



**Report
Umbrella Committee
for the Midterm Evaluation of the
Bonus Incentive Scheme**

15 October 2003

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0 Summary

Summary

The Umbrella Committee for the Midterm Evaluation of the Netherlands Bonus Incentive Scheme was appointed by the Governing Board of NWO to perform the midterm evaluation of the research schools (NRCs) selected under the Bonus Incentive Scheme in 1998.

Having thoroughly studied all the relevant documents, including the selfevaluation documents, the peer review reports and the bibliometric analyses, and having interviewed the NRCs, the committee recommends that funding should continue to all six NRCs during the second five-year period.

This recommendation is based on the following considerations. The committee holds the view that BIS funding has had a positive, or even very positive, effect on the standing of the top research schools in the Netherlands. Exciting new scientific results have been presented by all the NRCs. Overall, the international visibility and standing of the NRCs has increased considerably during the first phase of Bonus Incentive Scheme. The NRCs have evolved into research centres of international repute.

The committee expects that all the NRCs will be able to improve their international standing further, or at least to maintain their already high international reputation. All six NRCs have good future potential. Most of them are efficiently organised, although in some the committee suggests certain improvements.

In section 3 of the report, the committee makes some specific recommendations for individual NRCs. These recommendations are intended to further enhance the position of the NRCs and to make it possible for them to benefit fully from the second phase of the Bonus Incentive Scheme.

In addition, section 2 of the report addresses some more general concerns about the Bonus Incentive Scheme, which were repeatedly voiced during the interviews with the NRCs.

1. The Bonus Incentive Scheme

1.1. Goal of the programme

In 1998, following advice from NWO, the Minister of Education, Culture and Science awarded grants to six top research schools under the competitive Bonus Incentive Scheme for National Research School Combinations (NRCs). The main aim of the scheme was to boost the international standing of the research conducted within the existing system of research schools in Dutch universities. Out of 34 proposals six were selected. Key areas of excellence were identified in the schools and the grants were awarded for the purpose of further enhancing these. At the start of the scheme (in 1999), the awardees had already to be capable of withstanding international comparison with leading foreign institutes in similar fields and had to have the potential to evolve further into research centres of international prestige.

Grants were awarded for a period of ten years, with an interim evaluation taking place in the fifth year. The decision to confirm the award of grant for the second five-year period was to depend on the outcome of the interim evaluation. The interim evaluation of the top research schools was conducted in 2002-2003 on the basis of the protocol appended to this document. The protocol specifies the aim of the interim evaluation and the assessment criteria, procedure and timetable to be observed during it. In addition, it provides guidelines for the selfevaluation document, including the appendices to accompany it, and for the report by the peer review committee appointed by each of the NRCs. Wherever possible, the protocol adheres to the new ('Van Bommel') protocol for the evaluation of Dutch universities and research institutes managed by the Royal Netherlands Academy of Arts and Sciences (KNAW) and NWO.

1.2. Midterm evaluation

The midterm evaluation was intended to reveal the extent to which the NRCs have been able to use the Bonus Incentive Scheme (BIS) funding, the talents of their researchers and the strengths of their research programmes to develop into research centres of international repute over the last five years. The evaluation was performed on the basis of a number of assessment criteria and questions about the research (listed below). These were designed not only to evaluate the preceding period, but also to look forward to the next five years.

The assessment criteria were as follows :

- 1 The research programme is of excellent quality, as shown for example by the output; it is coherent and clearly focused.
- 2 The NRC is internationally recognised as a leading institution and/or has greatly improved its international standing since the award of the incentive bonus.
- 3 The researchers involved are internationally recognised as excellent in their field and show very promising long-term academic potential.
- 4 The chosen form of organisation offers optimum conditions for the effective and efficient achievement of the objectives, and adequate scope for any necessary modification of the programme.
- 5 Optimum use has been made of the funds awarded, with a good balance being struck between human and other resources. The funds are administered in an effective and efficient manner within the universities concerned.

In addition, the future prospects of the individual NRCs were assessed on the basis of the following questions:

- 6 Is the NRC well placed to maintain the leading position it has achieved or to strengthen its international position substantially over the next five years?
- 7 What modifications to the research programme may be needed in order to achieve or maintain that kind of position?
- 8 What improvements are needed in staffing?
- 9 Is the organisational structure such that the NRC will be able to function at its best over the next five years, or are changes necessary?

1.3. Design of the evaluation

NWO set up an umbrella evaluation committee to conduct an independent external evaluation of the six top research schools. This committee was asked to advise the Governing Board of NWO whether the incentive bonus should be continued for each of the research schools. The Governing Board would then advise the Minister of Education, Culture and Science.

To serve on the umbrella committee, NWO selected six internationally renowned scholars, each of them particularly conversant with the field of research of one of the six NRCs. The committee was chaired by the former president of NWO.

In order to enable the umbrella committee to perform the midterm evaluation, each of the NRCs was asked to prepare a selfevaluation document and organise an international peer review. The members of the peer review committee were to be chosen by the individual NRC following consultation with NWO on the proposed composition.

The peer review committee had to be composed of internationally recognised researchers in the NRC's particular field of study. The members were to have no direct personal connection with the NRC and had to be in a position to form an independent opinion. As a rule, the majority of the members would be of non-Dutch nationality. However, at least one member of the committee had to be familiar with the Dutch research world and current research policies in the Netherlands.

The peer review committee was to produce a written report, in response to which the relevant NRC was asked to formulate their conclusions. All three documents (the selfevaluation, the peer review report and the NRC's conclusions) were then to be made available to the umbrella committee.

In addition, NWO commissioned bibliometric analyses by Professor Van Raan's Centre for Science and Technology Studies (CWTS). In July 2003, the NRCs were given an opportunity to inspect the results of these analyses and comment on them. The bibliometric analyses and the comments of the NRCs were also submitted to the umbrella committee.

The following timetable covers the entire period of the interim evaluation up to and including the Minister's decision.

