

# **Evaluation of Leading Research Schools 2009 - 2010**

**Advisory report to the Minister of Education, Culture and Science of the  
Netherlands**

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# Executive Summary

This report provides the outcome of the evaluation of the six Leading Research Schools carried out by an international Umbrella Committee.

The umbrella review committee, charged with a ranking of the Schools, met on June 13-15. The committee, having received the self-evaluation documents of the six Leading Research Schools, the reports of the respective Peer Review Committees and an extensive bibliometric analysis, also interacted with delegations from each of the schools.

On the basis of the information gathered and after ample consideration, the committee decided to restrict the ranking to two levels: 'exemplary' and 'excellent'. The schools NOVA and Zernike were placed at the first level; the remaining four schools at the second level. The main findings of the committee, including those on the consequences of termination of the Bonus Incentive Scheme (BIS)-funding, are summarized below.

## Exemplary schools (unranked within category)

**NOVA** has used the BIS-funds to create a coherent and compelling programme, allowing the Dutch astronomy community to maintain and enhance its already excellent international standing. The school was also instrumental in rejuvenating the leadership of the astronomical community. The implementation of a new and ambitious instrumentation programme deserves special praise. A key aspect of the strategy for instrument development is to attain PI status in future instrumentation programmes such as the E-ELT. Given the long-term nature of astronomy projects, such an activity is in need of stable, long-term funding.

The **Zernike Institute** belongs to the top ten interdisciplinary materials research centres world-wide. The BIS-funding has been used to create an exemplary environment at the interface of chemistry, biology and physics, that initiates, encourages and rewards collaboration and excellence in research and education, including that of emerging leaders of materials science. The Zernike Institute also has a vision for the future that is both ambitious and transformative.

## Excellent schools (unranked within category)

The **Centre for Biomedical Research (CBG)** supports world-class research in cancer and genetics. The team has made excellent use of BIS-funding for the rapid implementation of new technologies crucial to the success of multiple researchers. As biomedical research is being revolutionized by the introduction of new techniques in genomics and computational biology, strategic funding through BIS (or another vehicle) is essential to remain internationally competitive and to permit Netherlands researchers to participate in large international projects. This type of rapid and flexible strategic funding is essential in order to remain internationally competitive. CBG should remain open to the recruitment of leading scientists from outside as well as inside the Netherlands.

**COBRA** has utilized BIS-funding to establish a consolidated activity of international standing within the Netherlands. In particular, it has been possible to put in place world class/leading technological capabilities for integrated photonics. It will be of importance for research in this field in the Netherlands that these specialist facilities can be maintained and appropriately refreshed into the future.

**ISES** has used BIS-funding very effectively to create a coherent, multidisciplinary geoscience program, has leveraged this funding to take European-wide initiatives, and maintained its leadership worldwide in integrated solid earth science. It is urgent that ISES prepares for the upcoming retirement of the leadership and replaces current leaders with scientists of comparable world-class reputation.

**NRSCC** rejuvenated the Dutch field of catalysis by combining heterogeneous catalysis with molecular, biochemical and supramolecular catalysis, thus enhancing its already high international profile. It applied the BIS-funding successfully by integrating in the school a large number of groups, changing over time in composition, from eight universities. Its organization has become a role model in several foreign countries.

# 1 Introduction

**In 1998, in response to recommendations by NWO, the Minister of Education, Culture and Science awarded six research schools funding under a special bonus incentive scheme (BIS). The key objective of the scheme is to raise the international profile of the research conducted in the existing system of research schools.**

The bonus incentive scheme has identified and fostered national focuses of excellence in scientific research at research schools. They were expected to compare favourably with leading institutes in other countries working in related fields at the outset (1999), as well as having the potential to develop further into world-class research centres.

The bonus incentive was intended to cover a period up to 2013, with an interim evaluation planned for the fifth year and a full evaluation in 2009-2010. The recommendation to emerge from the interim evaluation in 2003 was that funding for all the six research schools should be continued.

