

Mr Richard King  
**Quinquennial Review Team Leader**  
Office of Science and Technology  
Albany House  
94-98 Petty France  
London SW1H 9ST

12 July 2001

*Dear Mr King*

**STAGE 2 OF THE QUINQUENNIAL REVIEW OF THE GRANT  
AWARDING RESEARCH COUNCILS (THE QRC).**

Further to my letter of 19 June with CST's response to your letter of last April about the second stage of this review, please find attached our report on the study visit to Sweden, which we undertook on 28 June.

During the day-long series of meetings, we pursued the main themes of our response with senior officials who are engaged in executing the research and innovation policy reforms that were introduced last year. We focused on the re-organisation of the Research Council system involving the creation of three new Councils, each assigned a distinctive role within an integrated system for funding Sweden's underpinning research base. We also pursued our proposals concerning *an Office for Innovation* by taking an early look at the new Agency, VINNOVA that is being established to strengthen Sweden's national innovation systems.

To present the main features of these four non-departmental executive bodies in context, the report additionally summarises the new policy framework, the structure of Sweden's research base and indicators of its present, world- class performance.

Because they fall outside the aims and purposes of our visit, we did not cover those aspects of the new policies concerning generational change, gender equality, and research ethics. Nor, due to time constraints, did we meet with researchers and other agencies to obtain their views about these reforms.

Nonetheless and despite the differences of scale between the two countries, the visit generally re-enforced our views and advice on the QRC. Indeed, we consider that Sweden provides a useful exemplar for putting them into practice. More especially:

- i) Strategically and operationally, the new Swedish Research Council is an integrated organisation, from both the internal and external viewpoints
- ii) The core tasks of the Council are to maintain the quality of Swedish research when judged by international standards; to ensure that the national research base is "fit for its

underpinning purposes"; to promote international research co-operation; and to provide top level advice to the Government on these and other strategic aspects of research policy issues.

iii) The Council's Board fulfils a distinct, overarching role to that of the three executive councils. For example, the Board is at present responsible for preparing a corporate plan, as well as for delivering a number of new horizontal policy initiatives, for which it has received separate financial appropriations.

iv) The three executive councils are severally responsible for funding basic, research in their respective subject domains from the financial appropriations that they receive individually.

v) The Council's parent Department, the Ministry for Education and Science is developing a suitable set of metrics for monitoring and evaluating the performance of the Council and the research base.

vi) The Council, along with its two mission orientated research funding partners, the Research Council for Environment, Agricultural Science and Spatial Planning (FORMAS) and the Research Council for Working Life and Social Sciences (FAS), are dedicated to funding researcher-led, high quality research as the bedrock of Sweden's prosperity and well being as a knowledge intensive society.

vii) The Innovation Agency, VINNOVA, funds mission orientated R&D for supporting innovation systems, sustainable development and growth. It is this Agency, not the Research Councils, that is primarily responsible for delivering the Government's innovation policy in relation to business-research base links, technology transfer and knowledge diffusion, the development of advanced technology, and the related aspects of creating wealth from public investment in the research base.

viii) The essential pull and push dynamics in this process are driven by VINNOVA focussing on the business or demand side, while the Research Councils concentrate on the research, supply side of the national innovation systems.

Personally, I was also particularly impressed by:

- the new research policy being so firmly and clearly based on the researcher led approach to funding the research base;
- the primary importance that is given to providing researchers with a diversity of funding sources - the autonomous research foundations are an interesting example;
- the way in which research funding for the arts, humanities and social sciences is incorporated and arranged within the new organisational structure;
- the funnelling of research funding from several ministries through the Research Council and the two missions orientated councils, FORMAS and FAS;
- the fact that researchers can apply to any of the three councils using one application route and format; and by

- the moves which the Research Council is beginning to make to meet more of the full economic costs of research projects and programmes by raising its percentage contribution to universities' indirect costs and by considering the eligibility of principal investigator costs. As in the UK, Sweden's general grants for universities comprise a diminishing proportion of the total amount of research expenditure in higher education.

I am copying this letter and the report for information to Lord Sainsbury, (Minister for Science), Professor David King (Chief Scientific Adviser) and my CST colleagues. A further copy will be placed on the Council's web site shortly, along with my previous letter and enclosure.

We trust this further contribution proves useful, not only to the QRC but also to the two reviews that were announced recently, concerning DTI's organisation and business support schemes.

Yours sincerely

*Julia Higgins*

PROFESSOR DAME JULIA HIGGINS CBE, FRS, FEng.