Timetable midterm evaluation

July 2002	Finalisation of evaluation protocol
August 2002- June 2003	Preparation of selfevaluation documents and appointment of peer review committees by NRCs; appointment of umbrella committee
February- June 2003	Bibliometric analyses
30 June 2003	Deadline for delivery of selfevaluation documents, peer review report, conclusions of the NRC and comments on bibliometric analyses to NWO
July 2003	Documents forwarded to umbrella committee
3-5 September 2003	Meeting of umbrella committee and interaction with NRCs
15 October	Presentation of committee report to NWO
22 October 2003	Decision by NWO Governing Board
23 October	Presentation of report by NWO to Minister of Education
November/ December 2003	Decision by Minister of Education
January 2004	Commencement of second period of Bonus Incentive Scheme

2. Committee review

2.1. Procedure

The protocol for the midterm evaluation provided for an interaction with the managements of the individual NRCs. Interviews were scheduled to take place on 4 and 5 September 2003 in Utrecht.

In preparation for these meetings, every member of the committee studied all the documents relating to the evaluation. In addition, each NRC was allocated to two particular members of the committee and those members were asked to make an in-depth analysis of the material provided in relation to that school.

At a preparatory meeting on September 3rd, the committee discussed the results of the bibliometric analyses with a representative of the Centre for Science and Technology Studies. Later, it discussed all the NRCs in greater detail in preparation for the interviews with the NRC managements.

During those interviews, each of the NRC managements was given the opportunity to make a brief presentation addressing the results of the review of its school. This was followed by a discussion of relevant topics. After each interview, the umbrella committee met in closed session to formulate its conclusions and recommendations.

Following the last of the interviews, the committee also discussed some issues of more general concern with regard to the Bonus Incentive Scheme. It then finalised its written report of the midterm evaluation and subsequently presented it to the board of NWO.

2.2. Overall conclusion

Having studied the documentation provided and interviewed the representatives of the six NRCs, the umbrella committee concludes that BIS funding has had a positive, or even very positive, overall effect on the prestige of Dutch research in their fields of study. Exciting new scientific results have been presented by all the NRCs.

The international visibility and standing of the NRCs has in general increased considerably during the first phase of the Bonus Incentive Scheme. The NRCs have evolved into research centres of international repute.

The committee expects that all the NRCs will be able to improve their international standing further, or at least maintain their already high international reputation. All six NRCs have good future potential. Most of them are efficiently organised, although the committee suggests certain improvements in some of them.

Insofar as the committee was able to judge from the material provided, the funds awarded during the first phase have been used efficiently, despite initial problems concerning the flow of funds.

The committee's general conclusion is that all six NRCs should be funded for the second five-year period.

Despite this positive overall judgement, the committee wishes to make some specific recommendations for individual NRCs. These are specified in section 3 of the report. The recommendations are intended to further enhance the position of the NRCs and to make it possible for them to benefit fully from the second phase of the Bonus Incentive Scheme. The response of the NRCs to the recommendations in this report should constitute an important element of the final review.

2.3. *General remarks on the Bonus Incentive Scheme*

Certain major issues and matters of concern emerged repeatedly in the committee's consultations and deliberations. The importance and impact of these issues is such that the committee has decided to draw attention to them in the following general remarks.

- *Inflation correction*

Practically all the NRCs stressed that the lack of an inflation correction to the lump sum BIS funding causes them considerable financing problems. Although the committee acknowledges the historical reasons for flat funding, it recognises the validity of the schools' desire that attention be paid to the serious consequences of recent increases in research costs. In view of the fact that postgraduate stipends have roughly doubled over the past five years, the committee feels that the NRCs have suffered a substantial loss of financial elbowroom due to circumstances completely beyond their control. This fact alone has reduced the purchasing power represented by the funding allocated to them by roughly 25%. If no inflation correction is made, therefore, the ambitions of the BIS will have to be substantially modified. This will adversely affect the original purpose of the Bonus Incentive Scheme.

- *Ramped-up payment and gradual decrease*

At the start of the programme, negotiations between the universities and the ministry resulted in a gradual increase in the level of funding up to the originally agreed stable level. The money thus saved was allocated to a run-down arrangement at the end of the first phase. The committee considers this a given, and - under the circumstances - perhaps even a wise decision. Should its recommendation for a continuation of the scheme be followed, it suggests that the funds reserved for the run-down arrangement should be used at the end of the ten-year funding period after a second phase of funding. This will allow a gradual incorporation of continuing costs into the mainstream university research funding system, contingent upon a favourable final review at that time.

- *The added value of the Bonus Incentive Scheme*

Both the review and the discussions with the six NRCs have given the umbrella committee a clear insight into the value of the scheme for the research schools concerned.

Two types of BIS-funded NRCs can be distinguished: new groups and established consortia. It is absolutely clear that the Bonus Incentive Scheme, with its flexibility in the implementation of the funds, benefits both types. On the one hand, it gives new groups greater visibility; on the other, it fosters more systematic patterns of collaboration in already established fields.

This midterm evaluation has clearly demonstrated that the BIS has led to the concentration of budgets from the first flow of funds (direct government funding to the universities). This has fostered coalitions between research groups and produced stronger teams than would have been likely to develop without this additional funding. The extra money has given the NRCs a critical enabling incentive that has resulted in excellent, and sometimes unexpected, new science.

The committee concludes that the scheme has demonstrated its success in creating world class centres of excellence in the Dutch university system. It therefore recommends that a second such competition be held with the aim of establishing in the Netherlands top flight centres of excellence able to compete for funding at the European level.

3. Committee reviews per school

3.1. CBG

3.1.1. Introduction

The Centre for Biomedical Genetics (CBG) is composed of six research schools with their roots in four universities. From these schools, 15 groups have been selected on the basis of the quality of their research. Together, these groups represent a wide range of relevant expertise in fields such as genetics, molecular and cell biology, biochemistry and structural biology. Thirty-seven collaborations have been initiated between the chosen groups over the past four years.

Mission

The CBG aims to employ a multidisciplinary approach to arrive at an understanding of the function of genes and gene products in relation to disease (an area often called functional genomics). A large number of common diseases are caused by combinations of (mildly) dysfunctioning genes and the environment. A major challenge for the CBG is to translate this knowledge into an understanding of physiology and pathology, and eventually into therapeutics and disease prevention. Functional analysis of the genome requires expertise in genetics, molecular and cell biology, protein chemistry and bioinformatics: a combination which the CBG offers.