The current evaluation should show to what extent the research schools have managed to build their international reputation, drawing on the talents of their researchers and the strength of the research programme, and using the resources allocated to them in the period under review. It should summarise the results achieved over that period and forecast what we can expect to see in the next five years. To summarise, therefore, the objective of the evaluation is to establish to what extent the research schools have succeeded in achieving the objectives of the incentive bonus scheme.

## 2 Procedure of the Evaluation

### The overall procedure

NWO has set up an international umbrella committee to perform an independent external evaluation of the six leading research schools. The committee will advise the NWO Governing Board about leading research schools. The Governing Board will then advise the Minister of Education, Culture and Science.

To prepare for the external evaluation, each research school has performed a self-evaluation. An international peer review organised by each of the leading research schools is conducted. The members of the peer review committee were selected by the research school.

For the overall evaluation, NWO has in addition commissioned a bibliometric analysis by the Centre for Science and Technology Studies (Leiden). The outcome of this analysis was sent to the leading research schools for their comments.

The self-evaluation documents, including the reports of the peer review committees, the bibliometric analysis and the research schools' responses were submitted to the umbrella committee. Subsequently, the committee held interviews with delegations from the six research schools.

For a detailed description of the procedure see Appendix 2.

### The Umbrella Committee

The umbrella committee consisted of seven members: an international expert in each of the six research fields of the research schools to be evaluated, and a chairman (see Appendix 1). Prior to the meeting, which took place on June 13-15<sup>th</sup> 2010, the committee received the following documentation:

- the self-evaluation documents of the six schools
- the six reports of the Peer Review committees of the schools
- the bibliometric analysis of the publication output of the schools
- the response of the schools to the findings in the bibliometric analysis.

Further input for the evaluation was provided by a discussion of the committee with a representative from the Center for Science and Technology Studies, which performed the bibliometric analysis; and by one-hour interviews by the committee with a delegation from each of the schools. The six interviews were conducted separately with each school; each interview consisted of a 15-minute presentation by the school followed by 45 minutes discussion with the committee.

The charge given to the committee was to arrive at a ranking of the six schools. Before the interviews, the committee agreed on a preliminary system to perform a fully quantitative ranking, while it also agreed on a number of generic questions to be asked to the schools, including one concerning the consequences for possible discontinuation of the BIS-funding.

The Terms of Reference for the umbrella committee may be found in Appendix 3.

## 3 Findings of the 'Umbrella Committee'

### 3.1 General Findings

The overall judgement of the committee on the research schools is that in all six cases the BIS-funding has been put to excellent use. Although the schools are quite different, in all cases the benefits of the BIS-funding are: greatly improved collaboration and focus on the national scale, the establishment of cutting-edge infrastructures, as well as considerably enhanced international visibility and impact in the fields selected. The BIS-funding has led to agility and flexibility for the schools both in the area of personnel and in that of equipment, which allowed them to react to and rapidly gain expertise in new developments in their fields. The schools have – to varying degree- become dependent on the BIS funding; the committee noted that –maybe not surprisingly- none of the schools appears to have developed a credible policy for adapting to the situation once BIS-funding would end. Based on the success of the BIS so far, the committee is of the opinion that it remains important for The Netherlands to maintain a scheme of this nature in order to create world-leading centers in selected areas with high potential.

The committee observed that the expert peer review panel for each School has assessed their research performance judged against international standards to be excellent. Thanks to the membership of one expert in each field, the committee was able to validate these judgements, while the broad mix of expertise allowed further evaluation in the context of a truly wide research landscape.

Having held the six interviews, the committee came to the conclusion that the initially agreed system for ranking was unsatisfactory. After considerable discussion, including consideration of several alternate systems, it was decided to restrict the ranking to two levels: "exemplary" and "excellent". **Two of the schools, Nova and Zernike, were judged to be exemplary in the way they fulfilled the objectives of the BIS funding. The remaining four schools were placed at the second level, without further differentiation.** They were indeed all four considered excellent. The areas of reservation or concern identified by the committee, which formed the basis for placing them at this level, were widely different in nature. Therefore differentiation within the level "excellent" was deemed to be not feasible; it would moreover not have done justice to the excellent performance in most other areas.

