compounds that have an effect on cancer cells."

"In the United States several cancer drugs developed from cyanobacteria are now undergoing clinical tests, but as yet none has been released on the market. Drug development is a long and complex process. Sometimes products are rejected in the very final stages of development."

Sivonen and her team have discovered several interesting compounds in cyanobacteria, and medical research is now underway to understand their mechanisms. Potential new drugs are often synthetic compounds that simulate the mechanisms of natural products.

In 2002–2007, Sivonen was in charge of the Academy-funded Microbial Resources Research Unit at the University of Helsinki. She is now working at the Centre of Excellence led by Academy Professor Eva-Mari Aro at the University of Turku. This new partnership has opened up fresh new perspectives.

launching Nordic cooperation on responding to the challenges of globalisation. NordForsk has decided to provide funding for joint Nordic excellence research projects, initially in the fields of climate change and energy research, and later in the fields of health and welfare.

The Academy joined forces with NordForsk, the Nordic Council of Ministers, the European Research Council and the Finnish Ministry of Education to organise a conference on international research policy. Conference themes included research career development, prerequisites for excellence research, and the ideal research environment. The conference also discussed the prospects of the Nordic Research and Innovation Area (NORIA) developing into a major area of cutting-edge research.

NordForsk opened a new call under the heading of NORIA-Net, inviting Nordic research funding agencies to file funding applications for the preparation of joint Nordic research projects. The Academy drafted six NORIA-Net initiatives, four of which were processed into applications. All four of these applications were successful. All major basic research funding agencies in the Nordic countries participate in the NORIA-Nets. The Academy has coordination of the project that is aimed at improving research funding cooperation between the Nordic and Asian countries, Nordic-Asian Research Funding Cooperation, and is involved in all three other projects: The Use of Bibliometrics in Research Policy and Evaluation Activities; Development of Peer Review in the Nordic Context; and The Nordic eScience Initiative.

The Academy's Research Councils participated in the work of the Joint Committees of the Nordic Research Councils (NOS).

Our funding

Funding for the very best projects

The Academy allocated a total of 264 million euros to promote high-quality research, researcher mobility and research career development (238.7 million euros in 2006). The Academy's financial situation in 2007 was strong, as funds available increased in real terms by 10 per cent. The extra funding was invested in upgrading the quality of research and developing research environments by supporting the 2008–2013 Centre of Excellence programme and the forest cluster within the framework of Strategic Centres for Science, Technology and Innovation, as well as in promoting internationalisation and research career development by increasing the number of Postdoctoral Researcher's projects. The Academy emphasised the importance of supporting emerging new fields of science and research arising from current research problems and scientific advances, as well as scientific breakthroughs that have greater than usual potential to produce long-term impacts.

Strategy: Academy funding has crucial significance to the development of new scientific breakthroughs

The Academy's key funding instruments were research project funding, programme funding (research programmes, Centre of Excellence programmes), research posts (Academy Professors and Academy Research Fellows), Postdoctoral Researcher's projects and support to graduate schools and researcher mobility in working life.

As in previous years, the value of applications received far outstripped the amount of funds available. The Academy received a total of 4,824 funding applications worth 1.1 billion euros; the figure for 2006 was 5,567 applications. The additional funds made available to the Academy made it possible to increase the amount of research grants awarded and in this way to defuse some of the increasingly intense competition for funding. For example, 27 per cent of all applications for general research grants were successful, and the overall figure for all funding applications was 21 per cent (Table 5).

The breakdown of funding decisions by research site shows that some 80 per cent of Academy funding went to universities to finance research projects and programmes as well as Centres of Excellence in research (Figure 5). Researchers based at the University of Helsinki received the largest amount of funding, a total of 67 million euros (Table 4).

Strategy: The Academy works closely with universities, research institutes, research funding agencies, business and industry, and public administration to improve the quality of research of basic research, its capacity for renewal and the application of its innovation potential

The Research Council for National Sciences and Engineering accounted for the largest share of Academy research funding (Figure 6).

Figure 3. Academy of Finland research funding in 2007

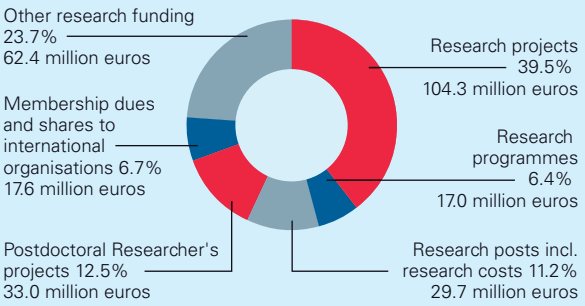


Figure 4. Development of Academy of Finland research funding 1997–2007

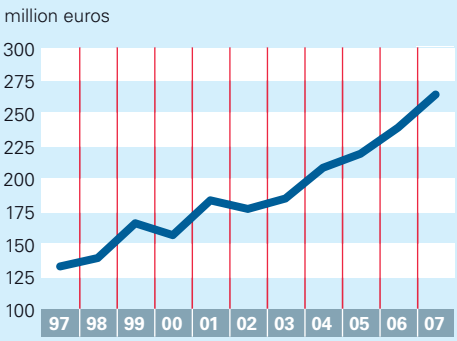


Figure 5. Academy of Finland research funding decisions by site of research in 2007

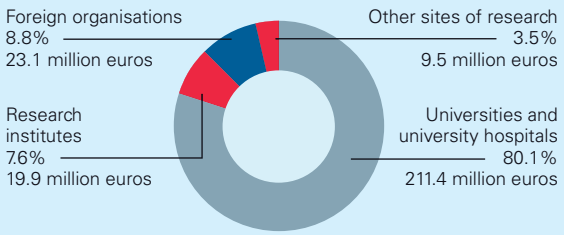
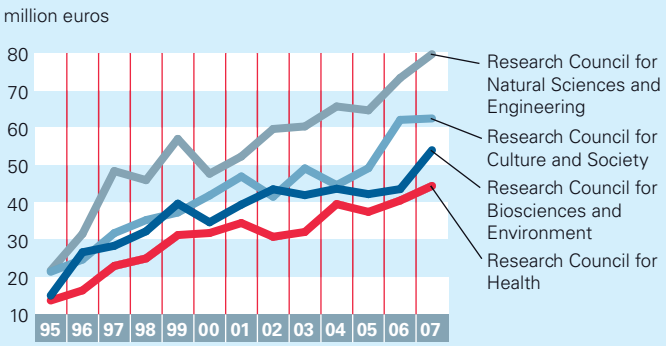


Figure 6. Academy of Finland research funding by Research Councils 1995–2007



High-temperature chemistry gives boost to bioenergy efficiency

Biofuels are needed not just in traffic and transport. Professor of Chemistry Mikko Hupa is focusing his research on the use of solid biofuels for electricity and heat generation in the wood processing industry and in municipal power plants.

"In order that biofuels can be burnt as cleanly and efficiently as possible, we need to understand their behaviour in the combustion process," Hupa says. Apart from the combustion process and emissions, another key factor is the durability of the materials used in combustion plants.

"In power plants, the overriding aim is always to achieve the highest possible efficiency ratio in electricity and heat production. The efficiency ratio depends in part on the temperature of the steam produced: the higher the better. This in turn means that the boilers and the pipelines must be able to tolerate that heat."

Research into combustion processes has yielded various practical solutions for cleaner and more efficient methods of biofuel use. In addition, Finnish manufacturers have gained invaluable know-how for the development of more competitive products.

"Several biofuels include components that cause corrosion in boilers and pipes. Our research aims to find out how the combustion process could be modified or pipeline materials improved with a view to reducing corrosion."