Research programme

The research programme focuses on four main themes:

1. Signal transduction, cell cycle control and the regulation of DNA replication
2. Mechanisms of genome maintenance and response to damage
3. Transcriptional control
4. Gene dysfunctioning in disease.

Personnel

Most groups are involved in more than one line of research.

All groups except one work in a medical setting such as a University Medical Centre or the Netherlands Cancer Institute. This will facilitate transfer of knowledge to clinical groups.

A total of 416 people (304 f.t.e. in 2002) are involved in CBG research. The cost of 50 of them (30.5 f.t.e.) is met out of BIS funding.

Research Leaders

Professor R. Bernards	The Netherlands Cancer Institute, Amsterdam
Professor Professor A. Berns	The Netherlands Cancer Institute, Amsterdam
Professor P. Borst	The Netherlands Cancer Institute, Amsterdam
Professor J.L. Bos	University Medical Centre Utrecht
Professor J.C. Clevers	Hubrecht Laboratory of Developmental Biology, Utrecht
Professor J.J. Geuze	University Medical Centre Utrecht
Professor F.G. Grosveld	Erasmus University Rotterdam
Professor J.H.J. Hoeijmakers	Erasmus University Rotterdam
Professor R. Kaptein	Utrecht University
Professor W.H. Moolenaar	The Netherlands Cancer Institute, Amsterdam
Professor G.J.B. van Ommen	Leiden University Medical Centre
Professor B.A. Oostra	Erasmus University Rotterdam
Professor R.H.A. Plasterk	Hubrecht Laboratory of Developmental Biology, Utrecht
Professor C.P. Verrijzer	Leiden University Medical Centre
Professor P.C. van der Vliet	University Medical Center Utrecht

From 1 January 2004, P. Borst, H. Geuze and P. van der Vliet will withdraw as group leaders. Their successors are:

Professor T. Sixma	The Netherlands Cancer Institute (NKI), Amsterdam
Professor M. van Lohuizen	The Netherlands Cancer Institute (NKI), Amsterdam
Professor B. Burgering	University Medical Centre Utrecht (UMCU)

Finance

Under the Bonus Incentive Scheme, a total budget of € 18.2 M was awarded to the CBG for the first five-year period. The BIS funds for the first phase amount to 9% of the total CBG budget of € 138.6 M. The CBG attracts 68% of its funding from competitive external sources.

The BIS money is spent on:

- investments and support staff (27%)
- PhD students and postdocs, including bench fees (54%)
- junior groups (18%)
- meetings and administration (1%).

Bibliometric analysis

The overall impact (CPP/FCSm) of the CBG's output is high and significantly above world average (260 %), although it has declined slightly over the past few years.

3.1.2. The committee's comments and criticisms

The committee was impressed by the impact of CBG publications, which was the highest of all the projects assessed. This success was reflected in the fact that over 60 Nature, Science or Cell papers had been published over the past five years.

The committee gained the impression that the CBG consists of a number of strong, creative, productive research groups, working in a loose association rather than as a tightly knit team led by an individual with a unifying top-down vision. This is more or less to be expected in the realm of cell biology and molecular genetics but did raise the issue of the degree of added value conferred on the CBG by BIS funding. This concern was to some extent compounded by the fact that the publishing impact of the group (CPP/FCSm) has shown a modest decline over the past five years, albeit still at a very high level.

On the other hand, the CBG board argued convincingly that the interaction matrix shows that the NRC's research programme strongly stimulates cooperation between groups and that the formal invitations received by the CBG demonstrate its international visibility.

The committee was somewhat concerned about the seemingly rigid way in which the BIS money was divided equally between the different research groups. It argued that the present division of funding should be open to discussion. However, the CBG board was able to convince the committee that, although the budget looked predetermined, the division of funds should be regarded as an initial plan rather than a commitment set in stone.

The BIS funds gave the CBG the flexibility to initiate at short notice quite bold and successful projects, e.g. breast cancer profiling and RNAi base cell array, that could not otherwise have been financed, or at least not so rapidly.

As to the future, the CBG is making plans for the post-BIS period. The CBG board wishes the NRC to continue after the end of the 10-year period.

Overall, the committee was pleased with the progress made by the CBG, although some areas were not thought to be as productive as others.

The committee would like to recommend one organisational improvement which it considers necessary:

- The CBG does not have an international advisory board. Despite the argument of the CBG board that the groups like to be judged by critical peers appointed on an ad hoc basis, the umbrella committee felt that the CBG would benefit from the presence of such a board. It recommends that the CBG should appoint an advisory board in the next phase of the BIS.

3.2. COBRA-Photonics

3.2.1. Introduction

The COBRA (= Communication technology: Basic Research and Applications) NRC is located at Eindhoven University of Technology and is one out of two NRCs located at one university and organised within a single research school. The NRCs programme combines research on materials, devices and systems.

Mission

The mission of the NRC is to realize all optical communication leading to smaller, and faster systems which have a higher capacity than the present systems.

Research programme

The COBRA programme focuses on future communication systems based on all-optical network elements. Communication networks will reach beyond the capacity level of Terabit/s, creating new challenges in transmission, cross-connecting and network management. The programme emphasises integration of ultrafast wide bandwidth and high-throughput photonic components for transmission and switching speeds into the Terabit/s domain. It is also intended to research and use Laser Neural Networks (LNN) to realise network nodes that are better suited to high speed and parallel operations.

The realisation of the all-optical network presents many scientific challenges in the areas of new materials and novel device concepts. The research programme combines three research lines:

- Semiconductor physics and photonic materials
- Opto electronic devices and integration technology
- Electro-optical communication systems.

The aim of the COBRA Photonics programme for the next ten years will be to:

- Make Cobra a leading international centre in the field of optical communication technology
- Provide an adequate technological infrastructure to support photonics research and collaborative consortia involving both academia and industry
- Facilitate technology transfer
- Prepare students for professional careers in photonics
- Promote economic development in association with a strong photonics industry.

Personnel

A total of about 120 people have been involved in the COBRA research programme over the past 5 years, almost equally divided over the three research lines. The BIS budget has covered about 21 % of COBRA's total staff costs.