COUNCIL FOR SCIENCE & TECHNOLOGY

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# QUINQUENNIAL REVIEW OF THE RESEARCH COUNCILS

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## A report on a study visit to Sweden on 28 June 2001

### Introduction

This report contains the findings from our visit to study the re-organisation of Sweden's Research Council system. It also describes the new agency that is being established to strengthen Sweden's national innovation systems.

2. The visit, arranged as part of our work on the quinquennial review of the UK's six funding Research Councils, was undertaken by Professor Dame Julia Higgins, Professor Kumar Bhattacharyya and Professor David Vandelinde. They were accompanied by Mr Steve Elton, CST secretary, Mrs Frances Nieduszynska, a member of OST's review team, and Dr Martin Ridge from the central innovation policy unit of the Department of Trade and Industry.

3. During a day long programme, we met the Swedish Government's Chief Scientific Adviser and the main architect of the reforms, Professor Hans Wigzell, President, Karolinska Institute. We also met

- Mrs Mariann Samuelson, Mr Erik Forsse; Mr Mathias Jarl and Ms Stina Gerdes, *Ministry of Education and Science*;
- Dr Anne- Marie Pilotti, Assistant Director-General, *the Swedish Research Council*;
- Professor Lisa Sennerby-Forsse, Secretary-General, *the Research Council for Environment, Agriculture Sciences and Spatial Planning (FORMAS)*;
- Dr Kenneth Abrahamsson, Programme Director, *the Research Council for Working Life and Social Sciences (FAS)*; and
- Dr Eva Lindecrone, Director, *the Swedish Agency for Innovation Systems (VINNOVA)*.

4. We are most grateful to all of them for their willing co-operation and kind assistance.

### Context

5. Sweden is one of the top scientific nations, producing around 2% of the world's publications and some 4% in such fields as neuroscience and immunology, and achieving one of the highest indexes of relative citation impact, second only to the US and Switzerland. On a per capita basis, Sweden is among the leaders of publication and citation leagues, along with Israel and Switzerland, and has particular strengths in biology and bio-chemistry, clinical medicine, ecology/environmental science, plant and animal science.

6. The nation's industrial R&D performance is similarly world class, when judged by the usual indicators. Per capita patenting levels, for instance, are close to Germany and ahead of the UK and the US and the UK. Business expenditure on R&D (BERD) is running at just under 3% of GDP, having grown from under 2% a decade ago. Total expenditure on R&D stands at around 4.0% of GDP, the highest in the OECD and over twice the UK figure of 1.8% (or 1.2% for BERD).

7. Like the UK, around ten large companies account for some 50% of Sweden's BERD, mostly in the transport, telecommunications and pharmaceutical sectors. The bulk of this expenditure is spent on developmental work: around 20% of BERD is spent by companies on basic and applied research work, mainly in engineering and to some extent in natural sciences and medicine. Companies and the public sector collaborate through jointly funded industrial research institutes that share many of the features of the UK's Research & Technology organisations (RTOs).

### **Sweden's Research Base**

8. Some 25% of national R&D expenditure (currently running at around £7.5 billion) is funded by the Government (GERD) through block grants for higher education institutions, the Research Councils, a number research foundations that were established in the mid 1990s, and sectoral agencies, such as National Road and Rail Administrations and the National Space Board.

9. In mostly comprising departments, centres and the like in universities, the research base is driven by strong competition for funds from the Research Councils and other funding bodies. There are very few public research establishments and like institutes in Sweden.

10. Accounting for most of this GERD figure, the higher education sector comprises 13 state universities and 23 state university colleges, all of which undertake research. The funding arrangements are comparable to the UK's dual support arrangements in that there are two principal streams of funding, general or block grants that are allocated formulaically and peer reviewed project and programme grants. Unlike the UK, the general grants are not distributed selectively on the basis of quality, as judged through the periodic research assessment exercises.

11. More generally, the governing principles for funding this research base are that:

a) All universities should undertake research, to support their teaching and economic roles.

b) Sweden's Government and Parliament have overall responsibility for ensuring that Swedish society develops and makes use of new knowledge.

b) Public funding should be provided through a diversity of sources and agencies. Particular importance is attached to the sectoral-research principle such that every

sector of society assesses its own needs for R&D inputs and weighs these against other needs to promote its development.

c) The Government and Parliament determine the overall apportionment of public funds between the different research fields while the researchers decide how the funds are to be spent on projects and programmes in these fields.

d) The Government guarantees research freedom in supporting basic research and post graduate research students.

e) Research funds should be spent on excellent ie world class work ie second rate research is not worth funding.