"We've been working on biofuel research and developing technologies of biofuel use for much longer than other European countries," Hupa points out. "Modern technologies of solid biofuel use are quite commonplace in Finland. In fact, biofuels account for more than 20 per cent of our total energy production. Elsewhere in Europe the figure is no more than a few per cent."

Know-how in high-temperature chemistry has many useful applications in the medical field, too. Professor Hupa is working with medical researchers from the University of Turku to develop bioactive glass, which is used for bone restoration. Bioactive glass is a ceramic material that requires know-how in high-temperature chemistry.

"Bioactive glass is a synthetic material with a special glass composition. When it's applied in powder form or in a single porous block to a damaged bone area, it reacts with body fluids; the body will then begin naturally to grow bone at the damaged site, while the glass will disappear."

Bioactive glass is already being used in dental surgery for jawbone and frontal bone repair. "One of our major interests is to find out how bone formation is affected by the composition of glass. In the future, we expect to use bioactive glass to make glass fibre, which in turn would be woven into a fabric with many important surgical applications. For instance, it could be used to repair damage to limbs."

Dean of the Faculty of Technology at Åbo Akademi University, Professor Mikko Hupa is based at the University's Center of Process Chemistry, which is one of the Academy of Finland's Centres of Excellence. "Funding through the CoE programme and Academy Research Fellowships have allowed us to concentrate on researching breakthrough technologies," Hupa says. "Each year our CoE produces around eight doctoral theses, and there are many areas of research that have produced several patents. In product development environments our research results are turned into marketable products."

Table 3. Academy of Finland research funding decisions by discipline 2005–2007

Discipline	2005	2006	2007
Natural sciences	**103,032,060**	**94,068,516**	**102,818,690**
Space research and astronomy*	15,956,960	4,048,780	5,656,630
Biology, environmental sciences	32,553,120	30,870,300	37,136,330
Physics**	24,145,320	28,208,090	25,665,290
Chemistry	8,762,350	10,092,540	9,334,080
Mathematics	5,931,520	5,506,645	7,085,320
Information processing science	12,262,820	10,241,341	9,470,310
Geography	961,540	1,905,960	3,457,770
Geosciences, meteorology	2,458,430	3,194,860	5,012,960
Engineering	**16,635,620**	**25,238,690**	**30,679,052**
Architecture	207,610	638,550	202,000
Construction engineering, community planning and municipal engineering	1,896,920	1,399,860	1,410,300
Electronical engineering	6,206,750	10,732,910	15,396,170
Energy technology	31,280	351,820	1,499,150
Metallurgy and extractive engineering		916,810	557,080
Mechanical engineering	3,086,830	1,421,450	1,510,610
Process and materials technology	3,410,500	3,753,930	1,997,030
Chemical engineering and chemical process technology		1,694,780	3,278,290
Wood processing technology		737,910	176,960
Biotechnology and food engineering	1,507,280	2,352,410	3,824,792
Other engineering	288,450	1,238,260	826,670
Medicine and health sciences	**42,214,876**	**45,264,520**	**53,037,113**
Biomedicine	20,311,836	22,548,310	24,737,620
Clinical medicine	13,294,170	9,383,600	13,841,350
Nutrition science	770,420	1,334,420	736,960
Public health science	3,569,710	6,661,340	5,607,765
Dental science	550,110	970,080	275,280
Sports sciences	128,000	361,790	987,620
Pharmacy	2,262,670	2,500,170	3,658,498
Nursing science	615,700	85,820	10,000
Veterinary medicine	712,260	1,418,990	3,182,020
Agriculture and forestry	**5,156,960**	**7,009,340**	**6,916,840**
Agricultural sciences, food sciences	2,339,590	4,237,790	2,915,850
Forest sciences	2,817,370	2,771,550	4,000,990
Social sciences	**31,627,221**	**39,069,610**	**40,166,072**
Economics	2,018,640	2,937,360	3,037,160
Business economics, economic geography	5,675,880	6,320,010	5,365,460
Law	1,862,730	3,871,260	3,020,110
Social sciences	6,975,430	11,432,090	12,683,669
Psychology	6,228,190	3,510,270	4,799,550
Education	3,087,771	4,746,040	2,862,533
Political science and administration	3,178,850	4,914,870	6,318,600
Communication, library science and information science	2,195,330	1,225,650	1,699,550
Statistics	404,400	112,060	379,440
Humanities	**19,836,223**	**24,964,878**	**24,940,240**
Philosophy	3,950,800	2,601,150	2,793,190
History and archaeology	4,316,550	7,307,510	5,860,100
Philology and linguistics	5,210,913	6,196,460	5,192,080
Arts research and literature	1,880,620	2,465,960	5,752,390
Theology	1,602,690	2,239,308	4,039,970
Cultural studies	2,874,650	4,154,490	1,302,510
Others* **	**200,000**	**3,084,980**	**5,471,370**
Total (€)	**218,702,960**	**238,700,534**	**264,029,377**

* The figures include the ESO annual membership dues (€1,798,000 in 2007) and admission fee in 2005 (total €10,529,010).
** The figures include the CERN membership dues (€8,936,340 in 2007).
*** The figures include the Academy's funding share to the EURYI Scheme (€1,000,000 in 2007) and additional funding allocated to universities (€4,271,370) for pay increases arising from the new UPJ salary system in Academy-funded projects for which the funding decision has been made before 2006, and for scientific publishing (€200,000).

Table 4. Academy of Finland research funding decisions by research site 2005–2007

Site of research	2005	%	2006	%	2007	%
Universities	**166,634,384**	**76.2**	**195,238,354**	**81.8**	**208,789,577**	**79.1**
Helsinki School of Economics	1,118,050	0.5	3,168,320	1.3	2,078,150	0.8
University of Helsinki	61,102,313	27.9	61,941,460	25.9	66,896,560	25.3
University of Joensuu	5,935,260	2.7	6,724,490	2.8	8,362,790	3.2
University of Jyväskylä	16,620,921	7.6	15,357,215	6.4	18,764,813	7.1
University of Kuopio	8,140,730	3.7	8,453,030	3.5	10,594,722	4.0
Academy of Fine Arts			180,000	0.1		0.0
University of Lapland	1,221,010	0.6	1,420,890	0.6	967,090	0.4
Lappeenranta University of Technology	919,930	0.4	3,069,260	1.3	3,233,860	1.2
National Defence College	113,380	0.1	900	0.0		0.0
University of Oulu	10,498,130	4.8	18,079,800	7.6	15,653,840	5.9
Sibelius Academy	21,000	0.0	788,020	0.3	233,420	0.1
Swedish School of Economics and Business Administration	647,600	0.3	118,130	0.0	1,399,280	0.5
University of Art and Design Helsinki	277,250	0.1	329,070	0.1	491,000	0.2
Tampere University of Technology	4,845,440	2.2	8,620,530	3.6	6,854,920	2.6
University of Tampere	9,135,650	4.2	15,915,220	6.7	13,286,815	5.0
Theatre Academy	,	0.0	180,000	0.0	317,020	0.1
Helsinki University of Technology	25,220,330	11.5	18,761,471	7.9	21,544,290	8.2
Turku School of Economics	779,330	0.4	1,864,880	0.8	1,172,270	0.4
University of Turku	14,214,730	6.5	22,984,740	9.6	27,410,300	10.4
University of Vaasa	446,460	0.2	241,510	0.1	891,880	0.3
Åbo Akademi University	5,376,870	2.5	7,039,418	2.9	8,636,557	3.3
University hospitals	**2,295,740**	**1.0**	**2,083,700**	**0.9**	**2,661,050**	**1.0**
Research institutes	**16,847,596**	**7.7**	**15,944,370**	**6.7**	**19,952,430**	**7.6**
Foreign organisations	**28,503,920**	**13.0**	**21,791,090**	**9.1**	**23,125,860**	**8.8**
Scientific societies	**1,241,430**	**0.6**	**1,440,420**	**0.6**	**1,762,390**	**0.7**
Polytechnics	**88,220**	**0.0**	**19,080**	**0.0**	**385,900**	**0.1**
Business companies, total	**248,530**	**0.1**	**373,250**	**0.2**	**626,500**	**0.2**
Other site of research	**2,814,810**	**1.3**	**1,799,830**	**0.8**	**6,725,670**	**2.5**
Individual researchers	**28,330**	**0.0**	**10,440**	**0.0**		**0.0**
Total (€)	**218,702,960**	**100.0**	**238,700,534**	**100.0**	**264,029,377**	**100.0**