Research Leaders

Professor J.H. Wolter	Eindhoven University of Technology
Professor M.K. Smit	"
Professor G.D. Khoe	"

Finance

Under the Bonus Incentive Scheme, a total budget of € 13.249 M was awarded to COBRA-Photonics for the first five-year period. The BIS funds amounted to 23% of the total COBRA-Photonics budget, which is € 58.257 M (excluding a budget of € 28 M from the university for a clean room building).

In addition to this special budget for clean room facilities, Eindhoven University of Technology supplied a budget of € 5.976 M from the first flow of funds. From the

competitive second flow of funds, the NRC attracted € 4.515 M and from the third flow (industrial contracts) € 4.842 M.

The BIS money for the first phase was spent on:

- Personnel (34%)
- Investments (42%)
- Small equipment and materials (24%)

Bibliometric analysis

In the case of COBRA, great care needs to be taken in interpreting the bibliometric data as an indicator of the performance of the institute as a whole. The main reason for this is that about 60% of the institute's output is in non-ISI covered outlets. These publications were only partly included in the analysis.

Taking account of all publications (ISI and non-ISI), productivity (P) has been virtually constant over the years. In the case of the ISI-covered publications, the overall impact score (CPP/FCSm) is slightly above world average (13%), but the trend over time shows a decline.

3.2.2. The committee's comments and criticisms

Prior to 1999, optics research in the Netherlands was scattered over a number of different universities. The Bonus Incentive Scheme support has changed this landscape significantly by concentrating photonics in the Netherlands within COBRA and hence giving it greater international visibility. A clear centralised focus has been created in the area of 'optical communications' and the work being done is of a genuinely high level. COBRA is a newly initiated group. In the first phase of the BIS programme, substantial effort has gone into establishing new experimental facilities and moving an experimental group from Delft to Eindhoven. These circumstances have no doubt impacted on the publication record, as reflected in the CWTS report.

The coherence of the COBRA-Photonics research strategy has helped to achieve the unique competitive advantage of having optical materials, device design and fabrication, and systems research all in one self-contained unit.

The fact that COBRA can do nano-scale device work in GaAs and InP and has set several records in system performance is truly unique. In fact, COBRA is one of only three centres in the world to possess this capability and science, the other two being in the USA and Japan. Thus, the seeds for a world class Dutch optics centre have been successfully planted in COBRA.

COBRA has been successful in attracting external funding (€ 4,842 K). In addition, it should be noted that Eindhoven University of Technology has shown considerable commitment in dedicating € 25 M to building clean room facilities.

The committee wishes to draw attention to three specific points:

- In relation to the international visibility of the NRC, its publishing policy is of some concern. The committee understands the reasons for the initial publication strategy but strongly advises more publication in high impact ISI journals such as *Optical Society of America (OSA)* journals or *Optics Letters* and *Optics Express* during the second phase of the BIS or even *Nature* and *science*.
- If COBRA is to maintain leadership in its field of research, senior figures with an international reputation and foreign connections in the world of science and

technology need to be hired to grow and strengthen the centre. The consequent higher visibility and greater support may also help to attract new young faculty hires.

- Because of the high pay-off commercial implications of the research conducted at COBRA NRC, management should take constructive steps and establish procedures under the Eindhoven University of Technology umbrella to ensure the protection of intellectual property (IP) rights. This will ensure long-term returns and a strong negotiating position in relation to parties interested in those IP rights.

Even though the centre is still under development at the time of this review, the committee considers that this NRC has strong potential. The committee expects that the next five years will further increase the reputation of COBRA in the field of applied optics and photonic science.

3.3. ISES

3.3.1. Introduction

The participants in the Netherlands Research Centre for Integrated Solid Earth Science (ISES) are geoscientists from three existing research schools, located at three universities in the Netherlands, that are investigating the solid Earth system: the Netherlands Research School of Sedimentary Geology (NSG), the Vening Meinesz Research School of Geodynamics (VMSG) and the Centre for Technical Geosciences (CTG).

ISES has been created to develop a new programme of research activities in solid Earth sciences. This research programme is ultimately aimed at achieving better geoprediction in space and time.

Mission

- To understand the solid Earth as a dynamic system: a prerequisite for responding to the basic needs of humanity on a vulnerable Earth.
- To advance the quantitative understanding of lithospheric and upper mantle evolution and processes, as well as the controls on and feedback mechanisms of Earth processes at or near the surface.
- To create and support the best possible opportunities for capacity building of young talent and to attract the best national and international talent.
- To identify areas of strength at a European level, in order to be an indispensable and attractive partner in the European Research Area.
- To perform high quality research in key areas by integrating expertise of demonstrable excellence in the subdisciplines of geology, geophysics, geodesy and geotechnology into multidisciplinary teams.

Research programme

The research programme was established in 1999 around the following three interrelated modules:

- Observation of the present
- Reconstruction of the past from the geological record
- Process modelling and validation.

The modular structure highlighted out three major discipline-based aspects of the ISES programme. However, to really test the developed methodology and use it in an integrated way, it is necessary to apply a range of different techniques to specific scientific problems. Therefore, action was taken after the first two years of ISES' existence to devise a strategy complementing the modular structure of the programme. This was done by defining a number of integrated programmes that cut across the modules. The four integrated programmes defined in 2001 are:

- NedSeis: the deep structure beneath the Dutch segment of the Northwestern European rift system
- Europe-Africa convergence and its consequences: an opportunity for integrated solid Earth science
- Pannonian basin-Carpathian system: natural laboratory for neotectonic control on continental topography
- Northwestern European margin : natural laboratory for continental break-up, melting and formation of topography at continent-ocean boundaries

Within the research programme, interactions have been established within several European research programmes and training networks financed by the EU and the European Science Foundation.

Personnel

A total of 274 people were involved in ISES research between 1999 and December 2002. The BIS budget for personnel is about € 5.3 M.