### **Research and Innovation Policy**

12. After some 4 years of review and preparatory work, Sweden's coalition Government enacted a new policy in the summer of last year to enable the country to compete and prosper as a modern, knowledge intensive society.

13. The twin goals of this policy are to strengthen Sweden's position as a leading research nation, and to boost knowledge, skills and innovation in the private sector for stimulating future growth, productivity and competitiveness. The underpinning rationale is that research provides the foundations for a prosperous and thriving knowledge intensive society, and that publicly funded research must therefore be high quality and relevant in terms of both breadth and specialisation.

14. The research policy is aimed specifically at

- improving the research environment and infrastructure;
- increasing the funding system's performance, particularly in supporting high quality research, assigning priorities, establishing leading edge strengths in important fields, ensuring breadth and promoting multi-disciplinary and inter-disciplinary work;
- dealing with the ethical issues arising from research; and.
- meeting the generational change - a considerable number of researchers are nearing retirement.

15. Demand for post-graduate scientists and engineers is rising fast due to the expansion of higher education and the development of research intensive business sectors. To meet this demand over the period of generational change, 16 new graduate schools are being established at a cost of some £15million (up until 2003) to act as attractive, centres of excellence for research post-graduate recruitment and education. Additionally, some £8 million will be spent over the same period in recruiting, supporting and developing the mobility, careers and prospects of talented young researchers.

16. Steps are also being taken to improve the recruitment of women into post graduate and higher research positions in universities through affirmative actions and through a fund of around £1m for gender research.

## Overview of the new Funding Arrangements

17. The main Ministries responsible are the Ministry for Education and Science on the one hand and the Ministry for Industry, Employment and Communications on the other. Both Ministries formulate joint and several policies for execution through a number of new and existing agencies. The Minister for Education and Science is responsible for co-ordination of research policy and associated budgetary matters and chairs an interdepartmental committee covering ten Ministries, including the Ministry of Health and Social Affairs and the Ministry of the Environment.

18. Five new organisations are being established, three for funding research, one for the national innovation systems and one for growth policy studies. Additionally, a research forum has been established to enable dialogue and co-operation between researchers, business, members of the public and other stakeholders.

19. These new organisational arrangements, involving the discontinuance and merger of a large number of funding bodies, are designed to facilitate concerted action in key scientific fields, strengthen researcher control, promote collaboration between research fields and improve the diffusion and taken up of new knowledge from the research base. It is tasked specifically with stimulating inter-disciplinary and multi-disciplinary research, and with giving eminent and talented researchers enough support to develop independent, innovative.

20. The new *Swedish Research Council* plays a pivotal role in these arrangements, supporting curiosity driven basic research, strategic and applied research in every field including the arts and humanities. More generally, it is responsible for maintaining the quality of Sweden's research base, promoting its vitality, mobility and standing, and for providing research policy analysis and advice to the Government.

21. Two special Research Councils have been established in two areas where the need for new knowledge is deemed particularly important to Sweden's future well being:

- *The Research Council for Working Life and Social Sciences (FAS)* promotes basic and mission orientated research in relation to welfare, public health, social care, the labour market, work organisation and the work environment.
- *The Research Council for Environment, Agriculture Sciences and Spatial Planning (FORMAS)* promotes research for sustainable development and aimed at furthering knowledge of biological natural resources, land, water, and society's sustainable exploitation of them.

22. The fourth new *Agency for Innovation Systems (VINNOVA)* funds mission orientated R&D to support innovation systems, sustainable development and growth.

23. In addition to their existing budgetary appropriations of some £240 million, these four agencies have received an additional allocation for the years 2001-2003 of

- £34 million for the *Swedish Research Council*.
- £1 million for *FAS*;
- £1.5 million for *FORMAS*; and
- £3 million for *VINNOVA* for supporting R&D in biotechnology and IT.

24. Over the period 2000-20003, the Government has allocated around £100m of additional funding for research and post graduate education, of which some

- 45% will be spent on research in high priority fields;
- 16% will be spent on establishing 16 graduate schools; and
- 7% will be spent on recruiting new researchers; and

25. Around £350,000 has also been allocated to improve higher education post graduate supervision in universities. The remainder has been allocated mostly for investments in the research infrastructure of universities.

## **Detail**

### *(a) The Swedish Research Council*

26. On 1 January 2001, this new Council replaced five former research councils and took up responsibilities for supporting fundamental research in all scientific fields.

27. The Council's core task is to support the creation of knowledge through top quality, curiosity driven, basic research. Its related responsibilities include the provision of advice to the Government on research policy issues, monitoring, evaluating and reporting on the situation and prospects of Sweden's research base, and providing general information about the funding, condition and performance of Swedish research. Its full mission statement is reproduced at Annex A and it is accountable to the Ministry for Education and Science.