Table 5. Success rate of applications submitted for general research grants 2003–2007

Research Council	2003			2004			2005			2006			2007		
	Of applications		Of funding applied	Of applications		Of funding applied	Of applications		Of funding applied	Of applications		Of funding applied	Of applications		Of funding applied
	no.	%	%	no.	%	%	no.	%	%	no.	%	%	no.	%	%
Biosciences and Environment	40	19	17	37	16	14	29	12	10	40	15	14	69	26	23
Culture and Society	60	27	14	46	17	9	47	17	9	64	22	13	66	23	17
Natural Sciences and Engineering	116	27	12	88	20	12	82	18	11	119	25	15	122	27	22
Health	64	37	15	48	27	15	38	22	11	46	23	14	70	32	21
Total	**280**	**27**	**14**	**219**	**19**	**12**	**196**	**17**	**10**	**269**	**22**	**14**	**327**	**27**	**21**

Research Council for Biosciences and Environment in 2007:

Emphasis on diversity and regeneration

The Research Council for Biosciences and Environment provided support for high-quality research in the fields of biosciences and the environment. Special emphasis was given to promoting the diversity, international competitiveness and potential for regeneration in the disciplines under the Council's purview.

The Council made funding decisions to a total value of 54 million euros. It awarded general research grants to 69 projects and supported research career development by allocating funding to 41 Postdoctoral Researchers, 11 Academy Research Fellows and 11 Senior Scientists. There are now nine Academy Professors and 14 graduate schools in the Research Council's disciplines. The Council provided funding for 13 newly graduated PhDs who went to work abroad in high-level research environments. It offered support for the doctoral studies of three employed persons.

Biosciences and environmental research provides answers to global environmental issues

The Research Council allocated funding to support Finnish contributions to two ERA-NET programmes, Plant Genomics and WoodWisdom. CIRCLE ERA-NET opened a Nordic pilot call for proposals focusing on climate policy research.

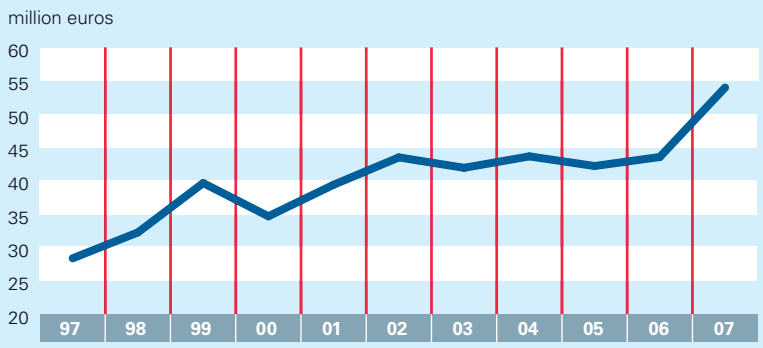
The Council's drive towards internationalisation continued in all fields of research. The Council was involved in the work to identify key areas of cooperation for Finnish, Brazilian and Chilean funding agencies.

The Council participated in several calls under the Academy's bilateral agreements of cooperation: with Japan, in the Core programme call in biosciences and medicine; with India, in the field of plant and crop biotechnology; with Russia, in the fields of materials technology and biosciences; with China, in the call for joint NSFC research projects; with Egypt, in the field of environmental research; and finally with the German Research Foundation (DFG) to promote cooperation between Finnish and German graduate schools.

Impact

The Council based its funding decisions on the criteria of high quality and scientific impact. Funding was allocated to the scientifically most rigorous and ambitious projects based on independent, international project reviews and the Council's own expert assessments.

Figure 7. Funding awarded in 1997–2007 to fields of research hosted by the Research Council



Biosciences and environmental research projects have a wide range of scientific and societal impacts. The impact of biosciences is manifested in technological development and economic benefits. Environmental research has an important role to play in informing national and international political decision-making: this is because environmental issues such as global change and biodiversity have gained increased prominence and at the same time generated growing demand for sound research knowledge. The Kyoto Climate Protocol and actions to improve the state of the Baltic Sea, for example, have benefited from the growing body of research.

The impact of environmental research projects is clearly reflected in the practice of environmental protection and its objectives. One major area of research focus is to explore the most effective and economic ways for improving the state of the Baltic Sea. This is the object of the ERA-NET BONUS programme, which supports research aimed at increasing understanding and producing more accurate predictions about how the Baltic Sea reacts to different changes.

In autumn 2007, the Academy and the Central Union of Agricultural Producers and Forest Owners (MTK) hosted a Baltic Sea Workshop where researchers and the natural resources sector had the opportunity to exchange views on research needs and on the state of research knowledge.

Evaluation

The state of water research in Finland was evaluated. The mandate of the international panel included an assessment of research into the impacts of nutrient run-offs and emissions into waterways. The evaluation covered research on water systems in general: rivers, lakes, springs, groundwater sources and sea research. Furthermore, it included research in different disciplines on water body movements, quality and populations. As for research concerned with the impacts of water processes, the evaluation extended to studies on eutrophication, climate change, the management of water resources and risk assessment.

Fields of research hosted by the Research Council for Biosciences and Environment:

- biochemistry
- microbiology
- genetics
- ecology, biosystematics and biophysiology
- forest sciences
- agricultural sciences
- food sciences
- research into substances hazardous to the environment
- research relating to the state of the environment and to environmental protection
- geography and regional studies
- research relating to environmental policy, environmental economy and environmental law
- biotechnology, molecular biology, cell biology, biophysics, bioinformatics and economic and technological research related to the above fields

Research Council for Culture and Society in 2007:

New focus on power, work and well-being

Funding from the Research Council for Culture and Society totalled almost 63 million euros, that is, one-quarter of the Academy's annual research funding. Council funding has increased in parallel with the growth of Academy funding overall.

The Council oversees 14 fields of research. The two biggest funding recipients were sociology and social work at ten million euros and history at 6.2 million euros.

Two new research programmes were launched under the Council's purview: the Research Programme on Power and Society in Finland (VALTA) and the multidisciplinary Research Programme on the Future of Work and Well-being (WORK). NORFACE (New Opportunities for Research Funding Agency Cooperation in Europe), a partnership of social science funding agencies coordinated by the Academy, launched a pilot programme on the re-emergence of religion as a social force in Europe, providing funding to ten transnational projects. During the year in review, preparations were started for a major NORFACE research programme. Focusing on the theme of migration in Europe and involving 13 countries, the programme will have a budget in excess of 22 million euros.