Research Leaders

Professor S.A.P. Cloetingh	Free University of Amsterdam
Dr R.A. Stephenson	"
Dr G. Bertotti	"
Professor W. Schlager	"
Professor P.A.M. Andriessen	"
Dr G.R. Davies	"
Dr J.R. Wijbrans	"
Professor D. Kroon	"
Dr G.M. Ganssen	"
Professor M.J.R. Wortel	University of Utrecht
Professor R.D. van der Hilst	"
Professor C.G. Langereis	"
Dr W. Krijgsman	"
Professor C. Spiers	"
Dr M.R. Drury	"
Dr F.J. Hilgen	"
Professor W. Spakman	"
Dr A.P. van den Berg	"
Professor G.J. van der Zwaan	"
Professor J.T. Fokkema	Delft University of Technology
Professor C.P.A. Wapenaar	"
Dr D.J. Verschuur	"
Professor S. Luhti	"
Professor P.M. van den Berg	"

Finance

Under the Bonus Incentive Scheme, ISES was awarded a total budget of € 16.2 M for the first five-year period. The external money attracted by ISES for its research programme for the 1999-2002 period amounted to a total of € 18.5 M (40% first flow, 40% second flow, 20% third flow of funds) for related PhD and post-doc projects.

The BIS money was spent on:

- Personnel (38%)
- Investment (31%)
- Small equipment and materials (8%)
- Field studies (12%)
- To be allocated (11%)

Bibliometric analysis

There has been a clear increase in productivity (P) over the years, with about 50% more articles being published in the 1999-2002 period than in the previous three years.

The average impact (CPP/FCSm) of ISES' output is significantly above the world average (more than 50%). The impact scores over the period under consideration have been virtually constant, which means that the institute has been able to maintain its high average impact (quality) while considerably increasing productivity.

3.3.2. The committee's comments and criticisms

This is a strong group. The committee is convinced of the international stature of the NRC. It is clearly one of the leading groups in Europe.

Among the developments worth noting are: the hypothesis that a migrating tear in subducting slabs can explain much of the geological activity observed at the surface; the construction of a new, paleomagnetic timescale in sediments; and the increased precision of seismic tomography that led the group to image a plume under Iceland.

The group has also been successful in integrating complex erosion processes into basin modelling. While basin modelling is obviously a strength, the continued success of ISES in phase 2 will very much depend on the group's ability to integrate it with other fields (paleomagnetism and seismology, in both of which it is world class) to tackle problems of fundamental scientific importance.

The expansion of field observations using GPS through ISES funding is important since it gives the group strong leverage for international collaboration in the field and will make extensive exchange of crucial data possible. The committee noted that the observational seismology unit in Utrecht is participating only marginally in ISES. The committee feels that taking it and the physical geodesy unit in Delft, on board would allow ISES to grow to its full potential.

The ambitions of the NRC to link climate changes to geophysical processes make it attractive to build national or international links with climate modellers and experts in the paleoclimate field. The NRC is advised to build bridges with climate modellers as it has already done in the field of paleoclimate, which will be part of the ISES core programme during the second phase. It is clear that the organisational structure of ISES needs to be made more flexible if the NRC is to accomplish these goals. This may require that younger scientists be brought onto the board.

During the first phase, the budgets of ISES for each partner were fixed. The umbrella committee acknowledges that this approach supported the establishment of a strong cooperative relationship between the groups involved in the new consortium. For the second phase, however, the umbrella committee strongly advises the ISES board to introduce greater budgetary flexibility in order to be able to achieve top level science. The steering fund of 16% could be modified in such a way that the allocation of resources is based on the results of an international peer review.

The ISES board argued that the scientific level of the programmes is automatically guaranteed by the fact that the number of worthwhile proposals that the NRC receives still outnumbers the positions to be allocated. However, the umbrella committee feels that international competition and peer review is necessary to enhance the quality of ISES' work. For this reason, it stresses that ISES should conform to the common practice of sending out proposals to completely independent reviewers before the scientific steering committee decides on the distribution of BIS funds.

New groups should be represented on the scientific steering committee, while less productive groups should be phased out. For this reason, it may be wise to take a critical look at the current advisory committee to ensure that its composition continues to reflect the main thrusts of research during ISES phase 2.

A strong tenet of ISES policy is that only projects which include cooperation between the participating research schools are eligible for BIS funding.

3.4. MSC

3.4.1. Introduction

The Materials Science Centre (MSC) NRC is based in the Faculty of Mathematics and Natural Sciences at the University of Groningen. All the leading researchers participating in the NRC are affiliated with this university.

The Materials Science Centre was founded in 1970, with the aim of stimulating communication and cooperative research projects between relevant groups in the departments of physics and chemistry. The aim was, and still is, to retain and respect the expertise in various physics and chemistry disciplines, but at the same time to set the stage for optimum use to be made of it without sacrificing high quality.

Mission

The design and scientific study of materials for functionality

- To attain an internationally recognised position as a leading materials research and training institute
- To conduct research addressing fundamental questions in the fields of functional materials
- To optimise synergy and knowledge transfer between the subdisciplines of physics and (bio)chemistry
- To educate a new generation of researchers in a cross-disciplinary approach in order to equip graduates with the range and quality of skills needed in today's society.

Research programme

The decision to focus on fundamental science, anchored in leading research groups and taken beyond its usual limits by interdisciplinary collaborations between these groups, is a key element in the strategy. To avoid fragmentation and enhance the coherence of the programme, the research of the NRC is concentrated in three main lines of research, known as thrust areas or simply thrusts.

The three thrusts are:

- Molecular BioOrganic Materials: Design, Construction and Control
- Functional quantum ordered Materials
- Electromagnetic Functionality : Photonics and Transport Properties.

Within each of the thrusts, two interdisciplinary research teams have been set up to address particular themes of the NRC's programme.

Personnel

A total of about 370 people were involved in MSC research between 1999 and 2003. The costs of 46 of them (27.2 f.t.e. in 2002) were met out of BIS funding. The BIS budget for personnel covers about 13% of total staff costs.

Research Leaders

All the research leaders are located at the University of Groningen. They are:

Professor P.W.M. Blom
Professor G. ten Brinke
Professor A.J.M. Driessen
Professor K. Duppen
Professor J.B.F.N. Engberts
Professor B.L. Feringa
Professor E. van der Giessen

Dr P.H.M. van Loosdrecht
Professor D. van der Marel
Professor A.E. Mark
Professor T.T.M. Palstra
Professor B. Poolman
Professor H.A.de Raedt
Professor P. Rudolf

Professor B. Hessen
Professor J.T.M. de Hosson
Professor J.C. Hummelen
Professor D.I. Khomskii
Professor J. Knoester

Professor J.G. Snijders
Professor U. Steiner
Professor B.J. van Wees
Professor D.A. Wiersma

The following researchers left the programme during its first phase: Professor D.O. Boerma, Professor G. Hadziioannou, Professor L. Niesen, Professor G.T. Robillard, and Professor G. Sawatzky.