### 3.2 Findings per Research School

#### 3.2.1 NOVA

The Nova Programme encompasses all Netherlands astronomy and is exemplary in meeting the objectives of the bonus incentive scheme. Netherlands astronomers have come together to develop and implement a coherent and compelling programme which will ensure that they maintain and enhance their already excellent international standing. The leadership of Netherlands astronomy has been rejuvenated by the strategic appointment of young people in the three collaborative network programmes, each of which plays to the strengths of Netherlands astronomy. Special mention should be made of the effective use of BIS-funds to implement a new optical/IR instrumentation programme. Excellent new instruments

have already been built and commissioned for major space and ground-based telescopes, and a development programme has been implemented to optimise the opportunities for securing a PI role for one E-ELT instruments, as well as co-investigator status in others. These initiatives will ensure access to the leading future facilities for Netherlands astronomers. It is noteworthy that the investments in the instrumentation programme have leveraged very significant additional funds which add considerable value to the programme. In addition, the NOVA programme provides the natural foundation for a national home-base for the coordination of Netherlands involvement in all aspects of ESO science and instrumentation. The NOVA programme has enabled the astronomers to develop an innovative and wholly convincing long-term strategy for future health and leadership role of Netherlands astronomy.

*Termination of BIS funding for NOVA would be felt most severely in the instrumentation programme which would effectively be terminated. The Netherlands could no longer aspire to be PIs of major astronomical instrumentation projects. It is clear that such a national home-base programme requires and deserves stable, long-term funding, for which the funding agencies should find an appropriate solution*

### **3.2.2 Zernike Institute**

The Zernike Institute has effectively utilized BIS funding to establish itself as one of the top ten interdisciplinary materials research centers world-wide. The many original scientific discoveries of the center, such as the rational design of mechano-sensitive membrane bound pores, chemically synthesized molecular motors, and multiferroicity, have produced a number of important high-impact publications and have received a great deal of attention world-wide. The leadership of the center have created and maintained an exemplary environment that initiates, encourages and rewards collaboration and excellence in research and education at the interface of chemistry, biology, and physics. The integrated research and educational strategies of the center, which have built upon the strong interdisciplinary traditions of Groningen, have been extremely effective in educating and training emerging leaders of materials science, several of whom have moved to leading active research programmes world-wide. The Zernike Institute's future vision is both ambitious and transformative, incorporating such topics as functional hybrid materials, self-repairing materials, and functional hybrid materials. Fortunately, The Zernike Institute with its excellent leadership, and collaborative culture and outstanding staff, faculty and students is in an excellent if not unique position to tackle these exciting challenges, and thereby to further raise its international profile and firmly establish itself among the top few international interdisciplinary materials research centers.

*The consequence of termination of funding to the Zernike Institute could seriously hamper the strategic development of promising new research collaborations in internationally important interdisciplinary areas of materials science, as well as the rate of progress on important strategic areas already being pursued.*

### **3.2.3 CBG**

The CBG is a world class center for biomedical research. The leading investigators and leading institutions are recognized throughout the world for the quality and impact of their research. The CBG has used BIS funding to create a reservoir of discretionary funds to allow them to implement new research technologies and recruit talented researchers in a rapid manner that is not possible under normal circumstances. Highlights include their continued success in developing core technologies (microarrays, massively parallel DNA sequencing) and recruiting very



high quality investigators in proteomics, etc. Importantly, their use of BIS funds has brought in research strengths that are not limited to a single researcher but contribute significantly to enhancing their fuller research community. The CBG's ability to use BIS funds rapidly and in strategically important directions has allowed them to advance their research projects quickly and thus maintain a competitive edge with the rest of the world. The CBG has used BIS funds in a strategically wise and successful manner. The CBG would even be further strengthened by continued access to state-of-the-art systems in this rapidly moving field. The group should also ensure a cohesive management and access of this data production cores and remain open to the recruitment of leading scientists from outside as well as inside the Netherlands.