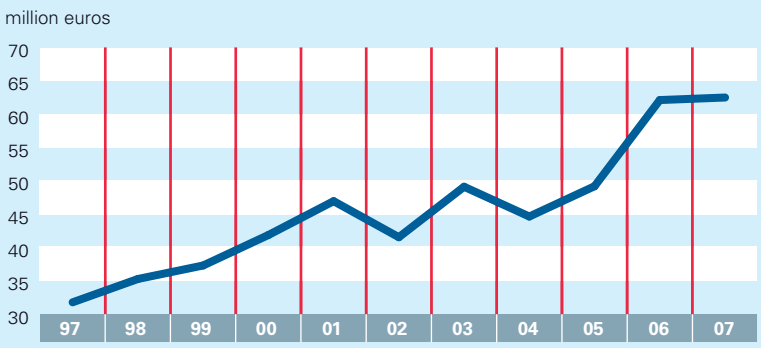
Scientific and societal impact are built-in requirements in the humanities and social sciences

The Council did not allocate targeted funding to specific disciplines or themes, but instead focused on supporting systematic research career paths.

Council funding for research projects was somewhat higher than in previous years. On average, projects were granted around 330,000 euros, compared to 250,000 euros in 2006. Most research projects are scheduled to run for four years. The aim and purpose of increasing the size of projects is to facilitate the recruitment of more experienced researchers, and not just doctoral students.

The Council participated in the ongoing debate on research infrastructures. In the humanities and social sciences, digital data storage and open access are crucially important.

Figure 8. Funding awarded in 1997–2007 to fields of research hosted by the Research Council



Fields of research hosted by the Research Council for Culture and Society:

- philosophy
- theology
- history and archaeology
- cultural studies
- arts research
- philology and linguistics
- law
- psychology
- logopedics
- education
- sociology and social work
- economics
- political science
- mass communication and library science

Research career

The Ministry of Education announced an action programme for the development of researcher training and research careers in 2007–2011. In line with this programme, the Council undertook a review of research career paths. The post of Academy Research Fellow is the most sought after of the Council's – and the whole Academy's – funding instruments. Competition for these posts is the most intense in the Research Council for Culture and Society, where less than 7 per cent of applicants are successful. The Council has now taken steps to increase the number of Academy Research Fellowships.

The Council has consistently followed the Academy's Equality Plan. Decisions on Academy Research Fellowships and Postdoctoral Researcher's funding are equally divided between men and women, and have been for several years. On the other hand, men continue to outnumber women among recipients of project funding and grants for Senior Scientists. This, however, is consistent with the male overrepresentation among applicants.

Internationalisation and researcher mobility have long been a major focus in the Council's research policy. Mobility is supported by funding decisions, and significant research funding always requires international cooperation. In keeping with this drive to internationalisation, the Council has sought to increase the proportion of foreign reviewers: 2–3 foreign panellists to one Finnish panellist is considered the ideal balance, providing a good combination of international expertise and knowledge of Finnish research tradition.

The Council organised a researcher meeting on research career paths and issues of research impact. The view was expressed by many of the participants that both scientific and societal impact are built-in requirements in both the humanities and social sciences.

Evaluation

The Research Council has for many years conducted evaluations of interdisciplinary research projects, using both multidisciplinary and intercouncil panels. The fields reviewed have included environmental law, policy and economics. Work is underway to create multidisciplinary and intercouncil evaluation panels in other fields as well.

The Council launched an international evaluation of arts research, due to be completed in 2009.

Research Council for Natural Sciences and Engineering in 2007:

Foresight and selection

The Research Council for Natural Sciences and Engineering stressed the importance of foresighting future needs in operational planning and continued to work towards the attainment of the objectives of Government research policy.

Key priorities and activities for the Council in 2007 were the allocation of funding for smart products and processes in the forest industry; the completion of the evaluation of Finnish computer science research; and the provision of funding for young and talented postdoc researchers. In its decision-making on general research grants, the Council emphasised the criteria of scientific ambition and quality, innovation potential and international cooperation.

There is a vigorous and growing interest in materials research, particularly optical materials research

The Council stresses the importance of general research grants to scientific breakthroughs. In engineering fields, the very special importance of Academy funding is recognised: it is the only source that allows for innovative and long-term basic research that, in turn, allows for the effective application of the new knowledge generated.

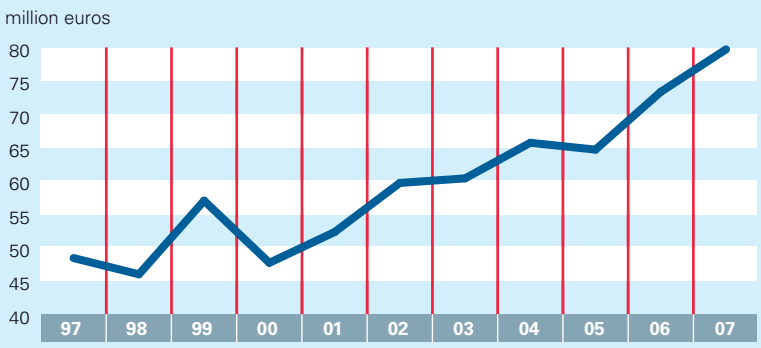
The Council allocated more than 29 million euros to 122 research projects. Close to half or 45 per cent of this went to engineering sciences, an increase of 15 per cent on the previous year. More than one-third of the projects were collaborations between different research teams. The single biggest project allocation was 912,000 euros.

In making its choices among shortlisted projects, the Council supported those proposals that had close contact with major international science projects and organisations, such as the European Space Agency (ESA), the European Southern Observatory (ESO), the European Organisation for Nuclear Research (CERN) and the fusion reaction project ITER. Council funding for scientific research associated with the ESA's Planck Project, for instance, amounted to more than one million euros.

There is a vigorous and growing interest in materials research, particularly optical materials research. Around 27 per cent of all projects funded by the Council apply different methods and approaches to study materials properties. The average size of projects funded was around 240,000 euros. The single biggest grant was 530,000 euros.

The Council allocated funding to innovative basic research designed to support the competitiveness of the forest cluster. This is a national priority presently

Figure 9. Funding awarded in 1997–2007 to fields of research hosted by the Research Council



as the forest cluster was the first and the only Strategic Centre for STI to start in 2007. The call for applications marked the beginning of a long-term and much-needed basic research effort in the forest industry: it is intended first and foremost to support the creation of networks of competence and cooperation and the training of talented young professionals in this field. A total of 2.2 million euros was awarded to five joint projects involving a total of 12 research teams. One-third of the funding recipients were women.

In 2007, the Council took several important decisions relating to international research infrastructures: see page 5.

Impact

The Council monitored the impact of the projects it has financed among other things by reviewing their research reports. According to the final reports of research grant projects ending in 2006, one million euros produced on average 54 internationally peer-reviewed journal articles, 2.3 doctoral degrees, 0.3 Licentiate degrees, 3.4 Master's degrees, 0.2 patent applications and 0.4 inventions reported to the employer. The number of publications and degrees completed in Academy-funded projects was significantly higher than the average for individual disciplines at Finnish universities.

Most projects (70%) had international partners, and 40 per cent involved research-related visits abroad. On average, project members spent 16 months on research visits per one million euros of funding. Foreign visitors were received in 14 per cent of all funded projects; one million euros of funding produced on average 14 visitor months. The number of visitors received was particularly high in the field of chemistry.

Over half or 57 per cent of the projects had national research collaboration with universities and/or research institutes. Cooperation had a favourable impact on the efficiency of publishing, and national cooperation seemed to have a significantly greater impact than international cooperation alone. Corporate cooperation was reported by 8 per cent of the projects. Cooperation with business and industry was particularly active in the fields of process and materials technology and in chemistry. The total number of projects surveyed was 148, and their average size was 135,000 euros.