Finance

Under the Bonus Incentive Scheme, a total budget of € 12 M was awarded to MSC for the first five-year period. An additional € 907 K was allocated by the University of Groningen. Other funds (from all three flows) amounted to € 79.7 M. The total MSC budget for the 1999-2003 period was € 92.6 M.

The BIS money was spent on:

- Personnel 59%
- Investments 20%
- Small equipment and materials 21%

Bibliometric analysis

There has been a gradual increase in productivity (P) over the years, with about 17% more papers being published in the 1999-2002 period than between 1995 and 1998. The average impact (CPP/FCSm) of MSC's output is very significantly above world average (more than 100%). There has been a very slight upward trend in impact scores over the years.

3.4.2. The committee's comments and criticisms

The MSC has derived a number of benefits from the receipt of funds under the Bonus Incentive Scheme. The development of materials science over recent years has given rise to special opportunities for exciting work at the interface of physics, chemistry and biology. The MRC group has made excellent use of these opportunities, pursuing research of the highest quality, originality and significance, all under one roof. The centre is operating in a highly competitive research field. MSC has been able to select those topics best suited to its rather unique combination of expertise.

While there have been questions about the focus and coherence of the group, these have now been resolved, in part by the recent effective organisational changes. The scientific board has been thoroughly reviewed and now has a clear and stable structure. Moreover, after a period in which the NRC lost some high-profile figures, the staffing situation now seems to have stabilised, especially since the appointment of a new scientific director. In addition, the board's decision that the allocation of funding should be restricted to joint research has worked well in achieving coherence across the participating research groups.

The attention paid to younger researchers and to education is another attractive feature of the centre. BIS funding was very helpful when the NRC needed to attract new, young people.

During the first phase, the centre lost several of its high-profile researchers, but it has been successful in attracting some very talented young researchers and has given them a strong voice in its leadership. This has helped to ensure the long-term viability of the MSC. Nonetheless, it continues to be difficult to hire young

scientists in this area of research. The recent successes of the NRC in attracting talented staff members has convinced the committee that it will succeed.

The peer review panel's remarks about the competitive environment in which the researchers in thrust 3 seem to have to operate elicited a convincing response from the thrust leader.

The MSC board is not seriously concerned about the future financing of the NRC. MSC seems to be quite successful in obtaining alternative forms of funding if necessary. Moreover, Groningen University is ready to lend the NRC additional support if required. The MSC board intends the NRC to continue after BIS funding comes to an end.

The centre must be regarded as a great success. Its record to date shows impressive vitality in opening new lines of research and achieving genuine international visibility. The spirit of collaboration in the senior team suggests that the centre will become exceptionally productive and influential in next five-year period.

3.5. NOVA

3.5.1. Introduction

The Netherlands Research School for Astronomy (NOVA) is a federation of the astronomical research institutes of the universities of Amsterdam, Groningen, Leiden and Utrecht and the department of astrophysics at the University of Nijmegen. All postgraduate astronomy education in the Netherlands is concentrated within NOVA.

Mission

Nova's mission is two-fold:

- To carry out front-line astronomical research in the Netherlands
- To train young astronomers at the highest international level.

Research programme

The research programme started in 1999 and concerns the life-cycle of stars and galaxies. It focuses on the formation and evolution of galaxies, on the formations of stars and planetary systems, and on the high-energy phenomena which occur in the stellar populations and in galactic nuclei.

NOVA's scientific programme is based on three multiply-connected inter-university networks, built around key researchers who lead groups in their respective institutions and already have ongoing collaborations.

Network 1: Formation and evolution of galaxies: from high redshift to the present

Network 2: Birth and death of stars: the life-cycle of gas and dust

Network 3: Final stages of stellar evolution: physics of neutron stars and black holes

Personnel

The university astronomical community in the Netherlands consists of over 185 scientific research staff. Fifty-six of them hold tenured positions and 130 are on temporary contracts.

During the 1999-2003 period the BIS budget was used to fund 15.5 person years for permanent staff and approximately 156 person years for temporary research staff (~ 83 person years on astronomical research and ~ 73 person years on instrumentation projects).

During the 1999-2003 period the BIS budget for personnel was about 20% of the total NOVA personnel budget. For the overlap positions the BIS budget allocation amounts to 4 M€ integrated over phase I (1999-2005).

Research Leaders

Professor E.F. van Dishoeck	Leiden University
Professor M. Franx	Leiden University
Professor H.J. Habing	Leiden University
Professor G.K. Miley	Leiden University
Professor P.T. de Zeeuw	Leiden University
Professor E.P.J. van den Heuvel	University of Amsterdam
Professor M. van der Klis	University of Amsterdam
Professor L.B.F.M. Waters	University of Amsterdam
Professor F.H. Briggs	University of Groningen
Professor K. Kuijken	University of Groningen
Professor A.G.G.. Tielens	University of Groningen
Professor A. Achterberg	University of Utrecht

Professor H.J.G.L.M. Lamers
Professor F. Verbunt

University of Utrecht
University of Utrecht

Finance

Under the Bonus Incentive Scheme, a total budget of € 14.5 M was awarded to NOVA for the first five-year period. The total NOVA budget for the 1999-2003 period was € 60.3 M. In addition to the BIS funds, NOVA attracted about € 9.2 M from the competitive second flow of funds and € 31.9 M from the first flow of funds. Funding from other sources amounted to about € 47 M.

In 2003 the NOVA BIS funded program corresponds to 9% of the national expenditure on astronomy, which also includes the NWO institutes ASTRON and SRON, and the national subscriptions to ESO and the astronomy program at ESA. (

The BIS money was spent on:

- Personnel 64%
- Material, travel, instrument hardware 36%

Bibliometric analysis

NOVA's productivity (P) has remained constant over the years. The average impact (CPP/FCSm) of its output is significantly above the world average (more than 50%). The impact scores over the years have remained virtually constant.