*Given that many of the most successful laboratories in the world do have access to strategic discretionary funds, the loss of BIS will constitute a competitive disadvantage to biomedical research in The Netherlands. It will not halt the progress but will slow it down, especially by negatively affecting the ability to recruit top researchers and trainees.*

#### **3.2.4 COBRA**

COBRA/NRC Photonics, through BIS funding, has established itself as a significant player on the world stage in the field of photonics and optical communications. A key enabler for this has been the ability to put in place a leading capability in photonic integration which is up with the best in the world and world class results are being achieved in several areas. Some truly excellent people have been attracted to participate in COBRA and some outstanding 'world first' results have been achieved in all areas where COBRA operates, from technology through to system level innovations. This has resulted in publications being produced in high impact journals and at leading specialist conferences. Of particular note here is that post-deadline paper publication in certain conferences such as OFC and ECOC is of particular importance in this research community and COBRA has a high presence in this respect – perhaps more so than is indicated by conventional bibliometric analysis of ISI journal papers. Concerning the future there is a clear and convincing view presented by COBRA of the required future developments for the technology capabilities and what these will enable in terms of technology research. At the higher levels, closer to systems-related research activities, the distinctiveness of the COBRA research agenda seems to be less sharply defined.

*Considering that COBRA relies more heavily than most of the other schools on BIS funding, termination of that funding would have serious impact, in particular on the possibilities to keep the equipment up to date. However, given the nature of the field and the stature of COBRA, increased support from industry could help mitigate the problem.*

#### **3.2.5 ISES**

ISES is \*the\* leading group in Europe in integrated solid earth science, and has a reputation of excellence in the US as well. Their published output has grown with BIS funding and competes well with the best groups of this kind in Europe and in the US (we note that the citation comparisons may be affected by the much larger research efforts in the climate science community). Several developments - such as the astronomical time scale, the connection between geodynamics and climate, and the stress map - are likely to set the pace for future research.

ISES has effectively used BIS funding as a catalyst for European-wide research programs that have generated extra funding. Nevertheless, BIS forms a uncommonly large part of the funding for this group. Upon their retirement, ISES

should make sure the current leadership is replaced by equally world-class scientists.

*The infrastructure that has been created with BIS funding will certainly continue even without this financial incentive. However, it will be more difficult for ISES to maintain its leading role in a number of European and national projects for which it took the initiative, and for which it is leveraging BIS funds.*

### **3.2.6 NRSCC**

The BIS has allowed the NRSCC to rejuvenate the Dutch field of catalysis by combining heterogeneous catalysis and reaction engineering with molecular, biochemical and supramolecular catalysis and strengthen its international position. The school encompasses a large number of groups from eight universities. Careful management allowed the school to create and keep a coherent research programme of high international quality. The BIS funding has helped to attract foreign faculty members to The Netherlands and has played a pivotal role in the integration of the different groups in the school. The organisation of the school has become a role model in several foreign countries. The output of the NRSCC is on a level that is high for international standards and several group leaders have achieved outstanding international visibility.

*An eventual termination of BIS funding would not make it easy to keep a coherent programme and to consider further integration of other groups such as photochemistry and electrocatalysis. This would not only lead to an international disadvantage but also to a national weakening of a field that is of prime importance for solving the problems of the future such as energy and renewable resources.*

## 4 Appendices

### 4.1 Appendix 1: Members of the umbrella committee

#### **Umbrella Committee for the Evaluation of the Bonus Incentive Scheme 2009-2010**

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### 4.2 Appendix 2: Protocol Evaluation Leading Research Schools 2009-2010

### 4.3 Appendix 3: Terms of Reference for the umbrella committee