Fields of research hosted by the Research Council for Natural Sciences and Engineering:

- geosciences
- space research and astronomy
- mathematics
- information processing sciences
- telecommunications and automation technology
- electronics and electrical engineering
- medical engineering
- physics and technical physics
- chemistry and chemical engineering
- materials and process technology
- mechanical engineering and manufacturing technology
- architecture and construction and municipal engineering
- statistics
- biotechnology, biophysics and bioinformatics relating to the above fields of research

Evaluation

The Council is conducting a discipline assessment in the engineering field in 2006–2008. In 2007, the focus was on computer science research. The international evaluation panel was impressed by the quality and scope of research in this field, which supports Finland's leading position in the ICT sector. The panel regarded the industry collaboration of scientists at different stages of the product development cycle as exemplary. They considered it particularly encouraging that several research-driven spinoff companies had been set up alongside more established businesses.

Research Council for Health in 2007:

Research ranging from regional health challenges to global issues

The changing age structure, increasing obesity and the growth of type 2 diabetes as well as climate change are presenting major new threats to public health. These threats are both regional, national and global challenges that can only be solved through a consistent and coherent health policy, new care innovations and the recognition of health issues outside the traditional health sector.

Scientific research provides a sound knowledge base for modern healthcare and health policy. Most of the funding allocated to health research is based on high scientific quality rather than expected societal impacts. On the other hand, it is precisely the best scientific studies that yield the greatest benefits in society, at least in the long term.

The main focus of interest in health research is on areas that are the most important to people's well-being, both nationally and globally. Academy research programmes are strategic funding instruments that are used to direct the attention of researchers to societally significant issues. This steering effect is reflected in the themes of these programmes: in addition to the Health Services Research Programme (TERTTU) that was completed in 2007, there were three ongoing programmes, i.e. the Research Programme on Nutrition, Food and Health (ELVIRA), the Research Programme on Substance Use and Addictions (ADDIKTIO) and the Research Programme on the Future of Work and Well-being (WORK). Furthermore, the Council was closely involved in the preparation of two programmes, Responding to Public Health Challenges (SALVE) and Child Welfare and Health.

Evaluation

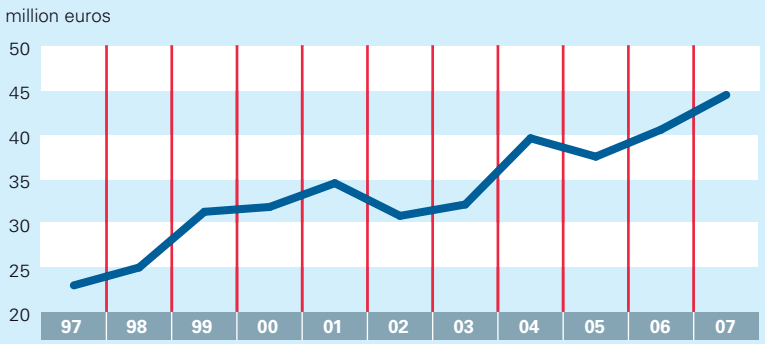
The Research Council for Health commissioned an evaluation of dental research in Finland, which overall received a very good rating. Particular praise was expressed for the work of the craniofacial research team at the University of Helsinki Institute of Biotechnology. The evaluation was conducted at the Dentistry Departments at Helsinki, Oulu and Turku and at the independent research institutes that have received Academy funding for dentistry research.

The evaluation panel also drew attention to areas and aspects in need of development. The point was

Fields of research hosted by the Research Council for Health:

- biomedicine
- veterinary medicine
- pharmacy
- dental science
- nursing science
- public health science
- clinical medicine
- sport sciences
- nutrition
- occupational and environmental medicine
- biochemistry, genetics, microbiology, biotechnology, molecular biology, cell biology, biophysics and bioinformatics relating to the above fields of research

Figure 10. Funding awarded in 1997–2007 to fields of research hosted by the Research Council



made that research teams here are relatively small and have only limited network contacts. This effectively hampers the achievement of the critical mass that is essential for scientific research. In another critical comment, the panel pointed out that clinical education in dentistry is organised in connection with municipal dental care. This outsourcing arrangement has undermined capacity for clinical research.

The Council has allocated funding to doctors who work in clinical practice. A young doctor in clinical specialisation has been eligible to receive a research grant equivalent to 20 per cent of the Academy's Postdoctoral Researcher's and a senior physician a grant equivalent to 50 per cent of the Academy Research Fellow's salary. The idea is to give doctors the opportunity to conduct part-time research while continuing in clinical practice.

The number of applications received for this funding fell well short of expectations, although the applications that did arrive were of a very high quality and extremely interesting. In 2007, almost half of the applications were funded. Concern over the decline of clinical research is not just a Finnish phenomenon, but the problem has also been highlighted by the European Medical Research Councils (EMRC) under the European Science Foundation. The Research Council for Health will continue to provide funding to support clinical research careers in 2008 and then reconsider the situation.

The main focus of research interest is on areas that are the most important to people's well-being, both nationally and globally

Another disappointment in the field of health research was the lack of interest in research grants for researcher mobility in working life, which are intended to support movement from academia to industry and vice versa. Given the small number of projects funded under this funding instrument, they did not necessarily generate any significant added value to the existing collaboration between universities and small spinoff companies.

Customer satisfaction

The Health Research Unit conducted an online customer satisfaction survey, which was mailed to all 200 or so researchers who had applied for general research grants in 2007. The purpose of the two-stage survey was to canvass researchers' impressions and experiences of the Academy application process, the way that applications are reviewed as well as their opinions on decision-making, particularly in the field of health research.

Many of the respondents, 74 per cent, said they would want to know more about the scientific background and rationale for funding decisions; 69 per cent about other research policy factors influencing decisions; and 53 per cent about preparations leading up to decision-making after the panel reviews.

In the future, researchers would like to be kept up to date on the Research Council's long-term plans, joint international calls and ongoing preparations for research programmes in the field of health research.

Academy Board 1 Jan 2007–31 Dec 2009

Raimo Väyrynen,
President of the Academy
of Finland
Chair until 28 Feb 2007

Markku Mattila,
President of the Academy
of Finland
Chair as from 1 Mar 2007

Paavo Pelkonen, Professor
Research Council for
Biosciences and Environment
University of Joensuu

Eila Helander, Professor
Research Council
for Culture and Society
University of Helsinki

Erkki Oja, Professor
Research Council for Natural
Sciences and Engineering
Helsinki University of
Technology

Kalervo Väänänen, Professor
Research Council for Health
University of Turku

Tiina Mattila-Sandholm,
Senior Vice President
Valio R&D

Pirkko Nuolijärvi, Director
Research Institute for the
Languages in Finland

Council members 1 Jan 2007–31 Dec 2009

Research Council for Biosciences and Environment

Chair
Professor Paavo Pelkonen
University of Joensuu

Professor Jaana Bamford
University of Jyväskylä

Adjunct Professor
Marina Heinonen
University of Helsinki

Professor Hely Häggman
University of Oulu

Professor Jouni Häkli
University of Tampere

Research Director
Juha Kämäri
Finnish Environment Institute

Professor Reijo Lahti
University of Turku

Adjunct Professor
Jyrki Luukkanen
Turku School of Economics

Professor Liselotte Sundström
University of Helsinki

Agricultural Counsellor
Leena Vestala
Ministry of Agriculture and
Forestry

Professor Karl Åkerman
University of Kuopio

Research Council for Culture and Society

Chair
Professor Eila Helander
University of Helsinki

Professor Pertti Haapala
University of Tampere

Research Professor
Matti Heikkilä
National Research and
Development Centre for
Welfare and Health (Stakes)