3.5.2. The committee's comments and criticisms

Astronomy has traditionally been very strong in the Netherlands. This is at least partly due to the coherence across the university system, which has succeeded in maintaining a strong focus in research and instrument development activities. NOVA, together with SRON and ASTRON (the two research institutes), has managed to maintain the Netherlands' strong position in this field, despite the evolution into "big science", which would seem to favour larger countries. Thanks to careful targeting of the additional resources on personnel and instrumentation, the additional BIS funding is clearly having a significant impact in terms of strengthening this position even further.

An emerging concern about staffing is being addressed by appointing 10 permanent academics to replace people soon to retire from senior posts. It was made clear that the willingness of the universities concerned to create the new (overlap) positions was due to NOVA's ability to pre-finance them. The move constitutes a strong long-term commitment to astronomy on the part of the Dutch universities involved.

Selective investment in major ground-based and space-borne facilities (particularly in ESO, ESA and NASA programmes) is bringing benefits in terms of visibility, competitive advantage and leverage for external funding. Not very many astronomers develop instruments. The Netherlands' high level of activity in this domain gives the Dutch astronomical community a competitive advantage and access to observational facilities way beyond the 'rights' associated with the level of funding. Furthermore, NOVA seems to have been quite successful in attracting technical staff for the second phase of the BIS programme.

Additional use of BIS funding to organise workshops, a visiting scientist programme, and an astronomy website are worthy initiatives, as is the preparation of astronomical teaching material for schools. The research efforts of the NOVA group are concentrated in three highly topical and important areas. In all three areas, Dutch astronomers are well able to compete at an international level.

The committee would like to raise the following points:

- The committee feels that NOVA management needs to clarify its strategy for anticipating the termination of BIS funding after 2008. It may well be that 'overlap' appointments will have temporarily alleviated the ageing problem among staff, but the timescale and financial contributions to major instrument development programmes could leave NOVA with a significant funding shortfall in the immediate post-BIS era.

The peer review panel was somewhat puzzled by NOVA's intention to fund (part of) the DOT (Utrecht) project, which seemed to fall outside NOVA's chosen area of interest. NOVA's representatives explained to the committee that funding of the DOT project is justified because the relatively small investment involved secures for students the opportunity to acquire work experience in the technical development of instrumentation, an area which is considered important for the future of astronomy. The umbrella committee agrees that projects like DOT are important in terms of engaging students in activities related to instrument development at an early stage in their careers; however, while understanding that the funding of DOT will eventually serve the goals of the core activities, the committee would prefer the main emphasis in postgraduate support to remain on NOVA's core activities.

- The umbrella committee detected a certain lack of balance in the peer review panel report. A substantial part of the report is devoted to a critical analysis of the administrative and financial constraints on the school.

3.6. NRSC-Catalysis

3.6.1. Introduction

The National Research School Combination-Catalysis (NRSC-Catalysis) unites the departments of chemistry and chemical engineering at seven Dutch universities. The collaborative research programme involves a total of 16 groups from these departments.

Mission

To provide a strong innovative catalysis programme aimed at achieving full control of molecular recognition in complex chemical transformations.

Research programme

The interdisciplinary character of the NRSC-Catalysis is rooted in the three thrust areas of homogeneous catalysis, molecular heterogeneous catalysis and functional architectures, all governing integrated aspects derived from the traditional disciplines of organic, inorganic and physical chemistry.

Each of the three thrust areas forming the basis of this NRC stands to make useful contributions to the achievement of control of recognition in complex chemical transformations.

- *Homogeneous catalysis* (thrust area leader: Professor P.W.N.M. van Leeuwen (UvA)).
- *Molecular heterogeneous catalysis*: (thrust area leader: Professor D.C. Koningsberger (UU)).
- *Functional architectures*: (thrust area leader: Professor B.L. Feringa (RUG)).

With the aim of producing knowledge useful in responding to future challenges, three long-term targets were defined at the start of the programme:

- The determination and forecasting of the structural and electronic properties of the catalytic active site (homo- as well as heterogeneous) during the anchoring and conversion of reactants
- The design and synthesis of molecular systems through self-instructed and self-reproducing chemical processes, involving template-directed selectivity
- The development of complex chemical transformations under environmentally friendly conditions, leading to a society that uses its resources in a sustainable way.

Personnel

On average, a total of about 205 f.t.e. were involved in the NRC's research programme during the first phase of the BIS. The BIS budget for personnel covers about 12% of the total staff costs of the NRC.

Research Leaders

Professor H. Hiemstra	University of Amsterdam
Professor J.W. Verhoeven	"
Professor P.W.N.M. van Leeuwen	"
Professor C.J. Elsevier	"
Professor E.J. Baerends	Free University of Amsterdam
Professor J.A. Moulijn	Delft University of Technology
Professor E.W. Meijer	Eindhoven University of Technology
Professor R.J.M. Nolte	"
Professor R.A. van Santen	"
Professor B.E. Nieuwenhuys	"
Professor D. Vogt	"
Professor J.B.F.N. Engberts	University of Groningen

Professor B.L. Feringa	"
Professor J.H. Teuben	"
Professor J.Reedijk	Leiden University
Professor D.C. Koningsberger	Utrecht University
Professor K. de Jong	"
Professor G. van Koten	"

Finance

Under the Bonus Incentive Scheme, a total budget of € 19.5 M was awarded to NRSC-Catalysis for the first five-year period (1999-2003).

The BIS funds amounted to about 16% of the total NRSC-Catalysis budget of € 83.13 M.

In the course of the programme it was decided to transfer 7.5% of the general budget to the 'free' budget round, aimed specifically at biomimetic catalysis.

The BIS money was spent on:

- Personnel 54%
- Investments 30%
- Small equipment and materials and other 16%

Bibliometric analysis

There has been a very slight gradual increase in productivity (P) over the years, with about 5% more papers being published in the 1999-2002 period than between 1995 and 1998.

The average impact (CPP/FCSm) of NSRC-Catalysis's output is with a value of 2.2 clearly above the world average (about 220%), with a clear upward trend in impact scores over the years.