28. The Council is fully integrated, organisationally and operationally. It is led by a main Board, and also comprises three subject committees (executive research councils for particular subject areas), respectively and separately responsible for funding basic and strategic research in the fields of medicine; the natural and engineering sciences; and the arts, humanities and social sciences.

29. Each of these committees receives its own appropriation from the Swedish Parliament, while the Board receives a separate appropriation for cross cutting or other within its distinct, overarching responsibilities. The present allocations for the three executive councils are some:

- £15.2 million pa for the arts, humanities and social sciences;
- £25 million pa for medicine; and
- £7 million pa for the natural sciences, engineering and technology

30. The new research policy specifically recognises that global and societal changes, along with scientific advances, is increasing the need for arts and humanities

research. Similarly, the policy recognises that, increasingly, the knowledge and contribution of researchers in these fields is indispensable for inter-disciplinary and multi-disciplinary research areas, for example those concerning the human-computer interface.

31. The Council's Board comprises 8 researchers appointed by their fellow researchers through an electoral-college type system, and five Governmental appointees, including the chair. There is no joint membership of the Board and the three executive councils but the Board can provide them with broad directions and guidance concerning the discharge of their distinct responsibilities and budgets. Conversely, the three councils make their recommendations to the Board about their future budgets and the Board can adjust them before submitting its considered funding proposals to its parent department, the Ministry for Education and Science.

32. The Board is supported by a strategy, analysis and evaluation unit and has its own budget, appropriated by the Swedish Parliament. This budget at present amounts to some £35 million per annum for a range of cross cutting initiatives concerning young researchers and research in the life science, IT, materials science and education fields. The Council also has a special education committee on educational science, tasked with promoting the development of closer links between research and post graduate education on the one hand, and teacher training and practice on the other.

*(b) The Research Council for Social Issues and Working Life (FAS)*

33. The purpose of this new mission orientated Council is to fund, direct and evaluate the creation of knowledge concerning peoples' health and living conditions, public regulation and social security, and the orientation and development of working life. Within these fields, its mission is to

- promote and support basic and applied research;
- identify important research needs;
- facilitate dialogue, dissemination and transfer of knowledge; and to
- promote co-operation between researchers, nationally and internationally, and particularly in the EU RTD Framework programmes.

34. Mostly through peer review, it provides grants for projects and programmes in centres of excellence and other university departments; research posts, networks of scholars; visiting scholars and post doctoral positions overseas; scientific publications and conferences.

35. Reporting to the Ministry for Health and Social Affairs, the Council receives funding appropriations from a range of Departments, and serves the key purpose of ensuring that these financial streams support a coherent and comprehensive portfolio of high quality research and related activities, in partnership with other funding bodies. At present, this pivotal role of co-ordination covers the following fields and sub-fields:

- chemical and physical hazards at work, including electromagnetic fields;
- stress, work and health;

- work organisation;
- labour market issues;
- public health and health services;
- international migration and ethnic relations;
- social policy and social insurance;
- social welfare;
- family and children;
- the elderly;
- disability; and
- drug use

36. The Council's Board comprises a chairman and 12 members, each with a deputy. The research community elects seven members and the others are Government appointees. The Council presently has an annual research budget of some £17 million, an administrative budget of some £1.5 million for operational costs; and 21 staff.

*(c) The Research Council for the Environment, Agriculture and Community Planning (FORMAS)*

37. This new Council serves the same purposes as FAS, principally in the fields of agriculture, the environment and ecologically sustainable development. Among its chief responsibilities at present are:

- the development of joint initiatives with other funding bodies concerning research in food production, forestry, climate change and environmental technology
- the production of a research strategy for 2002-2005.

38. Its Board is similarly constituted similarly and it presently has an annual research budget of some £34 million and running costs of some £3million. Around 50% of the research budget is allocated for collaborative research projects in agriculture, some 10% environmental protection and some 5% on energy and the built environment.

*(d) The Innovation Agency (VINNOVA)*

39. This new Agency also became operational on 1 January 2001, taking over responsibilities of the former Transport and Communications Board, the R&D funding part of the National Board for Industrial and Technical Development (NUTEK) and some of the tasks of the Council for Work Life Research.

40. Its main role is to strengthen and develop the networks of public and private institutions in which the production dissemination and use of new techniques and knowledge take place, in short to make R&D investment as profitable as possible. Essentially, its ethos is one of continuous improvement of the means and systems through which wealth and value is created by a knowledge-based society.