Research Director
Päivi Hovi-Wasastjerna
University of Art and Design
Helsinki

Professor Anne Kovalainen
Turku School of Economics

Professor Jaakko Pehkonen
University of Jyväskylä

Professor Lea Rojola
University of Turku

Professor Pekka Ruohotie
University of Tampere

Professor
Katariina Salmela-Aro
University of Jyväskylä

Professor Marja Tuominen
University of Lapland

Professor Jan-Ola Östman
University of Helsinki

Research Council for Natural Sciences and Engineering

Chair
Professor Erkki Oja
Helsinki University of
Technology

Professor Helena Aksela
University of Oulu

Professor Jaakko Astola
Tampere University of
Technology

Research Professor
Johanna Buchert
VTT Technical Research
Centre of Finland

Professor Hannu Hänninen
Helsinki University of
Technology

Professor Timo Jääskeläinen
University of Joensuu

Professor Pertti Mattila
University of Helsinki

Professor Jarmo Partanen
Lappeenranta University of
Technology

Research Professor
Tuija Pulkkinen
Finnish Meteorological
Institute

Professor Kaisa Sere
Åbo Akademi University

Professor Pirjo Vainiotalo
University of Joensuu

Research Council for Health

Chair
Professor Kalervo Väänänen
University of Turku

Professor Anssi Auvinen
University of Tampere

Professor Helena Gylling
University of Kuopio

Professor
Kirsti Husgafvel-Pursiainen
Finnish Institute of
Occupational Health

Professor Marja-Liisa Hänninen
University of Helsinki

Professor Tatu Juvonen
University of Oulu

Professor Jorma Keski-Oja
University of Helsinki

Professor Mikael Knip
University of Helsinki

Research Director
Anna-Elina Lehesjoki
University of Helsinki

Professor Tuula Salo
University of Oulu

Professor Pia Vuorela
Åbo Akademi University

Academy Professors in 2007

Lauri Aaltonen
1 Aug 2002–31 Jul 2007,
1 Jan 2008–31 Dec 2012
TumorGeneResearch Program;
Registry-based Identification of
Novel Cancer Susceptibility
Phenotypes and Genes
University of Helsinki

Risto Alapuro
1 Aug 2005–31 Jul 2009
Spaces of Democracy,
Association and Political
Culture in Finland in
a Comparative Perspective
University of Helsinki

Rauno Alatalo
1 Aug 1997–31 Jul 2002,
1 Aug 2004–31 Jul 2009
Individual Performance –
Inheritance, Maternal Effects
and Sexual Selection
University of Jyväskylä

Kari Alitalo
as from 1 Aug 1993
with tenure
Molecular Biology of Cancer
University of Helsinki

Eva-Mari Aro
1 Aug 1998–31 Jul 2008
Dynamics and Signaling
in Photosystem II
University of Turku

Kari Astala
1 Aug 2006–31 Jul 2011
Geometric Analysis and
Applications
University of Helsinki

Ralph-Johan Back
1 Aug 2002–31 Jul 2007
Formal Methods in Software
Construction
Åbo Akademi University

Dennis Bamford
1 Aug 2002–31 Jul 2007
Structures of Macromolecular
Assemblies and Functions
of Molecular Motors
University of Helsinki

Ilkka Hanski
1 Aug 1996–31 Jul 2011
Metapopulation Biology
University of Helsinki

Marjatta Hietala
1 Aug 2002–31 Jul 2007
Scholars, Science, Universities
and Networks as Making Cities
Attractive
University of Tampere

Olli Ikkala
1 Aug 2005–31 Jul 2010
Functional Materials Based
on Hierarchical Self-Assembly
of Synthetic and Biological
Polymers
Helsinki University
of Technology

Howard Jacobs
1 Aug 2006–31 Jul 2011
Mitochondria, Ageing
and Disease
University of Tampere

Kalevi Järvelin
1 Aug 2004–31 Jul 2009
Multi-lingual and Task-Based
Information Retrieval
University of Tampere

Olli-Pekka Kallioniemi
1 Aug 2004–31 Nov 2007
Functional and Translational
Canceromics
VTT Technical Research
Centre of Finland

Simo Knuuttila
1 Aug 1994–31 Jul 2009
1) The History of the
Philosophy of Mind
2) From Philosophy to Science
3) Medieval Trinitarian Theology
Studies in Philosophy
of Religion
University of Helsinki

Erkki Koskela
1 Aug 2006–31 Jul 2011
Equilibrium Unemployment,
Optimal Taxation and Forest
Economics
University of Helsinki

Martti Koskenniemi
1 Aug 2005–31 Jul 2010
The Limits of International Law
University of Helsinki

Juha Kostamovaara
1 Aug 2006–31 Jul 2011
Design of High-Speed
Integrated Circuits and Devices
University of Oulu

Jussi Kukkonen
1 Aug 2005–31 Jul 2010
Ecotoxicology of Natural
Organic Material (nom) in
Aquatic Systems:
Characterization and Effects on
Contaminants and Organisms
University of Joensuu

Markku Kulmala
1 Aug 2004–31 Jul 2009
Formation and Growth of
Atmospheric Aerosols
University of Helsinki

Antti Kupiainen
1 Aug 1999–31 Jul 2009
Mathematical Physics
University of Helsinki

Markku Laakso
1 Aug 2005–31 Jul 2010
Identification of New Genes
for Type 2 Diabetes
University of Kuopio

Markku Leskelä
1 Aug 2004–31 Jul 2009
Nanomaterials and
Nanostructures via
Metalorganic Synthesis and
Deposition of Thin Films
University of Helsinki

Heikki Mannila
1 Aug 2004–31 Jul 2009
Algorithmic Pattern Discovery
and Theory of Data Mining
Helsinki University
of Technology

Juha Merilä
1 Aug 2006–31 Jul 2011
Evolutionary Genetics of
Adaptation in the Wild
University of Helsinki

Uskali Mäki
1 Aug 2006–31 Jul 2011
Trends and Tensions in
Intellectual Integration:
Studies on Interdisciplinary and
Inter-theoretic Relations in the
Social Sciences, with Special
Attention to the Role and
Credibility of Economics
University of Helsinki

Risto Nieminen
1 Aug 2003–31 Jul 2008
Computational and Theoretical
Materials Physics
Helsinki University
of Technology

Kevät Nousiainen
1 Aug 2004–31 Jul 2009
Egalitarian Contentions.
Minna Canth Academy
Professorship (Women's
Studies and Gender Research)
University of Helsinki

Hannu Nurmi
1 Aug 2003–31 Jul 2008
Studies on Models
of Political Institutions
University of Turku

Risto Näätänen
1 Sep 1983–30 Jun 2007
Cognitive Function
and Its Neural Basis
University of Helsinki

Leena Peltonen-Palotie
1 Aug 2003–15 Oct 2007
Genomwide Analyses
of the Background
of Common Diseases
National Public Health Institute
and University of Helsinki

Riitta Salmelin
1 Aug 2006–31 Jul 2011
Neural Organisation
of Language Function
Helsinki University
of Technology

Mikko Sams
1 Aug 2002–31 Jul 2007
Neurocognitive Mechanisms
of Multisensory Perception
Helsinki University
of Technology

Ari Sihvola
1 Aug 2005–31 Jul 2010
Electromagnetics of
Geophysical, Composite and
Metamaterials
Helsinki University
of Technology

Lea Sistonen
1 Aug 2004–31 Jul 2009
Regulation of the Heat Shock
Transcription Factors HSF1
and HSF2
Åbo Akademi University

Kaarina Sivonen
1 Aug 2000–31 Jul 2010
Cyanobacteria and Their
Bioactive Compounds
University of Helsinki

Jari Turunen
1 Aug 2005–31 Jul 2010
Foundations of Wave-Optical
Engineering
University of Joensuu

Jari Valkonen
1 Aug 2006–31 Jul 2011
Molecular Mechanisms of
Resistance to Potyviruses
University of Helsinki

Kim Wallin
1 Aug 2006–31 Jul 2011
Micromechanism-based
Modelling of Fracture with
Emphasis on Structural
Integrity Assessment
VTT Technical Research Centre
of Finland