3.6.2. The committee's comments and criticisms

The NRSC is a very large enterprise in itself, but is a subset of an even larger community in the shape of the internationally well-known Dutch School of Catalysis. The NRSC is well aware of its lack of corporate identity but is consciously refraining from changing the present situation. It acts as a group within the larger Dutch School for Catalysis but ensures effective communication within the NRSC group by holding annual meetings to facilitate the exchange of information at all levels, including postdoc and PhD.

The committee confirms the high international visibility of the Dutch School of Catalysis. NRSC's output is high in terms both of numbers of papers and of quality. The publication rate is increasing and the so-called crown bibliometric quality factor (CPP/FCSm) has increased by 25%, even though the field factor (FCSm) has simultaneously increased by some 15%, making it even harder to achieve such high ratings. This confirms the impression that the group has not only maintained a remarkably strong international position, but has actually considerably improved it over the initial years of the Bonus Incentive Scheme. The NRSC-Catalysis is now in a position to challenge the supremacy of the CBG concerning impact.

BIS supplies only a relatively minor part of total funding for catalysis research in the Netherlands (17%), but the fact that its funding is flexible and long-term has allowed several high risk projects to be undertaken.

The NRSC needs to assist in the creation of strong new groups focussing on biocatalysis. For this reason, it should strongly support the new activities in this field in Amsterdam and Delft. With regard to the question of attracting a top level

biocatalyst, the NRC argues that the commitments from the universities seem at present to be insufficient to attract a top level group.

The umbrella committee advises the NRC to stimulate the growth of biocatalyst expertise in the Netherlands, for example in questions of succession.

The NRC is undertaking new projects focussing theory-experiment interaction on the achievement of a better understanding of certain oxidation enzymes, such as monooxygenase, for converting methane directly into methanol – a holy grail of catalysis. In addition, the group is ensuring a high degree of flexibility and dynamism by setting aside substantial funding (7.5% increasing to 20%) for open competition within the NRSC aimed at the exploration of new ideas emerging during projects.

One point of concern is the development of a long-term strategy.

- The leadership of the NRSC had not given much thought to what should happen when the Bonus Incentive Scheme comes to an end. The committee advises the groups to develop a strategy for the imbedding of the NRC after the end of the ten-year funding period.

In conclusion, the NRSC is a highly successful and well-run organisation, which benefits from BIS funding and is utilising it to the best possible effect.

Appendix A

Members of the umbrella committee

Umbrella Committee for the Midterm Evaluation of the Bonus Incentive Scheme 2003

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Appendix B : Members of the Peer Review Committees

CBG

- ❑ D. Huylebroeck, (chairman) (CELGEN), Laboratory for Molecular Biology, Leuven, Belgium;
- ❑ S.C. West, ICRF Clare Hall Laboratories, South Mimms, Hertfordshire, UK;
- ❑ A. Wittinghofer, Max Planck Institute, Germany;
- ❑ M. Yaniv, Oncogenic Viruses Unit, Pasteur Institute, France;
- ❑ N. Hastie, MRC, Human Genetics Unit, Western General Hospital, UK;
- ❑ N.G. Copeland, NCI Frederick Cancer Research and Development Center, USA.

COBRA

- ❑ P. Wyder (chairman), CNRS, Grenoble, France;
- ❑ J. Buus, Aston University, Birmingham, UK;
- ❑ E. Calleja Pardo, ETSI Telecommunication, Valencia, Spain;
- ❑ J. Capmany, ETSI Telecommunication, Valencia, Spain;
- ❑ W. Leeb, University of Technology, Vienna, Austria;
- ❑ P. Mégret, Polytechnics Faculty, University of Mons, Belgium;
- ❑ W. Sohler, University of Paderborn, Germany.

ISES

- ❑ A.G. Green, (chairman), ETH Zurich, Switzerland;
- ❑ E. Banda, ESF Strasbourg, France;
- ❑ J-P. Brun, University of Rennes, France;
- ❑ R.G. Gabrielsen, NRC, Oslo, Norway;
- ❑ J. Negendank, GeoForschungsZentrum Potsdam, Germany;
- ❑ B. Rasmussen, Norsk-Hydro, Norway;
- ❑ R. Rummel, Technical University of Munich, Germany;
- ❑ S. Stein, Northwestern University, USA.;
- ❑ P. Stoffa, University of Texas at Austin, USA.;
- ❑ I.D.R. Percival, Shell International, The Hague, The Netherlands.

MSC

- ❑ F.C. De Schrijver (chairman), Catholic University Leuven, Belgium;
- ❑ M.I. Baskes, Los Alamos National Laboratory, USA;
- ❑ B. Batlogg, ETH Zurich, Switzerland;
- ❑ P. Fulde, Max Planck Institute for Physics of Complex Systems, Dresden, Germany;
- ❑ R.H. Friend, University of Cambridge, UK;
- ❑ E.J. Kramer, University of California at Santa Barbara, USA;
- ❑ R.J.M. Nolte, Catholic University of Nijmegen, The Netherlands;
- ❑ R.J. Silbey, Massachusetts Institute of Technology, USA;
- ❑ H. Vogel, the Swiss Federal Institute of Technology of Lausanne, EPFL, Switzerland.

NOVA

- J.N. Bahcall (chairman), Institute of Advanced Studies, Princeton, USA;
- R. Ekers, Australian Telescope National Facility, Epping, Australia;
- K.C. Freeman, Australian National University, Canberra, Australia;
- M.J. Rees, IoA, Cambridge, UK
- F. Shu, National Tsing Hua University, Taiwan;
- R. Sunyaev, MPA, Max-Planck-Institute for Astrophysics, Garching, Germany;

NSCR Catalysis

- J. Meurig Thomas (chairman), Royal Institution, London;
- H. Alper, University of Ottawa, Canada;
- F. Schüth, Max Planck Society, Mülheim an der Ruhr, Germany;
- M. Lok, Billingham Nitrogen Manufacturing Plant, UK;
- J-E. Bäckvall, Stockholm University, Dept. of Organic Chemistry, Sweden;
- J.P. Sauvage, University Louis Pasteur Strasbourg, France;
- R. Raval, University of Liverpool UK.