41. By identifying and analysing pro-actively weaknesses and opportunities, the agency serves the purposes of building up Sweden's capacity, capabilities and competences to succeed in the risky business of innovation. As expressed to us, the two founding principles in its establishment are that "knowledge is not transferred but co-produced" and that its "OK to fail". Its core tasks are to

- finance research, development and demonstration activities that meet the needs of business and the public sector;
- foster co-operation between universities, industrial research institutes and business;
- promote the diffusion of information and knowledge, especially to small and medium-sized enterprises;
- stimulate increased Swedish participation in the EU's general R&D programmes;
- evaluate and develop the Technology Foresight process; and
- develop the role of research institutes in innovation systems.

42. Organisationally, *VINNOVA* has an industry-led Board that works closely with the venture capital and other financial sectors. and an annual budget of some £70 million. Its some 167 staff work in five main business groups, respectively responsible for Administration; Clusters, Regional and Partnership initiatives; Policy, Communications and PR; Funding R&D in priority areas (normally on a 50:50 basis); and Innovation Systems.

43. The innovation systems and analysis group is the brain of the organisation, identifying gaps, blockages and needs in industry or universities sectors, using inter alia Technology Foresight, sector SWOT analysis, business scanning and similar techniques, and by drawing on overseas practice and experience through, for instance, the network of Swedish Embassies. Once identified and assessed, these issues are acted upon as appropriate, for instance through collaborative (research) funding, or such other steps as referral to the appropriate Ministries for structural or regulatory action.

44. Its work is underpinned by research and its funding of R&D projects is based on an appraisal process that takes fully account of the trinity of interests, ie that of the research, business and policy communities which the agency exists to serve. At present, its priorities for R&D funding encompass

- Future communication networks;
- Industrial use of advanced engineering materials;
- Advanced manufacturing;
- Life science and biotechnology;
- Industrial bio-processing;
- Bio-based materials;
- Smart (intelligent) systems;
- Network-based software technologies;
- User centred IT development;
- Language technologies;

- ICT based services, including health and personal care in private homes;
- E-commerce;
- Energy use in transport; and
- Strategic working life issues for sustainable development.

45. The Agency is seeking to integrate research and development in technology, working life and society, working closely with a network of public and private players who will jointly develop, disseminate and apply new knowledge. In these regards, it is developing its expertise to ensure that new collaborative ventures involving partnerships between business and universities are soundly established to serve their joint and several interests.

46. More generally, *VINNOVA* is aiming to encourage increased mobility and interaction between the political, business and research worlds by encouraging the exchanges of people so that they become more aware of the forces at work in the economy, and thus improve its capacity for innovation.

47. Particularly on these latter matters, it works closely with the Research Councils, the Swedish Industrial Development Fund, and the Swedish Business Development Agency. The latter agency is equivalent to the UK's Small Business Service, operating through a regional network of offices. It provides similar main stream business support services such as information, advice, counselling, consultancy, and financial support in the form of start up and business development loans, as well as regional development grants. It also has programmes to support female and ethnic minority entrepreneurs and runs a range of business development initiatives in the regions.

## THE SWEDISH RESEARCH COUNCIL

The Swedish Research Council aims to support basic, top quality research to ensure that Sweden is a leading research nation. To achieve this the Swedish Research Council:

- is controlled by a majority of researchers
- promotes interdisciplinary and multidisciplinary science
- works towards innovation and equality
- stimulates cooperation and communication

The duties of the Swedish Research Council based on its instructions (SFS 2000:1999) are:

The Swedish Council shall –

- promote the scientific quality and innovation of basic Swedish research
- support researcher-initiated research
- initiate and support multidisciplinary and interdisciplinary research initiatives
- work towards the profiling of gender perspective in research
- collaborate nationally and internationally with other authorities and bodies which conduct of finance research
- in co-operation with universities and colleges work, towards creating good research environments thereby promoting the prioritisation of research objectives
- promote Swedish participation in the EU's framework programme for research and technical development
- promote and instigate international research co-operation and the exchange of experience
- be responsible on a national level for general information on research and research results
- ensure that attention is drawn to ethical issues in research and disseminate information on research-related ethical issues.
- promote equality between men and women
- promote the mobility of researchers

The Swedish Council shall, in particular –

- negotiate funding for research
- negotiate funding for expensive scientific equipment, national research installations, international undertakings and high-performance computer systems
- evaluate and assess research and its scientific quality and importance
- be responsible for the SUNET communication system (Swedish University Computer Network) and in this way monitor the interests of research and other associated disciplines

- conduct research policy analyses and act as an advisory body to the Government in research policy matters.