Seppo Ylä-Herttuala
1 Aug 2005–31 Jul 2010
Biology and Applications of
Therapeutic Vascular Growth
University of Kuopio

Management and Unit Directors 2007

Markku Mattila, President, as from 1 Mar

Raimo Väyrynen, President, until 28 Feb

Riitta Mustonen, Vice President, Research, as from 1 Jun

Anneli Pauli, Vice President, Research, until 31 Mar

Juha Sarkio, Vice President, Administration, until 14 Aug

Hedvig Mikkolanniemi, Vice President, Administration, 15 Aug–31 Dec

Biosciences and Environment Research Unit
Johanna Ikävalko, Director, until 31 May
Jaana Roos, Director, as from 1 Jun

Culture and Society Research Unit
Pirjo Hiidenmaa, Director

Health Research Unit
Riitta Mustonen, Director, until 31 May
Mikael Fogelholm, Director, as from 1 Sep

Natural Sciences and Engineering Research Unit
Susan Linko, Director

Administration Unit
Maarit Saarela, Director

Communications Unit
Maj-Lis Tanner, Communications Director

Finance Unit
Aalto Jaana, Director, until 31 Aug
Mervi Taalas, Director, as from 1 Sep

Information Management Unit
Seppo Raejärvi, Director

International Relations Unit
Raija Hattula, Director

Programme Unit
Ritva Dammert, Director

Services Unit
Seppo Hongisto, Director

Honorary title of Academician

The highest recognition to scientists and scholars

Based on nominations by the Academy of Finland, the President of the Republic may grant the title of Academician to highly distinguished Finnish or foreign scientists and scholars. The title of Academician can be held by no more than twelve Finnish scientists and scholars at a time. There are no restrictions on the number of foreign Academicians.

Finnish holders of the honorary title of Academician

Erik Allardt
Albert de la Chapelle
Nils Erik Enkvist
Olavi Granö
Pekka Jauho
Teuvo Kohonen
Olli Lehto
Jorma K. Miettinen
Pirjo Mäkelä
Arto Salomaa
Päiviö Tommila

Foreign holders of the honorary title of Academician

Sir Arnold Burgen, Great Britain
Alfred W. Crosby, USA
Jared M. Diamond, USA
Ludvig D. Faddejev, Russia
Hans Fromm, Germany
Bengt Hultqvist, Sweden
Leon Lederman, USA
Yuri I. Marchuk, Russia
Sanjit K. Mitra, USA
Martha Nussbaum, USA
Birgitta Odén, Sweden
Richard Peto, Great Britain
Lennart Philipson, USA
Darwin J. Prockop, USA
Stig Strömholm, Sweden
Richard Villems, Estonia

Academy-funded FiDiPro Professors

Jan Blommaert, Great Britain
Hsiu-Hsi Chen, Taiwan
Kalyanmoy Deb, India
Edward Delp, USA
Jacek Dobaczewski, Poland
Ari T. Friberg, Sweden
Jussi Hanhimäki, Switzerland
Rikard Holmdahl, Sweden
Ghassan Jabbour, USA
Antti-Pekka Jauho, Denmark
Mark Nuttall, Canada
Josef Rauschecker, USA
Bo Stråth, Italy
Roger Säljö, Sweden
Joe Terwilliger, USA
Douglas Worsnop, USA

Ongoing research programmes 2007*

Business Know-how, LIIKE2 (2006–2009)

Environment and Law, ENVLAW (2005–2008)

Environmental, Societal and Health Effects of Genetically Modified Organisms, ESGEMO (2004–2007)

Health Service Research, TERTTU (2004–2007)

Industrial Design (2004–2007)

Information Technology in Mechanical and Automation Engineering, KITARA (2005–2009)

Nanoscience, FinNano (2006–2010)

Neuroscience, NEURO (2006–2009)

Nutrition, Food and Health, ELVIRA (2006–2010)

Power and Society in Finland, VALTA (2007–2010)

Russia in Flux (2004–2007)

Substance Use and Addictions, ADDIKTIO (2007–2010)

Sustainable Production and Products KETJU (2006–2010)

Systems Biology and Bioinformatics, SYSBIO (2004–2007)

(* funding started or ongoing in 2007)

Centres of Excellence in Research 2007

Finnish Programme for Centres of Excellence in Research 2002–2007

Applied Microbiology Research Unit
University of Helsinki

Bio- and Nanopolymers Research Group
Helsinki University of Technology,
University of Helsinki and University of Turku

Centre for Environmental Health Risk Assessment
National Public Health Institute and University of Helsinki

Centre of Excellence for Research in Cardiovascular Diseases and Type 2 Diabetes
University of Kuopio

Centre of Population Genetic Analyses
University of Oulu and University of Helsinki

Developmental Biology Research Programme
University of Helsinki

Finnish Research Unit for Mitochondrial Biogenesis and Disease (FinMIT)
University of Tampere and University of Helsinki

Formal Methods in Programming
Åbo Akademi University

From Data to Knowledge Research Unit
University of Helsinki and Helsinki University of Technology

Helsinki Brain Research Centre (HBRC)
University of Helsinki, Helsinki University of Technology, and Helsinki and Uusimaa Hospital District

History of Mind Research Unit
University of Helsinki and University of Jyväskylä

Research Programme on Male Reproductive Health
University of Turku

Research Unit of Geometric Analysis and Mathematical Physics
University of Helsinki and University of Jyväskylä

Research Unit on Economic Structures and Growth
University of Helsinki

Research Unit on Physics, Chemistry and Biology of Atmospheric Composition and Climate Change
University of Helsinki, University of Kuopio and Finnish Meteorological Institute

Smart and Novel Radios Research Unit (SMARAD)
Helsinki University of Technology

Finnish Programme for Centres of Excellence in Research 2006–2011

Adaptive Informatics Research
Helsinki University of Technology

Ancient Greek Written Sources
University of Helsinki

Cancer Biology
University of Helsinki

Complex Disease Genetics
National Public Health Institute, University of Helsinki and Folkhälsan

Computational Complex Systems Research
Helsinki University of Technology

Computational Molecular Science
University of Helsinki

Computational Nanoscience
Helsinki University of Technology

Evolutionary Genetics and Physiology
University of Turku and University of Helsinki

Evolutionary Research
University of Jyväskylä

Global Governance Research
University of Helsinki and University of Turku

Inverse Problems Research
University of Helsinki, University of Kuopio, Helsinki University of Technology, University of Oulu, and Lappeenranta University of Technology

Learning and Motivation Research
University of Jyväskylä

Low Temperature Quantum Phenomena and Devices
Helsinki University of Technology and VTT Technical Research Centre of Finland

Metapopulation Research
University of Helsinki

Nuclear and Accelerator Based Physics
University of Jyväskylä

Plant Signal Research
University of Helsinki and University of Turku

Political Thought and Conceptual Change
University of Jyväskylä

Process Chemistry
Åbo Akademi University

Signal Processing
Tampere University of Technology

Study of Variation, Contacts and Change in English
University of Helsinki and University of Jyväskylä

Systems Neuroscience and Neuroimaging Research
Helsinki University of Technology and University of Helsinki

Translational Genome-scale Biology
VTT Technical Research Centre of Finland, University of Turku, and University of Helsinki

Virus Research
University of Helsinki

Finnish Programme for Centres of Excellence in Research 2008–2013

Algorithmic Data Analysis Research
University of Helsinki

Analysis and Dynamics Research
University of Helsinki

Cardiovascular Diseases and Type 2 Diabetes Research
University of Kuopio

Foundations of European Law and Polity Research
University of Helsinki

Functional Materials
Åbo Akademi University

Generic Intelligent Machines Research
Helsinki University of Technology

Host Defence Research
University of Turku

Integrative Photosynthesis and Bioactive Compound Research at Systems Biology Level
University of Turku

Interdisciplinary Music Research
University of Jyväskylä

Microbial Food Safety Research
University of Helsinki

Molecular and Integrative Neuroscience Research
University of Helsinki

Molecular Imaging in Cardiovascular and Metabolic Research
University of Turku

Philosophical Psychology, Morality and Politics: Human Conduct in the History of Philosophy
University of Helsinki

Physics, Chemistry, Biology and Meteorology of Atmospheric Composition and Climate Change
University of Helsinki

Public Choice Research
University of Turku

Research on Mitochondrial Disease and Ageing (FinMIT)
University of Tampere

Smart Radios and Wireless Research (SMARAD)
Helsinki University of Technology

White Biotechnology – Green Chemistry Research
VTT Technical Research Centre of Finland

Nordic Centres of Excellence 2007

Nordic Centre of Excellence Programme on Global Change Research 2003–2007

The Dynamics of Ecological Systems under the Influence of Climatic Variation
University of Oslo

Luminescence Research
University of Aarhus

Research Centre on Biosphere–Aerosol–Cloud–Climate Interactions
University of Helsinki

Studies of Ecosystem Carbon Exchange and Its Interactions with the Climate System
Lund University

Nordic Centre of Excellence Programme on Molecular Medicine 2004–2009

Disease Genetics
University of Helsinki

Neurodegeneration
Lund University

Research in Water Imbalance Related Disorders
University of Oslo

Nordic Centre of Excellence Programme for the Humanities and Social Sciences 2005–2010

Cognitive Control: Behavioural and Brain Studies of Cognitive Control in Attention, Perception, Language, Memory, and Emotion
Umeå University

Empirical Labor Economics
Uppsala University

NORMS – Microcomparative Syntax
University of Tromsø

The Nordic Countries and the Medieval Expansion of Europe. New Interpretations of a Common Past
University of Bergen

Nordic Centre of Excellence Programme on Food, Nutrition and Health 2007–2011

HELGA: Nordic Health – Wholegrain Food
Danish Cancer Society

MitoHealth: Centre for Bioactive Food Components and Prevention of Lifestyle Diseases
University of Bergen

SYSDIET: Systems Biology in Controlled Dietary Interventions and Cohort Studies
University of Kuopio

Nordic Centre of Excellence Programme on Welfare Research 2007–2012

Reassessing the Nordic Welfare Model
Norwegian Institute for Research on Welfare and Aging

The Nordic Welfare State – Historical Foundations and Future Challenges
University of Helsinki

ERA-NET projects 2007

Coordination

BONUS, BONUS for the Baltic Sea Science – Network Funding Agencies, 2004–2007

NORFACE, New Opportunities for Research Funding Cooperation in Europe – A Strategy for Social Sciences, 2004–2008

Partners

ERA-CHEMISTRY, Implementation of Joint Bottom-up European Programmes in Chemistry, 2004–2008

ERA-AGE, European Research Area in Aging Research, 2004–2007

ERA-PG, European Research Area Plant Genomics, 2004–2007

WoodWisdom-Net, Networking and Integration of National Programmes in the Area of Wood Material Science, 2004–2007

MarinERA, National and Regional Marine RTD Activities in Europe, 2004–2008

Pathogenomics, Trans-European Cooperation and Coordination of Genome Sequencing Functional Genomics of Human-pathogenic Microorganisms, 2004–2009

NanoSci-ERA, NanoScience in the European Research Area, 2005–2008

CIRCLE, Climate Impact Research Coordination within a Larger Europe, 2005–2009

CO-REACH, Cooperation of Research between Europe and China, 2005–2009

HERA, Humanities in the European Research Area, 2005–2009

MATERA, Material Science and Engineering in Europe, 2005–2009

ERA-SAGE, European Research Area on Societal Aspects of Genomics, 2005–2010

ERASysBio, Towards a European Research Area for Systems Biology, 2006–2009

ERA Neuron, Network of European Funding for Neuroscience Research, 2007–2010

Publications 2007

Academy of Finland brochure (2007), Finnish (pdf), Swedish (pdf), English (pdf), French (pdf), German (pdf), Spanish (pdf)

Finland Distinguished Professor Programme: Teaming up with the Best (pdf)

Finnish Programme for Centres of Excellence in Research 2008–2013 (pdf)

Academy of Finland publication series 2007

1/07 Microbes and Man Research Programme 2003–2005 (MICMAN). Evaluation Report

2/07 Research Programme on Proactive Computing (PROACT) 2002–2005. Evaluation Report

3/07 Civilisation Cannot Be Imported. Researcher Commentary on the Impact of Cultural and Social Research

4/07 Uudet avaukset. Tutkimuksen riskirahoitus Suomen Akatemiassa. Maunu Häyrynen

5/07 Baltic Sea Research Programme (BIREME) 2003–2006. Evaluation Report

6/07 Breakthrough Research. Funding for High-risk Research at the Academy of Finland. Maunu Häyrynen (only in pdf)

7/07 Academic Finns Abroad – Challenges of International Mobility and the Research Career

8/07 Computer Science Research in Finland 2000–2006. International Evaluation

9/07 Dental Research in Finland 2001–2005. International Evaluation

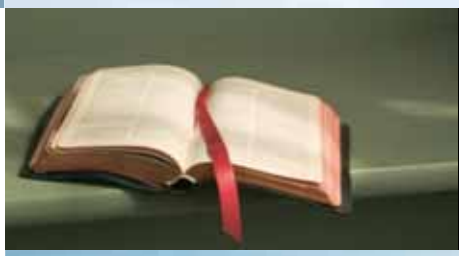
Academy of Finland in 2007

- The value of the Academy's decisions on research funding reached 264 million euros.
- 2007 was a good year for the Academy. Funds made available to the Academy increased in real terms by 10 per cent. The extra funds were invested in stepping up funding for Centres of Excellence (CoE), promoting the internationalisation of research and supporting renewal and new breakthroughs in research. Increased funds were allocated to high-level, investigator-driven research.
- The Academy signed agreements detailing the tasks and funding of the units selected to take part in the fourth Finnish Programme for Centres of Excellence in Research. All in all, in the CoE programmes funding was provided to 39 units.
- The Academy contributed to funding five Nordic Centre of Excellence Programmes.
- The Academy had national responsibility for two specific programmes and six sub-programmes under the EU 7th Framework Programme for Research. It coordinated two ERA-NET projects and was involved as a partner in 14 projects.
- There were 14 ongoing research programmes.
- The Academy had 260 posts for Academy Research Fellows and 40 posts for Academy Professors.
- New members were appointed to the Academy's Board and four Research Councils.
- The Academy's Administration Office had a staff of 155. In addition, 18 persons were on leave of absence. The proportion of staff with a PhD was 23 per cent, those with a higher university degree 30 per cent and those with a lower university degree 13 per cent.

Published by the Academy of Finland, 2008
Graphic design: GREY PRO Oy
Translated by David Kivinen
Printed by Libris, Helsinki 2008
ISBN (printed) 978-951-715-689-9
ISBN (pdf) 978-951-715-690-5

The Annual Report is available on our website at
www.aka.fi/publications in Finnish and English,
and an abridged version in Swedish.

More information on the Academy of Finland and Finnish science:
www.aka.fi/eng, www.research.fi



ACADEMY OF FINLAND

RESEARCH FUNDING AND EXPERTISE

Vilhonvuorenkatu 6 • POB 99, FI-00501 Helsinki • Finland
Phone +358 9 774 881 • Fax +358 9 7748 8299
www.aka.fi/eng • keskus@aka.fi